Reconstructing the Past

Revised Estimates of Italy's Product, 1861–1913

Stefano Fenoaltea

Fondazione Luigi Einaudi onlus

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Economists consider historical measurement mere "data-gathering," suitably farmed out to apprentices. The reconstruction of an economy's past is more nearly akin to the restoration of an ancient temple or a medieval cathedral, subtle, challenging work that requires a panoply of skills, a familiarity with the surviving evidence, and an intuition that can be acquired only through experience. This book discusses the requisite methodology – a methodology that does not inform the extant world-wide corpus of historical national accounts, which scream to be recast – and revises, yet again, the estimates for Italy's economy from Unification to the Great War. The new time series remove serious distortions, notably in the estimates for the services, and incorporate the fruits of recent research.

Stefano Fenoaltea obtained his Ph.D. in economics at Harvard University. He taught for over thirty years in the United States, and then for near twenty more in Italy; he is now a Fellow of the Fondazione Luigi Einaudi in Turin. He is best known for his early contributions to the economics of institutions (ancient and modern slavery, medieval agriculture), and for his life-long quantitative reconstructions, and reinterpretations, of Italy's economy from Unification to the Great War. He has been a member of the Institute for Advanced Study, a Guggenheim Fellow, and a consultant to the Istituto centrale di statistica and to the Bank of Italy; he is listed in *Who's Who in the World*.

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First published July 2020

DTP and book design: Ibidem, www.ibidemstudio.it

Cover design: Valeria Duò

Cover image: *Temple ruins, Selinunte*. Photograph by Giovanni Crupi (1859–1925)

ISBN 978-88-32139-02-0

This book is available, open-access, on the publisher's website.

Per Emma

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Dulce et decorum est pro patria mensurare.
Roman saying, ca. MMDCCLXX a.u.c.

What you cannot as you would achieve,
You must perforce accomplish as you may.
William Shakespeare, *Titus Andronicus*

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NB: the time series are often illustrated with a logarithmic vertical scale. In such cases equal vertical displacements imply equal relative movements, and equal slopes imply equal growth rates.

PREFACE

This book is a *summa* of what I have learned over decades devoted to reconstructing the past. The immediate object of my attention is the Italian economy from Unification (1861) to the eve of the Great War (1913), and correspondingly specific; but the method evolved to reconstruct the past from limited sources is of general import.

The early chapters of this work are accordingly devoted to that method: to assist others who would also reconstruct the past, to allow all to evaluate the extant reconstructions. The world-wide corpus of historical national accounts seems tragically uninformed by due reflection on what our sources actually are, and on what we should do with them: what is presented here is also a *summa contra cliomensores*.

The later chapters of this volume present my latest, revised estimates for the economy, and time period, at hand.[1]

The present effort owes much to the advice and encouragement of Alberto Baffigi, of the Bank of Italy, and Giovanni Vecchi, of the

[1] These are a *reprise* of three recent papers amending the estimates of the production side of the historical national accounts, of the expenditure side, and of the composition of investment (Fenoaltea 2017, 2018a, 2018b). The time series presented there have been further revised: they now incorporate the recently completed estimates for the leather industry (*IIPH*), some minor improvements, and also a small number of *pentimenti* (most of them related to the treatment of maintenance, to which I had not devoted adequate thought). The now standard author-date reference format is ill-suited to the citation of public documents, serials, or multi-part works; for the latter I have preferred short titles or acronyms ("*IIPH*"), entered as such in the bibliography.

University of Rome "Tor Vergata." I am no longer at Tor Vergata, but frequently at the Bank, and Alberto in particular has been generous with his time, willingly discussing everything from the minutiae of an algorithm to high epistemology. Giovanni and Brian A'Hearn, of Oxford University, annotated in detail my chapters on method; helpful comments were also received from Alfredo Gigliobianco and Paolo Piselli, also of the Bank of Italy, from Aurora Iannello, Fiorenzo Mornati, Lisa Sella, and Pietro Terna of the University of Turin, from Christopher Hanes of SUNY-Binghamton, from Oddný Helgadóttir of the Copenhagen Business School, from Giuseppe Tattara of the University of Venice (emeritus), and from the participants at seminars at the Fondazione Luigi Einaudi (Turin), the Università Politecnica delle Marche (Ancona), the Scuola Superiore Sant'Anna (Pisa), and the Bank of Italy. I thank them all – equally, for all labored in the vineyard – *et omnes absolvo a peccatis meis.*

I am also most grateful to the Fondazione Luigi Einaudi in Turin for publishing this book, to the members of its staff who smoothed its production, and in particular to Roberto Marchionatti, chairman of the Foundation's Scientific Committee.

Over the last half century both the Bank of Italy and the now Istituto nazionale di statistica have much aided my research, not least by putting their sources and facilities at my disposal; without the generous assistance of their libraries' staff my work would have been materially delayed. To both institutions, to the kind people who cheerfully met my often exceptional needs, again, my heartfelt thanks.

Some parts of this book appeared in earlier work, notably Fenoaltea (2010), © Associazione Paolo Sylos Labini, and Fenoaltea (2019a), © Fondazione Luigi Einaudi; they are reproduced here by permission.

The cover photograph is of course a metaphor for the sources available to those of us who would reconstruct the past. Alberto Baffigi used part of it for his own recent book (Baffigi 2015); my cover sincerely flatters his.

Special thanks are due Lucrezia Bruna Fenoaltea Pièche: for comments, suggestions, sound advice, and – not least – for Emma.

I

INTRODUCTION: RECONSTRUCTING THE PAST

1

ECONOMICS, ECONOMIC HISTORY, AND THE "DATA"

1.1 The scientization of economics

This work presents estimates of Italy's product from Unification to the Great War: revised estimates, but still only interim estimates, compiled to be superseded. To explain why and how that is so, one must perforce begin with an intellectual history, and a *discours de la méthode*.

The discipline we call economics was born in Europe. By the early twentieth century economics was felt to comprise three essential strands, indissolubly linked: economic theory, economic history, and the history of economic thought. These were the core disciplines in the university training of economists, as it was then structured; a Luigi Einaudi, an Eli Heckscher, a Joseph Schumpeter moved seamlessly across all three.

Economics, so structured, so taught, was clearly not considered a "science": a medical doctor, for example, is considered fully trained even with no exposure to the history of medicine (Hippocratic humors) or to the history of medical problems (the Great Plague). Economics studied not the natural world but human behavior and institutions; it was clearly seen as more subtle, more complex, more political, *à tout prendre*, than a science. To use the language of our own day, economics was seen as a non-linear, multi-layered discourse that could not be understood by hearing only its most recent lines. To master economics, the logic ran, one has to understand how and why it has come to contain what it does, understand the problems that engaged past economists, the economic problems of their day, what to us is economic history; and to understand economic history, by the same token, one has to master economics.

The first half of the twentieth century was marked by a number of related changes. First and most broadly, the two World Wars Europe inflicted upon itself stripped it of its former hegemony, which passed to the United States, in cultural matters as in others. American graduate programs in economics used to mimic European models; now the reverse is true.

The Americanization of economics was not without consequence, for America has its quirks. Culture is not there highly regarded, it seems to be considered more a feminine adornment than stuff for real men.[1] America instead worships science, only America could spawn a Church of Scientology. In Europe the élite schools educated, the bright kids did classics, the scientific program was for second-raters; in America schools train, the scientific program carries the highest prestige.

We all value prestige; American economics, *quā* American, morphed into a "social science" (a poor oxymoron to anyone with any *nous*, but now, like the dollar, international currency). The triad that composed economics was quickly dissolved: economic history and the history of economic thought were demoted from the core curriculum to fringe specializations, the histories of economic thought recast, impoverished, as the development of context-free abstract reasoning.[2] The discipline attributed to itself the cumulative nature of the (true) sciences: leading economists have been heard to brag that they have their students read nothing over three years old, in the early 1960s I myself heard Paul Samuelson declare that "any graduate student today is a better economist than Keynes." Economics became culture-less, and lost its sense of what it is.[3]

[1] When my then Department chairman at Duke University described his family's European visit he noted that they had abandoned the slow-moving guided tours, and boasted "We had done four cathedrals before breakfast!"

[2] To my mind one cannot understand the theory of international trade if one does not understand Ricardo. Ricardo is now portrayed as "the first abstract economist"; I see him as a thinker fully engaged in the political struggles and economic controversies of his day, and his *Principles* as a tract against the Corn Laws and the landed aristocracy that imposed them. His "model of trade" attacks tariffs in general with a carpet of dumb bombs; the smart bomb precision-guided to his target was his "model of growth" (a stealth characterization, to push the metaphor); see Fenoaltea 2011a, pp. 152–165, 252–257, 265–272.

[3] A telling episode is the discipline's reaction to the "prisoner's dilemma," greeted as a novel challenge to our faith in the "invisible hand." As far as I could tell from

Between the wars, too, the developed world suffered the Great Depression: a challenge to the orthodox economic theory of the day, which could not begin to explain it. The well-known outcome was of course the Keynesian revolution, the commitment to maintain full employment (even in peacetime), the development of "national accounts" (and their continuous updating by the appropriate public Bureau) to diagnose the path of the economy and inform anticyclical intervention; on all this more below. A possible side effect was that the employment problem captured the attention of the profession, which with bigger fish to fry set economic history aside; and the void was filled by historians with no grasp of economics at all, even the best of whom penned interpretations no economist could accept. Whatever the reason, between the wars economic history became ever more history, ever less economics; the throwaway distinction between "economic historians" and "competent economists" by Lionel Robbins (1939, p. 9) was harsh but not unjustified.

That of course set the stage for the *reconquista*, the recovery of economic history by competent economists, the recovery specifically of the principle that economic historians must use the tools provided by up-to-date economic theory (Einaudi 1936a, p. 158). As we know, it happened first in the United States (and struggled to cross the Atlantic, overcoming only with difficulty the entrenched opposition of Departments of economic history, non-existent or

the early literature nobody pointed out that contemporary economists alone were ignorant of the issue, and of the solution (norms, ethical or legal, in the specific case at hand the "honor code" of *omertà*, and the certainty that if you confess to anything at all your family will be exterminated). The lesson of the "prisoner's dilemma" was common knowledge, and considered generally valid, from time immemorial; economics traces its tap-root to the physiocratic intuition that in certain ("economic") walks of life self-interested behavior need *not* be collectively maleficent (at least under certain conditions that have since been explored, e.g., free and informed consent, sufficient competition, ethical restraint on the abuse of asymmetric information, *und so weiter*), and that regulation is then unnecessary if not harmful. In fact, the non-cooperative full-punishment-for-both-prisoners solution is clearly suboptimal for the prisoners themselves, but presumably optimal for society at large; and economics had taught at least since *The Wealth of Nations* that if firms pursued their immediate private advantage – if they competed, instead of colluding and sharing monopoly profits – they would damage each other and finally themselves, but generate better results for society as a whole.

virtually so in North America). It need not have – European economists could well have revived their own earlier tradition – but it did; and the "new" economic history that emerged owed and owes much to postwar American economics.

With a proto-Trumpian sense of subtlety, culture, and decorum the "new" economic history trumpeted its innovative "scientific" method, the construction of models and explicit counterfacts, the testing of hypotheses against the data. It provoked initial opposition, much of it directed at Robert Fogel's startling (and clearly wrong) claim that the railroads' contribution to America's economic growth was "not important"; but it was ineffective opposition, the obtuse complaint that counterfactuals are unhistorical (as if any statement that *a* affected *b* does not rely on one, at least implicitly), that economists' models are "too simple" (as if simplicity were not in itself a virtue that commands assent, and *excessive* simplicity were not to be determined case-by-case, depending on the model's use and purpose).[4] Brash enthusiasm met incompetence, a swift triumph was foregone.

I was in the United States, working on a doctorate in economics, when the "new" economic history burst upon the scene; I was present at the creation, I was born, as it were, a "new" economic historian. With my European background (and the cultural snobbery of the classically educated) I would as lief be called a hog farmer as a scientist; nor do I set particular store by quantification, let alone the econometric "testing" of hypotheses, called for in

[4] The *human* mind, every last one of us, is convinced by the simplest possible explanation: think of the fellow who discards the complex set of hypotheses that supposedly explain his wife's repeated tardiness in returning home from work in favor of the single, powerful hypothesis that she is seeing somebody else. The complaint of unrealistic oversimplification was made *ad personas*, nobody extended it to the astronomers who model our entire world as a mere point with mass. Fogel played on the confusion of importance with necessity rather than sufficiency, arguing that Brutus (Cassius) was "not important" to Caesar's death because Cassius (Brutus) would have killed him anyway. He pretended to calculate the railways' marginal product, the extra output ("social saving") they allowed, as an economist would; but when we measure a factor's marginal product we do *not* contemplate substitution, if we did the marginal product of (homogeneous) labor would be identically zero (see Fenoaltea 2011a, pp. 168–169, and references therein). The early confusion between the differential and scarcity components of the rent of land comes to mind.

some cases but not in others.[5] The "new" economic history soon earned the sobriquet "cliometrics," but that was merely a joke that stuck, a name accepted perhaps because it played on the prestige of *Econometrica*, but not meant to capture the essence of the discipline. That essence, to my mind, is the return to economic history of competence in economics, and that alone. I do not believe much, but I do believe that without such competence one cannot hope to understand the economic past – just as one cannot hope to understand the past history of disease, say, if one is not versed in epidemiology, no more, no less. I see economic theory as the mistress of the cliometric household, quantification and econometrics as mere servants, to be summoned as needed.[6]

1.2 Economics, measurement, and "data"

For all that, of course, the application of economics to real-world problems remains a naturally quantitative exercise, never more so than in the context of the present effort, the reconstruction of past economic growth. A hundred years ago, the aspiration of the profession to empirical relevance led to the creation, at Harvard, of

[5] Testing hypotheses is like skinning cats, the econometric way is not the only one. The hypothesis that gravity bends light was verified by taking advantage of a solar eclipse to observe a star (angularly near the sun) where we knew it wasn't: the theory correctly predicted that what we observed was not a fact at all. My own model of slave management correctly predicted that the observations in the secondary sources which contradicted it misrepresented the facts (Fenoaltea 1984, footnote 40).

[6] This was the shared view of the cliometric pioneers: at the 1985 meetings of the (American) Economic History Association, by then dominated by its cliometric Young Turks, the going prizes were swept by a paper that contained no algebra, no tables, and no econometrics, but for all that fully satisfied its cliometric judges because it developed an analysis only an economist could have authored. But we armed our children with econometric packages and let them loose upon the world, rather like Africa's boy soldiers; we may have done no more than ferry economic history from serious historians who were inadequate economists to serious econometricians who are inadequate historians and, in much of the work they do, sociologists/political scientists/whatever as embarrassingly amateurish as the "old" economic historians were economists. In a way, in fact, the discipline has come full circle: where ours was proudly problem-driven, that of our young is as source-driven as the historians' "old" economic history used to be.

The Review of Economic Statistics. That title contained a research program: we economists were asking ourselves what measures we wished to have, and how to construct them. Within thirty years that search was abandoned, that flag hauled down, that journal blandly renamed ("*The Review of Economics and Statistics*"): in the wake of the Keynesian revolution national and supranational bureaucracies took on the task of documenting the economy, and the profession sat back, happy enough to receive its data from an external source. At that very time (American) economics was redefining itself as a science; most sciences jealously reserve unto themselves the generation of their empirical evidence, but two do not. One is economics, the other, astrology.

The upshot was that "scientific" economics developed a schizoid attitude towards the empirical evidence. Much attention was paid to the quality of data-*processing*, to the exploration of the relationships among the numbers: econometric technique became ever more sophisticated, improving by leaps and bounds. Vanishing attention was instead paid to the quality of the data themselves. Data were simply taken as *data*, given (typically by public Bureaus), to be retrieved and uploaded (or, increasingly and even more simply, downloaded); "measurement" was viewed as no more than data *retrieval*, an activity perhaps time-consuming but quintessentially unskilled, suitably assigned to graduate students or farmed out to research assistants. We skilled economists would respect data *analysis* enough to do it ourselves, mere "data," "measurement" we would hold in contempt.

It is tempting here to return to an earlier mode of thought, to attribute personality to data and measurement, to say they resented that contempt; and that they exacted their revenge. At one point economists analyzed macroeconomic time series for the American economy going back into the nineteenth century, and found that the economy was far less stable then than it had since become. Numerous articles on "the stabilization of the American economy" quickly appeared in the leading journals; but that strand of the literature came to a sudden end. Christina Romer (1986), in the *American Economic Review*, informed the profession at large of what was, among the pioneering cliometricians, common knowledge: that the estimates for the more distant past were not comparable to the data for more recent times, that they could perhaps illuminate the longer-term movements of the American economy but certainly not its short-term variability. As Romer pointed out that early variability was much overstated, the economy's much-discussed "stabilization" never happened at all: it was "a figment of the data," data no one had bothered to validate before putting them to use.

I do not of course read astronomy journals, but somehow I cannot imagine a scholarly discussion of a newly discovered galaxy being terminated by a piece in the *Annual Review of Astronomy and Astrophysics* essentially saying, "uh, guys, hold up: we checked the original photograph, and what looked like an undiscovered galaxy was actually a reflection of the light on the newspaper boy's bicycle." In fact, nobody seems to read the journals of alien disciplines, and the economics profession washed its dirty linen in reasonable privacy; and that may sufficiently explain why economists were not laughed out of academia then and there.

But what is less easy to understand is the discipline's own reaction to what should have been a sharp lesson: a total *lack* of reaction. The discipline was entirely unfazed, it did not plunge into introspection (as anthropology did, with a different but equally damning trigger, as succinctly recalled in Fenoaltea 2019a); the general attitude was "another day, another dollar, steady as she goes, nothing to see here, move along." Nothing happened; some twenty years on Richard Easterlin (2004) would note, and eloquently lament, the low esteem in which economists (continue to) hold measurement, the reconstruction of the facts.

Economics – American, Americanized "scientific" economics – retains unchanged its cavalier attitude towards the evidence; and "scientific" economic history, *la cliométrie sa fille*, inherited that attitude in its genes. For all their emphasis on quantification, cliometricians' historical measurement is in the main unskilled work, poor work simply because it is not informed by due reflection on method; and that brings us back to methodology, to the very logic of our reconstructions of past aggregate product, to the reasons why after half a century of work the estimates I can offer are still preliminary.

1.3 On method: the economic historian's craft

The historian's craft may overreach, *this* historian's craft may be the most I can attempt to describe. In courts of law, I gather, witnesses' credentials are examined before their testimony is taken; so let me introduce my professional persona.

Economists, American and Americanized, are in the mass still wedded to naïve nineteenth-century positivism: cut off from the cultural mainstream, a lost tribe in the intellectual jungle (Fenoaltea 2019a). I am in contrast a deep skeptic, unsure of the ultimate reality of my own person (Descartes be damned), let alone that of "the real world."[7] But even apart from that I am thoroughly convinced that what we call "facts," (supposedly) observable bits of reality, do not exist at all: even granting an external reality, what we can observe is not a fact. We both saw a chicken cross the road, did it not do so, is that not a fact? I would answer no, our eyes capture only patterns of light and color: we "see" "a chicken" "cross" "a road," every word in quotes is not an observed object or action but a construct, an *interpretation* of what our eyes actually perceive. What we call *facts* are no more than agreed-upon, shared interpretations: perhaps "real" enough for practical purposes, but only within a shared set of expectations, *culture-bound* expectations. "Facts," and *a fortiori evidence* of facts, are very slippery stuff.[8]

Past facts are a will o' the wisp, I cannot write history *wie es eigentlich gewesen ist*. All I can do is tell a story, whether in numbers or in words matters little; what matters is that I want to tell a *good* story. In Italian, as in French and German, the distinction between history and literature is merely that between *la storia* (*the* story, history) and *una storia* (*a* story, literature). Literature does not care to be "true" (and allows limited suspensions of disbelief, as with talking animals in fables or satire), history would like to be

[7] I do know that the possibly imaginary world I perceive is characterized by consistency, by predictability (the bedside book that was there when I fell asleep was again there when I woke up, *les autres* that appear to me maintain their characteristics from appearance to appearance); and so I behave as if my world were real enough for practical purposes, as if there were such a thing as *the* world. If observed, I presumably appear, so to speak, perfectly normal: my skepticism would seem to be a private matter, a hidden hairshirt.

[8] That someone who doesn't believe in facts should turn to writing *history* may seem odd, but in my case the explanation is simple enough. I see myself first and foremost as a writer, but one denied the wit to create literature, to invent a world out of whole cloth, in fact a wannabe, a mere wordsmith; forced by my own limitations to borrow my story line, I take it from the past.

"true" but cannot be; neither is *vera*, but both can be, and to be any good must be, believable, *verisimilar*. My (hi)story will be good if it *rings* true (at least to those with a mind-set similar to mine), no more can be asked of it; the historian's craft is worlds away from the scientist's, "scientific history" is an oxymoron that proclaims, again, a lack of education, a lack of (contemporary) culture.

For a (hi)story to "ring true" it must not clash with our strong beliefs; and I have two. I believe in the power of human logic, in our capacity for error-free deduction (Descartes be blessed); and I believe in the human aversion to work, to effort, to "the sweat of our brows." The one allows us to develop the ineluctable implications of the other: the discipline that does so, that investigates what we call "rational choice" (as if it could be anything else) is what we call "economics."[9] And that is why I see the recovery of competence in economic theory as the defining feature of the "cliometric" approach, why I see myself as a cliometrician, whether or not the problem I am addressing requires quantification; why I find no value in the "economic histories" that make no *economic* sense, the stories that are simply *not* possible if we believe, as I do, in the validity of human logic, and in the human aversion to effort.

To ring true as *economic* history, in short, my story must be good economics. To ring true as economic *history*, quite analogously, it must be good history, it must sit well with "the facts." As noted, however, our cliometric *vulgata* glorifies "interpretation," the elucidation of the relationships among the facts, and reduces the elucidation of the facts themselves to "measurement," seen as the simple process of setting a yardstick next to an observed object, seen as only a simple-minded nineteenth-century positivist (or contemporary economist) could see it.

Whether or not we can "observe" the present, we certainly cannot observe the past, for it is *gone*; all we can observe are the traces it left behind.[10] The quantitative traces ("data") of particular

[9] It follows that economics is relevant wherever choices have to be made, if only because the day is not infinitely long: those who consider our discipline relevant only to modern market economies utterly misapprehend it.

[10] I am reminded here of a book I had, that taught the reader to recognize the presence of unseen wildlife from their droppings. The title that sticks in my mind sounds like *Birds of North America*, but I know it wasn't that.

interest to us are themselves not ("scientific") observations, but constructs – typically byproducts of other, and usually fiscal, public concerns – that must be deconstructed if their relation to the "facts" that interest us is to be understood at all. We cannot observe past objects, our sources reveal only their shadows, to reconstruct a shape from its shadows we must pinpoint the sources of light; to understand the data in the sources we must understand how, by whom, and to what purpose they were produced, we must learn to read our quantitative sources, or rather to read *through* them. This is the historian's stock-in-trade, but not even a glimmer in today's economists' mind's eye. That our quantitative sources present numbers clearly labeled in our native language, numbers that positively invite us to take them at face value, is a trap, a trap for beginners, a trap for *naïfs*: a trap a trained economic *historian* should readily recognize and avoid, a trap that should never have become a trap for our entire profession.[11]

What we call "measurement" is in fact a work of interpretation, no less than what we call "interpretation"; we quantitative historians cannot measure the past, we must interpret the sources to reconstruct it. And *this* interpretation is far more difficult than the subsequent "analysis," for three sufficient reasons. One is that it is not directly constrained, and thus facilitated, by codified (economic) theory and (econometric) technique; it is correspondingly the work not of fungible "scientists" but of non-fungible artisans, no two of whom will obtain the very same results from the very same materials.[12] Another

[11] Thus for example the long literature that takes Italy's industrial employment in 1911 directly from the "employment" data in that year's industrial census, never cottoning to what that census actually contains; see Fenoaltea (2015a, 2016) and references therein. The root problem is of course the profession's belief that "data" are merely to be collected, the lack of any sense that proper "measurement" requires that the sources be approached with suitable training, the sort of training doctoral programs in history provide as a matter of course. To the best of my knowledge the only graduate students in economics ever exposed to a formal course in "reconstructing the past" were those who took my course by that name at the Collegio Carlo Alberto in 2014.

[12] Because the derivation of production series is so personal, too, the constructed "data" can be verified, replicated, and improved only if their derivation from source to final estimate is exhaustively documented. I was taught by Gerschenkron (1962 [1955]) that such documentation was required to meet the minimal

is that the sources are opaque, that we learn to understand them only little by little (*poco a poco*, Einaudi 1936b, p. 7): that their hidden defects surface, rather like those of our former spouses, only with extended cohabitation. The third is so to speak that the evidence itself is often not evident. When it is indirect, as it so often is, it takes a good, experienced eye to identify it at all, to grasp its potential significance: it takes a Holmes to see clues where Watson sees nothing, an Indian scout to see tracks where the cowboy sees only dust.

We cannot observe the past, we cannot reconstruct it as it really was; we can only reconstruct it as to our eyes, in the light of everything we know, it most probably was, "it must have been." The obvious parallel is Viollet-le-Duc's "restoration" of Vézelay or Notre-Dame: a sobering parallel, sobering because such reconstruction clearly requires a taxing panoply of skills and breadth of knowledge, sobering too because it remains all the same highly personal, and can readily appear distorted by its author's fantasy.

The bottom line is that economists and cliometricians are right to believe that "interpretation" and "measurement" require different levels of skill and experience, but entirely wrong in their mapping. Our graduate students, our research assistants, well trained in economics and econometrics, are as well-equipped as we their elders for "analysis" and "interpretation"; it is in the creation of the "data," the reconstruction of the past, that they are challenged, challenged by a lack of training in *historical* scholarship, challenged even if so trained by a lack of familiarity with the sources, challenged above all by their lack of experience.[13] Only a contemporary economist, highly trained but badly undereducated, can be so *borné* as to entrust to a graduate student the restoration of a medieval cathedral, the reconstruction of the past.

The body of the present work is my "measurement" story: my reconstruction of "the facts" (recounted in the framework of the

standards of serious scholarship; but his lesson was not generally heeded, and as will be recalled below the original Istat-Vitali national accounts and the later contributions on agriculture by Giovanni Federico and on the services by Vera Zamagni (and her "Bologna school") are all frustratingly underdocumented.

[13] Experience is necessary but of course not sufficient: some distinguished colleagues appear to have discovered the fountain of youth, and make beginners' mistakes decade after decade.

national accounts, about which more below), as God gave me the light to see those facts.[14] Such reconstruction is not a science but a craft, an *arte*: an *arte* with its *regole*, its rules of good practice.[15] The ur-rule is of course to tell as verisimilar a story as one can, a story verisimilar in its description of human behavior, and verisimilar too in its interpretation of the surviving sources, sources that are never complete and not infrequently inconsistent: in practice we maximize our story's overall plausibility only in an algebraic sense, we struggle in fact to minimize its overall implausibility. But the operative word is *overall*, for our implicit loss function is "quadratic," larger deviations from the norm carry more-than-proportional weight: a story the reader repeatedly glosses "maybe…" may receive serious consideration all the same, a single "never!" or "impossible!" will see it rejected out of hand.

The ur-rule can be developed into a set of less abstract recommendations. The next chapter offers a pentalogue that distils the fruit of my hard-won experience, and begins to codify the art of reconstructing economic growth; the examples are taken from my own work, my case study, but their import is general.

[14] It is *my* story, *my* reconstruction, derived in Bayesian terms from the surviving data and *my* priors; the measures I obtain put *my* posterior on the line. My "interpretation" story, my story of how the (apparent) facts (apparently) relate to each other, I have told elsewhere – repeatedly, and very differently, as the evidence accumulated and my understanding evolved (Fenoaltea 1969, 1988a/2011a, 2020).

[15] *A regola d'arte* is a common enough Italian phrase, without a direct equivalent in colloquial English: it harks back to medieval craft guilds (the *arti*), that guaranteed quality by imposing strict rules (the *regole*) on the materials and the manufacturing process. A literal translation is "[made] according to the rules of the trade."

2

RECONSTRUCTING ECONOMIC GROWTH: *LE REGOLE DELL'ARTE*

2.1 Rule 1: Vet the data!

The first rule, already noted, is that the data in our sources cannot be taken at face value. We must see through them, gauge their relationship to the facts they ostensibly document, verify their credibility and potential usefulness; we must vet them, to use a trendier term deconstruct them.

In principle we should establish how each number in our sources was actually obtained, we should systematically investigate the underlying "data-generating process." We who work on post-Unification Italy have the benefit of work done by Istat, then the Istituto centrale di statistica, for Italy's centenary: the lastingly useful multi-volume *Rilevazioni statistiche* documents the production of our "historical statistics," complete with reproductions of the forms circulated to gather the raw data. But even that is not enough, to understand what our data really are we would need to recover the instructions given to the enumerators, instructions possibly surviving in some archive, possibly never written down at all.[1]

Some of that we can certainly do: if production statistics are generated by a production tax, for example, we can and should go

[1] As is well known, the *Censimento 1881* counted impossible numbers of female textile workers in Italy's South. Tariffs on textiles had recently been hiked, and the textile factories were notoriously in the North; one wonders whether the census enumerators were "encouraged" to document that the industry was nation-wide, thus rescuing the tariff from the charge that it benefited the North alone. But even if this actually happened one hardly expects to find documentary confirmation.

back to the enabling legislation, and learn what exactly was being taxed. Even the mere recognition that the production data are tax-based can be instructive, and suggest for example that a sharp decline following a tax increase registers a decline in *taxed* production only, less a decline in production than a shift to bootlegging. But a systematic approach to documenting the data-generating process is *ultra vires*, and, to the extent that it merely verifies the absence of evidence that it changed from one period to the next, not particularly efficient; most of the research we can and should do on the data-generating process is not *a priori* but *a posteriori*, triggered by signs that it changed provided by the data themselves. The identification of such signs is again a judgment call, a matter of interpretation; my guiding principle is Marshall's *natura non facit saltum*, it is the discontinuities in the series that attract my eye, that signal to me a change in the data-generating process.[2]

The eye should in fact look deep into the data. These may be found, already as well-arranged long time series, in abstracts of historical statistics (for Italy, the *Sommario*), abstracts which have typically lifted them from the statistical annuals of the day (the *Annuario*), annuals which in turn transcribe the more interesting figures from a cited battery of primary, narrowly focused sources. At times, a look at the final series is enough to warn us that it is not homogeneous over time; in the context at hand two examples come readily to mind. One concerns the official human-grain-consumption series, which displays an increase around the turn of the century that is simply not credible; it turns out to result from the interpolation of earlier (grossly underestimated) grain-production figures, disbelieved even when they were published, and later (far higher) figures based on much-improved production statistics (Fenoaltea 1969, pp. 97–98, 2010, pp. 83–85). The other concerns the official State-expenditure-on-public-works series, which looks perfectly normal save for an inexplicable downside outlier in 1870; research into the public budget's accounting rules revealed a change at that

[2] This is admittedly a one-sided test, I will not notice simultaneous discontinuities in the data-generating process, and in the underlying matter the data refer to, that nicely offset each other; the lame response is that such coincidences are presumably rare, and that in any case even a one-sided test is an improvement over the prevailing absence of any test at all.

time, the practical result of which was that the figure for 1870 was only a partial one (Fenoaltea 1986, pp. 7–8).

But the reconstructed series in the secondary sources typically mask far more than they reveal, and nothing catches the eye until one goes back to the primary sources themselves. These typically tell us far more about the data they report than the subsequent annuals and abstracts, and most of all they generally allow a literal deconstruction of their aggregates, the identification and reconstruction of their components; and even a beginner can then spot that the series' coverage may change over time, that some components appear or disappear. Such reconstructions can also signal an altogether subtler trap, when many components do not change at all from year to year: it means that the elementary data were *not* systematically updated, that the current issue of the primary source simply published the latest available figures as the best estimates of the current ones, altogether missing what may be significant growth (thus in the case at hand the "annual" quarry and non-metallic-mineral-product output data for 1901 ff. in the *Rivista mineraria*: *IIPB*, *IIPC*). This is in fact a trap that will catch all those who construct a cross-section for a given year by consulting only the sources for that particular year: the broader lesson is that cross-sections need to be validated by time-series evidence that places year-specific data in their intertemporal context.

The final point, *qui devrait aller sans dire*, is that the historical data are also to be vetted in the light of their broader context, what we know, or should know, of the relevant activities, institutions, and technology, of somehow related data in other historical sources: the knowledge, the specific culture, that accumulates with experience.[3] The inexpert can fail badly, assuming for example that all State expenditure for public works was funded by the *Ministero dei lavori pubblici*, confusing for example natural silk and artificial silk, measures of volume with measures of weight (Fenoaltea 1986, pp. 6–7, 29; 2003, p. 1099; 2018c, p. 302); my own early howler was

[3] Only acquired familiarity with the institutional framework will reveal what is perhaps the most subtle trap, the at times changing definition of the self-same unit of measurement: merchant ships in particular were measured "uniformly" in register tons, but the formula used to calculate tonnage from the ship's specific dimensions was repeatedly changed.

the confusion of the engineering industry with the "machinery" industry, a confusion prompted by everything, the very little, I had read at the time (Fenoaltea 1967, 2020).

2.2 Rule 2: Disaggregate!

Disaggregate, disaggregate, that is Moses and the prophets!

To a historian the impulse to disaggregate should be a natural one, a direct consequence of our curiosity about the past. An aggregate alone is like the low-resolution newspaper photographs of now long ago, which if magnified dissolved into a meaningless blur; the internet has made us used to photographs that when magnified reveal increasing detail, photographs that allow me to zoom in from my hemisphere to my continent, to my country, to my province, to my house, to add an Italian touch to my laundry drying in the sun. An aggregate ("chemicals") that allows us to zoom in on its immediate components ("electrochemicals") and then on theirs ("calcium cyanamide"), and even on the local sources of these, is thoroughly satisfying – a rare satisfaction, achieved only where the surviving documentation is unusually rich. But the impulse remains, we want disaggregated "data" because details are our *friandises*.

But the curiosity that drives us is by no means idle. In general, the path of an aggregate places only very loose constraints on the possible "interpretation" of its movements, as is well illustrated by the extant literature on post-Unification Italy; the likely validity of such interpretations can be gauged only by drawing out their specific implications, and verifying their likelihood in the light of more detailed "data." More specifically, when we limit ourselves to an aggregate we implicitly and naturally assume that its composition remained more or less unchanged; disaggregation can reveal the falsehood of that assumption, it can demolish the shared beliefs that underpin an entire literature (as that on the industrial investment cycle in post-Unification Italy, Fenoaltea 2020).

Technically, of course, as far as aggregate-level "measurement" alone is concerned the purpose of disaggregation is reaggregation, the calculation of an improved aggregate that takes changes in composition into account; and to that purpose both vertical disaggregation (across "stages of production" within a production sequence) and horizontal disaggregation (across production sequences) are to be pursued. Disaggregation rarely reaches an objective limit: the practical limit comes from *vita brevis*, we disaggregate far less than we theoretically should but as much as we practically can. Even our elementary disaggregated series typically remain aggregates, aggregates we can only hope remain reasonably homogeneous over time; the point is simply that that hope is the less forlorn, the more extensively we actually disaggregate.

The point of vertical disaggregation is of course to distinguish the *different* time paths of successive stages of production; and these differ most readily in the presence of international trade in the partially processed goods that are the output of one stage of production and the input into the next. In practice, then, our vertical disaggregation will be dictated by the major trade flows (for example of yarn, to distinguish the path of cloth production from that of yarn production), while we ignore or collapse the minor ones (making no attempt to distinguish, say, gray, bleached, and dyed yarn). The myriad steps that compose a full production sequence are thus, in practice, reduced to a few: *e pluribus unum*, or not much more than that.

But vertical disaggregation has a further aspect that bears notice. In general, we can calculate the quantity of product *A* from the "apparent consumption" (production plus net imports, ignoring undocumented inventory change) of its input *B*, and the corresponding input-output ratio (*B*/*A*); applied through the production sequence, this algorithm generates a set of series (one for each successive stages of production) that are locked together by the data on the intervening trade flows.[4] From this it follows, most obviously, that any one "known" series can be used, with the trade data, to generate the rest of the set (as is not infrequently done, using for example net imports of raw cotton to estimate yarn production, and those figures plus net imports of yarn to estimate cloth production). In a data-poor environment, on the other hand, none of the series may be "known," all we know (from the trade data) is how they differ from each other. To fix any one is then to fix all the others, and to attribute a plausible path to one may imply

[4] The algorithm obviously extends to (apparent) final consumption, which is simply the production of the finished good plus the net imports thereof.

an implausible path for another; in such cases the full set must be fixed with an eye to the *joint* (im)plausibility of the resulting estimates, for the implicit maximand is, as noted, the verisimilitude of the entire story we tell.[5]

Technically, horizontal disaggregation improves the aggregate exactly as vertical disaggregation does, in this case by distinguishing among goods, and processes, that differ in their value added per measured unit of product – typically because of qualitative differences, as for example between woollens and worsteds, or between battleships and submarines, at times because of economies of scale.[6] Heuristically, it involves very different considerations. A systematic approach to disaggregating an aggregate forces one to identify its components: a novice may consider Italian shipbuilding adequately documented by the "ships launched" series in the *Sommario*, but if we ask ourselves at all what "shipbuilding" covers we will soon discover that it includes the production of new ships, merchant and naval, and the maintenance of existing ships, again merchant and naval. The extant series' unit of measurement (register tons) is then enough to reveal that it refers to merchant ships alone (naval vessels were measured in displacement tons); and "ships launched" clearly

[5] Imagine, to clarify the point, the flax-linen production sequence, undocumented at any stage. A burst of flax imports can be interpreted as fueling a burst of linen consumption, with flat flax production – or as offsetting a flax harvest failure, with flat consumption. As noted, joint verisimilitude reflects a quadratic loss function: numerous mildly unlikely events, together, are less unlikely than a single highly unlikely event.

[6] As a rule, there is no substitute for horizontal disaggregation; but at times it can be finessed by suitably choosing the unit of measurement. The archetype here is the wartime measure of aircraft production in the United States: rather than counting aircraft and distinguishing, say, trainers, fighters, and medium and heavy bombers, a meaningful aggregate figure was obtained directly by counting airframe tons. In the case at hand, similarly, sufficiently detailed trade data allowed the conversion of the aggregate cotton yarn and cloth production figures from units of weight, which fail to reflect quality differences, to units of length (of yarn produced, of yarn woven into cloth), which directly capture them (*IIPH*). Again similarly, the water-supply industry includes the product of aqueducts, characterized by significant economies of scale; a synthetic measure could be obtained by measuring the aqueducts' yield not in tons (per unit period) but in equivalent tons, calculated as the actual tons to a power that captures the economies of scale (*IIPJ*).

refers to new ships alone, revealing that the series in the sources documents only one out of the industry's *four* basic activities (*IIPF*). Horizontal disaggregation thus serves in the first instance the same purpose as explicit models and counterfacts, it brings out, and invites reflection on, assumptions that otherwise remain implicit and unexamined.

The present example was not selected without cause, for the maintenance of durable goods raises specific issues of its own. In the first place, it must clearly be distinguished from new production: the latter tracks the gross additions to a stock, maintenance varies in the first instance with the stock itself. Unlike new production, too, maintenance cannot be meaningfully measured by a physical output, because the attendant value added varies, for any given type of equipment, with the condition it happened to be in when brought in to the shop; in general, the best elementary "real" series one can construct is a measure in "constant" monetary terms (typically obtained as a benchmark value added estimate, extrapolated by an index of the maintained stock's activity, at worst of the stock itself). Third, and in the circumstances unsurprisingly, maintenance is even more sparsely documented than new production: ships, trains, and public infrastructure aside, there is damn little to go on. The upshot is that the disaggregation to separate maintenance from new production is at once necessary, and difficult: in the case at hand the censuses did not separate maintenance shops and workers from new-production shops and workers – which were often the very same ones, as blacksmiths, for instance, engaged indifferently in the one as in the other – and the two activities can only be disentangled with the aid of ancillary evidence.[7]

[7] Evidence that may be far removed, and not obvious *a priori*. To clarify the point with an example, estimates of the blacksmiths' aggregate value added in 1911 can be derived from that year's census data. Per unit of value added, new production consumes far more metal than maintenance; given total metal consumption, and the value added/metal consumption ratio in new production revealed by market prices, the disaggregation of value added into new production and maintenance yields an implicit value added/metal consumption ratio in maintenance which must itself be reasonable next to the corresponding ratio in new production. The estimates for 1911 are much more tightly constrained by the relative ratios they imply for 1871, when total metal consumption per worker was much lower, than by the relative ratios they imply for 1911 itself (*IIPF*).

The separation of maintenance from new production entails in fact two further problems, of a different order. The minor problem is whether to attribute value added in maintenance to industry or to the services; the choice affects only the distribution of an unchanged aggregate, and the issue is no more than an irritant (attributable to the United Nations, as the *ISIC* is here thoroughly inconsistent). The more significant problem is whether to consider maintenance production of (reconditioned) durables, and thus capital formation that inflates GDP, or a cost of producing the goods and services that employ those durables, an intermediate product that finally cancels out of GDP (as do all intermediates consumed in further production); and on this there is no consensus, nor uniformity in the literature. These issues are here only noted for future reference; further discussion is relegated to a dedicated appendix (ch. 2A).

2.3 Rule 3: *Think* when you index!

"Indexation" is a catch-all term for filling gaps in "the data," for coping with time series that lack pieces or do not exist at all; it is so called because we use a "known" series as an "index" of (a proxy for the movements of) an unknown series. The above discussion of vertical disaggregation recalls a common form of indexation, the use of raw material consumption movements as an index of production movements: it is indexation based directly on a relatively tight technical relationship, there is no cause for complaint. But much indexation in the literature is utterly mindless, based on nothing other than bad precedent, unjustified and unjustifiable: proper measurement requires that we observe our third rule, that indexation be thought out.

If a series displays a gap, the latter can be filled in ("the series can be interpolated") in a variety of ways. The simplest index, the know-nothing index, is simply the passing of time: the interpolated values are obtained assuming constant growth.[8] Even here, however, some reflection is in order before proceeding with the calculation. Most of us quantitative historians live in semi-log space,

[8] The procedure is so standard that this is the default meaning of "interpolation" if no specific interpolating variable is explicitly indicated.

we consider a constant growth *rate* (*x* percent per year, log-linear or "geometric" interpolation) altogether more natural (verisimilar) than constant *absolute* growth (*x* tons or whatever per year, linear or "arithmetic" interpolation).[9] The obvious problem, however, is that while linear interpolations are additive, log-linear interpolations are not: the sum of the linear interpolations of *a* and *b* is the linear interpolation of (*a* + *b*), the sum of the log-linear interpolations of *a* and *b* is not the log-linear interpolation of (*a* + *b*). Imagine that from one end of our interpolation to the other *a* has grown sharply, and *b* declined sharply by just enough to offset that, so that (*a* + *b*) does not change at all. Linearly interpolating *a* and *b*, or (*a* + *b*), or log-linearly interpolating (*a* + *b*), we obtain, obviously, a flat interpolation, a constant value in each intervening year; if we log-linearly interpolate *a* and *b* and then aggregate, (*a* + *b*) will decline and then recover, displaying a cycle that is nowhere in the data and as a rule thoroughly unlikely on its face.[10] It may well make more sense, in such cases, to reverse the order of the estimates, first log-linearly interpolating (*a* + *b*), and then obtaining *a* and *b* by interpolating their shares of that total.[11]

[9] If we plot tons (say) against time, constant *absolute* growth yields a straight line, a constant growth *rate* a curved one; if we plot log(tons) against time, constant *absolute* growth yields a curved line, constant *relative* growth, a constant growth *rate*, a straight one (whence "log-linear" if the growth *rate* is held constant).

[10] The published series that display a U-shape between benchmarks signal that they were most probably constructed by log-linear interpolation of their components. The attribution of constant-growth paths to the individual components may seem reasonable if we look no further, but the implied U-shape of the aggregate remains implausible: if the above scenario were to hold across a series of benchmarks, a U-shape would link each successive pair, with the hardly credible implication that each and every observation happened to coincide with a local maximum.

[11] Shares are best interpolated linearly, as they then sum to one. Log-linearly interpolated shares do not (and the share obtained for *b* from the log-linear interpolation of *a* is not the share of *b* obtained by its own log-linear interpolation; log-linearly interpolating the shares of both *a* and *b* and then rescaling the results to sum to one seems pointlessly complex). Conversely, (input-output and other) ratios are best interpolated geometrically, as the interpolated values of (*a*/*b*) then equal the inverse of the interpolated values of (*b*/*a*); arithmetic interpolation yields different values, depending on which form of the same ratio is actually interpolated.

Again frequently, we interpolate a gap in our series for *a* by attributing to *a* the movements of a "known" related variable *b* ("using *b* as an index of *a*").[12] Extraordinary good fortune aside, however, over the relevant gap the relative changes in *a* and in *b* do not coincide, and must be reconciled. The standard ("automatic") solution is a trend correction, i.e., the elimination of the discrepancy by adding a constant to *b*'s annual percentage changes; but that algorithm need not be appropriate. When *b* grows much more than *a*, and its growth sharply accelerates, the trend correction may turn the years of relatively slow growth in *b* into years of decline in *a*; and that decline in *a* may again make no sense at all, for example if both *a* and *b* are responding, with different elasticities, to the same impulse (e.g., income growth). In such cases, the mere recognition of the problem points to its solution: not a trend correction but an elasticity correction, i.e., the elimination of the discrepancy by a *multiplicative* scaling of *b*'s annual percentage changes.[13] Alternative solutions may yield very different profiles; the point here is again that there *are* alternative solutions, and that the choice must be made with due consideration.

But the most damagingly mindless indexation occurs across production sequences, when entire industries are undocumented, the time path of their product "unknown"; and it occurs more often than not, for the surviving evidence is terribly partial. The standard procedure, in such cases, is to calculate the desired aggregate from its known components, up from aggregate to higher-level aggregate (using for example cotton and silk alone to represent the entire textile sector, and then the textile series, and those for the other thus reconstructed sectors, to represent all industry): so standard a procedure that it is simply followed, without discussion or justification (with a single well-known exception, returned to below).

[12] There is in such cases the obvious temptation to regress *a* on *b*, and to interpolate *a* using the resulting parameters; but these are typically so sensitive to the selected regressors and sample period that the resulting estimates are no less arbitrary than those obtained by the direct indexation with which we typically make do. The ultimate criterion, once again, is verisimilitude, the "reasonableness" of the result.

[13] In the case at hand, this is geometrically equivalent to forcing the interpolating curve through the desired end-point by flattening it, as opposed to rotating it.

Followed also without a thought, clearly, for any thought at all would have killed it before it became established. The procedure's first step is to attribute to unobserved production the path of observed production "of the same sector": a double absurdity, *le vice appuyé sur le bras du crime*. The "sectors" into which we classify the economy may have a logic, but they were not designed to support extrapolation across their components: from the present perspective they are simply arbitrary. Think of the rubber industry, indifferently considered a sector in its own right or part of the "chemicals (and related products)" sector, and imagine that its product is "unknown." With the latter classification rubber is attributed the path of the known elements of the "chemicals" group (in Gerschenkron 1962[1955], the production of sulphuric acid); with the former, the path of the known elements of industrial production in general (there milling, cotton, sulphuric acid, etc., all weighted by their value added and again by a coefficient that reflects the coverage of the individual industry groups). With the standard procedure the path attributed to rubber, and therefore to industry as a whole, is as arbitrary as the selected industrial classification.

The attribution of the path of observed production to unobserved production "of the same sector" is also nonsense because the components of a given sector may be independent, or even rivals. Consider for example the textile industries, and imagine, for simplicity, that they process only cotton and linen; that neither is covered by output data; and that the apparent consumption of raw materials documents the growth of the first (because raw cotton is imported), but not of the second (because flax is home-grown). The growth of the textile sector is therefore represented by that of the cotton industry, in effect assuming that the linen industry matched its growth. But we know that the cotton industry was the first to be mechanized, that the linen industry was successfully mechanized over a century later: that technological change did not affect the cotton and linen industries together, but long favored the first *at the expense of* the second. The assumption that linen production grew as cotton production did could not be more palpably wrong-headed.

Consider too the case of the extractive industries, made up of the mining group and the quarrying group. In many (Continental) countries the subsoil belonged to the Crown: mining was regulated, and documented, as quarrying was not. In standard practice, the entire extractive group is indexed by mining alone, implicitly assuming that quarrying moved exactly like mining. Ask yourself how you would estimate quarrying production in its own right, and set yourself to the task: would you ever assume it moved like the mining sector, which operates in an essentially unrelated market? Would you not infer its movements from construction activity, whose materials quarrying provides, working back through the production sequence exactly as above (§2.2)? One wonders why that reasonable procedure is not normally applied across sectors as it is within them: it is as if quantitative economic historians were mesmerized by the Statistical Bureaus' partitioning of the economy into different sectors, like deer caught in the headlights of a fast-approaching car, and with equally gruesome results.

The procedure's second step is to take the path of the sum of the (partly) documented sectors to represent the aggregate, that is, to attribute to the (totally) undocumented sectors, together, the path of the (partly) documented sectors, together; and similar considerations apply, in spades. Some industries, typically those processing tropical products, were documented as noted by the general statistics on international trade; but direct evidence of production was gathered first and foremost where it was of particular interest, and relatively easy to obtain. On both counts, the sources tend generally to document the new factory industries far more than the traditional, much smaller-scale and far more dispersed, artisanal sectors: in general, the better-documented sectors were growing at the expense of the less-documented ones, the assumption that artisanal production grew as factory production did could not be, again, more palpably wrong-headed. There may be practical reasons that demand an immediate aggregate estimate, that warrant resort to guesswork rather than research; but nothing can justify *mindless* guesswork, the standard guess that defines the path of the undocumented sectors without so much as considering what those were, and how they differed from the documented ones.[14]

[14] Contrast Fenoaltea (1972), p. 349: because documented manufacturing seemed essentially to cover new/factory industry and in particular the cyclical investment-goods sector, undocumented manufacturing was identified with the artisanal production of consumer goods, and attributed a simple (demographic) trend.

The roots of the standard procedure can only be inferred, as they are essentially unspoken; and three possibilities come immediately to mind. The first is the natural desire to produce an aggregate that includes only historical "data," to the exclusion of estimates, "guesses"; but that line of thought leads nowhere. One reason, familiar to those happy few who have actually approached the historical sources as historians, vetting them before copying "the data," is that the reported figures are not infrequently themselves guesses, the best guesses of the experts, or appointed officials, of the day. At times, as recalled above, the frequency of data publication exceeded the frequency of observation, and the best guess for "this year" was "same as the last time we looked, *x* years ago": in such cases the "data" are not only guesses, but guesses not even as good as those we can make, as we know what was discovered with the next actual observation. The other, overarching reason, which should be immediately obvious even to non-specialists, is that any aggregate series based on a partial set of ("observed") component series implicitly incorporates the very definite guess that the excluded ("not observed") series, together, moved exactly like included ones, again together. The surviving "data" are very partial, the only way to avoid including guesswork in the aggregate is not to produce the aggregate at all.[15]

This brings us to the second possibility: that the extrapolation from the documented subset to the aggregate is recognized as a guess, but considered a good guess, the legitimate attribution to the population of the time path of the sample. The problem here is that the sample is "random" only in a colloquial sense, when I started I had no idea what I would find, what I did find was what the sources happened ("randomly") to throw up.[16] A *statistically*

[15] As just noted, Fenoaltea (1972) treated the index constructed in Fenoaltea (1967) as an index of *documented* production alone. The earlier work did not address that issue: my concern there was rather to show that the growth rates obtained from aggregate indices were very sensitive to the way one weighted the component series, implicitly undercutting the argument in Gerschenkron (1955, pp. 365–366) from the growth rate generated by his own index (Fenoaltea 2011a, pp. 24–25).

[16] With the same logic one would attribute to the entire population the mean documented income, the income of the few rich enough to pay income tax and thus leave a record of their income. As far as I know nobody has ever done *that*, the procedure is obviously absurd; why its absurdity seems not to be obvious in the present context I cannot begin to explain.

random sample is made of sterner stuff, it must be *designed* to be representative of the underlying population; and the historical sources of production data were designed with other ends in view, they reflect the specific (and typically fiscal) concerns of the governments of the day. Statistical representativeness was neither here nor there, traditional artisanal industries in particular were of no interest and correspondingly "undersampled": to attribute to the aggregate the path of its documented subset is not only to guess but, as a rule, to guess demonstrably badly.

And that leads us to the third (and only documented) possibility, Sir Charles Feinstein's assertion that there is nothing else one *can* do, that necessity is here the mother of the lack of invention (Feinstein 1972, p. 207). The central point here is that Feinstein was simply wrong, where direct evidence is lacking there is typically much indirect evidence that can be exploited, if only one recognizes it for what it is. The proper method is time-consuming, but ultimately simple, in fact simplex. Invent the series you seek to construct, your initial best guess; but don't stop there, the starting point matters little only if you move beyond it. Draw out the implications of your series as an applied economist would, recognizing technical relationships, the impact of trade, the substitution effects that can be inferred from the typically abundant evidence on relative prices, the income effects, where appropriate, that influence consumption; and set those implications next to the corpus of surviving "data," as best you can master it, as an historian would. You will soon enough find that your initial estimates violate "data" constraints, constraints that may be distant but are effective constraints all the same. Revise, rinse, and repeat; at the end of the process you will have a production series, for the "undocumented" industry at hand, that is reasonably tightly constrained by (the application of economic logic to) the historical evidence. No more could be asked of it.

The bottom line is that *all* "undocumented" production too must be estimated, with suitable disaggregation, explicitly and in its own right – which should be enough to wean you from the standard "indexing" procedure, which no one can possibly follow *en connaissance de cause* – and above all with due research and reflection, identifying and exploiting the available indirect evidence. And once all not-directly-documented production too is properly estimated in its own right, the classification of economic activities becomes harmless: the estimate of rubber production is then what it is, whether we count rubber as a separate group or part of the chemical group affects only our groupings; the higher-level aggregates, like the elementary disaggregated estimates, are quite unaffected.

But that is the least of it. Once all not-directly-documented production too is properly estimated in its own right, the historical sample of surviving "production data" is also rendered harmless. Imagine economy *A*, made up of two sectors, (booming) *x* and (stagnating) *y*, and that our "data" track only one: with the standard procedure our estimate for *A* will reflect what our sample happened to be far more than what actually happened. Imagine a second economy *B*, identical to *A*, save only that the "documented" sector is the other one: with the standard procedure our estimates will spawn a literature on the differences between those two economies, a literature with no empirical basis at all, *stories* but never *history*.

Indexation, the inference from the known to the unknown, must be thought out: we must think *before* we index, we must think *while* we index, we must think again, for good measure, *after* we index. It's a sad comment on the state of our ("intellectual") profession that we should have to be reminded to *think*.

2.4 Rule 4: Deflate all current-price values with the *same* deflator!

Our historical measures of value are born, inevitably, at current prices; to eliminate the distortions due to the changing purchasing power of the monetary unit, we "deflate" them into what we call "real" measures.[17]

The fourth rule is that deflation must be general and not activity-specific. The discussion can be technical (Fenoaltea 1976),

[17] *Deflate*, because when the problem first presented itself the immediate need was to eliminate the distortion of different-year current-price measures caused by *inflation*. In general, the "real" measure *R* is obtained as, or equivalent to, the current-price ("nominal") measure *V* divided by a price index *P*, $R = V/P$. *V* is unambiguous, our concern here is with the deflator *P*.

but the essential point is simple enough. To construct aggregates, to compare their components, we need to reduce these to a common metric; in the measurement context at hand the obvious metric is "value added," that corresponds at once to the value of an activity's product, net of the materials it consumes, and to the value of the activity itself, the income accruing to the primary factors of production ("land, labor, and capital"). Three points bear notice. The first is that "value added" is the obvious metric only now that the concept is part of our standard intellectual baggage; we owe it to the United States Census Office, who developed it over the late nineteenth century, not without difficulty, to meet the perceived need for a *net* measure unaffected by vertical (dis)integration (ibid., p. 111).[18] Second, the value-equivalence of the results of activity and of the activity itself is *in ipsis rebus*, given that activities are valued by their results; it is complicated by speculation, market power, and taxation, but these have been dealt with elsewhere (ibid.), and need not detain us here. Third, the objection that this equivalence holds only in zero-profit long-run equilibrium is based on the standard textbook model of short-run equilibrium, which contemplates non-zero profits; but that objection is as worthless as that model (ibid.; also Fenoaltea 2001).[19]

[18] The measure that came more naturally to hand (to the census-takers that measured production, to the legislators that taxed it) was simply *value*, the firms' sales. But it was recognized that equal sales could correspond to very different levels of activity, for example if two textile firms sold identical quantities of cloth at the same price, but one worked from the raw fiber, the other from purchased yarn; and that the aggregate sales of the firms in an industry (and the accompanying "turnover tax") could be radically reduced by vertical integration even though nothing changed on the shop floor, as the transfer of yarn from the spinner to the weaver would pass from a sale on the market to a transaction internal to the now integrated firm.

[19] Any economic historian/historian of economic thought can readily see how that model emerged out of its British context, where industrial firms owned their machinery. Any economist should recognize that in a world of complete markets firms (can) rent their machinery as they rent their labor, that in the short run the stock of (industry-specific) machinery is given not for the firm but for the *industry*: with competing entrepreneurs the rental rate of machinery (its annual shadow price, if it is owned) varies to drive profit to zero even in the short run. Nor is that all: it should also be obvious that if an industry is the sole consumer of a raw material the possible variations in output may well be broad

In any year, at that year's prices, we happily accept that if the value added of industry *a* is twice that of industry *b*, industry *a* produces twice as much, and is twice as big, as industry *b*. Problems arise in comparing "value added" across years, because the monetary unit in which we denominate our measures (e.g., a dollar) has the nasty habit of stretching, or more often shrinking, over time. To obtain a measure free of the attendant distortion we must "deflate" our current-price figures into what we call measures "in constant dollars" or more directly "in real terms." In the present context, as noted, the problem can be expressed as the need to deflate current-price value added to calculate "real value added." So far so good.

What, then, do we want of our "real" measures? At a minimum, surely, that they not generate wrong answers where we know the right one. Imagine, to illustrate the issue, a school's class photographs. Imagine that we have (as we do in the present context) an interest in relative magnitudes; and reduce it for simplicity to a merely ordinal interest in heights, we want to know only who is taller than whom, never mind by how much. So on the day the students come to school in flat shoes, each class arranges itself from tallest to least tall, and the photographs are taken. A further photograph is taken of the entire student body, similarly arranged. Clearly, if in the photograph of their common class Judy is taller than John, in the photograph of the entire student body Judy is again taller than John: how could she not be?

The class photographs correspond to our current-price value added measures, that establish relative rank in a limited context (the year); the student-body photograph, to our "deflated" measures, that we want to illustrate relative rank even across years.[20]

enough to affect the price of the raw material even with a fixed aggregate stock of machinery. The *only* difference between the (correctly understood) long-run equilibrium and the (misunderstood) short-run equilibrium is that in the latter *industry* supply is constrained by the given stock of equipment. The textbook dictum "the short-run industry supply curve is the horizontal sum of the firms' short-run supply curves" is simply *wrong*. We economists are as careless about the theory we teach as about the "evidence" we use: "scientists" indeed!

[20] The objective is to render every observation directly comparable to any other, say industry *a* in a given year to itself in a different year, to industry *b* in the same year, and to industry *b* in a different year.

Return to the metaphor: our problem is that we cannot actually take the student-body photograph, we must construct it by photoshopping, and merging, the pictures of the individual classes – which, as it happened, arrayed themselves at varying distances from the camera. So one class photograph can be taken as is, as the base; but to reconstruct the student-body photograph all the others must be scaled, the individuals extracted and slotted into the appropriate place in the larger group. The merging is not easy – it is hard to tell how the tallest student in one class compares to the tallest in another – but one thing is clear: all the individual figures in each class picture are to be scaled in the *same* proportion. If that simple rule is not respected, our reconstructed picture of the student body may show our friend John as taller than his class-mate Judy; we already know that is wrong, and if that is how they appear in the student-body reconstruction the responsible photoshopper is clearly incompetent.

The reader unfamiliar with the literature may well be wondering why s/he had to suffer through the preceding paragraphs to reach a conclusion obvious to the meanest intelligence (a characterization on which I take the Fifth); the reader familiar with the literature will have grasped their import. The rule that deflation must be general and not activity-specific is the claim, in the terms of our metaphor, that Judy and John must be scaled in the same proportion, and not in different proportions specific to Judy on the one hand and John on the other. It is apparently not obvious to the profession, for *the standard "real" measure in the literature violates this elementary rule*, and deflates the value added of different activities with activity-specific deflators.

That measure is the Fabricant-Geary "double-deflation" measure (*SNA*, p. 295), calculated from the standard value-added formula using constant ("base year") prices. Let $v_{it} = p_{it}Q_{it} - z_{it}R_{it}$ represent the current-price value added of activity i in year t, where p_{it} and Q_{it} are the price and quantity of its output and z_{it} and R_{it} the price and quantity of its raw material(s); the standard measure of "real value added" at the prices of the base year o is $v_{rito} = p_{io}Q_{it} - z_{io}R_{it}$. Three things immediately hit the eye, and the fan. First, this measure is equivalent to deflating current-price value added by an activity-specific deflator: $v_{rito} = p_{io}Q_{it} - z_{io}R_{it} = (p_{it}Q_{it} - z_{it}R_{it})/[(p_{it}Q_{it} - z_{it}R_{it})/(p_{io}Q_{it} - z_{io}R_{it})]$, where the denominator in square brackets is a (current-year-quantity-weighted) index of the (output and input) prices specific to industry *i*; to return to our earlier metaphor, our photoshopper is clearly incompetent, the algorithm generates nonsense results. Second, as every economist should know, current-price value added can be indifferently measured as sales net of material costs, or payments to land, labor, and capital (above, footnote 19): $v_{it} = p_{it}Q_{it} - z_{it}R_{it} = r_{it}K_{it} + w_{it}L_{it}$, where *K* represents (land and) equipment in physical units, *r* is the rental value per unit, *L* is the labor consumed also in physical units, and *w* is the unit wage, all of course per unit time. If current-price value added is indifferently measured in two different ways, deflated ("real") value added too should be indifferently obtained from either one; but if we use quantities and base-year prices that will not be the case, in general $p_{io}Q_{it} - z_{io}R_{it}$ will *not* equal $r_{io}K_{it} + w_{io}L_{it}$.[21] Again, the measure yields nonsense results: its inventors and their imitators are attempting *economic* measurement with an inadequate grasp of economics, that the result should be rubbish is hardly surprising. Third, there is nothing in $p_{io}Q_{it} - z_{io}R_{it}$ that guarantees a positive outcome, measured "real value added" may well be negative – and it will be, if as we go back in time the input-output ratio becomes higher and higher, as it does in any industry marked by significant materials-saving technical progress (including fuel-saving progress, as for example in metallurgy). The measure's results are then obviously nonsense (strongly suggesting that they are always nonsense, even when not obviously so). The immediate problem is again bad economics: there is a logic to the price system, relative input and output prices reflect productivity, the input-output ratio; combining prices that reflect one technology and quantities that reflect another is absurd on the face of it.[22]

[21] The one deflates current-price value added by an index of output and raw material prices, the other by an index of labor and machinery prices (rental rates).

[22] Of these three problems, only the third was widely noted by the profession, because negative estimates soon turned up. Characteristically, the reaction was not to *think*, starting from first principles, but to look for band-aids. Paul David (1962), in particular, proposed deflating value added by the output price alone: guaranteeing non-negative results, but maintaining activity-specific deflation, and violating the first condition that we want a value added measure to meet, that the aggregate be insensitive to vertical (dis)integration. Current-price value added in turning cotton fiber into cloth is the same whether we consider it one

The root problem seems twofold. On the one hand, the sheer intellectual sloppiness of our standard measures reflects our professional indifference to measurement, our refusal to think about it, seriously, as economists; it is yet another manifestation of our casual approach to the evidence. On the other, the particular form of the standard measures points to a lack of general education, of adequate literacy. "Real" measures have been taken to mean measures literally in (price-weighted) things, *res*, with no recognition that the technical meaning of the word is metaphorical. Even a casual acquaintance with the history of economic thought is enough to elucidate the matter: we called our deflated measures "real," thing-like, in the context of inflation, when things are "real" not because they are things but because they keep their value in exchange, and the currency does not. Imagine a world with a stable price level, with substantially unchanged relative prices, save that one good loses its value (because of exceptional technical progress, or mass conversion to a religion with dietary restrictions); in that world money is "real," and all goods are "real" except that one. The antonym of literal "real" is "unreal," the antonym of metaphorical "real" is "nominal": a clear enough signal, one would think, save for the verbally challenged, the "scientific" economists and economic historians, American and Americanized, who never learned how language works because they never struggled, in their formative years, with Latin and Greek. In this literature the only exceptions known to me, economists who saw *through* the *res* metaphor and advocated general rather than activity-specific deflation, are two Italians born early enough, and well enough, to have reaped as a matter of course the benefits of a classical education (Fenoaltea 1976, Fuà 1993); methinks it is not a coincidence.[23]

activity from end to end, or two activities, one producing yarn from fiber, the other cloth from yarn; David's index produces different results if all value added from fiber to cloth is deflated by the cloth price, or if the cloth price is used to deflate only the value added from yarn to cloth, and the price of yarn is used to deflate the value added in working fiber into yarn.

[23] Two comments may be added here. The first, to engage in counterfactual intellectual history, is that the profession's "real" measures might have followed a very different path had that poisoned metaphor been kept at bay, and the problem verbalized only as that of "deflating" current values into a time-invariant unit.

The bottom line is that to measure all production by the same unchanging standard what we actually want to calculate is not "real" value added but "real value" added: we want to deflate *all* current-price values by the *same* deflator, the price of "the" good that maintains its "real value." Here, sadly, the argument peters out without reaching closure, for no such good stands out. Setting aside extravagant suggestions (Fenoaltea 2010), the leading candidates are the early favorite, an hour of common labor (as "[the] value [of a nominal sum] is precisely equal to the quantity of labor which it can ... purchase or command"), or the current standard, a broad basket of goods; but the first neglects the rising value of labor itself as productivity increases, the second neglects the declining value of goods as they become more abundant.[24] Both seem to be limits to, rather than examples of, an intuitively appealing measure: our "real" measures appear to be defined, at best, up to the growth of the "real wage."

This ambiguity of our "real" measures is so to speak *in ipsis rebus*, there is no getting around it; and that is why our fourth rule goes no further than it does. A standard of "real value" cannot be identified or prescribed; but whatever we select as our make-do standard it is clear that it must be used across the board, that deflation must be general and not activity-specific.[25]

The other is that the profession's lack of adequate verbal skills is confirmed by its failure to see through Fogel's attention-seeking word games, first on the "importance" of the railways (above, §1.1, footnote 4), and then again on the "efficiency" of slavery (Fenoaltea 1981), not to mention in the present context the Sims-Arrow claim that "real value added" does not even exist unless the production function is so separable that the primary factors of production alone combine to produce such a "thing," a thing that then interacts with the raw materials to produce the final product (Sims 1969, Arrow 1974).

[24] That decline may be limited, and tied as it were to pigovian diminishing marginal utility, or catastrophic, as and if goods increasingly become mere counters in a veblenesque zero-sum status game. The "goods" standard in particular is further burdened by the arbitrariness of any selected basket.

[25] It bears notice that if current-price value added is uniformly deflated by a common deflator, the much-observed "Gerschenkron effect" simply disappears: it too reflects not an "index-number problem," but simply bad measurement (Fenoaltea 2019b).

2.5 Rule 5: Measure what you want to measure!

The above four rules all concern *how* product should be measured. A fifth rule concerns *what* we should measure, and it is *on ne peut plus Lapalissien*: we should measure what we want to measure. It follows, in the case at hand, that as we are interested in the economy's aggregate product, *that* is what we should measure.

Our standard measure of the economy's aggregate product is what we call "gross domestic product," familiarly, GDP. Long ago, when teaching Economics 1 in the United States, I would end my presentation of the national income accounts with the question, "why does the U.S. have the world's highest per-capita product?" (as it then was). The students answered with obvious references to advanced technology, abundant resources, "capitalist" efficiency (no comsymps there). Those reasons, I would answer, were true but superficial: "the real reason," I would say, "is that the measure was invented here." The point, of course, was that measured product was not a fact, something we observed, but a construct, one of many possible constructs.

That particular construct was defined by its particular genesis: who built it, to what purpose, and of what materials. The U.S. national accounts appeared *in utero* in the 1930s at Wesley Clair Mitchell's National Bureau of Economic Research, an institution marked at once by its atheoretical approach, and by its specific interest in cyclical fluctuations (e.g., Lerner 1947); they emerged as official statistics in the U.S. shortly thereafter, and world-wide, essentially on the American model, in the aftermath of the Second World War.[26] They came of age in a world marked by the Great Depression, when it was widely believed that mature capitalism tended inevitably to crisis and mass unemployment, that rearmament and war had been only momentary, dreadful remedies, that the next great slump was just around the corner. Governments therefore

[26] The success of the American model again owed more to hegemony than to technical merit. Istat's *Reddito nazionale* had followed the Italian conventions, and excluded *intermediate* government services from aggregate final product; the Fuà team was funded by the Ford Foundation, and Vitali's estimates included them (Fuà 1969), as do our more recent ones.

took on the task of stabilizing the business cycle, and maintaining employment, with the tools suggested by the *General Theory*; but to employ them to good effect they needed timely evidence on the path of the economy. The national accounts were to provide that evidence, with minimal delay: they had to be calculated quickly, even if approximately, using statistics that were already available or easily obtained; they were to document the current path of the economy, its likely impact on paid employment.

The official accounts were shaped by Simon Kuznets, a protégé of Mitchell's. In his measure Kuznets included all agricultural production, for the market and not, because the available data were based on observed acreages and yields. He included industrial production only for the market, and counted its value added, or its value, depending on what data were already provided by the Department of Commerce.[27] Of the services Kuznets again counted those sold on the (legal) market, but also the imputed rental value of owner-occupied housing, again because the underlying ready-made statistics refer, as in the case of agriculture, to the aggregate stock. *Nada mas*: Kuznets gave us an empirical aggregate to solve a practical problem, a creature of the National Bureau with no theoretical basis at all. It is not a *measure* of anything, it is at best a rough index of paid-employment-generating production, an even rougher index of total product: and that in the short run, when the *ceteris paribus*

[27] For most industry, as noted (§2.4), the Department had evolved measures of value added; but the Department lacked information on the value of the sub-soil resources the extractive industries consumed, and Kuznets simply counted the mining firms' sales rather than their value added. The drawing-down of (underground) stocks is simply ignored; in strict logic, the mining sector is treated as if the goods it sells were created out of thin air rather than extracted (Fenoaltea 2005, pp. 306–307), whence of course the sky-high per-capita "product" of oil-producing deserts. To be precise, in the national accounts the mining firms' "value added" is computed by deducting from sales only the cost of purchased fuel and similar ancillary materials. An analogous "value added" for the transportation industries would deduct from the (c.i.f.) delivered value of the goods only the cost of purchased fuel and the like, and *include* the (f.o.b.) value of the goods at the point of origin. This mixing of value added and value demonstrates that the national accounts do not consistently measure production on a value added basis to avoid duplication (and sensitivity to vertical integration), as we tell our students: the underlying criterion was not theoretical but practical.

clause may be a reasonable approximation.[28] It is not a fact, not an observation, but a construct, in fact a muddy one, good enough for government work. And government work it became: as noted above (§1.2) the profession hastily abandoned its pursuit of economic measures and happily took them, from then on, as issued by the relevant public Bureau.

Kuznets rendered the profession a great service, and a great *dis*service: he called his construct not "an index of predominantly market-oriented, paid-employment-generating economic activity," as he could and perhaps should have, not even "an index of gross domestic product," which seems the least demanded by intellectual honesty, but, notoriously, "gross domestic product" *tout court* (actually "gross national product," at the time, but that is here irrelevant). We all know that GDP falls if a man marries his housekeeper, even if there is no change in her activities (*honi soit qui mal y pense*), in her product, and therefore in *total* product, *ceteris paribus*; we all know, or should know, that "GDP" is not the measure its label suggests. But that has not stopped the profession from taking the label literally: because we do not take measurement seriously, perhaps once again because we are verbally challenged, perhaps also because we "social scientists" approach economics as a religion, proscribing heresy, accepting the dictates of the clergy, apparently believing that a statistic consecrated as a measure of gross domestic product is transubstantiated into exactly that (Fenoaltea 2019a).[29] Whatever the reason, the result is clear enough: we accept "GDP" not for what it is but for what it says it is, an economist is one who uses a government-issue screwdriver to hammer nails because it says HAMMER right on the handle.[30]

[28] The services of owner-occupied housing generate product but not paid employment; make-work projects, digging holes and refilling them, generate paid employment but no product; and so on, about which more below. A specialized index of paid employment and a specialized index of production are different tools; Kuznets' all-purpose Swiss army knife does everything, badly.

[29] So entrenched has "GDP" become as our measure of "the economy" that even the few economists who pursued a better measure of total product felt they had to give it a different name (e.g., Nordhaus and Tobin 1972).

[30] It bears notice that the bureaucrats and the profession have here parted company: where we take "GDP" at face value, at least in our empirical work, the United Nations emphasize that what they (nonetheless) call Gross Domestic Product is

We economic historians, in particular, have no interest in a rough-and-ready policy-guiding index of the economy's current path, in "GDP." We want to gauge the evolution of economies over decades and more, we want to compare them to each other as well as to themselves earlier or later; and to do that we need a proper measure of the economy's product, a measure of the opportunity set, in goods-space, it made available to those then alive (over their expected lives, at that, and not in any one year, think of the later fourteenth century). A number of considerations come immediately to mind. Market exchange and paid employment are, as such, simply irrelevant (Pollak 1985): our measure must count unpaid "family production" (typically the work of women, there is more than one battle to be fought here), the unpaid services of durables, including both consumer durables (not just owner-occupied housing but also, e.g., the appliances that allowed housewives to work also outside the home, Gordon 2016) and common-use infrastructure (the piazzas their Italian "owner-occupiers" enjoy daily, and Americans cross an ocean to see, which is of course where I came in), and obviously leisure (corrected for morbidity); and it must count the all-important gifts of nature, that vary from time to time and place to place. By the same token, our measure must exclude not just product-less make-work projects but "social intermediates" (armaments, by extension the police and the judiciary, perhaps the legal professions), and allow for negative externalities: production externalities (environmental costs, including if we want to count it

not that at all, that the "production boundary" is not all-inclusive (*SNA*, pp. 6–7). But they do not concede that the measure is what it is because Kuznets constructed it out of whatever statistics were readily available; their disingenuous claim is that it is a purpose-built measure of the part of the economy that is of interest to policy-makers, designed as it is to avoid "being swamped" by other values. They claim that it rightly "includes all production of goods for own use ..., as the decision whether goods are to be sold or retained for own use can be made even after they have been produced, [and] excludes all production of services for own final consumption within households ... because the decision to consume them within the household is made even before the service is provided" – as if a subsistence cultivator did not decide to consume the harvest before s/he planted it, or I could not decide to sell to my neighbor the steak to which I had just devoted my "cooking services" with an eye to eating it myself. The further argument that traditional women's work must be excluded to maintain consistency with their own definition of "the labor force," which fails to recognize it, is magnificently self-referential.

here the reduction of our subsoil assets), and consumption externalities too, those caused both by congestion (the crush of tourists that has rendered our favorite piazzas quite unlivable) and by social rivalry (which turns increasing consumption into a zero-sum game, Veblen 1899, and may well destroy much of what we call "modern economic growth").[31]

Our backcasting of what we call "gross domestic product" is in fact intrinsically laughable. Imagine us in our Valhalla, imagine our conversation with economic historians yet unborn, imagine that they ask us what our generation did. Shall we be allowed to answer "We reconstructed the historical national accounts" ("Oh, wow!")? Or will Valhalla admit only the unvarnished truth? "We reconstructed the short-term indices of paid-employment-generating-production that would have helped past governments implement their stabilization policies, had they had our statistics and had they had such policies" ("You did *what???*").

The bottom line is that if we are interested in economic growth we should *not* construct that index of predominantly market-oriented, paid-employment-generating economic activity we have misnamed "gross domestic product," but measure instead the relevant aggregate, correcting "GDP" to include for example leisure, unpaid "family production," and the services of public and

[31] This paragraph could easily be expanded into another book, but a few points bear immediate notice. One is that the flow account must be complemented by a stock account, with the former incorporating the per-period changes in the latter; the current product includes investment, by firms and households (as the present value of future services), reduced by disinvestment (the drawing down of stocks due to obsolescence, catastrophe, depletion, and depreciation: our fixation with gross rather than net product may reflect the original concern with paid employment, or a deeper concern that the available depreciation data reflect tax-accounting rules rather than any underlying reality). Another is that the value of free goods cannot be gauged by their market price, sending us back to Dupuit. In the presence of free goods, it may be noted, our "GDP" figures vary in the wrong direction altogether: the opportunity set of people who must arm themselves against a threat, or heat their houses, is smaller than that of those who have no need to, *ceteris paribus*, but their "GDP" is greater. Our measure should grow, and not decline, as we approach Eden, or Marx's communism. A third is that veblenesque consumption externalities (footnote 24) may well validate the essential message of Easterlin (1974), despite the ambiguity of the evidence the author adduces (self-rated "happiness," again interpreted with no sense of what words actually do).

private durables other than houses, to exclude for example such "social intermediate goods" as the military, and to allow for the externalities of both production and consumption. A challenging agenda, to be sure, but no more so than the very different one that gave Kuznets his place in our intellectual history.

2A

APPENDIX: RECKONING WITH MAINTENANCE

2A.1 Industry v. services

The quantitative reconstruction of the past is organized by an accounting framework. The *ISIC* (p. 29) treats maintenance with the lack of uniformity, not to say common sense, we have come to expect of the United Nations: the repair of motor vehicles and the repair of personal and household goods are considered services (respectively trade, division 45, and other services, division 95), the repair of other machinery and the repair of buildings and other structures are considered industry (respectively manufacturing, division 33, and construction, division 43).

Logically, surely, maintenance is either the one thing or the other. As to which it is, a repairman surely provides a maintenance service; and equally surely that is entirely irrelevant, for factors of production always provide services, and the relevant criterion is whether or not those services yield a commodity, a good that exists in its own right and can be stored and resold.[32] New production of goods takes commodities with certain physical characteristics and transforms them into commodities with more desirable ("valuable") physical characteristics, maintenance takes commodities with certain physical characteristics and transforms them into commodities with more desirable ("valuable") physical characteristics; there is no meaningful difference between the two, the only sensible solution is to consider maintenance activity uniformly as "industry" rather than "services."

[32] Services proper cannot be, which is why the providers of transportation or medical services can price-discriminate as commodity-producers cannot.

2A.2 Net production/capital formation v. cost of production

All this involves only what is counted where; but maintenance involves a more serious issue, the issue of whether it should ultimately be counted at all. The issue turns on whether maintenance is considered production (of reconditioned durables), or a cost of production (of the goods and services that use those durables). The United Nations are, on the subject, unusually guarded: the *SNA* asserts that ordinary maintenance and repairs are to be considered a cost of production, while maintenance that involves major improvements is to be considered production – but grants the possible objection that all maintenance should be considered production.[33]

The objection appears valid: painting a hull yields a painted hull, to consider it production of a durable good (and capital formation) in some cases and a cost of production (of seaborne transportation) in others seems frankly quixotic. Maintenance produces a commodity (a newly reconditioned good) that wasn't there before, just as new production produces a commodity (a brand-new good) that wasn't there before; and the former commodity is clearly a durable good, just as the latter is. Logically, maintenance is industrial production, and capital formation; *secundum non datur*.[34]

[33] "Ordinary maintenance and repairs undertaken by enterprises to keep fixed assets in good working order are treated as intermediate consumption. However, major improvements, additions or extensions to fixed assets, both machinery and structures, which improve their performance, increase their capacity or prolong their expected working lives count as gross fixed capital formation. In practice it is not easy to draw the line between ordinary repairs and major improvements, although the SNA provides certain recommendations for this purpose. Some analysts, however, consider that the distinction between ordinary repairs and maintenance and major improvements and additions is neither operational nor defensible and would favour a more 'gross' method of recording in which all such activities are treated as gross fixed capital formation" (*SNA*, pp. 8–9).

[34] Logically, too, the "durability" of a good depends not on a convention related to how long it lasts ("one year"), but on the facts of the case: whether use implies the consumption of the good itself (food, a raw material, an hour of labor), which disappears, or the consumption (only) of the services of the good, which survives (a refrigerator, a tool, a laborer). From this perspective the exclusion of clothes-washing from durable-good-producing industry is arguably not an exception, as while the textile products themselves are clearly durables, their spotlessness and odorlessness are not: the national income and product accounts are a hair-splitter's playground.

2A.3 The "logic" of the United Nations

The national accounts were less concerned with production in general than with paid-employment-generating production in particular; one consequence was the neglect of household production (and the attendant consumption), essentially traditional "women's work," the women's work that is never done. A further consequence was the neglect of households' consumption of the services of the durables they owned (save housing), and, derivatively, of the corresponding stock of durables. The accounting framework does not allow households to invest in durable goods (save housing, as will not be repeated): everything households purchase is treated as a non-durable, households are assumed to consume not the transportation services of their vehicles but the vehicles themselves, to eat not just the food in the refrigerator but the refrigerator too.

Choices are path-dependent. In the national accounts firms are recognized as owners of durable goods, their additions to their stocks are recognized as investment; the maintenance of their assets could be considered industry, as seemed sensible (there is not much difference between the shops in which locomotives are assembled, and those in which they are disassembled and reassembled), and it could as noted be taken to produce either a final good or, as the United Nations prefer, an intermediate good consumed in the production of other goods and services. But maintenance could not be taken as an intermediate good in the production of the services of household durables: because these durables were altogether ignored, there was no imputed value-of-product from which this input could be deducted. But the product of firms that maintain household durables had to be counted *somewhere*; and the "clever" solution was to pretend that those firms' activity did not yield (altered) commodities, that those firms were not "industry" but "services." And that is where, in the production accounts, they are supposedly to be counted: a blacksmith repairing a farmer's plow works in industry, but the moment he turns to repairing a household's andirons he migrates to a different sector, only to return when that job is done. I kid you not.

3

THE EVOLUTION OF ITALY'S HISTORICAL NATIONAL ACCOUNTS

3.1 *Genesis*: from rules to generations

The pioneering historical national accounts, for the major European economies – a mere handful, easily reviewed (Fenoaltea 1982) – took the production "data" in the sources at face value, did not pursue disaggregation (or separate out maintenance), used the available production series to represent the missing ones sector by sector, calculated "real" series through Fabricant-Geary "double deflation," and estimated bog-standard "GDP." Those "first-generation" estimates in the obvious chronological sense ignored all the above rules: they are usefully considered "first-generation" estimates in the methodological sense as well.

The corpus of historical national accounts has since exploded – the Maddison project website provides no fewer than twenty-three such national sets, along with Angus Maddison's own famous world-spanning reconstruction – and I cannot claim to have mastered it.[1] But as far as I have been able to tell these accounts replicate the pioneers', the above rules continue to be ignored: the international corpus of historical accounts appears to be, in the mass, a "first-generation" effort.[2]

[1] The national accounts are collected at https://www.rug.nl/ggdc/historicaldevelopment/na/, Maddison's figures at http://www.ggdc.net/maddison/oriindex.htm (accessed December 2019). On my reasons for questioning both Maddison's competence and his intellectual honesty see below, §3.2.

[2] This revealed preference for replication may reflect the prudent pursuit of "herd immunity," the immunity from negative referees' reports granted those who follow the leaders as a flatteringly imitative herd; for a broader perspective on how individual career incentives shape our social "science" see Helgadóttir (2020).

The above rules are on different levels, and suggest a sequence of generations. The first three rules – vet the data, disaggregate, *think* when you extrapolate – together inform the construction of our elementary production series (typically in their natural physical units, e.g., "tons of steel"): our understanding of the historical "facts" that could have been observed, our preparation of the materials with which we shall reconstruct the economy's past.[3] The fourth rule – use a common deflator – informs the subsequent transformation of physical-product estimates into "real value added" estimates that can be meaningfully compared and aggregated, the fifth enjoins us to correct the estimates of "GDP" to obtain a measure of aggregate product; both inform the economist's measures of "the economy," both are as relevant to the present as to the past. In the circumstances it is natural to identify the "second-generation" corpus with the production series derived respecting the first three of the above rules (and only those), and the "third generation" corpus with the estimates of "real value added" properly derived from those physical-product estimates, respecting also the fourth rule. The proper estimates of aggregate product, as per the fifth rule, would in turn be estimates of the "fourth generation."[4]

These generations are biblical, as comparatively long-lived as the patriarchs. The fourth and last may well take damn near forever, as conventional "GDP" is vigorously defended by entrenched international bureaucracies, and happily accepted by an economics profession that would rather play econometric games with ready-made "data" than address the serious problem of measuring "the economy"; the supersession of our Kuznets-style index is urgently required, but after seventy-odd years still in the murky, indefinite

[3] These production series, carefully derived from the sources, are of course "elementary" only metonymically, as (our substitute for) the production "data" ideal sources would have handed down to us ready-made, and again computationally, as the activity-specific reconstructions that then enter the higher-level estimates.

[4] Logically, of course, one should *start* from a clear definition of what is to be measured; but the extant national accounts backcast "GDP," and in practice any proper aggregates will be derived from the GDP series themselves, with suitable sanding and filling.

future.[5] Closer to hand, the derivation of the "second-generation" production estimates is itself enormously time-consuming: where the evidence must be discovered, the algorithms that exploit it developed step by step, the estimates derived through repeated iterations, months stretch into years, and years into decades. *Italia docet*: after half a century my second-generation estimates of industrial production are still incomplete, it will take more years of work, Lachesis permitting, to round out the set.[6]

The third generation is not particularly challenging, but neither is it trivial. Common deflation requires the prior construction of current-price value added estimates, estimates that must themselves be obtained by mating the ("second-generation") year- and product-specific quantity estimates to matching year- and product-specific estimates of value added per physical unit; and these last have yet to be compiled. In the interim, to satisfy our curiosity, to get an idea of what may eventually emerge, we construct "second-generation" national accounts that simply combine the extant second-generation product estimates, and preliminary series

5 It is urgently required, even if it is not seen to be, because any measure creates an incentive to do well in its terms – whence policies that increase "GDP" even as they damage the economy, or decrease measured "public debt" while actually increasing the State's net liabilities.

6 My estimates for the construction industry, for example, took three years of full-time research. One year yielded the initial set of estimates, for railway construction (from mileage data), for other infrastructure (from the public-works budgets), and for private buildings (from buildings-tax data); but (much like Istat's) my estimated aggregate value added in 1911 fell far short of that implied by that year's census. Searching for what I (and Istat before me) may have missed, I discovered that many public works appeared in other budgets (e.g., the construction of schools, in the education budget); a second year through the sources produced estimates that gave for 1911 a total that was higher than before, but still not high enough to match the census. The still-missing component turned out to be privately financed non-railway infrastructure (e.g., the hydroelectric dams built by the power utilities); and this was recovered with a third year of work. The time absorbed by other major sectors is not so readily established, as they were studied, set aside, and then returned to; but such complex and largely ill-documented sectors as textiles or engineering each easily absorbed, over time, half a dozen full-time-equivalent years. Gerschenkron (1962 [1955]), his first-generation index of Italian industrial production, incorporated a few dozen series mostly found ready-made in the *Annuario*; it should not have taken more than a few months.

for the sectors not yet properly studied, with base-year weights, product-specific estimates of value added per physical unit calculated for the "base" year alone.[7] Such accounts are mere temporary structures built with a still inadequate stock of materials: because they incorporate preliminary series as well as proper second-generation estimates they are subject to progressive revision as the latter component expands (until it is "completed," i.e., one throws in the towel); and because they are measures "at constant prices" that correspond implicitly to activity-specific deflation, they violate our fourth rule and distort the composition of the aggregate, increasingly so as one moves further from the "base year."[8]

But these last distortions are tied to changes in relative prices, themselves tied, in the main, to differential productivity growth; and about that, in the large, we have a fairly clear notion. We know therefore *how* our second-generation structure is distorted, at least *dans les grandes lignes*; and we can tentatively correct for that, producing conjectural third-generation subaggregates and summary national accounts not at base-year prices but at the base-year price *level*.[9]

[7] If our second-generation quantity estimates distinguish n elementary activities over t years, we have n elementary physical-product series and $N = n \times t$ elementary year-specific estimates of physical product; in the case at hand we can expect, in round figures, $n = 300$, $t = 50$, and $N = 15{,}000$. The second-generation "constant price" aggregates combine these N quantity estimates using just n product-specific estimates of value added per unit ("at base year prices"). Third-generation aggregates would be obtained by the common deflation of n current-price value added series, themselves derived by attaching to the N quantity estimates another N (year- and product-specific) estimates of value added per unit. In practice, of course, year-specific input-output data are very rare, and the value-added-per-unit series will be built up by interpolating and extrapolating far fewer than N independent estimates; but for all that much work remains to be done.

[8] The second-generation elementary "real value added" series are base-year-value added-weighted physical product series, in the above notation $v_{rito} = (v_{io}/Q_{io})\ Q_{it}$. Expanding this last, $v_{rito} = (p_{it}Q_{it} - z_{it}R_{it})/[(p_{it}Q_{it} - z_{it}R_{it})/((p_{io}Q_{io} - z_{io}R_{io})(Q_{it}/Q_{io}))]$: the implicit value-added deflator, in square brackets, is obviously activity-specific. The calculated "real" value-added relatives are therefore distorted – like the first-generation "double-deflated" relatives, albeit typically less so (Fenoaltea 1976).

[9] E.g., Fenoaltea (2011b). The second-generation aggregate is there accepted, but its *composition* is tentatively recalculated to allow for plausible trends in relative prices, whence in principle a constant price level but current relative prices.

So the first generation respects none of the *regole dell'arte*; the second generation, well along, respects the first three; the third generation, barely adumbrated but very much *in pectore*, the first four. The fourth generation that would respect all five, and measure aggregate product rather than "GDP," is for the moment only a pipe dream. The present figures do not even point in that direction: the current second-generation series are built for GDP-compatibility, excluding for example from "industrial production" the transformation of cloth into finished goods performed within the household for its own use, and the aggregate presented here hews as closely as it can to "GDP" as conventionally defined. One reason is that "GDP" is now the well-entrenched international standard, even more than English it is the language to be used if one is to communicate with other scholars with similar interests; another, even more compelling, is that anything systematically better is at the present time simply *ultra vires*.[10]

And so we reach, at length, the reasons why after half a century of work the estimates I can offer are no more than interim figures (§1.2). In the first place, the production-side estimates are (still) second-generation estimates, not yet third-generation, let alone fourth. Worse, a full set of proper (second-generation) elementary production series, covering all sectors, is not yet in hand: the production-side historical national accounts proposed below are not even "final" second-generation estimates. And if the production side is poorly documented by the sources, the expenditure side is as near as makes no difference not documented at all: in practice the expenditure side has to be derived from the production side, it belongs to the same generation as the latter.

So mine are interim estimates, very much interim, still nearer the beginning of the journey than its end. Of that journey I cannot expect to see much more: my bright future is now mostly behind me, and Atropos is honing her scissors.

[10] A better measure cannot at first be presented without an accompanying standard measure, to document their differences. By the time my disenchantment with "GDP" matured, not least with my environmental education, my standard measure was well along, and my life expectancy too short to warrant attempting both.

3.2 The data, the centenary reconstruction, and its aftermath

Italy was unified in 1861. The State did not of course systematically monitor the economy then as it does now, and on the real side of interest here the data environment is not exactly lush. The oldest, most continuous sources are those that reflect specific interests of the State, indeed of the fisc. There are, obviously, statistics on foreign trade: these are increasingly detailed, in part because protection took the form of specific duties, and by all accounts relatively reliable. The railway sector, at once taxed, subsidized, and heavily regulated, was closely monitored; shipping too was the object of special legislation, and extensively documented. Commodity production was instead monitored only in exceptional cases. The richest data refer to the mining sector, as the sub-soil belonged to the Crown; salt and tobacco were State monopolies; ships were registered, and shipbuilding correspondingly tracked; and a few minor industries were monitored because they were subject to production taxes.[11]

The State was of course not uninterested in the wealth of the nation, and generated a growing corpus of production figures. Agriculture in particular was subjected to an initial survey, which provided loosely synchronic cross-section estimates, around 1880. Annual production figures were then produced for a few major crops (grain, wine, silk), but the estimating procedures were amateurish and the results were notoriously unreliable; a serious statistical service appeared only in the early 1900s.

Industrial statistics also became more abundant. A few industries were richly documented in the immediate aftermath of Unification, but these efforts remained one-offs. Over time, however, the mine inspectors gradually extended their inquiries to related sectors, and added production figures for metalmaking, chemicals, quarrying, and non-metallic mineral processing. Systematic surveys of industry were also put in hand. An initial survey proceeded slowly, province by province, and finally yielded a cross-section updated to 1903. A first industrial census was taken in 1911; but inexperience told, and the census failed to pick up "domestic"

[11] For an extended account, with appropriate references, see *IIPA*.

activity (apparently all activity at the owner's residential address, and not just that within the residential quarters).[12] The surveys and the industrial census provided employment and horsepower data; comprehensive information on value added, outputs and inputs would come only with the industrial census of the 1930s.

Finally, the State counted its citizens, at decadal intervals, from 1861 (skipping 1891, a crisis year, in an effort to save money). From 1871, detailed labor force figures are also included, by sector of activity; the distinction between housewives and domestic textile workers took a long time to settle down, but the figures for males seem relatively reliable. For a significant subset of the services, the only direct evidence is that provided by the census labor-force data.

By the standards of today, these pickings are slim indeed; but the standards of the time were very different. Economic measurement was then aborning, and the Italian school was in fact among the world's best: the data on which we can base Italy's historical national accounts are very incomplete, but not exceptionally so.

From these limited data Italy's historical national accounts have repeatedly been reconstructed. The first effort, then a pioneering one, was prompted by the centenary of national unification: in the later 1950s Istat (then the Istituto centrale di statistica) published the *Reddito nazionale*, the first set of historical national accounts from Unification right up to the then present. This initial effort included a complete reconstruction of the expenditure accounts at both current and constant (1938) prices; the corresponding production accounts included constant-price series for core agriculture (cultivation and herding) and core industry (manufacturing), but were otherwise presented at current prices alone.

This effort was resumed a few years later, under the auspices of the Kuznets-Abramowitz S.S.R.C./Ford Foundation project on the economic growth of the industrialized economies, by Giorgio Fuà and his "Ancona group." The statistician of the group, Ornello

[12] See Fenoaltea (2015a). Information on such activity was to have been provided in a dedicated section of the demographic-census form sent, on the same day, to every residential address; but the results proved too spotty to be worth tabulating. The industrial census thus seems systematically to omit the shops of the artisans who had them "downstairs" rather than "across the street," and even large factories located in a compound that included the owner's residence.

Vitali, completed the constant-price production accounts using Istat's own partial or related series (and tinkered with the expenditure side as well, above, §2.5, footnote 26; see Fuà 1966, 1969). The Istat-Vitali corpus constitutes the "first-generation" estimates of Italy's historical national accounts: not only chronologically but methodologically, as per the above taxonomy. The Istat-Vitali estimates violate all five of the above rules: their methodology was the international standard of the day, at the time absolutely unchallenged.

As was soon pointed out, the Istat-Vitali estimates for the decades to World War I seemed very seriously to distort the path of both agriculture and (downstream) industry because they acritically incorporated unsound series in the historical sources, and leveraged the error by using these "known" series to represent "unknown" ones (Fenoaltea 1969, 1972). Tragically, both Istat and Vitali described the derivation of their estimates only in very general terms; the underlying research was held back, and finally lost. The published results could not therefore be subjected to detailed scrutiny, much less to piecemeal revision: they had to be accepted as they stood, or rejected outright. In the circumstances, most scholars took the Istat-Vitali reconstruction at face value; a few tried to improve it by rearranging Istat's own materials; and fewer still embarked on the effort to replace it altogether.

The task of reestimating industrial production (only from Unification to the Great War) was taken on – in the mid-1960s, just as Vitali was completing his own effort – by the present author; the starting point was the Gerschenkron index, the construction of which was documented in detail (Gerschenkron 1962 [1955]). In the early 1980s, Albert Carreras independently produced a long-term reconstruction of Italy's industrial product, again fully documented, and the more impressive because it was only half the groundwork for his comparative project on Italy and Spain (Carreras 1983, 1992, 1999).[13] Also in the early 1980s the task of

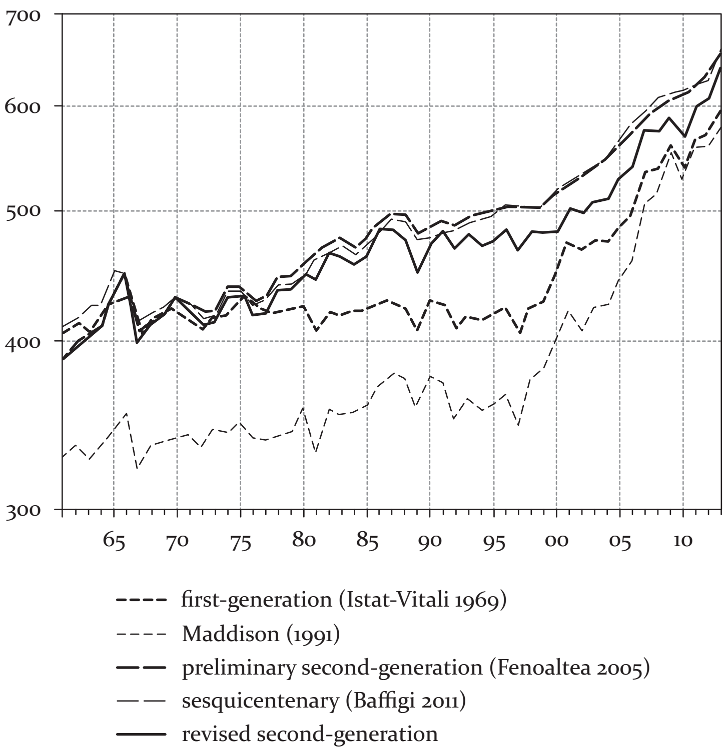
[13] Carreras' work did not influence the subsequent estimates for the period at hand, but was incorporated in the sesquicentennial estimates for later years; see Baffigi (2011), p. 45 and Carreras and Felice (2010). Carreras (1983), the high-water mark of the first generation, critiqued the data but did not venture to amend the

reestimating agricultural production was taken on by Giovanni Federico, with whom the present author would long work closely; and a few years later still, with an eye to its own centenary in 1993, the Bank of Italy commissioned a progressive revision of the entire historical accounts. The first fruits of this project were benchmark reconstructions of both the production and the expenditure side, at current prices, for 1911, and then for 1891, 1938, and 1951 as well (Rey 1992, 2000, 2002); these are returned to below.

As these efforts were progressing a production-side revision of the GDP series was proposed by Angus Maddison, who had found the initial levels of the Istat-Vitali GDP series impossibly high. To reduce initial GDP, working backwards, he needed to increase its growth rate; and he did this in two ways. He had no alternative to the Istat-Vitali series for agriculture and the services, but replaced their slow-growing industry series with one that grew much more rapidly, a series he constructed by selecting industry-specific series from my own work (ignoring, in particular, my estimates for the relatively stagnant traditional sectors). Not content with that, he further increased the growth rate of the aggregate by combining his sector series using early Istat weights: throwing coherence to the winds, he attributed to industry the large backcast early share of aggregate value added implied by the slowly growing Istat-Vitali series rather than the much lower backcast early share implied by

figures in the secondary sources (e.g., pp. 922–923), nor to complement them with estimates of undocumented production: his documented product, near 90 series directly aggregated with base-year value added weights, served as his index of total product. For his index Carreras claimed 56-percent coverage (in 1970, p. 1016), a figure lower than the 65 percent (in 1903) apparently claimed by Gerschenkron (1962 [1955], pp. 405–406) for his index that combined just 20-odd series; but the operative word is *apparently*, for Gerschenkron wrote "no less than 35 percent of Italian industry has remained outside the scope of the index," words craftily crafted to suggest 65-percent coverage without actually claiming as much. Gerschenkron's figure actually counts as "outside the scope of the index" not all the industries, but only the entire industry *groups*, for which he has no information: his residual 65 percent includes for example the entire chemical industry, (even though it is) represented by sulphuric acid production (alone: by my count, at 1911 prices ever well under 10 percent of the chemical industry as a whole, *IIPD*).

FIGURE 3.1 *Per-capita income at 1911 prices, 1861–1913: alternative estimates (lire)*



his own rapidly growing series.[14] Maddison's statistical legerdemain thus increased, as he wished to, the aggregate growth rate; but it changed little else, and his aggregate's short- and medium-term movements remained essentially those of the original (Maddison 1991; Bardini, Carreras and Lains 1995; Fenoaltea 2005; Figure 3.1).

[14] Maddison's series appear not to have been used in subsequent work on the pre-War Italian economy. That his procedure was logically indefensible was pointed out to him, and acknowledged by him, before his estimates were published; the correspondence survives. On his long-term world-wide reconstruction, naïve Whig history in numerical form, see Fenoaltea (2006).

An alternative revision of the GDP series from the expenditure side was proposed shortly thereafter by Nicola Rossi, Andrea Sorgato, and Gianni Toniolo. Their series began in 1890; it reweighted the original Istat-Vitali series using the new benchmark for 1911 published under the auspices of the Bank of Italy, and over the period of interest here it differed from the Istat-Vitali original even less than Maddison's (Rey 1992; Rossi, Sorgato, and Toniolo 1993; Bardini, Carreras, and Lains 1995).

3.3 The early second-generation estimates

Meanwhile, even as the first-generation Istat-Vitali estimates were being completed, the second generation tiptoed onto the scene. The author's very first reconstruction of post-Unification Italy's industrial production (Fenoaltea 1967) improved on Gerschenkron's by extending disaggregation (e.g., to allow for trade in cotton yarn) – and thoroughly revised it by actually vetting the data in the sources. The series that didn't pass muster were corrected (e.g., the grain-consumption series), or simply eliminated (e.g., the silk-production series): apparently an innovation, curiously overdue.

That first reconstruction also respected, in a backhanded way, the third rule above: the aggregate series was considered a measure of *documented* production alone, and not of aggregate production. The author's first estimate of *aggregate* industrial (actually manufacturing) production (Fenoaltea 1972) did *not* attribute the observed paths to the unobserved activities: documented production there represented only itself, undocumented production was estimated in its own right. The application was crude – because documented production appeared to cover the rapidly growing "modern" (factory) industries and the cyclical investment-good industries, undocumented production was identified with that of the traditional (artisanal) consumer-good industries and attributed a simple, slowly rising trend – but the principle was sound and, once again, apparently innovative.

The author then did one more thing, surely not unprecedented, but which was at the time (and so remains today) very lonely work: he thought of economic measurement as an economist, and not a mere statistician. The upshot was what I now call the fourth rule, the rule that deflation must be common and not activity-specific, the rule that when observed will yield our third-generation estimates (Fenoaltea 1976). With that, I was satisfied that I understood what my reconstruction of industrial production actually was, and how it should be interpreted; with that, I settled down to work. The first industrial sector to boast complete second-generation coverage was the utilities sector (Fenoaltea 1982); those estimates were *inter alia* the first to estimate the product of the ill-documented water-distribution industry in its own right, the first *not* to assume that the growth of that age-old industry was an internal average of the growth of the recently invented gas industry, and the even more recently invented electricity industry.

From about that time, as noted above, my work on industry was paralleled by Giovanni Federico's work on agriculture. The Bank of Italy took notice, and as also recalled above soon commissioned a revision of the historical national accounts; the entire project was entrusted to Guido Rey, then the president of Istat, and its first objective would be the reconstruction of ("benchmark") current-price accounts for 1891, 1911, 1938 and 1951.[15] The subor-

[15] Rey's strategy was to produce cross-section benchmarks, and then to correct the time series by adapting them to fit; the use of the word *pilone*, which refers to the towers that carry cables, captured the metaphor perfectly (Baffigi 2015, pp. 118–119). We sector specialists, then relatively junior, were brought in to build the towers, and then let go; the cables were to be restrung by Vitali, but he ran into problems – the word on the street was that internal consistency proved elusive – and sadly soon passed way, leaving the project in limbo until it was essentially revived for Italy's sesquicentennial. But the towers-and-cables approach was questionable, on various grounds. In the first place, when the project was conceived the extant series were the flawed Istat-Vitali corpus (plus only the first handful of industry-specific second-generation estimates), and those series called for far deeper revision than a mere trend correction between widely spaced benchmarks; this problem was fortuitously alleviated as the project was delayed, and a much-improved set of interpolating series were available by the time the sesquicentennial rolled around. In the second place, benchmarks require supporting time series evidence: in general (§2.1), and especially in the light of our specific sources (we had wage and labor force data, but only the path of production could have given us an idea of employment levels). In the third place, 1891 was apparently selected as the initial benchmark with an eye to the birth of the Bank of Italy, and not, like the later years, to the momentary abundance of historical data. Absent a census in that year, and absent useable time series (published or not), the 1891 "benchmark" estimates for the services in

dinate investigators of the "benchmark team" included Giovanni Federico on agriculture, the present author on industry, Vera Zamagni on the services, and Ornello Vitali on aggregate GDP and the expenditure side (Rey 1992, 2000, 2002).[16] Shortly thereafter, for 1861–1913 the present author published 1911-price series for industry, by sector (Fenoaltea 2002a, 2003), and Giovanni Federico published current- and 1911-price series for aggregate agriculture (Federico 2003a, 2003b). These time series incorporated years of research, but remained preliminary: the industry series because the still-unstudied sectors were represented by very crude estimates, the agriculture series because it allowed for equilibrium responses to price movements but not for short-term weather-related harvest fluctuations.

The time seemed ripe for an equally preliminary revision of the historical national accounts: the first "second-generation" esti-

particular were derived by averaging the 1881 and 1901 labor-force data (e.g., Rey 2000, p. 267); once the 1881–1901 time series were reconstructed, conserving the 1891 "benchmark" would illogically force them through the average of their end-points.

[16] The project's treatment of maintenance warrants clarification. The international-standard *SNA* distributes maintenance over industry and services, and over net production that inflates GDP and costs of production that do not; a moment's thought suggests it should be treated uniformly, as industry, and as net production (above, ch. 2A). In the case at hand, two points bear notice. One is that the (Italian-standard) "benchmark" sector definitions leave in industry the maintenance of almost all durables, and attribute to the services only the maintenance of non-leather apparel (mainly contract clothes-washing). The second is that Vitali's 1911 benchmark explicitly claims to consider maintenance a cost of production, to be excluded from capital formation, and his input-output table duly treats the maintenance produced by the engineering industry as intermediate purchases by the other sectors; but he then adds those purchases and the various activities' value added, as estimated in the sector-specific chapters, to obtain each activity's gross value product, and his GDP is simply the sum of those value added estimates and indirect business taxes (Rey 1992, pp. 294–295, 314–318). But those value added estimates are gross of the sectors' own maintenance expenditures, just as they are gross of their expenditure on banking services; Vitali's definitions would require the exclusion of double-counted maintenance (or the reduction of each activity's value added by its expenditure on maintenance, so that maintenance does not artificially inflate the estimated value product figures). The upshot is that Vitali actually and apparently unintentionally counts maintenance as net production that enters GDP; and to the extent that his investment figures exclude it, his consumption figures are correspondingly inflated. None of this was apparently noticed at the time, indeed at any time before the present.

mates, the first to remove the critical methodological flaws of the "first-generation" Istat-Vitali estimates. A 1911-price 1861–1913 production side was soon reestimated (Fenoaltea 2005): it combined the new Federico and Fenoaltea commodity-production series with new 1911-price series for the services obtained by extrapolating Zamagni's 1911 "benchmark" estimates with suitable real indices.[17] As we knew it would be, the measured path of GDP was radically altered (Figure 3.1). The turn-of-the-century acceleration that characterized the first-generation estimates altogether disappeared: the dominant pattern was a ("Kuznets cycle") long swing in the production of durables (with upswings over the 1880s and the *belle époque*) superimposed on relatively steady trend growth.[18] Some years later the corresponding 1911-price expenditure side was also reconstructed (Fenoaltea 2012): it incorporated the new Federico-Natoli-Tattara-Vasta trade series (Federico *et al.* 2011, also commissioned by the Bank of Italy), and allocated the production side to private and public consumption, and to investment, as suggested by Vitali's current-price expenditure-side estimates for 1911 (without grasping their distortions, above, footnote 16).[19]

3.4 The sesquicentenary reconstruction: the production side

Then Italy's sesquicentenary hit, and it was *déja vu* all over again. Istat (by then the Istituto nazionale di statistica) and the Bank of Italy ordered up a reconstruction of the historical national accounts,

[17] An intermediate GDP series that combined the new Federico and Fenoaltea series for agriculture and industry with the extant Istat-Vitali estimates for the services was immediately calculated by Gianni Toniolo (Toniolo 2003), but it was quickly superseded.

[18] On the Kuznets cycle see Fenoaltea (2011a), pp. 67–108. The neo-gerschenkronian resurrection of the Istat-Vitali trend break compares the trough-to-trough growth rate to 1896 to the trough-to-peak rate from 1896 to 1913: see Fenoaltea (2020), pp. 22–26, and references therein.

[19] This paper circulated, under varying titles, from 2009; the ms. is cited in Gomellini and O'Grada (2011) and again in Baffigi (2015), p. 171. The early versions used the trade series in Fuà (1969).

post haste, as the groundwork for a broad reconsideration of the Italian economy from Unification to the present day. The entire celebratory project would be directed by Gianni Toniolo (Toniolo 2013a). The reconstruction of the current- and constant-price historical national accounts was entrusted to the Bank's Alberto Baffigi, who devoted to the issue much sophisticated thought (Baffigi 2015), but was forced by his stringent deadline to take a number of practical short-cuts (Baffigi 2011, 2013).[20]

An early decision of the "sesquicentennial team" was to take as given the production- and expenditure-side estimates produced by the "benchmark team," as recapitulated by Vitali (Rey 2002); a further benchmark was manufactured for 1871, but in the event it was never documented (Baffigi 2011, p. 55). These benchmarks would be maintained *de pied ferme*, forcing through them, as necessary, all the time series, old and new; like the preliminary second-generation estimates in Fenoaltea (2005, 2012), therefore, Baffigi's reconstruction was based on Vitali's "benchmark" figures, and inherited their contradictions and distortions.[21]

Baffigi then began, as he had to (§3.1), from the production side. For agriculture, over the period at hand, Baffigi borrowed the aggregate production series and deflator in Federico (2003a);

[20] The relevant pages of Baffigi (2013) appear to be verbatim reproductions of Baffigi (2011); his work sheets as well as his final estimates can be found on the website of the Bank of Italy (https://www.bancaditalia.it/statistiche/tematiche/stat-storiche/stat-storiche-economia/index.html, last accessed May 2020). Baffigi (2015) provides useful further details, and a penetrating discussion of the broader methodological issues that devotes much-deserved attention to the writings of Giorgio Fuà; Italian is alas no longer the common language of cultured Christendom, and a translation of Baffigi's work, and Fuà's, would be most useful. Istat and the Bank had the clout to alter our paradigms, and with Enrico Giovannini then the head of Istat there was room to hope that they would pioneer a proper ("fourth generation") measure of aggregate product; but that was not to be, and here we still are, chained to "GDP" like Prometheus to his rock, with the United Nations playing the eagle.

[21] The partly bogus nature of the "1891" benchmark and Vitali's confused handling of maintenance have been noted above (footnotes 15 and 16), the serious flaws of the service-sector benchmark estimates are documented below (ch. 7; see also §4.1). Baffigi (2015, p. 119) notes that his own strategy was inevitably influenced by the opportunity to build on our earlier "quality work" on the benchmarks: he gave us far more credit than we deserved.

for industry, he borrowed the constant-price sector aggregates in the present author's production-side estimates (Fenoaltea 2005), and derived their current-price equivalents using the "centennial" deflators (Fuà 1969). For the services, he could have done exactly what he did for industry. He did not: the present author's 2005 constant-price series for the services were altogether set aside, and the "sesquicentennial team" reconstructed the time path of the services from the sources up.

This exceptional attention to the services sector presumably reflects the influence of Zamagni's immediate dismissal of the present author's constant-price series as simply "unacceptable" (Zamagni 2006), and the apparent lack of influence of the subsequent rebuttal (Fenoaltea 2011b); be that as it may, of the Bank's "benchmark team" she alone survived to contribute new estimates to the sesquicentennial project. With her former Bologna students Patrizia Battilani and Emanuele Felice she produced new current-price series for the services (Battilani, Felice, and Zamagni 2014); the (newly estimated) quantity series that entered those estimates were then used by Baffigi (with Istat's Alessandro Brunetti) to compile the corresponding constant-price estimates (Baffigi 2011, p. 56, 2015, pp. 106–110).[22] It may be noted that this procedure guaranteed consistency between the new current- and constant-price estimates for the services themselves, but introduced inconsistency between the estimates for the services and those for industry, as some services are produced by stocks augmented by industrial production; this inconsistency the present author's 2005 reconstruction had been careful to avoid.[23]

[22] There is irony here, as Zamagni considered the present author's service-quantity series "unacceptable" because they yielded a (1911-price!) share of the services in 1861 that was, to her mind, clearly too high (Zamagni 2006, p. 374). The Battilani-Felice-Zamagni quantity series, incorporated by Baffigi and Brunetti, imply a (1911-price) share of the services in 1861 that is even higher (37 percent instead of 35).

[23] The most serious inconsistency in the sesquicentennial corpus seems actually to be a different one, internal to Zamagni's work. Her 1911-demographic-census-based benchmark estimates for the services assume that the labor force was, in essence, fully employed (Rey, 1992, e.g., pp. 202, 224–226). At the same time, she insists that industrial employment must be taken from the (partial) industrial census of that year, implying an unemployment rate in industry, at the peak of the pre-War boom, in excess of 40 percent. The sesquicentennial labor force and employment estimates by Claire Giordano and Francesco Zollino, also

In the event, Baffigi's 1911-price production side did not differ much from that in Fenoaltea (2005), not least because both were anchored by the "benchmark" estimates for 1911 in Rey (1992, 2000, 2002). Both used Federico's series for agriculture; however, Baffigi's figures are rather lower than the present author's, with a reduction that grows smoothly from some 5 percent in 1871 to 7 percent in 1891, and then progressively declines to vanish by 1911.[24] Both used the present author's industry series (in Fenoaltea 2005, themselves taken from Fenoaltea 2003), and (at constant borders) the figures are identical. Baffigi's estimates for the services differ of course, in detail, from their predecessors (below, Figure 4.1, panels C1–C6); the sector aggregate is typically marginally higher, with a difference equal to some 2 percent in the 1870s and 1880s, rising to approach 5 percent around the turn of the century, and then progressively vanishing.[25]

of the Bank of Italy, follow the road Zamagni paved with good intentions; they are inconsistent with the estimates for industry, and the resulting "productivity" measures are sheer nonsense (Toniolo 2013a, Tables A5 and A6; Giordano and Zollino 2015; Fenoaltea 2015a, 2016, 2020, footnote 58). Giordano and Zollino have not replied to criticism, and simply continue to use their series as if nothing were amiss (Giordano and Zollino 2017). Zamagni has instead reaffirmed her position (Zamagni 2016); she is apparently ready to believe both that industrial unemployment could exceed 40 percent (and implicitly much more, in less prosperous years), and that such a rate is consistent with near-full-employment in the rest of the economy (as if at the bank or the post office, or when seeking employment, people joined the longest queues rather than the shortest).

[24] Baffigi's series is generally lower because the Federico current-price series was forced through the (Vitali 1891 and new 1871) value-added benchmarks before being deflated by the Federico price index (Baffigi 2011, p. 56).

[25] The Baffigi production- and expenditure-side estimates illustrated in Figures 4.1 and 4.4 below are direct transcriptions of his 1911-price series at current borders, from 1861 to 1911 (Baffigi 2017), with the following adjustments. First, the effect of the annexations in 1866 (Venetia) and 1870 (Latium) is eliminated by extrapolating his estimates for 1871 back to 1861 using his series at constant borders, the borders of today; the recalculated series are thus, like mine, at the constant borders of 1871–1913. Second, his 1911-price series are extended from 1911 to 1913 using his 1911–1951 1938-price series, none of them, obviously, taken from the present author. Baffigi's services and total value added series also include the entire value added of the banking and insurance industry, and he deducts double-counted banking and insurance services only when passing from aggregate value added to GDP; the "Baffigi" series in Figure 4.1 directly illustrate the *net* value added in banking and insurance services (panel C3), and the services' aggregate value added (panel C) already net of double-counting.

The changes to the sector aggregates are small and largely offsetting. Baffigi's estimate of aggregate value added is 98.6 percent of the 2005 estimate in 1871, dropping to 97.0 percent of it in 1891, and then climbing back to equality by 1911: all things considered, Baffigi's sesquicentenary 1911-price production-side estimates did not significantly depart from the preliminary second-generation series (Figure 3.1).

3.5 The sesquicentenary reconstruction: the expenditure side

As noted, both the above-mentioned second-generation expenditure side that eventually appeared in Fenoaltea (2012) and the sesquicentenary expenditure-side in Baffigi (2011) were derived, as they had to be, by disaggregating the estimate of GDP obtained from the production side; and they were derived from what were in fact, as just noted, very similar production sides. Contrary to what could have been expected, however, the two estimates of the expenditure side emerged with no consensus at all.

The present author's expenditure side was simply conceived, never going beyond the basic components *C*, *I*, *G*, *X*, and *M*, and simply derived. The 1911-price production-side estimates of value added were broken down into 22 components. These production series and net indirect taxes were attributed to investment *I*, private consumption *C*, and public consumption *G* with series-specific, time-invariant coefficients; deflated exports and imports were similarly allocated with year-specific coefficients that reflected their composition. The 1911-price expenditure-side estimates thus incorporated evidence of changes in the mix of goods produced and of goods traded, and were consistent by construction with the corresponding production side.[26]

[26] The title of Fenoaltea (2012) refers to the deconstruction, as well as the reconstruction, of the expenditure side. The former showed how the Istat-Vitali reconstructions were (like Maddison's) made to tell (in quantitative terms) the story their proponents believed to be true, *ex ante*. The logic of the story overrode both evidence and logic *tout court*; to belabor the point, it takes considerable *naïveté* to consider economics a science, and economic "data" (which they in fact are not) as objective "observations" rather than culture- (and prejudice-)bound constructs.

No doubt because the present author's reconstruction was still circulating privately, Baffigi made no use of it.[27] The expenditure side he essentially reestimated *ex novo*, and in greater detail than the present author's, saving limited time by borrowing some series from the earlier literature, and estimating the others through the use of puissant algorithms. As he retells it (Baffigi 2011, pp. 60–63), and as recalled above, he consistently used the 1871-1891-1911 expenditure-side "benchmark" estimates (consistent, by construction, with his similarly-anchored production side), if necessary forcing his current-price series through them. That apart, from the "centennial" corpus (Fuà 1969) he took the public consumption series at constant and current prices.[28] From the present author (Fenoaltea 1987) he took the constant-price "value of new construction" series (which does not include maintenance), mated it to the "centennial" deflator (Fuà 1969) to generate the corresponding current-price series, and pressed these into service to represent "investment in construction."

The other consumption and investment series were new estimates, indexed by proxies and then jointly rescaled, *nota bene*, to maintain consistency with the (at that point given) production-side estimates of GDP. Private consumption at current prices was indexed directly by the imports of consumption goods, from the Federico *et al.* (2011) database, and then deflated by Istat's cost-of-living index. Investment in plant, machinery, and transportation

[27] Publication of the present author's expenditure-side estimates was ironically delayed by the Istat-Bank of Italy project itself: as one referee put it, there was no reason s/he could see "why we cannot wait for an official more thoroughly researched generation of national accounts" (attached to the rejection letter from Cormac O'Grada, then editor of the *European Review of Economic History*, January 27, 2010). In the circumstances, "official" and "more thoroughly researched" sat together poorly, as the one involved a deadline that precluded the other.

[28] The constant-price public-consumption series reflects the corresponding production-side government services series, apparently badly distorted by a very poor deflator (Fenoaltea 2005, pp. 292–296). The complaint is not that Baffigi borrowed a series from the "centennial" corpus – that would be a stone thrown from a glass house (Fenoaltea 2005, p. 310) – but more specifically that he borrowed one that was known to be grossly distorted, and is, on top of that, quite inconsistent with his "public administration" production estimate (compare below, Figure 4.1, panel C6 and Figure 4.4, panel D).

equipment was similarly indexed to 1880 by the net imports of the appropriate goods from the Federico *et al.* (2011) database, and then by the import-quantity series in Warglien (1985), using the Fuà (1969) machinery price index for the appropriate conversions (Baffigi 2015, pp. 142–143).[29] Residual investment (some 20 percent of the total in 1861 and from 1885, but with an intervening peak of 35 percent in 1875) includes ("agricultural") investment in horses for urban services (indexed by the transportation and communications production series), but its dominant component refers to (industrial) "investment goods produced by other sectors," that is, all save engineering and construction. This last appears to have been estimated first in current terms, as a percentage (linearly interpolated between the benchmark figures) of that in plant, machinery, and equipment, and then deflated by the Istat cost of living index (ibid., pp. 145–146).

With these algorithms Baffigi obtained, from a 1911-price production side very similar to the present author's, an expenditure side that was at times very different (below, Figure 4.4). My government-consumption (*G*) series grew quite regularly, interpolating and extrapolating census benchmarks, with upside deviations to reflect the Austrian war of 1866 and, at the very end, the Libyan war; Baffigi's, as noted a *reprise* of Vitali's, registered similar growth from end to end (1861–1911), but displayed a strong *decline* over the first twenty years, then made up by faster growth. The private-consumption (*C*) series were much nearer each other, and both captured the new (*rectius* revived) conventional wisdom, to the effect that the 1880s were a period of rising consumption, like the *belle époque*, rather than a period of crisis, as claimed by the post-war historiography (Fenoaltea 2002b, 2011a, ch. 3). They were especially close after the turn of the century; before that, however, Baffigi's was consistently, perceptibly higher than mine. Major dif-

[29] With respect to 1881–1911 Baffigi (2011), p. 62 refers only to the "Warglien (1985) quantity index"; Baffigi (2015), p. 142 confirms that the reference is to Warglien's net-import-tonnage series (Warglien's Table 1, cols. 3 and, in index form, 4), and not to his constant-price-apparent-consumption-of-machinery series (his Table 7, col. 3), which varies altogether less (with a peak in 1908 just 1.20, as opposed to 1.78, times the 1911 benchmark). Warglien's apparent-consumption series reflects the present author's work in progress at that time; in the light of more recent work, between 1881 and ca. 1895 its time path too is seriously distorted (Fenoaltea 2020).

ferences again marked the investment (*I*) series, perhaps the most significant for our "interpretation" of the economy's growth. Mine displayed the (Kuznets-cycle) long swing, already evident in the production side. Baffigi's was dominated by a step-wise process: it displayed low investment in the 1860s, rapid growth to a markedly higher level in the early 1870s, fluctuations around that level, with only modest trend growth, into the later 1890s, a decade of rapid growth to a peak in 1907, and then a decline. The "take-off of the Giolitti years" evident in the first-generation GDP series was absent from the initial second-generation GDP series, and from Baffigi's too; but it was dramatically reintroduced by his investment series.[30]

These differences between the sesquicentenary and the (preliminary) second-generation series appear to be distortions rather than improvements. One source of weakness is Baffigi's use of the "centennial" price indices, which are as noted of questionable quality.[31] A more general concern stems from his use of consumption- and investment-good imports to proxy for the corresponding, much larger, expenditure aggregates.[32] The procedure assumes, or at least hopes, that imports and domestic production essentially moved together: ideally in lock-step (as if shocks were demand shocks and world and domestic supply elasticities were much the same), or at least in similar proportions across sectors (as the common error would then be appropriately corrected by the final, joint rescaling). Given the swings in the openness of the Italian economy over the period at hand (Federico *et al.* 2011, p. 5; Fenoaltea 2012, p. 293), and their differentiated causes, that assumption seems weak, that hope forlorn. Between the late 1870s and the mid-1890s a series of tariff hikes represented sector-specific relative-supply

[30] Baffigi's investment series does not appear to be referenced in Toniolo (2013b), but its turn-of-the-century step change is clearly grist for Toniolo's neo-gerschenkronian/neo-rostowian mill (Fenoaltea 2020, pp. 103–106).

[31] The cost-of-living index in particular seems to understate the fall in the cost of living in the early 1880s (Fenoaltea 2002b, p. 285); also above, footnote 28.

[32] The figures in Baffigi (2015), pp, 178–180, 185–187 have imports varying, over the period at hand, between 8 and 14 percent of total resources (GDP plus imports), and between 10 and 19 percent of (mis-labeled) private consumption plus non-construction investment: the extrapolation from a small part to the whole is akin to attempting the reconstruction of an entire skeleton from a handful of bones.

shocks that tended to move imports and domestic production in opposite directions; over most of the 1880s, the "grain invasion" was a major consumption-specific supply shock, and domestic grain production, at least, surely fell as imports surged and prices dropped; over the early 1900s the surge in demand for investment goods was *initially* met very largely by imports, as the short-run import-supply curve was significantly more elastic than its domestic counterpart, and after 1908 imports fell as domestic production continued to increase (Fenoaltea 1967, 2020; also Warglien 1985, above, footnote 29).

The most seriously distorted estimates would appear to be the investment series. After the turn of the century, the distortion is inherited directly from the machinery-import-series proxy, for the reasons noted: the final investment series much overstates the investment boom to 1908, and introduces a subsequent bust, because the initial import-based investment series does so.[33] Over the early 1880s, in contrast, the import proxies much overstate the growth of *consumption*; but consumption is much the largest component of the expenditure side, and whatever the vagaries of the initial estimates the rescaling of the figures to meet the GDP constraint reduces their final error to a relatively small one. But that rescaling is applied to the investment series as well: the overstatement of consumption is reabsorbed in part by reducing the overstatement of consumption itself, and in part by understating investment. Baffigi's investment estimates show a quantum jump around the turn of the century, but it would seem to be the product of their shift from a downward bias over the preceding years to an upward bias over the later ones.[34] The present author's preliminary expenditure-side estimates were simply constructed, and lack the investment breakdown of Baffigi's; but because they also reflect the domestic production of consumption and investment goods – and

[33] Because the short-run elasticity of the world investment-goods supply curve exceeded that of the domestic supply curve, imports were far more volatile than domestic production; they fell after 1908 not because demand fell, but because the growth in demand decelerated.

[34] The public-consumption and construction-investment series were not rescaled; but that simply increased the necessary rescaling of the residual (consumption, investment) series, and the point stands.

not just, as his do, the path of imports – they appear to be intrinsically sturdier.

Both Fenoaltea (2012) and Baffigi (2011) took their trade series from Federico *et al*. (2011), but here too discrepancies appear. The two export series are quite close; Baffigi's series is perceptibly higher over the 1860s, but that is because his series was converted from current to constant (post-1871) borders, and mine was not. The import series differ by more than that, and Baffigi's remains well above mine from 1861 through the mid-1880s; the bulk of the discrepancy seems traceable to Baffigi's forcing of the sesquicentennial series through the current-price 1871 import benchmark produced within the sesquicentennial project itself (reported in Baffigi's worksheets as 1,190.7 million lire, against 961.47 million lire reported by Federico *et al*. 2011, p. 88).

4

THE REVISED SECOND-GENERATION ESTIMATES

4.1 The production side

The new, revised second-generation estimates are developed as described in the following chapters; the first set (Table 4.1) refers to the production side, also illustrated in Figure 4.1.[1] As seen above, there was no deep complaint with Baffigi's production side; its revision was undertaken with an eye to marginal improvements, to a modest harvest of low-hanging fruit.[2]

The revised estimates for agriculture improve the Federico series of the earlier (2005) reconstruction in two ways. First, they incorporate evidence of year-to-year harvest fluctuations, which the extant estimates omit; this is done by applying to Federico's series the annual deviations from trend of the Istat-Vitali series, calculated over the sub-periods when the latter was reasonably homogeneous. This revision is particularly useful, as it eliminates the extant sector and GDP series' spurious smoothness (Baffigi 2015, p. 99; Figure 4.1, panel A). Second, the revised estimates include an allowance for on-farm improvements, which the previous production-side estimates simply overlooked. The allowance tentatively

[1] To avoid insignificant but annoying discrepancies, all the subaggregates and aggregates reported in the tables are obtained by summing over the appropriate series as also reported, rounded, in the tables.

[2] As far as maintenance is concerned, Fenoaltea (2005) explicitly counted it as net production, as opposed to a deductible cost of production; and so *de facto* did Baffigi (2011), who also borrowed the Vitali production-side "benchmark" estimates (above, §3.3, footnote 16).

Table 4.1 *Revised production series at 1911 prices, 1861-1913, Italian-standard classification (million lire)*

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
	value added in agriculture	value added in industry							
		extractive	manufacturing						
			food	tobacco	textiles	apparel	leather	wood	metal
vintage:	**2019**	**2015**	2003	2003	2003	2003	**2019**	2003	**2015**
quality:	2	4	1	1	4	4	4	2	4
1861	4,413	59	434	20	122	88	177	155	10
1862	4,630	64	433	20	118	87	179	132	9
1863	4,676	68	435	20	121	87	182	127	7
1864	4,676	68	437	20	119	89	186	127	7
1865	5,063	70	438	20	114	92	195	156	6
1866	5,300	67	439	20	117	90	202	169	7
1867	4,750	69	441	20	117	91	203	160	7
1868	5,045	74	443	20	118	91	212	131	7
1869	5,249	76	446	19	125	93	210	136	8
1870	5,535	76	450	20	128	93	213	146	8
1871	5,397	76	455	21	140	94	215	136	8
1872	5,168	85	459	23	140	97	211	141	9
1873	5,250	94	463	23	147	101	207	142	8
1874	5,677	93	467	24	149	103	208	137	10
1875	5,694	84	468	22	149	104	216	141	10
1876	5,334	90	469	25	137	106	222	156	10
1877	5,394	92	470	25	135	106	227	156	10
1878	5,861	95	474	22	143	106	229	156	9
1879	5,853	105	474	21	140	104	230	141	13
1880	6,106	110	481	22	150	110	240	136	14
1881	5,852	112	491	21	166	120	242	151	16
1882	6,379	123	494	20	166	122	243	156	17
1883	6,208	128	500	21	175	124	247	156	21
1884	5,863	126	506	24	177	131	257	171	22
1885	5,976	129	513	24	185	137	268	190	24
1886	6,529	128	520	24	192	143	277	219	28
1887	6,324	124	526	23	203	145	278	228	34
1888	6,130	127	533	23	220	142	278	204	39
1889	5,555	128	535	22	221	140	278	176	41
1890	6,337	129	542	22	229	143	283	176	36
1891	6,856	130	545	21	228	141	283	176	31
1892	6,496	130	547	22	224	140	277	171	27
1893	6,897	127	554	22	229	144	275	171	30
1894	6,588	124	565	22	252	148	279	175	30
1895	6,802	115	577	22	267	157	285	180	33
1896	7,053	118	584	21	273	162	288	194	33
1897	6,581	129	591	21	279	162	280	204	35
1898	7,048	133	601	21	293	164	283	223	39
1899	6,884	144	616	21	310	170	285	242	44
1900	6,855	146	631	22	308	170	292	233	46
1901	7,374	152	644	22	324	173	296	247	44
1902	7,094	159	661	22	339	181	296	257	43
1903	7,343	166	680	23	343	187	298	272	49
1904	7,365	168	684	23	358	189	299	277	55
1905	7,578	176	706	24	371	194	303	301	65
1906	7,585	183	739	24	402	214	309	311	78
1907	8,448	184	776	25	442	241	319	331	82
1908	8,021	188	799	26	450	248	324	360	97
1909	8,306	197	799	27	450	250	325	389	109
1910	7,431	213	823	28	433	243	328	400	117
1911	7,982	219	827	28	428	243	330	386	118
1912	8,150	228	872	29	475	255	333	367	134
1913	9,131	228	909	26	475	253	331	362	128

Table 4.1 *(continued)*

	(10)	(11)	(12)	(13)	(14)	(15)	(16)	(17)	(18)
	value added in industry (cont.)								
	manufacturing (cont.)						con-struc-tion	utili-ties	total industry
	engi-neer'g	non-met. min. pr.	chem., rubber	paper, printing	sundry mfg.	total mfg.			
vintage:	**2015**	**2015**	**2015**	2003	2003	**2019**	2003	**2015**	**2019**
quality:	4	4	4	3	1	2	4	4	3
1861	205	44	26	25	8	1,314	285	10	1,668
1862	211	51	26	26	8	1,300	324	10	1,698
1863	215	52	25	26	8	1,305	336	10	1,719
1864	216	53	27	27	8	1,316	331	11	1,726
1865	220	54	27	29	8	1,359	334	11	1,774
1866	220	46	27	30	8	1,375	287	11	1,740
1867	224	45	26	31	8	1,373	262	12	1,716
1868	233	44	26	33	8	1,366	259	12	1,711
1869	239	46	27	34	8	1,391	253	12	1,732
1870	241	47	27	36	9	1,418	267	13	1,774
1871	237	49	28	37	9	1,429	275	14	1,794
1872	240	53	30	39	9	1,451	294	14	1,845
1873	247	62	30	39	9	1,478	325	15	1,912
1874	257	65	31	42	9	1,502	336	15	1,946
1875	261	56	31	44	9	1,511	293	16	1,904
1876	257	55	32	46	10	1,525	284	16	1,915
1877	256	58	33	47	10	1,533	292	17	1,934
1878	251	58	34	49	10	1,541	297	18	1,951
1879	256	60	35	51	10	1,535	305	18	1,963
1880	270	65	35	53	10	1,587	329	19	2,045
1881	288	69	39	56	11	1,670	340	20	2,142
1882	305	77	39	59	11	1,709	387	21	2,240
1883	316	82	41	62	11	1,756	412	22	2,318
1884	330	86	42	65	11	1,822	423	23	2,394
1885	342	89	44	69	11	1,896	434	25	2,484
1886	366	92	45	73	11	1,990	444	28	2,590
1887	393	90	47	76	12	2,055	437	30	2,646
1888	408	90	47	80	12	2,076	439	31	2,673
1889	406	90	48	83	12	2,052	423	33	2,636
1890	392	93	50	87	12	2,065	418	35	2,647
1891	371	93	51	91	13	2,044	410	37	2,621
1892	356	89	53	96	13	2,015	389	39	2,573
1893	357	90	54	99	13	2,038	375	42	2,582
1894	365	91	55	103	13	2,098	374	42	2,638
1895	377	86	57	108	14	2,163	321	44	2,643
1896	389	86	59	111	14	2,214	307	47	2,686
1897	401	88	63	114	14	2,252	311	50	2,742
1898	421	89	66	116	14	2,330	308	55	2,826
1899	458	94	70	119	15	2,444	313	60	2,961
1900	485	98	74	121	15	2,495	323	62	3,026
1901	474	105	76	123	16	2,544	339	67	3,102
1902	471	116	82	128	17	2,613	368	72	3,212
1903	482	126	89	130	18	2,697	386	80	3,329
1904	508	136	97	150	19	2,795	405	90	3,458
1905	555	148	102	177	20	2,966	433	98	3,673
1906	625	158	112	206	21	3,199	460	107	3,949
1907	683	169	122	211	22	3,423	484	122	4,213
1908	727	181	135	224	23	3,594	513	138	4,433
1909	753	209	144	237	24	3,716	586	153	4,652
1910	786	237	158	248	25	3,836	661	168	4,878
1911	827	255	165	242	27	3,876	697	189	4,981
1912	873	267	180	270	28	4,083	713	209	5,233
1913	871	270	185	273	29	4,112	707	231	5,278

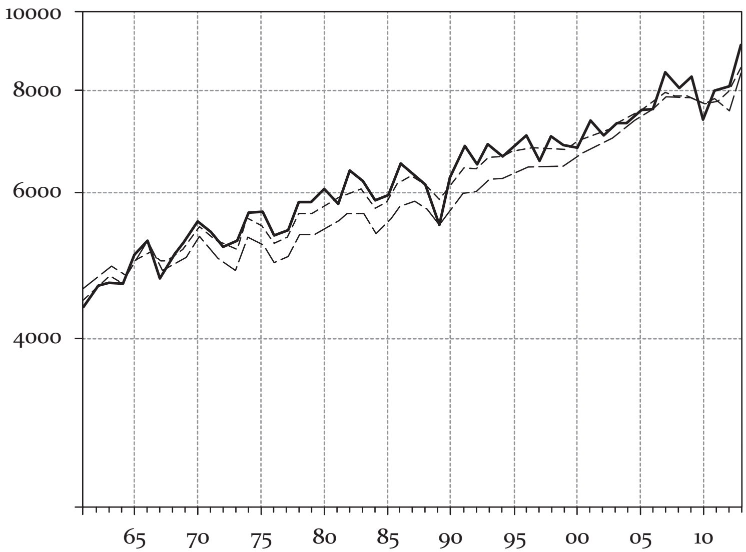
Table 4.1 *(continued)*

	(19)	(20)	(21)	(22)	(23)	(24)	(25)	(26)	(27)	(28)
	value added in services									
	trans-port., comm.	com-merce	net bank., ins.	misc. serv.	build-ings	gov't serv.	total serv.	total value added	net indir. taxes	gross domestic product
vintage:	**2019**	**2019**	**2019**	**2019**	**2019**	**2017**	**2019**	**2019**	**2005**	**2019**
quality:	3	3	2	1	3	2	2	2	1	2
1861	122	544	2	842	932	690	3,132	9,213	478	9,691
1862	134	566	2	842	939	722	3,205	9,533	501	10,034
1863	143	580	3	842	949	796	3,313	9,708	534	10,242
1864	148	589	4	846	959	822	3,368	9,770	667	10,437
1865	154	622	3	846	967	858	3,450	10,287	847	11,134
1866	150	630	5	850	973	1,102	3,710	10,750	885	11,635
1867	149	582	6	854	978	788	3,357	9,823	550	10,373
1868	154	604	6	854	984	827	3,429	10,185	630	10,815
1869	161	624	6	858	989	753	3,391	10,372	623	10,995
1870	171	649	5	859	993	845	3,522	10,831	587	11,418
1871	183	648	6	862	999	739	3,437	10,628	616	11,244
1872	195	645	8	866	1,008	766	3,488	10,501	550	11,051
1873	211	647	10	866	1,018	775	3,527	10,689	508	11,197
1874	216	694	9	867	1,032	794	3,612	11,235	531	11,766
1875	212	696	9	867	1,044	785	3,613	11,211	679	11,890
1876	220	671	8	871	1,053	780	3,603	10,852	693	11,545
1877	229	674	10	871	1,062	791	3,637	10,965	665	11,630
1878	234	721	10	876	1,071	809	3,721	11,533	679	12,212
1879	242	750	10	876	1,078	815	3,771	11,587	715	12,302
1880	253	758	13	879	1,086	825	3,814	11,965	670	12,635
1881	266	759	12	879	1,096	876	3,888	11,882	762	12,644
1882	286	804	16	880	1,109	856	3,951	12,570	745	13,315
1883	306	818	14	884	1,122	888	4,032	12,558	791	13,349
1884	321	808	15	885	1,135	922	4,086	12,343	883	13,226
1885	335	853	18	889	1,150	939	4,184	12,644	865	13,509
1886	348	912	22	898	1,167	977	4,324	13,443	833	14,276
1887	351	937	26	906	1,181	1,017	4,418	13,388	948	14,336
1888	358	853	27	907	1,190	1,070	4,405	13,208	998	14,206
1889	368	835	29	911	1,198	1,068	4,409	12,600	946	13,546
1890	373	873	27	907	1,208	1,046	4,434	13,418	876	14,294
1891	373	890	25	908	1,223	1,024	4,443	13,920	823	14,743
1892	378	869	25	908	1,235	1,017	4,432	13,501	849	14,350
1893	388	911	28	908	1,248	1,016	4,499	13,978	851	14,829
1894	394	884	23	904	1,264	1,015	4,484	13,710	911	14,621
1895	394	918	21	904	1,277	1,029	4,543	13,988	916	14,904
1896	405	934	24	904	1,290	1,048	4,605	14,344	969	15,313
1897	425	903	24	909	1,303	1,040	4,604	13,927	936	14,863
1898	443	976	26	917	1,317	1,042	4,721	14,595	874	15,469
1899	464	982	28	925	1,330	1,045	4,774	14,619	908	15,527
1900	488	978	31	929	1,345	1,050	4,821	14,702	980	15,682
1901	520	1,043	29	933	1,360	1,048	4,933	15,409	1,021	16,430
1902	559	1,048	32	941	1,381	1,048	5,009	15,315	1,102	16,417
1903	591	1,093	34	953	1,405	1,052	5,128	15,800	1,046	16,846
1904	616	1,101	37	969	1,434	1,053	5,210	16,033	1,046	17,079
1905	635	1,160	45	984	1,466	1,058	5,348	16,599	1,146	17,745
1906	683	1,216	49	1,000	1,498	1,076	5,522	17,056	1,240	18,296
1907	712	1,318	53	1,020	1,532	1,105	5,740	18,401	1,127	19,528
1908	763	1,326	56	1,037	1,570	1,114	5,866	18,320	1,251	19,571
1909	828	1,411	59	1,054	1,592	1,136	6,080	19,038	1,283	20,321
1910	899	1,371	70	1,071	1,640	1,163	6,214	18,523	1,341	19,864
1911	957	1,434	84	1,087	1,694	1,239	6,495	19,458	1,440	20,898
1912	1,006	1,492	96	1,103	1,751	1,247	6,695	20,078	1,405	21,483
1913	1,055	1,567	102	1,114	1,809	1,277	6,924	21,333	1,461	22,794

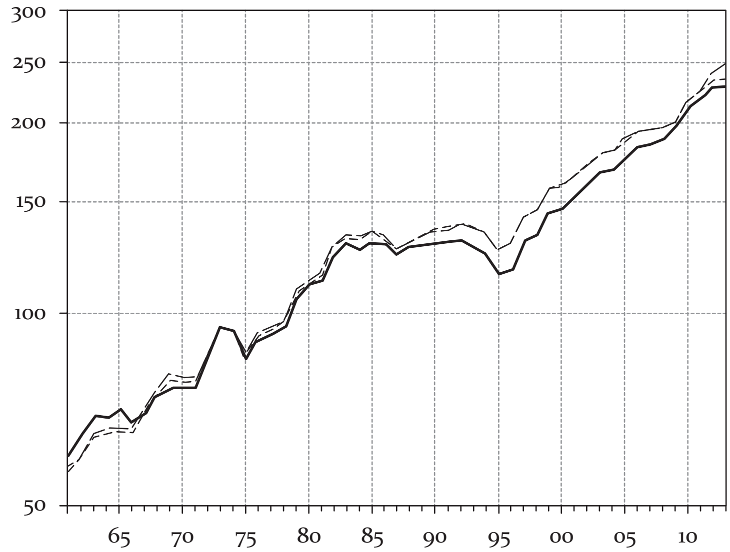
Source: see text.

FIGURE 4.1 *Production series at 1911 prices, 1861–1913, Italian-standard classification (million lire)*

A. Agriculture



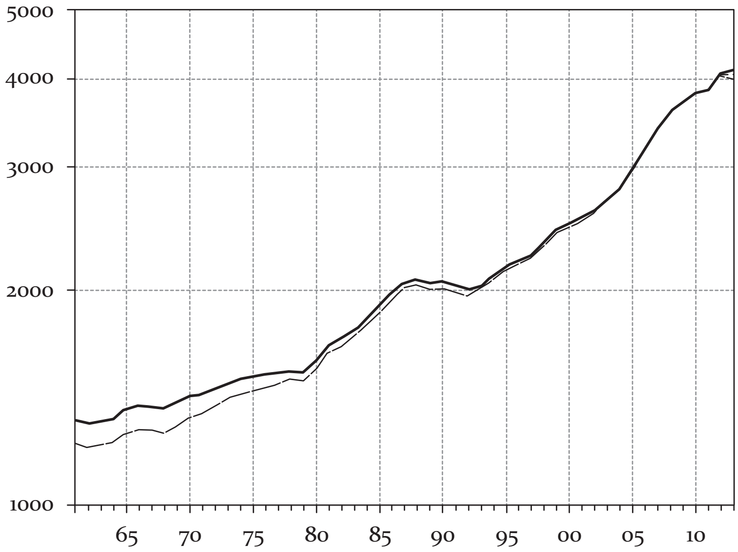
B1. Extractive industries



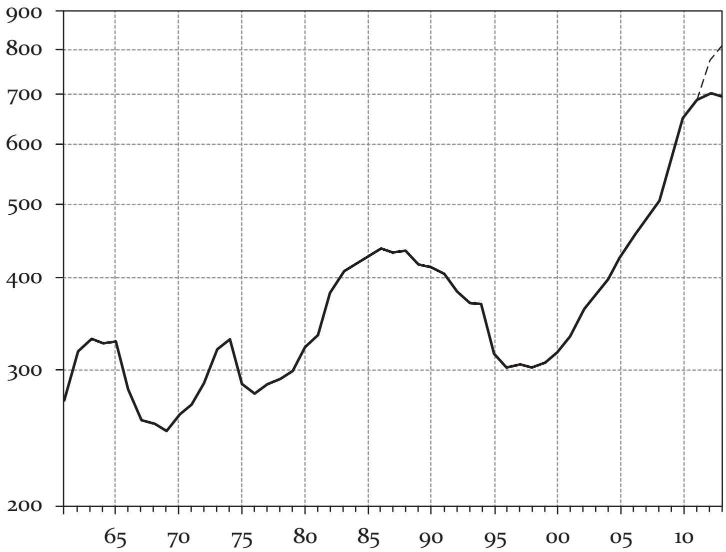
- - - - preliminary second-generation (Fenoaltea 2005)
— — sesquicentenary (Baffigi 2011)
—— revised second-generation

Figure 4.1 *(continued)*

B2. Manufacturing industries



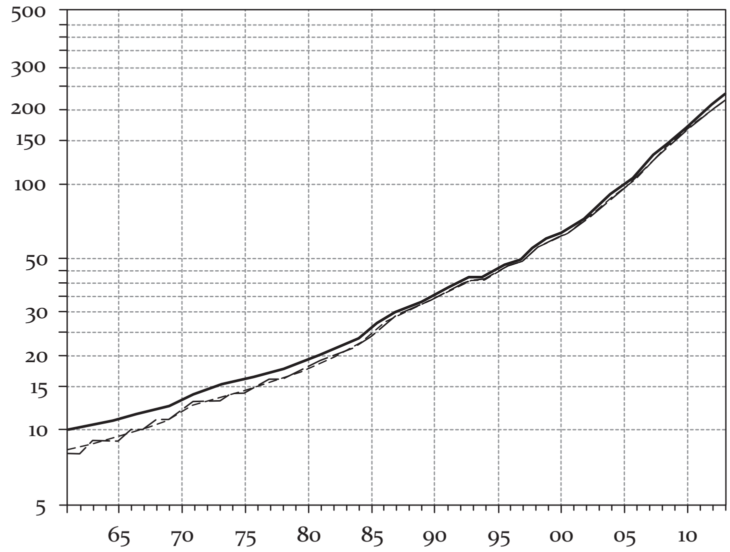
B3. Construction industries



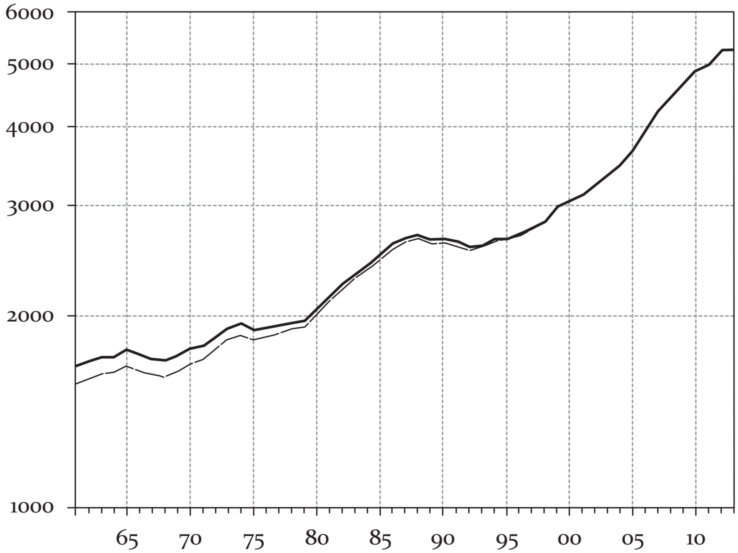
- - - - preliminary second-generation (Fenoaltea 2005)
— — sesquicentenary (Baffigi 2011)
—— revised second-generation

Figure 4.1 *(continued)*

B4. Utilities industries



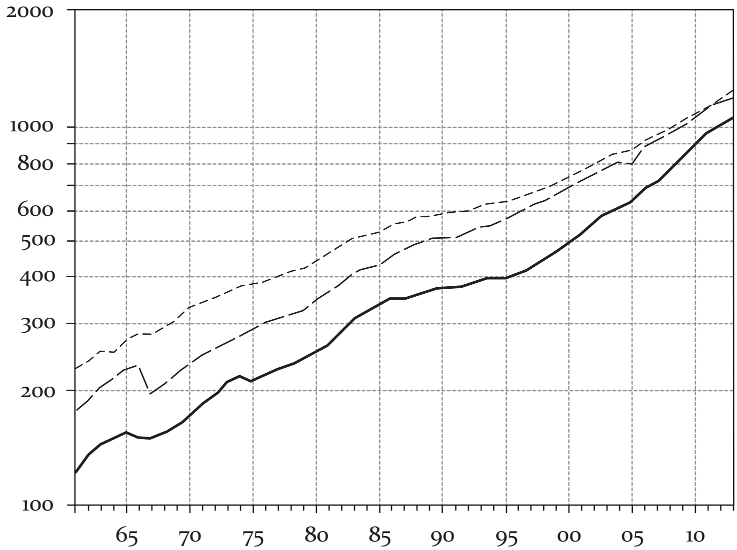
B. Industry



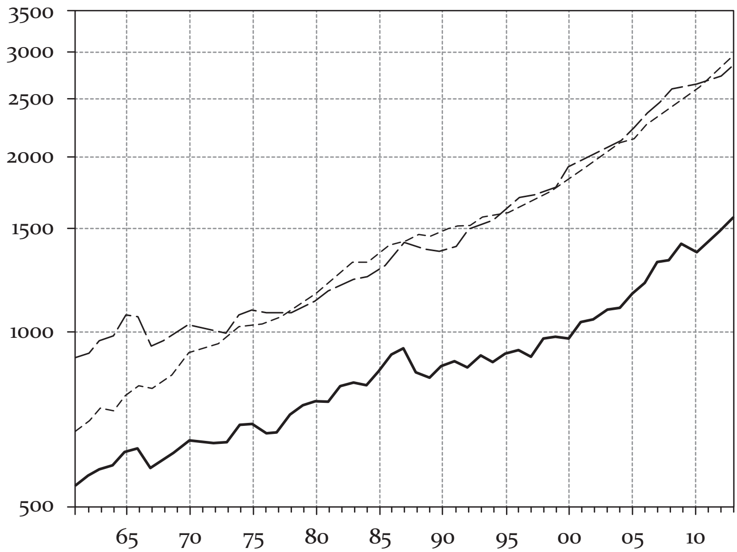
- - - - preliminary second-generation (Fenoaltea 2005)
— — sesquicentenary (Baffigi 2011)
—— revised second-generation

Figure 4.1 *(continued)*

C1. Transportation



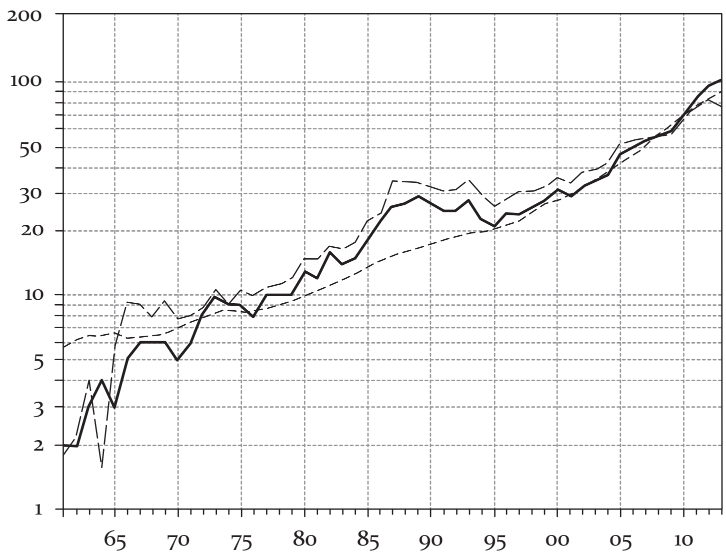
C2. Commerce



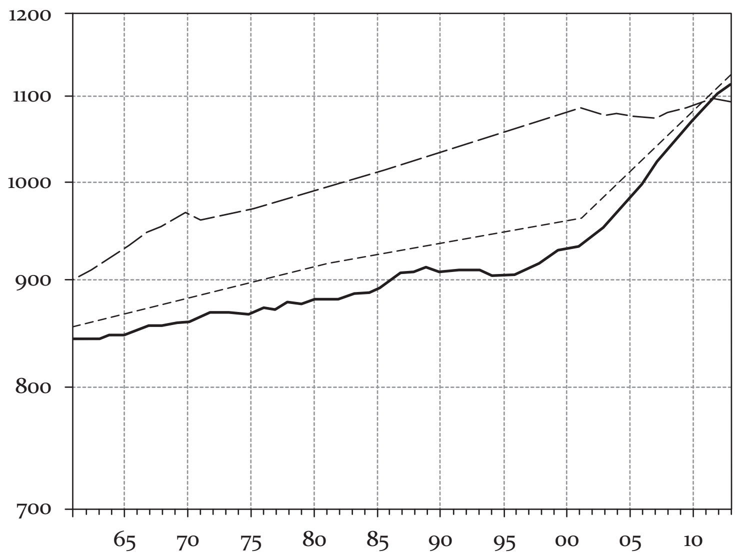
preliminary second-generation (Fenoaltea 2005)
sesquicentenary (Baffigi 2011)
revised second-generation

Figure 4.1 *(continued)*

C3. Net banking and insurance



C4. Miscellaneous services



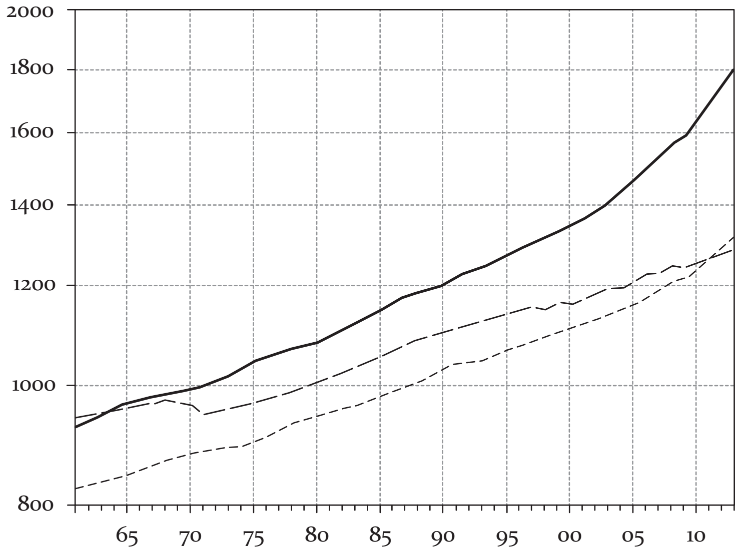
- - - - preliminary second-generation (Fenoaltea 2005)

— — sesquicentenary (Baffigi 2011)

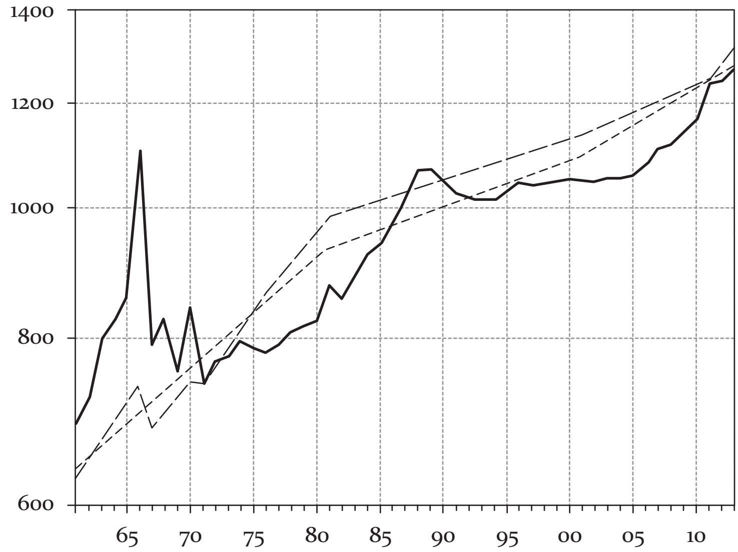
——— revised second-generation

Figure 4.1 *(continued)*

C5. Buildings



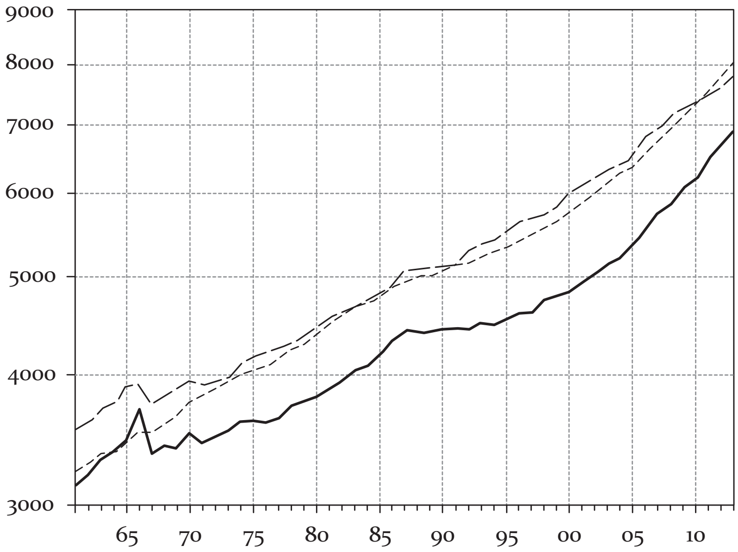
C6. Government services



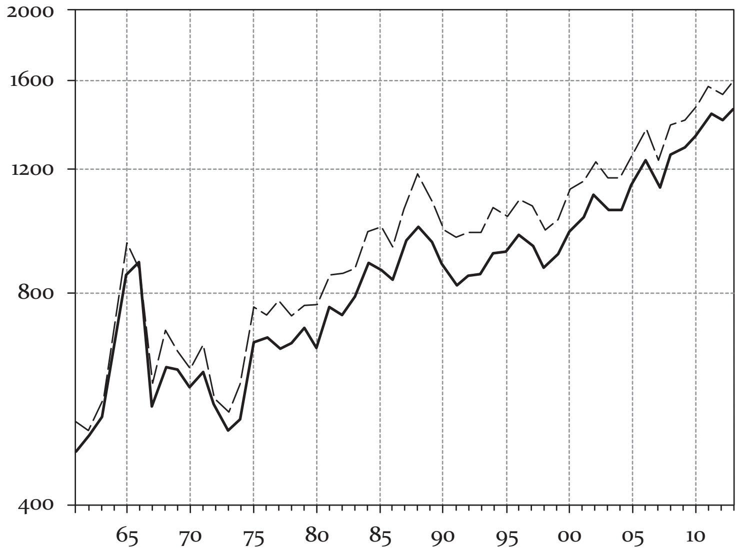
preliminary second-generation (Fenoaltea 2005)
sesquicentenary (Baffigi 2011)
revised second-generation

Figure 4.1 *(continued)*

C. Services



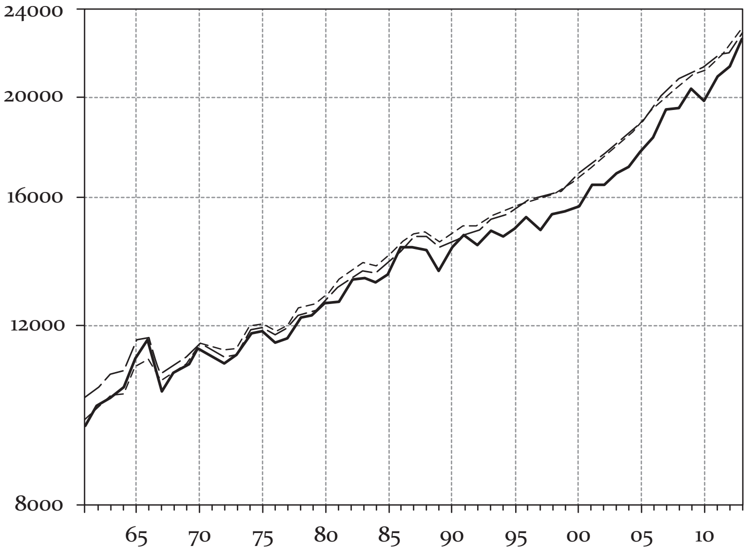
D. Net indirect taxes



preliminary second-generation (Fenoaltea 2005)
sesquicentenary (Baffigi 2011)
revised second-generation

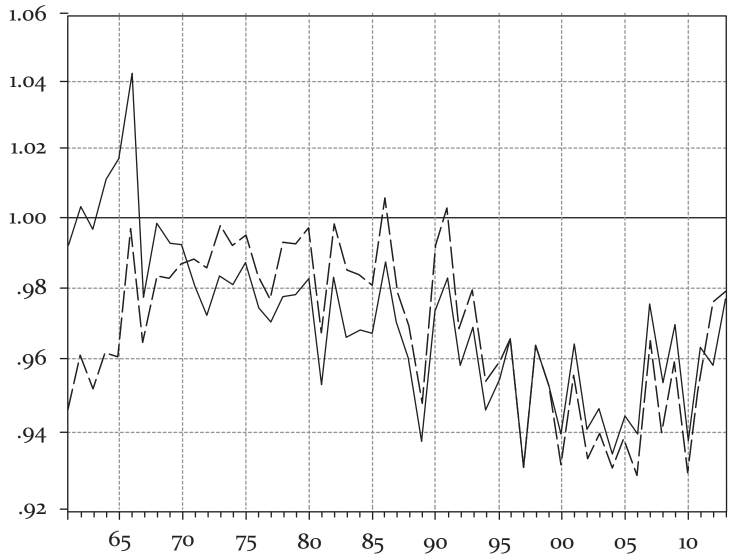
Figure 4.1 *(continued)*

E. GDP



preliminary second-generation (Fenoaltea 2005)
sesquicentenary (Baffigi 2011)
revised second-generation

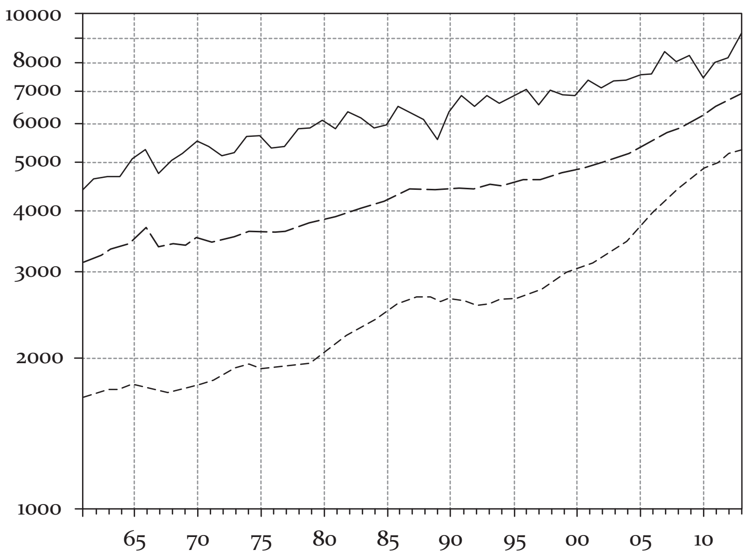
F. Gross domestic product: ratio of revised estimates to the previous estimates



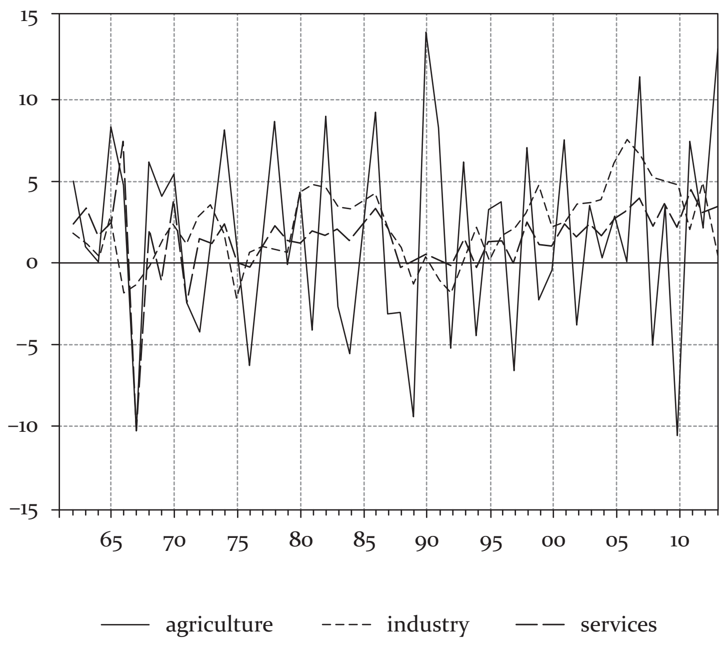
ratio to preliminary second-generation (Fenoaltea 2005)
ratio to sesquicentenary (Baffigi 2011)

Figure 4.1 *(continued)*

G. Gross domestic product: major-sector paths



H. Gross domestic product: major-sector growth rates (percent)



distributes over time, with an eye to the path of production, a cumulative figure based on calculations performed long ago by Ornello Vitali; fortunately, that figure is small, and not much is here at stake.

The revised industry series in turn incorporate the recent results of the author's ongoing work. On the one hand, they update the 2003/2005 second-generation estimates for the extractive, metal-making, non-metallic mineral products, chemical, and utilities industries; on the other, they replace the preliminary series for the engineering industry, and the leather industry, with proper second-generation estimates, newly compiled. The other industries continue to be represented by the 2003 estimates: some may be considered good (the second-generation estimates for textiles, apparel, construction) or nearly so (those for paper and publishing), others are clearly poor (the preliminary aggregates for food, tobacco, wood, and manufacturing n.e.c.).

With respect to the figures in Fenoaltea (2005) the time paths of industry's four main sectors are differentially revised (Figure 4.1, panels B1–B4).[3] The new series for the extractive industries points to a stronger decline from the mid-1880s to the mid-'90s; this stems almost entirely from an improved aggregation algorithm that better captures composition effects within mining on the one hand and quarrying on the other (below, ch. 6). The new manufacturing series reflects the new second-generation estimates: those for the early years are perceptibly higher, and the long-term growth rate lower, mostly because the large leather industry appears to have grown much more slowly than had been surmised. The construction-industry estimates, carefully obtained long ago, are unchanged; those for the utilities industries have been amended, and now also display higher initial levels and lower growth. The emendation is entirely in the estimates of the aqueducts' product, and reflects a change in the interpretation of the sources: the previous estimates assumed that the undated aqueducts had been constructed at the same pace as the dated ones, the new ones assume that the undated aqueducts were all already present in 1861, that they were undated because they were too old to be dated (ibid.). Industry is dominated by manufacturing, and the revisions to the

[3] The revised industry-level series are illustrated below, in Figure 6.1.

estimates for industry as a whole much resemble those for manufacturing alone (Figure 4.1, panel B).

In the case of the services, as noted, Fenoaltea (2005) and Baffigi (2011) independently extrapolated the "benchmark" estimates for 1911 obtained by Zamagni (in Rey 1992, partly revised by Zamagni and Battilani in Rey 2000); our disagreement clearly called for a revision of those extrapolations, the construction of improved indices that would supersede the extant ones. But a careful reading (overlong delayed, *et mea culpa*) of the description of the "benchmark" estimates' derivation unexpectedly suggested that they are rife with serious distortions: those estimates too have been extensively revised, with much more work, and far more serious alterations to the final estimates, than had been anticipated.

The new estimates for the transportation sector combine a significantly lower 1911 benchmark, and a different time path (Figure 4.1, panel C1); over the long term the latter largely parallels Baffigi's series, which grew rather faster than that in Fenoaltea (2005). The corrections span a variety of subsectors. The "benchmark" estimates for rail transportation were based on company budgets, adding a return to capital to the reported wage bill. The procedure failed to exclude the railway companies' industrial activities (construction, rolling-stock maintenance), already (and rightly) covered by the estimates for industry; the corrected transportation estimates eliminate this double-counting. The extrapolation of the new benchmark is also improved; it is now based on vehicle-ton-kilometers, a metric that allows for the growth of the cars' unit weight and unit carrying capacity. The "benchmark" estimates for other inland transportation have also been reduced, to eliminate workers improperly included, and to cut the wage bill allowed porters (most of whom were apparently not, as Zamagni assumed, highly paid longshoremen). The main improvement is however to the time path of production, based for the first time on the *weight* of the goods actually carted: as it turns out, construction materials far outweighed anything else, and the inland-transportation series now reflects the construction cycle far more than it did before.

The most significant downward revision is to the 1911 "benchmark" estimate for the "commerce" sector. Some 150 million lire are cut from the minor hotels-and-restaurants component, mostly by reducing estimated per-capita wages from (mostly) white-collar levels to (mostly) blue-collar levels, and replacing Zamagni's allowance for capital costs (near 40 percent of labor costs) by a direct estimate of the rental value of the premises. A further ca. 50 million lire are cut from the also minor commercial-services component, mostly by eliminating workers also counted elsewhere. The most unkindest cut of all is however to the figure for trade proper, reduced from Zamagni's ca. 2,100 million lire (Rey 2000, p. 365) to under half that. Zamagni's procedure is complex, but the heart of it seems to be the application of trading margins observed in the 1930s to aggregate marketed consumption in 1911: as if trading margins had not plausibly increased, in the interim, as productivity growth in production and transportation outstripped that in marketing, and Fascist legislation reduced commercial competition; as if Italians had done their shopping at the supermarket and the mall a century ago as they do today. If from Zamagni's aggregate one deducts plausible estimates of both labor costs (derived from census labor force data) and fixed-capital costs (the rental value of the premises, based on plausible staffing densities and rents per room), one obtains as a residual an estimate of the implied variable-capital costs, the cost of carrying inventory; and this last implies an average investment in inventory which in turn implies average inventories far in excess of annual sales, and thus an impossibly low turnover rate. The revised estimate for 1911 is obtained as the sum of labor costs, fixed capital costs, and an estimate of the cost of carrying inventory characterized by two improvements: on the one hand, it reflects a reasonable turnover rate, and thus a reasonable relation to total sales; on the other, total (merchants') sales exclude the goods artisans and farmers sold directly to final consumers. The time path that extrapolates the revised (aggregate) "commerce" benchmark is also new: it is based on the estimated (constant-price) flow of goods actually handled by merchants, including imports as well as domestic goods. Its short-term movements arguably resemble those of Baffigi's series more than those of the author's 2005 series (Figure 4.1, panel C2).

Banking and insurance services (Figure 4.1, panel C3) are measured in net terms, deducting those provided to firms but not excluded by the direct estimates of the other sectors' value added. Both the new estimates and Baffigi's start from the new current-price gross value added series provided by De Bonis *et al.*

(2011); the main differences are that the new estimates do not force anything through superseded "benchmarks," and that the new estimates deflate the new series with a wage index (converting it into labor units, as is done for other technologically stagnant sectors) rather than with the centennial price index used by Baffigi (which converts it, as noted unreliably, into goods-in-general).

The new "miscellaneous services" series (Figure 4.1, panel C4) instead essentially returns to that in Fenoaltea (2005), with two minor emendations. One separates out textile-maintenance ("washerwomen's") services (estimated in *IIPH*), correcting the apparent underestimate of their numbers in the 1911 "benchmark"; the other smooths the series through the census benchmarks. For reasons that are not clear Baffigi's series seems not to capture the changes in composition that fueled aggregate growth from 1901 to 1911.[4]

In the case of buildings' services (Figure 4.1, panel C5), the author's 2005 series extrapolated the "benchmark" estimate with a series that reflected the pace of construction; from Battilani, Felice, and Zamagni (2014) Baffigi obtained a series that resurrected Vitali's slower-growing centennial estimates, based on demographic growth alone.[5] The new estimates are a *reprise* of the author's, improved in various ways. First, they now display a sharp upward revision of the 1911 rent pool, reflecting a new ("benchmark") estimate consistent with the tax on rents, the census room count (including the rooms left empty, largely by seasonal migrants, which the extant "benchmark" omitted), sample rent data, and the estimated mix of bourgeois and working-class dwellings. The extrapolation is also improved: it now reflects both the pace of construction activity and, boosting the measured growth rate, the increasing concentration of the population in large cities, where real rents were relatively high.

In the case of government services (Figure 4.1, panel C6), the author's 2005 series and Baffigi's were both log-linear interpola-

[4] Baffigi's series also dips and recovers between those benchmarks, suggesting log-linear interpolation at the subaggregate level, above, §2.3.

[5] Vitali's estimates had been superseded, as subsequently recovered evidence indicated that the construction cycle was tied to capital flows rather than to demographic change (Fenoaltea 1988a, 2011a, ch. 2).

tions and extrapolations of census-based benchmarks.[6] The revised series essentially keeps the extant 1911 benchmark, but displays a very different time path: it is now obtained from the current-price series Battilani, Felice, and Zamagni reconstructed directly from budget data, so deflated as to reflect the changing mix, and relative remuneration, of career civil servants (and military officers), other civilian public employees, and common soldiers.

For the services as a whole the net result of these corrections is a new series that roughly parallels Baffigi's over the first three decades, and that in Fenoaltea (2005) from then on; it is however sharply lower than both of those, thanks to a 14 percent cut in the 1911 estimate, from the "benchmark" 7,520 million lire to 6,495 million lire (Figure 4.1, panel C).[7] This reduction to the product of the services reappears of course in the estimate of net value added, and of GDP; the two differ by the allowance for net indirect taxes (Figure 4.1, panel D), also a *reprise* of the author's earlier series, again somewhat lower than Baffigi's.[8]

The GDP series in Fenoaltea (2005) and Baffigi (2011) were as noted quite similar; the revised GDP series (Table 4.1, col. 28) is perceptibly more volatile, essentially because it now reflects harvest fluctuations, and from the mid-1880s perceptibly lower (Figure 4.1, panels E and F), essentially because the services are no longer artificially inflated (and because from the mid-1880s that correction is no longer offset by the addition of previously neglected agricultural improvements).[9] Beyond that, the paths of the three

[6] Baffigi's series (Figure 4.1, panel C6) displays what appear to be spurious breaks in 1866–67 and 1870–71: his series at current borders is in fact log-linear from 1861 to 1881, suggesting that it was already at constant borders, and that the subsequent correction for border changes introduced error.

[7] The revised estimate for the services group in 1911 turns out to be much closer to Istat's centenary estimate than to that of the "benchmark team," whose contribution here appears to have been negative. Our progress may be monotonous, monotonic it is not.

[8] Our net-indirect-taxes 1911 benchmarks differ because I used (and use) the Istat figure as revised by Vitali in Rey (1992), Baffigi the unrevised Istat figure that Vitali unaccountably returned to in Rey (2002): *quandoque bonus dormitat.*

[9] The only significant upward revision is with respect to Fenoaltea (2005), in the 1860s; it is due to the revision of the estimates for government services (Figure 4.1, panel C6).

major sectors (to the same scale in Figure 4.1, panel G), and of their annual growth rates (panel H), reinforce an already anticipated point (Fenoaltea 2011a, p. 47): industry and the services account for GDP's long swing, agriculture for its year-to-year fluctuations.

That the downward revision of the aggregate estimates is specifically in the services, and not in commodity production, bears notice: it is in the main a downward revision of the estimated cost of local distribution, the estimates of the quantities of the *final* services and commodities actually produced and consumed are little affected. But it also bears notice that with the new series the per-capita 1911-price income peak of 1886 was not surpassed until 1901, and not, as we had thought, by the mid-1890s (Figure 3.1).

The revised 1911-price production-side estimates collected in Table 4.1 maintain the classification of economic activities that informed the earlier estimates, the better to illustrate the substantive revisions to the various component series. Each series is attributed a rough quality index on a scale that runs from 1, for crude first approximations, up to 7 (or more, depending on one's standards). The top recorded score is a 4, given to the series carefully reconstructed from the available evidence by the present author, and definitive under the Nathan Hale constraint; lower scores sadly abound.

Tables 4.2 and 4.3 modify the estimates in Table 4.1 in different ways, to different purposes. As recalled above (§3.4), one strain of the literature is much concerned with the composition of GDP (*rectius*, here, total value added, indirect taxes are not an issue), and specifically with the share of the services sector. Rather obviously, one would have thought, it makes no sense to evaluate the composition of GDP (total value added) in any given year using prices other than those that then prevailed; and this is of course why our second-generation estimates (at constant prices) are unsatisfactory, why we need the current-relative-price-conserving *third*-generation estimates (§2.4, 3.1). These are still well in the future; all one can do at present is to tease out some reasonable conjectures that transform the second-generation major-sector shares into *ersatz* third-generation sector shares by taking into account the apparent relative pace of productivity growth in the various sectors. This exercise, performed years ago with the preliminary second-generation estimates (Fenoaltea 2011b), is repeated here; its not-unfamiliar thrust is that the sectors in which productivity

TABLE 4.2 *Revised conjectural production series at the 1911 price level, 1861–1913: Italian-standard classification (million lire)*

	(1)	(2)	(3)	(4)	(5)	(6)
	value added (million lire)			shares		
	agric.	industry	services	agric.	industry	services
1861	4,169	2,106	2,938	.45	.23	.32
1862	4,378	2,146	3,009	.46	.23	.32
1863	4,423	2,173	3,112	.46	.22	.32
1864	4,424	2,182	3,164	.45	.22	.32
1865	4,796	2,246	3,245	.47	.22	.32
1866	5,038	2,210	3,501	.47	.21	.33
1867	4,497	2,171	3,155	.46	.22	.32
1868	4,786	2,169	3,230	.47	.21	.32
1869	4,981	2,196	3,195	.48	.21	.31
1870	5,257	2,252	3,322	.49	.21	.31
1871	5,118	2,274	3,236	.48	.21	.30
1872	4,891	2,333	3,277	.47	.22	.31
1873	4,963	2,416	3,310	.46	.23	.31
1874	5,376	2,463	3,396	.48	.22	.30
1875	5,398	2,412	3,401	.48	.22	.30
1876	5,046	2,421	3,384	.47	.22	.31
1877	5,103	2,445	3,416	.47	.22	.31
1878	5,557	2,472	3,503	.48	.21	.30
1879	5,550	2,487	3,550	.48	.21	.31
1880	5,786	2,590	3,589	.48	.22	.30
1881	5,530	2,705	3,648	.47	.23	.31
1882	6,044	2,809	3,717	.48	.22	.30
1883	5,883	2,880	3,795	.47	.23	.30
1884	5,554	2,944	3,845	.45	.24	.31
1885	5,669	3,030	3,945	.45	.24	.31
1886	6,214	3,139	4,091	.46	.23	.30
1887	6,024	3,179	4,185	.45	.24	.31
1888	5,846	3,184	4,178	.44	.24	.32
1889	5,302	3,112	4,186	.42	.25	.33
1890	6,077	3,110	4,231	.45	.23	.32
1891	6,601	3,062	4,257	.47	.22	.31
1892	6,265	2,982	4,255	.46	.22	.32
1893	6,672	2,972	4,334	.48	.21	.31
1894	6,377	3,010	4,323	.47	.22	.32
1895	6,602	2,994	4,392	.47	.21	.31
1896	6,860	3,020	4,463	.48	.21	.31
1897	6,405	3,056	4,466	.46	.22	.32
1898	6,877	3,127	4,592	.47	.21	.31
1899	6,723	3,247	4,649	.46	.22	.32
1900	6,706	3,292	4,704	.46	.22	.32
1901	7,232	3,351	4,826	.47	.22	.31
1902	6,966	3,441	4,908	.45	.22	.32
1903	7,225	3,539	5,036	.46	.22	.32
1904	7,259	3,647	5,127	.45	.23	.32
1905	7,483	3,843	5,273	.45	.23	.32
1906	7,502	4,099	5,455	.44	.24	.32
1907	8,375	4,341	5,685	.46	.24	.31
1908	7,966	4,532	5,822	.43	.25	.32
1909	8,268	4,721	6,049	.43	.25	.32
1910	7,413	4,913	6,197	.40	.27	.33
1911	7,982	4,981	6,495	.41	.26	.33
1912	8,170	5,195	6,713	.41	.26	.33
1913	9,173	5,201	6,959	.43	.24	.33

Source: see text.

TABLE 4.3 *Revised production series at 1911 prices, 1861-1913: approximate ISIC-standard classification (million lire)*

	(1)	(2)	(3)	(4)	(5)	(6)
	value added (million lire)			shares		
	agric.	industry	services	agric.	industry	services
1861	4,413	1,591	3,209	.48	.17	.35
1862	4,630	1,620	3,283	.49	.17	.34
1863	4,676	1,640	3,392	.48	.17	.35
1864	4,676	1,644	3,450	.48	.17	.35
1865	5,063	1,687	3,537	.49	.16	.34
1866	5,300	1,648	3,802	.49	.15	.35
1867	4,750	1,623	3,450	.48	.17	.35
1868	5,045	1,615	3,525	.50	.16	.35
1869	5,249	1,637	3,486	.51	.16	.34
1870	5,535	1,676	3,620	.51	.15	.33
1871	5,397	1,697	3,534	.51	.16	.33
1872	5,168	1,747	3,586	.49	.17	.34
1873	5,250	1,815	3,624	.49	.17	.34
1874	5,677	1,847	3,711	.51	.16	.33
1875	5,694	1,802	3,715	.51	.16	.33
1876	5,334	1,809	3,709	.49	.17	.34
1877	5,394	1,826	3,745	.49	.17	.34
1878	5,861	1,840	3,832	.51	.16	.33
1879	5,853	1,851	3,883	.51	.16	.34
1880	6,106	1,929	3,930	.51	.16	.33
1881	5,852	2,023	4,007	.49	.17	.34
1882	6,379	2,119	4,072	.51	.17	.32
1883	6,208	2,194	4,156	.49	.17	.33
1884	5,863	2,265	4,215	.48	.18	.34
1885	5,976	2,348	4,320	.47	.19	.34
1886	6,529	2,448	4,466	.49	.18	.33
1887	6,324	2,502	4,562	.47	.19	.34
1888	6,130	2,526	4,552	.46	.19	.34
1889	5,555	2,486	4,559	.44	.20	.36
1890	6,337	2,493	4,588	.47	.19	.34
1891	6,856	2,465	4,599	.49	.18	.33
1892	6,496	2,416	4,589	.48	.18	.34
1893	6,897	2,425	4,656	.49	.17	.33
1894	6,588	2,478	4,644	.48	.18	.34
1895	6,802	2,479	4,707	.49	.18	.34
1896	7,053	2,519	4,772	.49	.18	.33
1897	6,581	2,575	4,771	.47	.18	.34
1898	7,048	2,658	4,889	.48	.18	.33
1899	6,884	2,791	4,944	.47	.19	.34
1900	6,855	2,853	4,994	.47	.19	.34
1901	7,374	2,925	5,110	.48	.19	.33
1902	7,094	3,032	5,189	.46	.20	.34
1903	7,343	3,148	5,309	.46	.20	.34
1904	7,365	3,265	5,403	.46	.20	.34
1905	7,578	3,465	5,556	.46	.21	.33
1906	7,585	3,724	5,747	.44	.22	.34
1907	8,448	3,982	5,971	.46	.22	.32
1908	8,021	4,193	6,106	.44	.23	.33
1909	8,306	4,403	6,329	.44	.23	.33
1910	7,431	4,622	6,470	.40	.25	.35
1911	7,982	4,725	6,751	.41	.24	.35
1912	8,150	4,960	6,968	.41	.25	.35
1913	9,131	5,001	7,201	.43	.23	.34

Source: see text.

increased relatively rapidly will appear relatively larger at early-year prices than at late-year prices. The details of the exercise are provided below (§8.2); its results are presented here in Table 4.2 and illustrated in Figure 4.2.

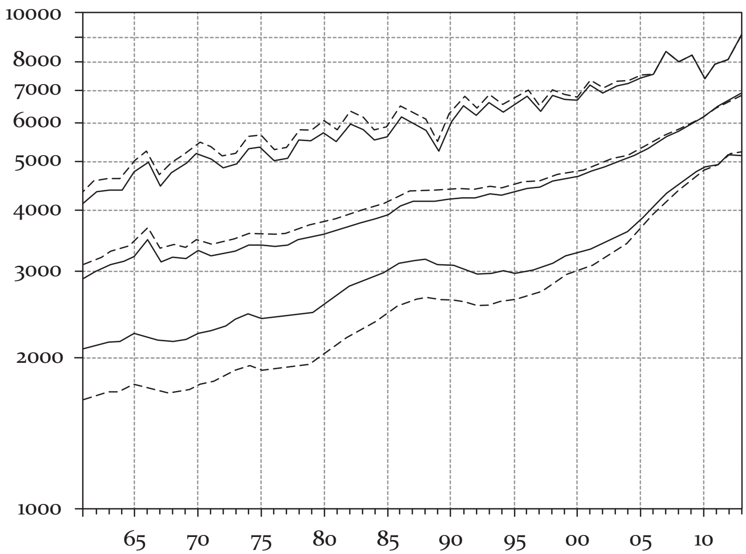
These results differ from their predecessors (Fenoaltea 2011b) mainly in that the major-sector shares of total value added are now more volatile, simply because the new series for agriculture incorporates harvest fluctuations; when agriculture does poorly (as for example in 1889) its share dips, and those of the other sectors pop up. Over the longer term, the main features are unchanged. In productivity terms industry was relatively progressive, and its share of aggregate value added grew less rapidly at current relative prices than at 1911 prices: from some 23 percent, as opposed to 18 percent at 1911 prices, in 1861 to 26 percent in 1911. But 1911 was a peak year in industry's long cycle; discounting cyclical fluctuations, at current relative prices industry's share barely grew at all. Agriculture and the services were less technically progressive, comparably so, and the higher early share of industry at current prices translates into comparably lower early shares for the other sectors. Agriculture's estimated share of aggregate value added thus declines over the half-century at hand, to 41 percent in 1911, from, in 1861, 45 percent, as opposed to 48 percent at 1911 prices; the estimated share of the services, at 1911 prices equal to 33 percent in 1911, barely down from 34 percent in 1861, at current prices grows to 33 percent in 1911 from a barely lower 32 percent in 1861.[10]

The production-side estimates collected in Table 4.1 reflect the Italian-standard classification that informs their immediate predecessors, and not the international standard classification, as recently revised (*ISIC*). A reclassification of the present sector value added estimates to match the latter standard more closely is provided in Table 4.3 and illustrated in Figure 4.3. The reclassifi-

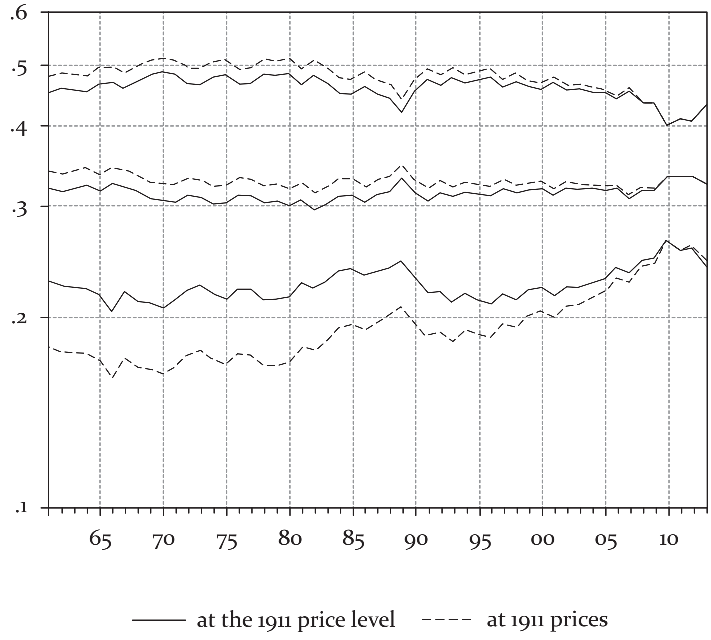
[10] If Zamagni finds these results as "unacceptable" as my earlier ones (§3.4), so be it. She presumes that the share of the services grew smartly in the early phases of Italy's modern economic growth as it did in the later ones, but that presumption is unhistorical: services have grown in recent decades largely as final goods that substitute for (more) commodities, in earlier times they were largely intermediate goods *complementary* to the production of commodities; that the share of the services (and of commodity production) then varied little should not come as a surprise (Fenoaltea 2011b).

Figure 4.2 *Conjectural production series at the 1911 price level, 1861–1913, Italian-standard classification*

A. Levels (million lire)[a]



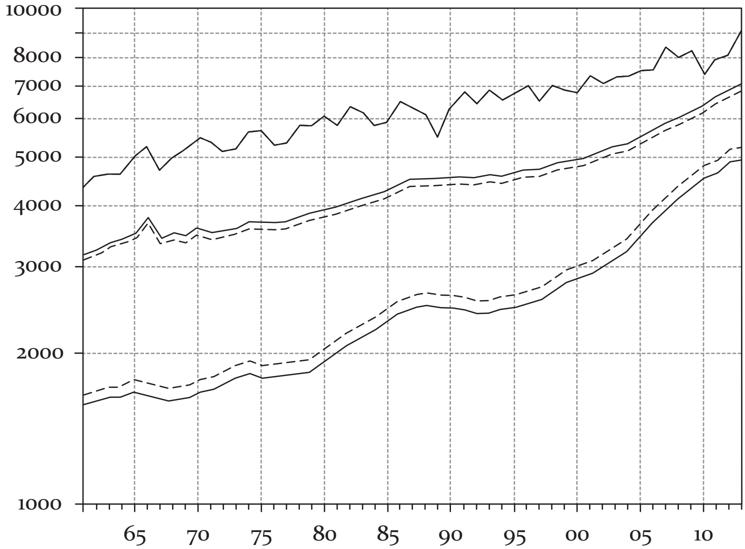
B. Shares of aggregate value added[a]



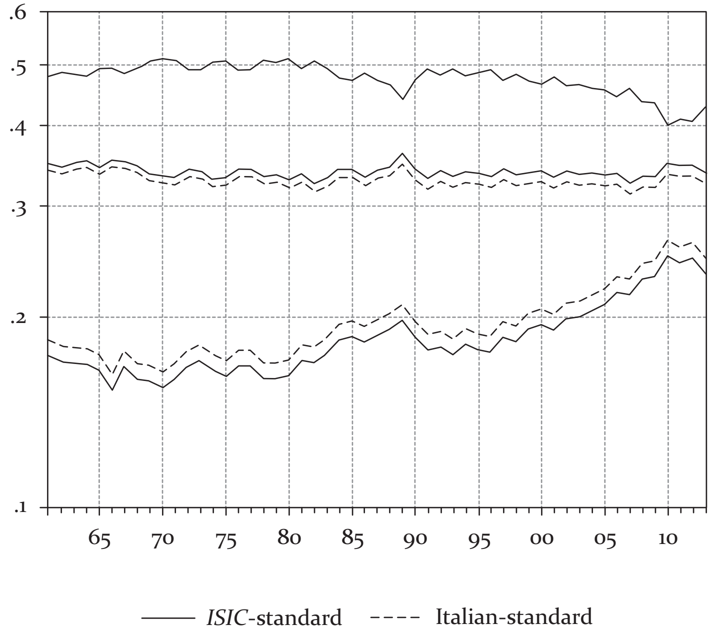
[a] the top two lines refer to agriculture, the middle two to services, the bottom two to industry.

FIGURE 4.3 *Production series at 1911 prices, 1861–1913, approximate ISIC-standard classification (million lire)*

A. Levels (million lire)[a]



B. Shares of aggregate value added[a]



[a] the top line refers to agriculture, the middle two to services, the bottom two to industry.

cation is described in detail below (§8.3); it involves the transfer from industry to the services of the value added attributed to the maintenance of such consumer durables as shoes, vehicles, clocks and watches, sewing machines, and the like, and the value added in some new production as well (printing and publishing). The exercise is performed *pro bono*, and does not seem to warrant comment.

4.2 The expenditure side

The second set of revised second-generation estimates refers to the expenditure side; for the reasons just noted, these are based on a production side that differs from the 2005/2011 series far more than was forecast. Methodologically, their recalculation avoids Baffigi's adventurous algorithms, and returns in essence to the present author's earlier effort: as before, the guiding principle is to estimate investment and consumption by allocating to these the production-side estimates of value added (and the value of exports and imports).[11] It would seem more natural to allocate the value of the available final goods to consumption and investment, but that approach is in fact impracticable: the breakdown of final goods and services cannot be calculated directly because the (large) fabricated-metal and wood-products industries both produce a mix of final goods (e.g., tools) and intermediate goods (e.g., elements of buildings), and the composition of the mix is unknown. But we do know that all fabricated-metal products, for example, are (final or intermediate) investment goods, and that aggregate investment therefore includes the entire value added of that industry (and that contributed, supplier by supplier, to its raw materials).[12] The

[11] As noted, the present investment estimates include value added in maintenance, but are sufficiently detailed to allow alternative calculations. Maintenance appears to be excluded from Vitali's investment estimates, but not from his estimates of GDP (above, §3.3, footnote 16). More broadly, the present estimates attribute to investment all durables, save only those purchased by households; Vitali counted as investment most government-financed durables (e.g., roads), but not naval ships (Rey 1992, p. 315; the army's durables would presumably have been similarly treated, had they been separately identified).

[12] This of course to a first approximation, to clarify the concept; the consumer-durable component is in fact non-trivial, but it can be estimated and

calculation of the expenditure-side aggregates remains based on this simple intuition.

A number of refinements are naturally introduced. First and most obviously, the estimates are no longer constrained by the superseded "benchmark" expenditure-side estimates for 1911 (in Rey 1992, 2002). Second, the joint constraint imposed on C (private consumption), I (gross investment), and G (public consumption) by GDP (from the production side), X (exports), and M (imports) is amended: by the revision of the GDP series, again obviously, and also by a revision of the X and M series, to allow for some miscounted items and for the international freights earned by Italian ships.[13] Third, the estimates of C, I, and G are obtained sequentially rather than together, and in greater detail. Public consumption G is a gimme, estimated first simply by scaling up the production-side figures for government services to allow for the consumption of materials; fixed investment I_f alone is estimated next, by identifying, as before, the components of the here elementary (1911-price value added) production and trade series that are investment goods, or enter their production; private consumption C and inventory investment I_i are then obtained as a large joint residual, disentangled on the assumption that inventory investment could vary sharply from year to year, while consumption

deducted. As a practical expedient the estimating algorithms were at times simplified (bastardized, if one will) by abandoning the allocation (to the expenditure categories) of production value added and of import and export values, uniformly applied in Fenoaltea (2012). In the case of the industries that processed agricultural products, in particular, the investment component was calculated directly in value terms, including the cost of the raw materials; the (agricultural) production of the latter, and the corresponding international trade, did not therefore need to be considered. Similarly, the investment-good consumption of (other) agricultural goods was estimated directly in aggregate terms, again obviating the need to deal separately with (agricultural) production and imports.

[13] It may be worth bringing to the profession's attention that the *Movimento commerciale* appears to omit imports of naval vessels, and of military weapons as well (the trade categories identify rifles and pistols – apparently including military rifles in the early 1860s, Fenoaltea 2020 – but not cannon, machine guns, and the like). The omission of naval vessels is readily confirmed and made good (Fenoaltea 2018c; below, ch. 10), but in the case of military weapons clarification would require *ad hoc* archival research.

tended to be autocorrelated.[14] Fourth, the time-invariant allocation of the elementary series to (fixed) investment is also refined: in Fenoaltea (2012) the elementary series were 22 production-group series, the revised estimates rely where useful on the author's product-specific series, of which there are hundreds. The impact of this last refinement is however perforce a modest one, as it captures only the changing composition of what are, in the present perspective, minor industries; the big-ticket items are the large durable-goods industries like construction and engineering, and these continue to dominate the aggregate (fixed) investment series.

Of these refinements, the most deserving of further comment is the calculation of a separate inventory-investment series. To a first approximation inventory movements are not documented at all, and can be reconstructed only by inference; and the quantitative historiography is not encouraging. In the centennial corpus, it may be recalled, the inventory-investment series was absurd in its own right, and in fact the slack variable that reconciled the production-side story shaped by the sources and the expenditure-side story shaped by the conventional wisdom of the day (Fenoaltea 2012 and above, §3.5, footnote 26). Fenoaltea (2012) ducked the issue altogether, presenting only a "total investment" series that actually referred, by construction, to fixed investment alone. In the sesquicentennial corpus, "inventory investment" and "fixed investment" were derived together from a trend-cycle decomposition of aggregate investment: a perplexing approach (given that investment was estimated from the producer-durable figures alone) that yields implausible results (suggesting for example that in 1907 and 1908 much machinery was produced and imported to be left idle).

Here, fixed investment I_f is estimated directly, using the algorithm described above, and total investment is derived by

[14] The new ordering of the estimates, from small (I) to large (C), is itself a methodological improvement, as in the presence of an overarching constraint as one moves from sector to sector the derivative errors tend thus to be reduced rather than magnified. An example may be clearer than an abstract explanation. Imagine that $C + I = 100$, and that our direct estimates of C and I will be off by 8 percent. Say $C = 75$ and $I = 25$. If we estimate C first, and get 69, $I = 100 - C = 31$: the 8 percent error in C yields a 24 percent error in I. If instead we estimate I first, and get 27, $C = 100 - I = 73$: the 8 percent error in I yields a less-than-3 percent error in C.

adding a separate estimate of inventory investment that serves essentially to smooth consumption (not least of agricultural products, to the extent that harvest fluctuations were not absorbed by international trade). The decomposition of the joint residual $C + I_i$ is obtained in two steps. To allow for the normal growth of inventories as the economy grows, estimates of production-and-distribution inventory investment I_{ipd} are derived as fractions of the annual change in (mining and manufacturing) production on the one hand and the volume of goods handled by merchants on the other. The net residual $C + I_i - I_{ipd}$ is then smoothed by taking a five-year moving average with triangular weights; the smoothed values are identified with consumption C, the residuals with consumption-smoothing inventory investment I_{ics}. Total inventory investment I_i is then obtained as $I_{ipd} + I_{ics}$, and total investment I as $I_i + I_f$.

The revised 1911-price expenditure-side estimates are collected in Table 4.4, and illustrated, with their predecessors, in Figure 4.4. To start from the minor items, the revised series for exports, now also corrected to constant borders, essentially confirms Baffigi's. In the case of imports, on the other hand, Baffigi's series seems marked, as noted, by an overstated 1871 benchmark (above, §3.5); the revised series tends to confirm the present author's earlier estimates (save in 1861–66, due to the new allowances for Venetian imports, and for naval vessels the trade statistics omitted). The revised public-consumption series resembles neither of its predecessors; it resembles rather the extensively revised "government services" production estimates, from which it is derived.

The new fixed investment series essentially confirms the author's 2012 series; arguably, in the light of the evidence in the sources, as well as of the methodology, it could not do much else. The new total-investment series is a noisy version of the fixed-investment series: very noisy, because the "inventory investment" estimates are dominated by the residuals from smoothing consumption, almost an order of magnitude greater than fixed investment.

Because the minor series are minor, and the investment series is little changed, the reduction in the production-side estimate of GDP shows up essentially in the estimates of consumption, now significantly lower than the author's earlier estimates (and, *a fortiori*,

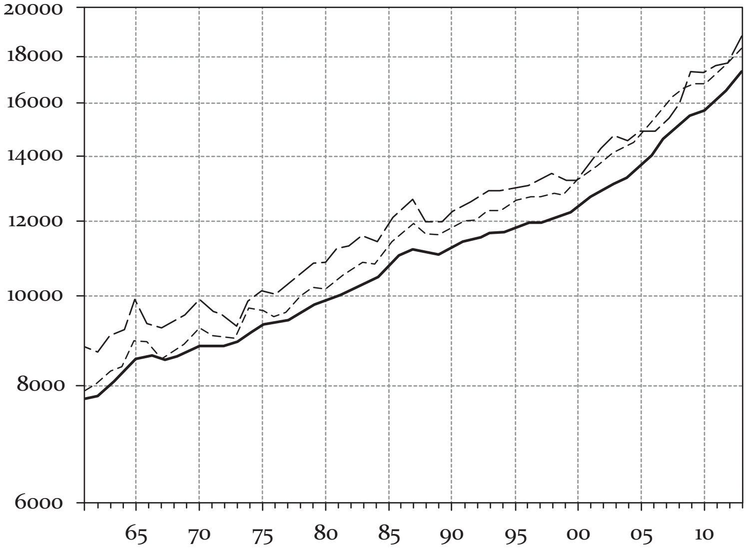
TABLE 4.4 *Revised expenditure series at 1911 prices, 1861-1913 (million lire)*

	(1)	(2)	(3)	(4)	(5)	(6)	(7)
		I					
	C	fixed	total	*G*	*X*	*M*	*GDP*
1861	7,766	1,015	992	1,092	470	629	9,691
1862	7,831	1,104	1,166	1,143	544	650	10,034
1863	8,016	1,131	1,064	1,260	614	712	10,242
1864	8,278	1,122	1,057	1,301	565	764	10,437
1865	8,537	1,117	1,421	1,358	548	730	11,134
1866	8,640	1,034	1,323	1,744	613	685	11,635
1867	8,554	968	604	1,247	604	636	10,373
1868	8,593	949	896	1,309	653	636	10,815
1869	8,707	996	1,091	1,192	668	663	10,995
1870	8,837	1,040	1,255	1,337	631	642	11,418
1871	8,843	1,033	1,062	1,170	857	688	11,244
1872	8,851	1,093	998	1,212	772	782	11,051
1873	8,942	1,263	1,073	1,227	748	793	11,197
1874	9,166	1,260	1,519	1,257	700	876	11,766
1875	9,316	1,199	1,397	1,242	823	888	11,890
1876	9,350	1,233	1,062	1,235	835	937	11,545
1877	9,428	1,234	1,135	1,252	712	897	11,630
1878	9,582	1,277	1,414	1,280	905	969	12,212
1879	9,747	1,298	1,467	1,290	954	1,156	12,302
1880	9,877	1,375	1,455	1,306	1,039	1,042	12,635
1881	9,964	1,464	1,312	1,386	1,141	1,159	12,644
1882	10,138	1,620	1,866	1,355	1,159	1,203	13,315
1883	10,272	1,680	1,777	1,405	1,201	1,306	13,349
1884	10,440	1,799	1,598	1,459	1,140	1,411	13,226
1885	10,730	1,825	1,907	1,486	1,030	1,644	13,509
1886	11,028	1,943	2,270	1,546	1,141	1,709	14,276
1887	11,172	1,920	2,285	1,610	1,194	1,925	14,336
1888	11,111	1,857	1,626	1,694	1,138	1,363	14,206
1889	11,054	1,756	1,336	1,690	1,066	1,600	13,546
1890	11,209	1,765	1,910	1,656	982	1,463	14,294
1891	11,416	1,686	1,946	1,621	1,035	1,275	14,743
1892	11,491	1,680	1,484	1,610	1,121	1,356	14,350
1893	11,610	1,630	1,858	1,608	1,141	1,388	14,829
1894	11,667	1,620	1,409	1,606	1,298	1,359	14,621
1895	11,811	1,569	1,701	1,629	1,279	1,516	14,904
1896	11,934	1,595	1,856	1,659	1,334	1,470	15,313
1897	11,948	1,620	1,339	1,646	1,423	1,493	14,863
1898	12,067	1,649	1,927	1,649	1,526	1,700	15,469
1899	12,190	1,712	1,727	1,654	1,715	1,759	15,527
1900	12,385	1,931	1,788	1,662	1,611	1,764	15,682
1901	12,670	1,982	2,306	1,659	1,704	1,909	16,430
1902	12,882	2,103	2,101	1,659	1,829	2,054	16,417
1903	13,128	2,171	2,345	1,665	1,827	2,119	16,846
1904	13,343	2,271	2,240	1,667	1,896	2,067	17,079
1905	13,713	2,507	2,627	1,675	2,039	2,309	17,745
1906	14,161	2,912	2,925	1,703	2,155	2,648	18,296
1907	14,792	3,255	3,809	1,749	2,073	2,895	19,528
1908	15,206	3,556	3,638	1,763	1,987	3,023	19,571
1909	15,588	3,498	4,053	1,798	2,108	3,226	20,321
1910	15,723	3,756	3,384	1,841	2,195	3,279	19,864
1911	16,143	3,888	3,986	1,961	2,221	3,413	20,898
1912	16,632	4,079	4,094	1,974	2,434	3,651	21,483
1913	17,306	4,037	4,539	2,021	2,505	3,577	22,794

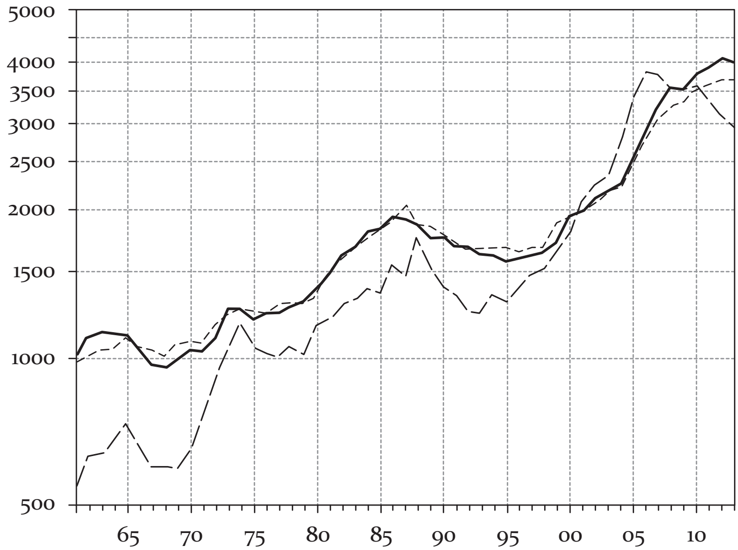
Source: see text.

Figure 4.4 *Expenditure series at 1911 prices, 1861–1913 (million lire)*

A. Consumption



B. Fixed investment



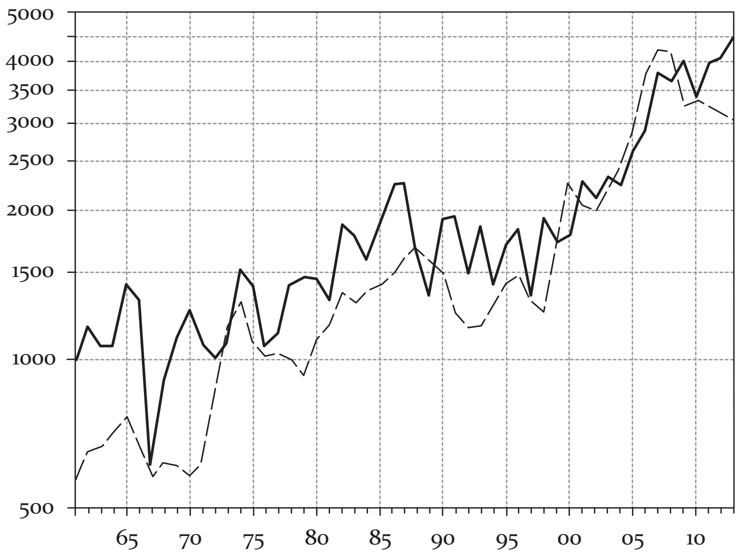
- - - - preliminary second-generation (Fenoaltea 2005)

— — sesquicentenary (Baffigi 2011)

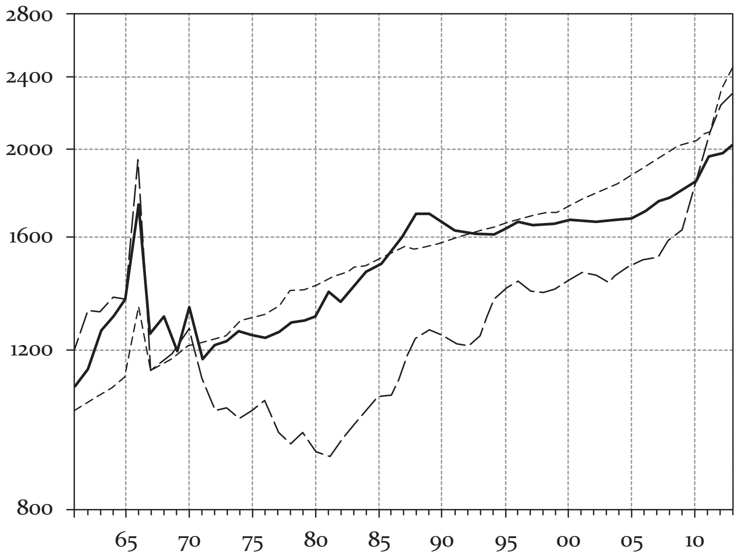
——— revised second-generation

Figure 4.4 *(continued)*

C. Investment (total)



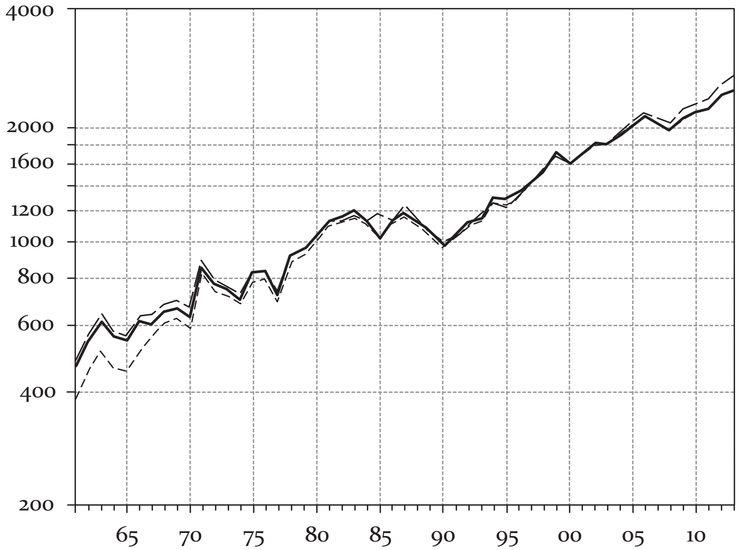
D. Government



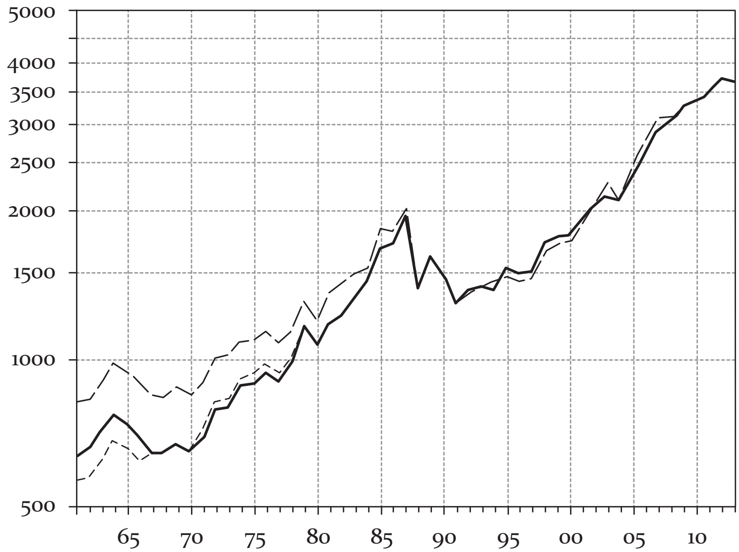
preliminary second-generation (Fenoaltea 2005)
sesquicentenary (Baffigi 2011)
revised second-generation

Figure 4.4 *(continued)*

E. Exports



F. Imports



- - - - preliminary second-generation (Fenoaltea 2005)
— — sesquicentenary (Baffigi 2011)
—— revised second-generation

Baffigi's) – and, by construction, perceptibly smoother. As already noted, however, the reduction is essentially in the quantity of local distribution services associated with the consumption of commodities; the latter is not reduced, and neither, therefore, are implied living standards.

The revision of the expenditure side thus yields, in the main, an advance on one front, and a retreat on another. The advance concerns private consumption: it too, like GDP, is revised downward. The retreat concerns investment: the step-wise growth attributed to investment by the sesquicentennial series is rejected as a figment generated by unfortunate algorithms, and the earlier view that investment followed a (Kuznets-cycle) long swing is emphatically reaffirmed.

4.3 The composition of fixed investment

Following Baffigi where I had feared to tread, the present revised second-generation estimates are extended to investigate the composition of investment; but his categories are here modified, the better to highlight the distinction between infrastructure and business investment. Because compositions are ultimately meaningful only at current prices, the 1911-price estimates are accompanied by conjectural third-generation figures, at the 1911 price level and (approximate) current relative prices (Tables 4.5, 4.6 and Figures 4.5, 4.6).[15]

The exercise is non-trivial, as it requires in essence the decomposition of durable-goods production to distinguish final from intermediate goods, but in the light of our ultimate objectives very much worthwhile. We reconstruct the past to understand it, to explain to our satisfaction *why* things went the way they did; and because we are easily satisfied the literature is full of interpretations ("hypotheses," but that is just a trope) based on

[15] For what appear to be sufficient reasons (ch. 2A), the present estimates of fixed investment include maintenance; but maintenance is separately identified, not least to facilitate comparisons with the maintenance-excluding estimates in the extant literature (e.g., Vitali in Rey 1992, pp. 314–315; Baffigi 2011, p. 63, with reference to his investment-in-construction series).

TABLE 4.5 *Components of fixed investment at 1911 c.i.f. prices, 1861-1913 (million lire)*

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
	inv. in	investment in new durable goods								
	main-		by and	construction		horses,	ships,	metal	tools,	display
	tenance	total	in ag.	priv.	pub.	harn's	rr.veh.	mach.	wood m.	goods
1861	347	668	51	100	296	22	39	22	133	4
1862	358	746	72	158	324	22	57	21	87	4
1863	364	767	62	134	358	20	74	18	97	5
1864	365	757	73	153	337	20	60	18	92	5
1865	369	748	35	128	362	20	58	23	118	5
1866	372	662	54	98	289	8	49	18	142	5
1867	379	589	24	110	227	12	44	23	145	5
1868	381	568	24	89	238	15	48	23	126	5
1869	388	608	52	107	213	18	47	32	134	5
1870	392	648	62	95	246	20	43	23	154	5
1871	395	638	47	122	242	19	40	26	137	5
1872	400	693	43	126	275	24	37	38	146	5
1873	405	858	114	174	302	27	59	43	135	5
1874	412	848	91	212	290	24	53	41	132	5
1875	413	786	120	152	252	11	46	40	160	5
1876	420	813	154	139	237	18	38	42	181	5
1877	427	807	122	137	250	31	36	42	185	5
1878	433	844	192	127	261	21	28	35	175	5
1879	436	862	195	120	279	24	32	32	175	5
1880	447	928	191	126	314	24	37	52	179	5
1881	450	1,014	167	147	322	28	51	64	230	5
1882	461	1,159	181	178	381	35	65	77	236	7
1883	467	1,213	162	175	432	31	69	79	257	7
1884	469	1,330	220	183	449	30	66	92	283	7
1885	476	1,349	181	207	452	33	69	100	300	7
1886	489	1,454	191	209	462	33	88	100	364	7
1887	499	1,421	74	160	475	28	109	144	424	7
1888	513	1,344	31	116	503	22	97	146	423	7
1889	523	1,233	3	124	461	31	89	147	374	5
1890	527	1,238	77	164	422	29	69	145	327	5
1891	533	1,153	101	181	391	26	52	121	276	5
1892	537	1,143	164	163	361	26	43	115	264	7
1893	544	1,086	128	186	317	29	43	116	260	7
1894	547	1,073	104	183	315	29	41	125	269	7
1895	554	1,015	122	177	216	23	45	160	265	7
1896	562	1,033	148	177	184	26	43	182	266	7
1897	571	1,049	129	176	187	32	58	179	282	7
1898	580	1,069	80	176	180	33	80	203	309	7
1899	585	1,127	–8	177	188	35	120	255	353	7
1900	588	1,343	83	183	208	36	155	320	352	7
1901	598	1,384	132	204	224	41	122	297	357	7
1902	611	1,492	193	239	251	47	92	277	385	7
1903	620	1,551	164	274	259	46	91	300	410	7
1904	633	1,638	111	306	267	43	109	370	426	7
1905	641	1,866	142	335	300	53	135	449	444	7
1906	651	2,261	189	329	361	54	188	624	507	9
1907	662	2,593	228	349	393	53	248	743	569	9
1908	680	2,876	338	373	432	59	216	843	604	11
1909	695	2,803	118	444	529	78	180	783	660	11
1910	715	3,041	147	519	618	79	169	806	691	11
1911	740	3,148	130	555	646	69	219	784	734	11
1912	759	3,320	171	564	661	73	273	761	804	13
1913	782	3,255	180	547	652	65	272	706	821	12

Source: see text.

Table 4.6 *Conjectural components of fixed investment at the 1911 price level, 1861-1913 (million lire)*

	(1) inv. in main-tenance	(2) investment in new durable goods: total	(3) by and in ag.	(4) construction: priv.	(5) construction: pub.	(6) horses, harn's	(7) ships, rr.veh.	(8) metal mach.	(9) tools, wood m.	(10) display goods
1861	375	1,129	51	100	296	22	130	73	444	13
1862	390	1,126	72	158	324	22	186	68	283	13
1863	397	1,191	62	134	358	20	235	57	309	16
1864	397	1,127	73	153	337	20	186	56	286	16
1865	401	1,164	35	128	362	20	176	70	358	15
1866	405	1,082	54	98	289	8	145	53	420	15
1867	413	999	24	110	227	12	127	66	419	14
1868	417	935	24	89	238	15	135	65	355	14
1869	428	990	52	107	213	18	129	88	369	14
1870	434	1,028	62	95	246	20	116	62	414	13
1871	436	975	47	122	242	19	105	68	359	13
1872	442	1,047	43	126	275	24	95	97	374	13
1873	447	1,220	114	174	302	27	147	107	337	12
1874	452	1,180	91	212	290	24	129	100	322	12
1875	454	1,133	120	152	252	11	110	95	381	12
1876	461	1,167	154	139	237	18	88	98	421	12
1877	466	1,148	122	137	250	31	82	95	420	11
1878	471	1,140	192	127	261	21	62	78	388	11
1879	474	1,145	195	120	279	24	69	69	378	11
1880	486	1,232	191	126	314	24	78	110	378	11
1881	488	1,385	167	147	322	28	105	132	474	10
1882	499	1,550	181	178	381	35	131	155	475	14
1883	506	1,610	162	175	432	31	136	155	505	14
1884	508	1,741	220	183	449	30	127	176	543	13
1885	513	1,763	181	207	452	33	129	187	561	13
1886	526	1,917	191	209	462	33	161	183	665	13
1887	536	1,956	74	160	475	28	194	257	756	12
1888	551	1,843	31	116	503	22	169	254	736	12
1889	560	1,664	3	124	461	31	151	250	636	8
1890	563	1,598	77	164	422	29	114	241	543	8
1891	568	1,434	101	181	391	26	84	196	447	8
1892	570	1,392	164	163	361	26	68	182	417	11
1893	577	1,317	128	186	317	29	66	179	401	11
1894	578	1,297	104	183	315	29	62	188	405	11
1895	584	1,239	122	177	216	23	66	235	390	10
1896	590	1,250	148	177	184	26	62	261	382	10
1897	599	1,261	129	176	187	32	81	251	395	10
1898	607	1,289	80	176	180	33	109	278	423	10
1899	610	1,373	-8	177	188	35	160	341	471	9
1900	612	1,597	83	183	208	36	202	417	459	9
1901	621	1,597	132	204	224	41	155	378	454	9
1902	633	1,675	193	239	251	47	114	344	478	9
1903	639	1,722	164	274	259	46	110	364	497	8
1904	650	1,806	111	306	267	43	129	438	504	8
1905	656	2,026	142	335	300	53	156	519	513	8
1906	664	2,431	189	329	361	54	212	704	572	10
1907	673	2,751	228	349	393	53	273	818	627	10
1908	688	3,001	338	373	432	59	232	906	649	12
1909	701	2,885	118	444	529	78	189	822	693	12
1910	718	3,081	147	519	618	79	173	826	708	11
1911	740	3,148	130	555	646	69	219	784	734	11
1912	756	3,276	171	564	661	73	266	743	785	13
1913	775	3,169	180	547	652	65	259	673	782	11

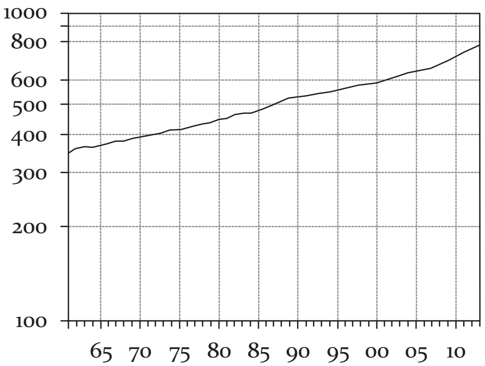
Source: see text.

broad evidence that certainly admits them, but as readily admits alternatives. To narrow the field we must look beyond, or more precisely within, the broad aggregates with which we too often rest content, to verify that the story we tell is consistent with finer-grained evidence; and if we are concerned with economic development our focus must be not on aggregate domestic product (which can grow for a spell thanks to no more than favorable weather) but on capital formation, on investment – and by the same token not on aggregate investment (which can be in palaces and amusement parks as well as in means of production), but on its various components. The desired disaggregation is of course by destination, distinguishing for example investment in agriculture, and investment in industry; the present figures are limited to a partial (but, as a first step, necessary) disaggregation by instru-

FIGURE 4.5 *Components of fixed investment at 1911 c.i.f. prices, 1861–1913 (million lire)*

A. Aggregate investment

A1. Maintenance



A2. New-good investment

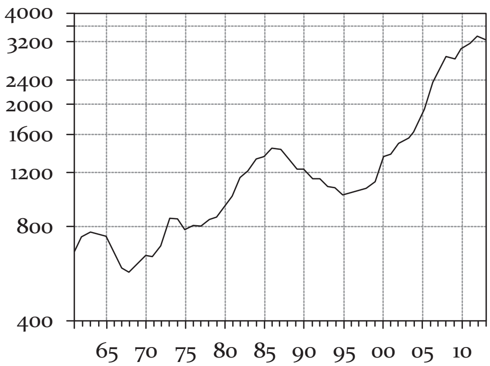
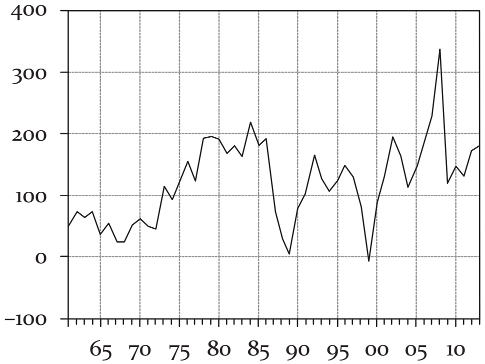


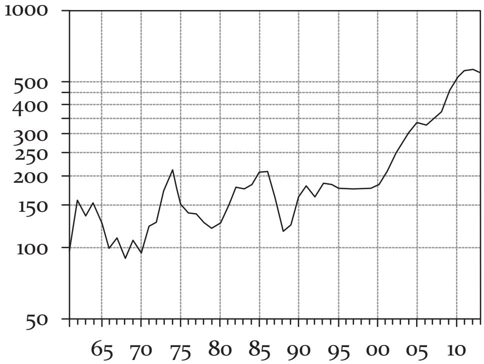
FIGURE 4.5 *(continued)*

B. New-good investment

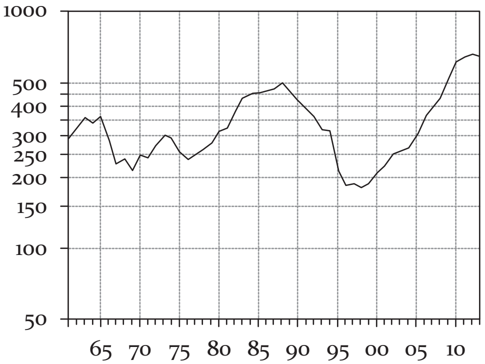
B1. By and in agriculture



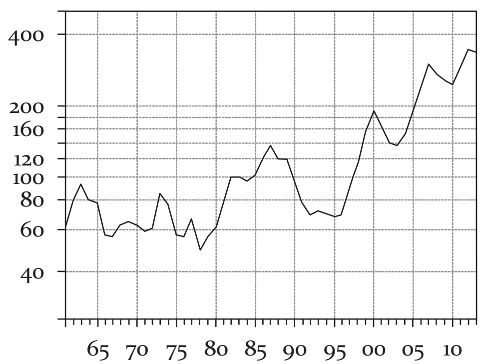
B2. Private structures



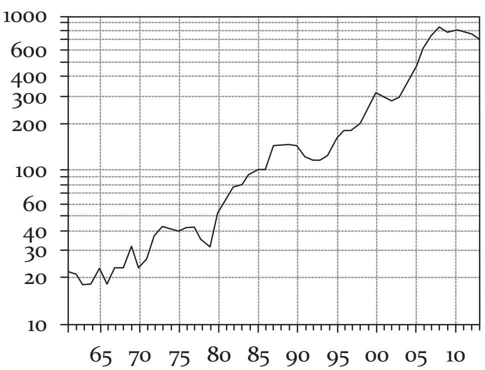
B3. Other fixed infrastructure



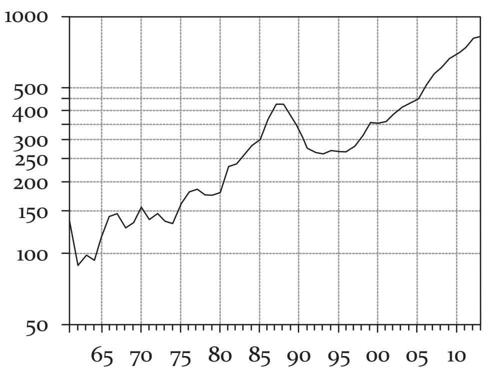
B4. Vehicles, horses, harnesses



B5. Metal (ordinary/precision) machinery



B6. Tools, wood machinery



ment, distinguishing for example investment in structures, and investment in machinery.[16] *Est tempus in rebus.*

The new second-generation, 1911-price estimates of the components of investment are obtained as follows. As recalled above, aggregate fixed investment was estimated from the value added in the production of final and intermediate investment goods, rather than directly from the value of the final investment goods, because only a subset of the latter can be identified: to the best of our knowledge no evidence directly documents the distribution of significant products – notably those of the (overwhelmingly artisanal) wood-working and hardware industries – between final goods in their own right (e.g., tools, wood machines) and goods incorporated in the product of other industries (e.g., wood doors and windows, or metal gates and blinds, incorporated in structures).

Here, the 1911-price fixed-investment aggregate is accordingly disaggregated into its various directly identifiable components, tentatively converted from f.o.b. (factory-gate) to c.i.f. (delivered) values, and a residual taken as an estimate of the unobservable (c.i.f.) value of the final goods of wood and fabricated metal, essentially tools and wood machinery – a very rough estimate, inevitably, as this residual inherits all the errors of its parent figures. These estimates reaffirm the long-established presence of a long swing in investment in infrastructure, and the recently-established *absence* of that swing in investment in ordinary (industrial and agricultural) metal machinery (Fenoaltea 2020, Pezzuto 2019). The novel result is that investment in tools (and wood machinery) also apparently followed the familiar long swing, with super-normal growth over most of the 1880s, a decline into the early '90s, and renewed growth from the turn of the century (Table 4.5 and Figure 4.5).[17]

[16] A more ambitious disaggregation of investment, by type (housing, public works, machinery and vehicles, non-residential structures, other) and by destination (housing, agriculture, industry and services, public infrastructure) appears in Fuà (1969); but the underlying ("first-generation") estimates are so poor that these figures are of little use.

[17] This point is in part *sub judice*, as the wood-industry value added series is preliminary; the extant estimates incorporate lumber-import quantity data for the late 1880s that may be overstated by a factor of 10, artificially inflating estimated production – and, derivatively, estimated investment in tools and wood machinery – over those years. The late-1880s spike may well be overstated, but the long-swing story itself seems robust.

The additional evidence reviewed in earlier work suggested that the long swing in investment in infrastructure (and, derivatively, in total investment and GDP) was due to variations in the supply of finance, determined over most of the period at hand by "autonomous" developments in the international market for capital (Fenoaltea 1988a, 2011a, ch. 2). The obvious hypothesis developed here (§14.3) is that investment in tools was similarly determined by the availability of finance: not from the international banks and bond market tapped by the State, not from the local banks tapped by private builders, but simply the retained earnings of the artisans themselves.

With all investment thus identified, directly or indirectly, the question of its composition can finally be addressed. Clearly, the composition of a value aggregate is meaningfully gauged only at current relative prices; but the direct recalculation of the investment series on a current-price basis is too great an effort to be embarked on here. Following precedent (Fenoaltea 2011b, 2015b), what is produced here is a simple first approximation, obtained

FIGURE 4.6 *Conjectural components of fixed investment at the 1911 price level, 1861–1913*

A. Share of new-product investment in aggregate investment

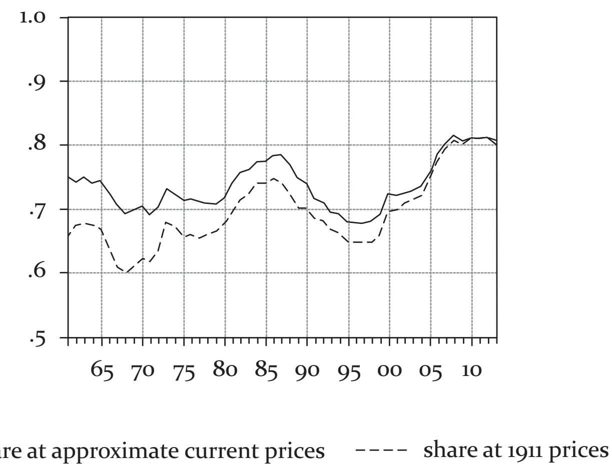


Figure 4.6 *(continued)*

B. Shares of new-product investment

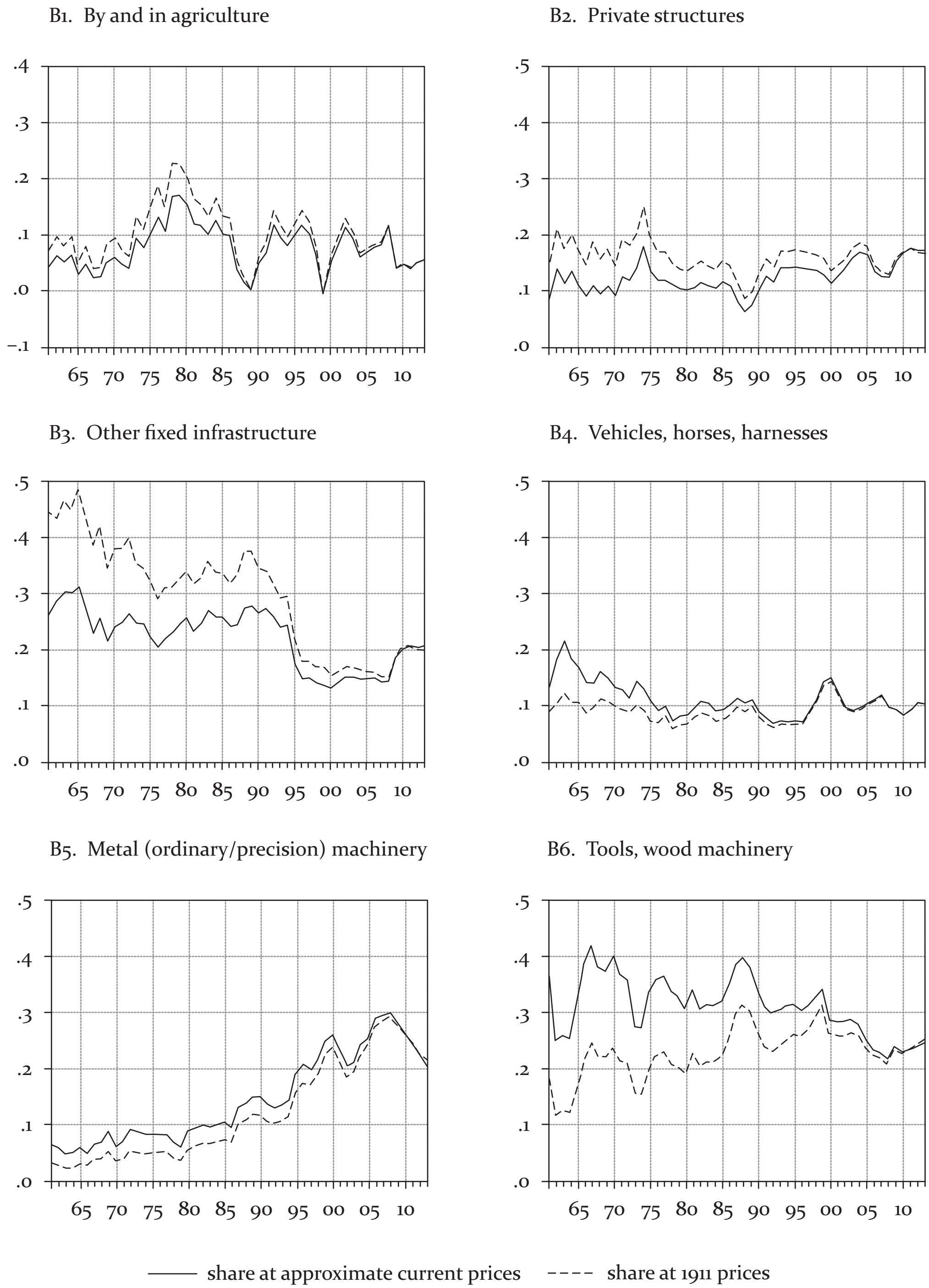
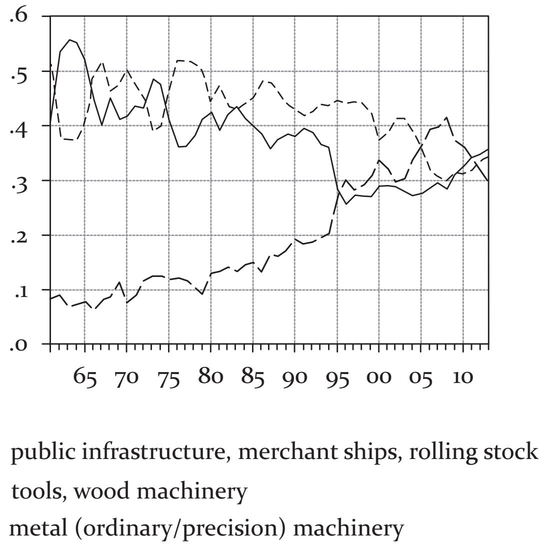


FIGURE 4.6 *(continued)*

C. Relative shares of productivity-enhancing investment, 1861–1913



from the available constant-price series by crudely correcting them to allow for differential productivity growth.

What emerges on this approximate current-relative-price basis is collected in Table 4.6 and illustrated in Figure 4.6; the salient results can be summarized as follows.[18] First, the ratio of investment in new goods to investment in maintenance varied of course as new-good investment followed the long swing, and maintenance did not; cyclical variations apart, that ratio appears to have remained essentially stable, near 3 to 1 (panel A). Within investment in new goods (panel B), agricultural improvements and breeding varied most: their share was typically in the 5-to-15 percent range, but with a maximum approaching 20 percent in 1878 and 1879, and near-zero minima in 1889 and 1899. The share of private structures was normally 10 to 15 percent, but with peaks approaching 20 percent

[18] Figure 4.6 also illustrates the purported composition of investment at 1911 prices, highlighting the attendant distortions; see below, §15.2.

in 1874 and not much less than that in 1904–05 and again in 1911–13. The combined share of other infrastructure and (related) vehicles drifted down, with cyclical variations, from 40 to 50 percent in the early years to a minimum of 20 percent in 1896, and then recovered to some 30 percent by 1913. The share of (metal) machinery grew relatively steadily from some 5 percent at Unification to a peak of some 30 percent in 1908, and then fell back to nearer 20 percent by 1913. The share of tools (and wood machinery), finally, appears to have remained between 30 and 40 percent through the nineteenth century, and then to have drifted down to nearer 25 percent: figures that are large, but perhaps not surprisingly so, in a country that was and largely remained a land of artisans and cultivators.[19]

Figure 4.6, panel C illustrates the relative shares, in their joint total, of productivity-enhancing new-good investment in "infrastructure" (public works and vehicles, Table 4.6, cols. 5 and 7, excluding however naval ships), "machinery" (ibid., col. 8), and "tools" (including wood machinery, ibid., col. 9). "Tools" were overall the largest single component, with "infrastructure," through the turn of the century, a close second; "machinery" started a distant third but grew to capture a solid first place over the halcyon years of the prewar boom, and by 1913 the shares of these three components were roughly equivalent.

Some implications for the literature may usefully be spelled out, by way of conclusion.

The interpretations of Italy's economic growth have paid more attention to aggregate investment than to its composition; the long swing of the aggregate whose composition is investigated here was ascertained decades ago (Fenoaltea 2011a, chs. 1 and 2, and references therein), so nothing of substance needs to be added here.

A significant difference in the path of the components is observed above, as the evidence points not to a long swing, but to relatively steady growth, in investment in (metal) machinery. That investment is our best proxy for investment specifically in industry: we had all presumed that it too followed the long swing, and as that presumption seems thoroughly in error the historiography of the last half-century and more goes swiftly down the tubes. A major

[19] The share of precious-metal display goods is not illustrated; it declined from perhaps one percent in 1861 to nearer half that by 1913.

result, but not a new one, as its implications have already been developed (Fenoaltea 2020).

Further considerations bring us back to the very beginning of the postwar literature. Rosario Romeo is little known in the English-speaking world, as his work has reached it only though Alexander Gerschenkron's increasingly malevolent critique (Romeo 1959; Fenoaltea 2011a, ch. 1, and references therein); but he was Gerschenkron's contemporary, and in this particular field very much his equal. More significantly, for present purposes, he represents an exception to the common focus on *aggregate* investment, as the story he told turned very much on the (then quite undocumented) *composition* of investment. In his logical, proto-rostowian account, an adequate infrastructure (in essence, a railway system) is a necessary prerequisite for industrial growth; in capital-constrained Italy, the State quite rightly steered investment into infrastructure in the 1860s and '70s, and then into industry. As far as we can now tell investment in infrastructure much exceeded investment in industrial machinery through the 1860s and '70s, as he thought; but on that score nothing would change through the 1880s and beyond, and his claim that the prerequisites were created over the first two decades receives no support at all.

How might Romeo have shaped his account, had he had in his hands the evidence and estimates presented here? If one takes the changing composition of investment as a guide to *when* the prerequisites were in place and industry could "take off," the present estimates point to the mid-1890s, as Gerschenkron had argued; but Romeo could have salvaged the rest of his story, as the expansion of the railway net actually came to an end right about then (Fenoaltea 2011a, p. 171).

This exercise in counterfactual historiography will go no further, not least because the entire stages-of-growth approach that underpins Romeo's story (and Gerschenkron's) is to be dismissed: the international mobility of labor, capital, and technology tied local development to the location choices of internationally mobile entrepreneurs, and the domestic-resource-constrained creation of necessary prerequisites is a will o' the wisp (ibid., ch. 1).

II

REVISED SECOND-GENERATION ESTIMATES: THE PRODUCTION SIDE

5

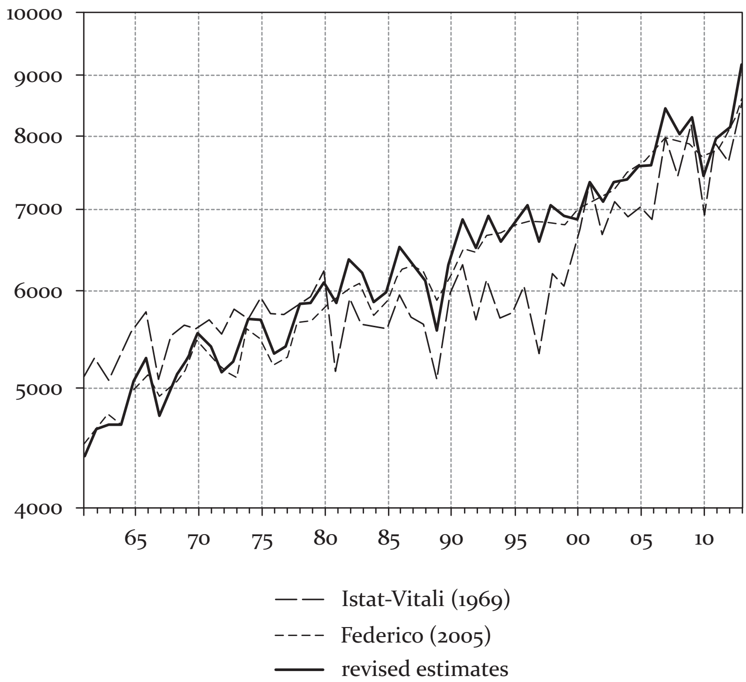
AGRICULTURE

5.1 Introduction

The two original constant-price estimates of the value added in agriculture are the "centennial" Istat-Vitali series, and the "second-generation" Federico series. The former is a 1938-price value added series (Fuà 1969), transcribed in Fenoaltea (2005), Table 1, col. 2; it is here illustrated in Figure 5.1, rescaled to interpolate the Istat-Vitali current-price estimate for 1911. The latter was presented as an index of gross saleable production at constant prices and current borders, accompanied by a current-price series and an implicit deflator (Federico 2003a, p. 377). Figure 5.1 also illustrates the Federico value added series in Fenoaltea 2005, Table 3, col. 1 (also above, Figure 4.1, panel A); it extrapolates the Federico value added estimate for 1911 in Rey (2000), p. 19 with an index of agriculture's value added at 1911 prices and constant (1871–1913) borders kindly furnished to the present author by Federico himself (Fenoaltea 2005, pp. 285, 306).

That said, the Istat-Vitali "centennial" series and the "second-generation" Federico series have an unfortunate feature in common: neither was accompanied by an adequate description of the underlying sources and methods, so neither can be verified, reconstructed, or (organically) improved. In other ways, however, they are practically mirror-images. The Istat-Vitali series was compiled by acritically stringing together partial series produced at the time by successively different bodies using different methods; it presumably reflects year-to-year harvest fluctuations when the successive figures are homogeneous, and sheer nonsense when they

FIGURE 5.1 *Value added in agriculture, 1861–1913 (million lire at 1911 prices)*



are not. Federico back-cast the relatively sound production figures available for the last few years of the *belle époque* using reasonable supply and demand functions; his series presumably captures the medium-term movements of production, but not, as he was careful to point out (Federico 2003a, p. 369), the year-to-year fluctuations in the harvests. The first correction to the Federico series to be performed here accordingly modifies it, as described below, to incorporate the evidence of harvest fluctuations contained in the Istat-Vitali series.

The further correction is more insidious, and warrants a return to first principles. A productive activity's value added can be indifferently measured as the difference between the value of its product and that of purchased intermediates, or as the sum of the values of the primary resources it consumes. That is true in principle (Fenoaltea 1976; also above, §2.4), and true in practice *if* *everything is properly counted* – which it tends to be if we measure primary resource values, and tends *not* to be if we measure product-and-purchased-input values. Consider, to clarify the issue, a firm that is opening up a new mine. Over the accounting period it has absorbed capital and labor; from this perspective its value added is clearly positive. If it has yet to extract any ore, however, the conventional sales-less-purchases measure of its value added is zero (or negative, by the value of its purchased materials); and it is the latter measure that is defective, because it overlooks the firm's actual value product, which is the increase in the value of its now more accessible subsoil resources. We conventionally count additions to inventory – goods produced but not sold – as part of a firm's product, and investment; the point is simply that subtler forms of investment deserve equal treatment.

Federico's gross saleable product figures are akin to our hypothetical mining firm's value-of-ore-sold measure of its value product: they include additions to the herds (Federico 2003a, footnote 26), but appear to exclude, by construction, any other investment. Quite properly so in most cases, as tool and machinery purchases are counted as the product of the engineering industry, and land-reclamation projects among the construction industry's additions to social overhead capital; but such on-farm improvements as the conversion from pasture or cultivation to tree crops appear nowhere else on the production side. This omission is here made good, if only in principle; pending the necessary basic research, a crude allowance for on-farm improvements is here added to the constant-price value added series for agriculture.[1]

The final, revised estimates of 1911-price value added in agriculture are transcribed above in Table 4.1, col. 1. This series' quality warrants no more than a 2: not so much because the (comparatively trivial) "improvements" component is weak, but because the parent Istat-Vitali and Federico series cannot be reconstructed and, as necessary, improved.[2] The new, revised estimates are illustrated,

[1] Fenoaltea (2017) included a third "improvement" to the earlier series, a deduction for the maintenance services consumed by agriculture; but that was the result of muddled thinking, since clarified.

[2] Federico (2003a) himself points out, in a final footnote, that his demand side warrants revision in the light of the wage series in Fenoaltea (2002b).

next to their parent series, in Figure 5.1; they are compared to the Baffigi series above, in Figure 4.1, panel A. The revised estimates are more volatile, and (like the 2005 series) generally higher, than Baffigi's; over the medium term the upward revision grows over the 1870s, remains high over the 1880s, harvest failures aside, and then declines over the 1890s, effectively vanishing from the turn of the century.

5.2 Harvest fluctuations

The Federico estimates are initial second-generation medium-term-trend estimates; the preceding "centennial" estimates typically reflect the year-to-year fluctuations suggested by the historical data, but badly distort the longer-term picture. Following precedent (Fenoaltea 1988b, on the silkworm cocoon crop), the later series is here simply amended to incorporate the annual deviations from trend displayed by the earlier one.

The algorithm is straightforward. The Istat-Vitali series (illustrated in Figure 5.1) is broken up into three segments, respectively 1861–80, 1881–99, and 1900–13. A quadratic trend is fitted to the first and third periods together, and another to the intermediate period.[3] In all three periods, the ratio of the estimate to its trend value is calculated, and its square root is applied to Federico's estimate.

The square-root step is of course an *ad hoc* adjustment. The Istat-Vitali estimates may be excessively volatile, if they use a subset of products to represent the whole (in effect assuming a perfect correlation between documented-production and omitted-production movements). Between 1919 and 1940, when the agricultural data may be presumed of relatively high quality, the year-to-year growth rates vary between +13 and –11 percent. Directly applying the Istat-Vitali relative deviations to the Federico series yields annual variations between +12 and –15 percent in the first period, between +21 and –14 percent in the second, and between +20 and –18 percent in the third; applying their square root reduces their

[3] The early and late years are considered together, as both appear to reflect relatively credible data: the late tail reflects the reorganization of the data-gathering process, the early one is confirmed by, and perhaps based on, fiscal data (Fenoaltea 2011a, p. 23).

range to more reasonable levels (respectively +9 and −10 percent, +13 and −9 percent, and +12 and −11 percent).

The series so derived is transcribed in Table 5.1, panel A, col. 1; it is Federico's series, amended only to allow for the harvest fluctuations suggested by the historical data incorporated by the Istat-Vitali series.

5.3 Omitted improvements

The further adjustment to Federico's series aims to remedy the improper omission of the value added in on-farm improvements to the land. Their archetype is the conversion from pasture or cultivation to vineyards and other tree crops: an investment typically carried out by the agricultural labor force itself, an expenditure side item with no counterpart, at present, in the production-side estimates.

The present adjustment is highly tentative. The sought-for value added series does not appear to exist in the literature; but Vitali (1968) – a mimeographed working paper apparently spawned by his work on the centennial project – contains closely related estimates of investment in land improvements at current and constant prices, at today's borders. These series are here transcribed, not least to resurrect them, in Table 5.1, panel A, cols. 2 and 3.[4] The description of the current-price series' derivation (ibid., pp. 20–21) is encouraging: Vitali used a broad range of sources to document the acreage devoted to tree crops at varying dates, and the unit costs of the attendant improvements (no doubt also at varying dates); the measured increases in acreage were distributed over the relevant intervals at even rates, unless, we are cryptically informed, there was reason not to.

[4] The current-price series appears in Vitali (1968), Table 8, the constant-price series in Table 9. Vitali's tables include other investments in agriculture (land reclamation, machinery), but as noted their production-side equivalents are already covered. The discrepancy between today's borders and those of 1871–1913 can be considered immaterial. Vitali also mentions other improvements such as the construction of access roads, and of farm buildings; this hints at double-counting, to the extent that (at least in principle) the present construction estimates include all buildings.

Table 5.1 *Value added in agriculture, 1861-1913: intermediate series*

Panel A: Value and value added series (million lire)

	(1) Federico 1911-price value added, w/ harvests	(2) Vitali investment in on-farm improvements at current prices	(3) Vitali investment in on-farm improvements at 1938 prices	(4) 1911-price value added in on-farm improvements
1861	4,396	34	189	17
1862	4,595	34	193	35
1863	4,641	31	196	35
1864	4,624	31	201	52
1865	5,063	30	205	0
1866	5,283	35	212	17
1867	4,750	36	194	0
1868	5,028	40	199	17
1869	5,214	40	205	35
1870	5,500	36	210	35
1871	5,380	40	211	17
1872	5,151	46	221	17
1873	5,180	51	232	70
1874	5,590	60	276	87
1875	5,589	132	690	105
1876	5,212	163	877	122
1877	5,272	214	1,014	122
1878	5,669	234	1,148	192
1879	5,696	234	1,224	157
1880	5,949	219	1,135	157
1881	5,712	163	905	140
1882	6,222	138	744	157
1883	6,103	102	588	105
1884	5,723	71	429	140
1885	5,854	56	321	122
1886	6,372	51	290	157
1887	6,289	41	249	35
1888	6,130	36	214	0
1889	5,555	31	173	0
1890	6,250	31	169	87
1891	6,751	33	185	105
1892	6,374	39	231	122
1893	6,827	39	247	70
1894	6,553	61	402	35
1895	6,697	61	381	105
1896	6,931	61	378	122
1897	6,476	66	419	105
1898	6,961	71	439	87
1899	6,849	71	428	35
1900	6,750	71	409	105
1901	7,234	71	411	140
1902	6,937	71	425	157
1903	7,256	71	429	87
1904	7,313	71	448	52
1905	7,456	71	430	122
1906	7,445	76	520	140
1907	8,291	87	538	157
1908	7,881	87	538	140
1909	8,201	87	528	105
1910	7,309	66	381	122
1911	7,877	56	310	105
1912	7,975	46	248	175
1913	8,956	31	167	175

Table 5.1 *(continued)*

Panel B: Quantity series: expected production of tree crops

	(1)	(2)	(3)	(4)	(5)	(6)
	expected production			increment over previous peak		
	wine (million hectol.)	citrus fruit (million quintals)	olive oil (million quintals)	wine (million hectol.)	citrus fruit (million quintals)	olive oil (million quintals)
1861	24.0	2.5	1.4			
1862	24.1	2.5	1.4	.1	.0	.0
1863	24.1	2.6	1.5	.0	.1	.1
1864	24.2	2.7	1.5	.1	.1	.0
1865	24.3	2.8	1.6	.1	.1	.1
1866	24.3	2.8	1.6	.0	.0	.0
1867	24.4	2.8	1.6	.1	.0	.0
1868	24.4	2.8	1.6	.0	.0	.0
1869	24.4	2.8	1.7	.0	.0	.1
1870	24.5	2.9	1.7	.1	.1	.0
1871	24.6	2.9	1.8	.1	.0	.1
1872	24.7	2.9	1.7	.1	.0	.0
1873	24.8	2.9	1.7	.1	.0	.0
1874	25.2	2.9	1.7	.4	.0	.0
1875	25.6	3.0	1.8	.4	.1	.0
1876	26.1	3.1	1.8	.5	.1	.0
1877	26.7	3.2	1.8	.6	.1	.0
1878	27.4	3.2	1.8	.7	.0	.0
1879	28.3	3.3	1.9	.9	.1	.1
1880	29.1	3.4	1.9	.8	.1	.0
1881	29.8	3.6	1.9	.7	.2	.0
1882	30.4	3.7	2.0	.6	.1	.1
1883	31.1	3.9	1.9	.7	.2	.0
1884	31.6	4.0	1.9	.5	.1	.0
1885	32.3	4.1	1.8	.7	.1	.0
1886	32.9	4.2	1.9	.6	.1	.0
1887	33.6	4.4	1.9	.7	.2	.0
1888	33.7	4.5	1.9	.1	.1	.0
1889	33.5	4.5	1.9	.0	.0	.0
1890	33.5	4.5	1.9	.0	.0	.0
1891	34.0	4.4	1.9	.5	.0	.0
1892	34.6	4.5	1.9	.6	.0	.0
1893	35.1	4.7	1.9	.5	.2	.0
1894	35.3	4.9	2.0	.2	.2	.0
1895	35.4	5.0	2.0	.1	.1	.0
1896	35.9	5.1	2.0	.5	.1	.0
1897	36.6	5.1	2.0	.7	.0	.0
1898	37.2	5.1	2.0	.6	.0	.0
1899	37.6	5.2	2.0	.4	.1	.0
1900	37.7	5.3	2.0	.1	.1	.0
1901	38.0	5.6	2.0	.3	.3	.0
1902	38.4	6.0	2.0	.4	.4	.0
1903	38.9	6.3	2.1	.5	.3	.1
1904	39.2	6.5	2.1	.3	.2	.0
1905	39.4	6.6	2.1	.2	.1	.0
1906	39.8	6.8	2.2	.4	.2	.1
1907	40.5	6.9	2.2	.7	.1	.0
1908	41.2	7.1	2.2	.7	.2	.0
1909	41.9	7.2	2.1	.7	.1	.0
1910	42.5	7.2	2.1	.6	.0	.0
1911	43.0	7.4	2.2	.5	.2	.0
1912	43.5	7.5	2.2	.5	.1	.0
1913	44.2	7.8	2.2	.7	.3	.0

Source: see text.

Vitali seems not to discuss his deflator; but it can readily be calculated. It is clearly (dominated by) the Istat cost-of-living index: not only a poor index of the cost of living (Fenoaltea 2002b, 2011a, pp. 127–131), but here, it would seem, the wrong index altogether. The dominant cost item in these improvements was not the cost of commodities (in the cost of living index, largely basic foodstuffs priced in international markets), but the cost of labor, the labor of the agricultural work force itself; deflation by an index of rural wages would be more appropriate, and it would yield a very different time path (ibid., pp. 125–129).

That is not an insurmountable problem, as an alternative deflator can readily be substituted; the more serious difficulty is the paucity of *useful* acreage data. The early editions of the *Annuario* (*1878* part II, pp. 98–104, *1886*, pp. 853–857, *1889-90*, pp. 610–611, 635–637) report in particular vineyard acreages equal to 1.87 million hectares in 1870-74, 1.93 million in 1876-81, and 3.17 in 1879-83, and a subsequent 11 percent increase to 1884-88; but the 1876-81 figure is treated as a corrected figure (for "1874") rather than an updated one, and cannot be used to measure acreage growth over the 1870s. The subsequent increase (to "1883") is said in turn to be partly bogus, as the measurement criteria were not uniform, and only the (11 percent) growth over the next few years is presented as a proper measure. Acreage data were subsequently omitted as unreliable (*Annuario 1905-07*, p. 397); they reappear in the *Annuario 1911* (p. 101), which reports 3.57 million hectares under vines intermixed with other crops and .91 million "specialized" hectares. The quantities of wine obtained from the two were similar, suggesting a ca. 1 to 4 ratio in the density of the vines (and a corresponding range in the cost of conversion to an unspecified "vineyard").

Vitali seems not to have used the far more solid data on international trade: they are not listed among his sources, and they sit poorly with his series' sharp decline over the 1880s, as wine exports in particular grew by leaps and bounds until they were throttled, after 1887, by the tariff war with France (*Sommario*, p. 161).[5]

In the circumstances, the present estimates are obtained as follows. To capture at least the information on conversion costs it

[5] Vitali's implicit lag between planting and abundant harvesting seems excessive: if not on agronomic grounds certainly on economic ones, as it implies that Italy's landowners had the ability to predict prices and policies up to a decade into the future.

apparently contains, Vitali's current-price investment series (Table 5.1, panel A, col. 2) is deflated by the agricultural-wage series in Fenoaltea (2011a), p. 125, shifted to set 1911 = 1; the resulting figures yield a total of some 6,000 million lire at 1911 prices. That is a value figure, and therefore in principle exceeds the value added of concern here; and it may well be overstated in its own right, to the extent that Vitali's took the above-noted increases in the vineyard-acreage data at face value. On the strength of these considerations, and sadly little else, total value added in improvements is here set at 80 percent of that value figure, or 4,800 million lire – a rough figure, but fortunately one under the average *annual* product of agriculture: not much is here at stake.

In 1911, according to Federico, production included some 42.7 million hectoliters of wine, 7.4 million quintals of citrus fruit, and 2.2 million quintals of olive oil (Rey 2000, pp. 14–15); exports equaled some 1.2 million hectoliters of wine, 3.9 million quintals of citrus fruit, and .4 million quintals of olive oil (*Sommario*, p. 161), implying a domestic consumption of some 41.5 million hectoliters of wine, 3.5 million quintals of citrus fruit, and 1.8 million quintals of olive oil. For simplicity, the consumption of all three goods is here extrapolated using a simple index obtained as the product of a population index and a per-capita consumption index. The (constant-border) population index assumes constant geometric growth throughout; setting 1911 = 1, and using the data in the *Sommario*, p. 39, the 1861 benchmark is set at (25/35). The per-capita consumption index assumes constant growth between benchmarks (and beyond the last to 1913); allowing for the major movements in the calculated (rural) real wage (Fenoaltea 2011a, p. 125), assuming an income elasticity near (1/3), and again setting 1911 = 1, the selected other benchmarks are .80 in 1861, .76 in 1873, .89 in 1888, and .90 in 1895.

Expected production, which tracks acreage, is estimated as domestic consumption plus "normal" exports, themselves calculated as a five-year moving average of recorded exports, with triangular weights (.11 on $t-2$ and $t+2$, .22 on $t-1$ and $t+1$, and .34 on t).[6]

[6] The calculations assume constant exports to 1861, and from 1913. Because the *Sommario* trade figures for 1861 refer to only part of the new Kingdom, and tend to undercount specifically Southern products, citrus exports in 1861 are set equal to the figure reported for 1862.

The resulting production series are transcribed in Table 5.1, panel B, cols. 1–3. Cols. 4–6 are derived directly from these: to approximate the expansion of the corresponding acreage they transcribe, good by good and year by year, the increase in estimated product over the previous peak.

Cols. 4–6 are then simply summed, year by year: per acre, vineyards seem at once more costly, and in physical terms more productive, than citrus or olive groves, and the appropriate deviation from unit weights is not obvious. That sum, shifted one year backward (assuming no change in 1913) to allow for investment/production lags, is here used to allocate, over the years, the 4,800-million-lire cumulative value added in improvements estimated above; the resulting series is transcribed in Table 5.1, panel A, col. 4. Like Vitali's series (col. 3) it grows sharply over the late 1870s, but unlike his it remains high, and reasonably so, until the market was upset by the tariff war with France.[7]

The revised 1911-price estimates of value added in agriculture (Table 4.1, col. 1) are the sum of the harvest-corrected series in Table 5.1, panel A, col. 1 and the on-farm-improvements series, ibid., col. 4.

[7] The tariff war started in 1888, but the quarrel was brewing in 1887; that expectations should have been revised, and investment curtailed, already in that year is entirely credible. The investment/production lag is limited to one year to maintain that timing.

6

INDUSTRY

In Table 4.1 above, cols. 2–18 refer to industry. The time series are a mixed bag, old and new, good, bad, and ugly. The (relatively) "good" series are those drawn from the completed chapters of the present author's work in progress (*IIPB*, *IIPC*, *IIPD*, *IIPE*, *IIPF*, *IIPH*, *IIPJ*, *IIPK*, which provide a full description of their derivation); of these, only those for textiles, apparel, and construction are unchanged from Fenoaltea (2005), the others are revised (and correspondingly bold-dated).[1] The lower-quality series (food, tobacco, wood, paper and printing, sundry manufacturing) remain as they were then.

Table 4.1, col. 2 refers to the extractive industries; the immediate source is *IIPB*, Summary Table B.3, panel B, col. 9. The sector was studied in depth long ago (Fenoaltea 1988c), and if memory serves the only change to the 2003 product-specific production series that is at least conceptually significant is the addition of a series for the extraction of mineral water.[2] The quantitatively more meaningful modification has a different origin altogether, tied to

[1] With respect to Fenoaltea (2017) the only change is to the estimates for the leather industry (and to the higher-level aggregates). *IIPA* is a general introduction to the sources and methods. *IIPG*, on the food and tobacco industries, and *IIPI*, on the wood, paper and publishing, and sundry manufacturing industries, do not yet exist: the former has yet to be started, the latter is well along but of uneven quality.

[2] Its quantitative significance is minor, as it is a smoothly growing series with a value added of under 3 million lire in 1911. "If memory serves": there is no variorum edition of the author's drafts, and a perusal of old hard copies to reconstruct the changes does not seem worth the bother.

the national income accounting conventions. As already noted (ibid.; also Fenoaltea 2005, pp. 306–307; above, §2.5, footnote 27), the conventional measures treat the extractive industries as if they created goods-above-ground out of thin air; the author's early estimates treated them, more sensibly, as producers of goods-above-ground from goods-below-ground. The 2005 series converted those estimates to the absurd conventional basis by directly inflating the extant subaggregates for mining on the one hand and quarrying on the other; the 2015 estimates separately inflate the unit value added attributed to each of the 32 identified products (*IIPB*, Summary Tables B.1–B.2), and accordingly capture composition effects better than before. The new series is illustrated in Figure 4.1, panel B1; it is there also compared to its predecessor (and to Baffigi's series, essentially indistinguishable from the latter).[3]

Table 4.1, cols. 3 and 4 refer to the food and tobacco industries, respectively; both simply reproduce the highly preliminary series in Fenoaltea (2003), Table 2, for the overwhelming reason that no further work has been done on either one. But they are not quite birds of a feather. As there noted (ibid., pp. 728–730), the tobacco series is crudely derived from the sources, and stands on its own. The food series is instead derived on the assumption that food consumption varied with non-food goods' consumption (with a 40 percent elasticity, derived from the Bank of Italy benchmarks), and allowing for international trade.[4] In principle, therefore, the food

[3] In Figure 4.1, the comparisons to Baffigi's series appear only in the panels for major groups of industries, as he did not separately consider individual manufacturing industries. The series for the latter that simply reproduce the 2003 estimates are not here illustrated at all; the corresponding figures may be found in Fenoaltea (2011a), p. 36.

[4] Baffigi (2015) discusses the present author's work very generously, in both senses; but his comments on these food-industry estimates may be worth clarifying. As he tells it, that industry's value added is assumed to vary, with a limited elasticity, with that in the production of other non-durables: it is accordingly an exception to the present author's "second-generation" methodology, and close in fact to the standard (and by the present author much reviled) practice whereby the undocumented industries are simply assumed to vary as the documented ones (ibid., pp. 101–103). A demurral is in order. As noted in the text, the elasticity-based calculation is not applied directly to production, but to *consumption*,

series should be recalculated to reflect the modifications to the other series; but this recalculation has not been performed. One reason is that the estimates are unlikely to change at all significantly, given the modest changes to the other relevant series.[5] Another, more compelling reason is that the inclusion of an updated food series could easily suggest, improperly, that it had been seriously improved; the reproduction of the old series meets the Pompeia criterion.

Table 4.1, cols. 5 and 6 refer to the textile and apparel industries. The immediate sources are *IIPH*, Summary Table H.3, cols. 8 and 11; to enhance comparability with the previous estimates for industry and the services, col. 11 excludes the maintenance of textile goods (notably that provided by washerwomen). These are also unchanged; but those industries were exhaustingly researched decades ago, and those estimates are as good as any currently available.

Table 4.1, col. 7 refers to the leather industry; the immediate source is *IIPH*, Summary Table H.3, col. 9 (which includes maintenance, notably shoe repair, again to maintain consistency with the estimates for the services).[6] The 2003 series was a very simple log-linear extrapolation of the 1911 benchmark using the four census labor force figures (1871, 1881, 1901, and 1911), corrected to reflect the long-term productivity growth rate of the technologically similar clothing industry; its odd deceleration from the turn of the century was noted, but left at that (Fenoaltea 2003, pp. 728–729). The estimates for the leather industry have very recently been thoroughly revised, and now meet the standards of the second generation. The

essentially on Engel-curve grounds, and production is then estimated by allowing for international trade. The estimates are crude, but methodologically of a piece with the others. Then, and now, these preliminary series violate not the third second-generation rule (re: indexation) but the first (re: using the sources) and second (re: disaggregation): see above, ch. 2.

[5] The short-term variations captured by the new series for agriculture are not particularly relevant, as trade and inventory movements smooth out the harvest cycles.

[6] The estimates for the services are based largely on the census labor-force figures, as rendered homogeneous over time (Vitali 1970). Vitali transferred washerwomen from the textile-related industries to cleaning services, but left the entire shoe-industry labor force (mostly cobblers) in the leather industry.

changes from the preliminary series are quite significant (Figure 6.1, panel A).[7]

Table 4.1, col. 8 refers to the wood industry; it too is transcribed from Fenoaltea (2003), Table 2. The 2003 series is of low quality (ibid, p. 727), not least because the industry is very poorly documented, but it has not been improved by further work.

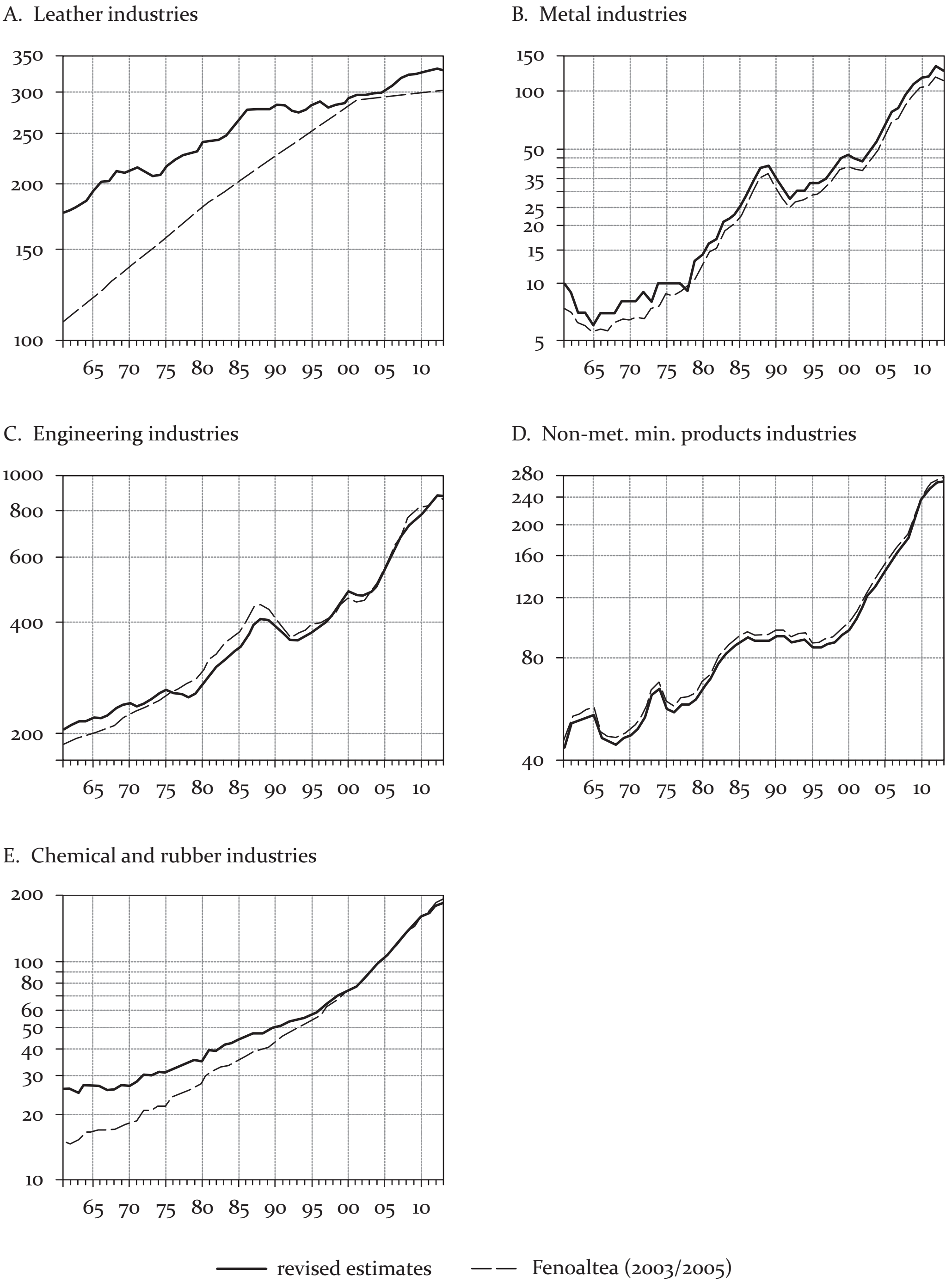
Table 4.1, col. 9 refers to the metal industry; the immediate source is *IIPE*, Summary Table E.3, col. 3. The industry was extensively researched long ago, and the modifications since 2003 reflect no more than detail refinements. The new industry aggregates are generally higher than before, as some 1911-price estimates of value added per ton were revised upward, and more volatile in the early decades, as the estimates of input supply that underlie the ferrous-metals output estimates are less vigorously smoothed (Figure 6.1, panel B).

Table 4.1, col. 10 refers to the engineering industry; the immediate source is *IIPF*, Summary Table F.3, col. 20 (which includes maintenance). The 2003 aggregate combined four provisional indices, and took its essential movements from the apparent consumption of ferrous metals excluding rails. By 2015 the estimates had been brought up to second-generation standard, and the industry aggregate now combines 46 separate new-production and maintenance series. The two aggregates are illustrated in Figure 6.1, panel C: the reduced estimate of production over the 1880s reflects newly captured composition effects, the reduced (and varying) growth rate over the previous decades the inclusion of (wood) sailing-ship construction.

Table 4.1, col. 11 refers to the non-metallic mineral products industry; the immediate source is *IIPC*, Summary Table C.3, col. 3. Like the metal industry it was extensively researched long ago; the

[7] Fenoaltea (2017) contained improved preliminary estimates, which added an 1861 census benchmark (corrected for border changes), and calculated the productivity-growth correction separately for each intercensal period: the productivity-enhancing diffusion of (largely hand-powered sewing and other shoe) machinery seems to date essentially from the turn of the century, and once the changing pace of productivity growth was allowed for the estimated path of the industry's product no longer displayed its odd deceleration after 1901. That series too turned out to be quite wide of the mark; that there is no substitute for actually doing the work may be a source of comfort, or of despair.

Figure 6.1 *Value added in industry, 1861–1913 (million lire at 1911 prices)*



modifications since 2003 are very minor (Figure 6.1, panel D), and again reflect no more than detail refinements.

Table 4.1, col. 12 refers to the chemical (and related) industries; the immediate source is *IIPD*, Summary Table D.3, col. 16. The 2003 estimates have been revised, mainly by further work on the poorly documented traditional sectors (e.g., soaps, essential oils). The most significant correction reflects the inclusion of the pharmaceuticals produced by chemists, as their share of the total markedly (and, *e verbis*, obviously) declined over time (Figure 6.1, panel E).

Table 4.1, cols. 13, on the paper and printing industries, and 14, on sundry manufacturing, are also transcribed from Fenoaltea (2003), Table 2. The former industries were seriously researched many years ago, but may warrant revision; the series for sundry manufacturing is a simple provisional index.

Table 4.1, col. 15 refers to total manufacturing (the simple sum of cols. 2–14). Figure 4.1, panel B2, illustrates the new aggregate, and compares it to its predecessor (and to Baffigi's series, again indistinguishable from the latter). The modifications to the aggregate, dominated by those to the engineering and especially the leather series, increase the estimates for the 1860s by some 8 percent, and reduce the subsequent growth rate, especially over the 1870s. The quality rating of this subaggregate is brought down by the low scores of the important food and wood industries; overall, like the agriculture series, it rates no more than a 2.

Table 4.1, col. 16 refers to the construction industry, including maintenance. The immediate source is *IIPK*, Summary Table K.1, col. 18, but these estimates too are unchanged (and, his post-1911 extension apart, the same as Baffigi's, Figure 4.1, panel B3); as in the case of the textile and clothing industries, a serious research effort was made in the now distant past.

Table 4.1, col. 17 refers to the utilities industries; the immediate source is *IIPJ*, Summary Table J.3, col. 4. These estimates too have recently been revised, significantly increasing production at Unification, and reducing the subsequent growth rate (Figure 4.1, panel B4). The revision is specific to the water-supply industry: the previous estimates assumed that the undated aqueducts were built at the same pace as the dated ones, the current ones that the undated aqueducts were undated because they were (very) old.

Table 4.1, col. 18 refers to the total for all industry (the sum of cols. 2 and 15–18). It is illustrated, and compared to its predecessor (and again to Baffigi's series) in Figure 4.1, panel B; the resulting patterns resemble, in muted form, those described above for the manufacturing subtotal alone. Since the non-manufacturing industries all rate a 4, the rating for this series is bumped up a notch with respect to that given manufacturing: perhaps abusing the privilege of self-grading, it is given a 3.

7

SERVICES

7.1 Introduction

As recalled above (§3.4), Baffigi's 1911-price series for the services are derived from the quantity estimates compiled by Battilani, Felice, and Zamagni (2014), which make no use of their earlier counterparts by the present author (Fenoaltea 2005): the later estimates are not *improved*, they are merely different (and, as also noted, not consistent with the industrial side of the sesquicentennial corpus).[1]

Rebus sic stantibus, the services are usefully reconsidered, component by component: to improve the quantity indices that entered the present author's (internally consistent) estimates of 2005, and also, as it turns out, to revise Zamagni's 1911 "benchmark" estimates, until now accepted at face value. The new series, derived as described below, appear in Table 4.1, cols. 19–24, and, summed, in col. 25; they are illustrated in Figure 4.1, panels C1 ff.[2] The series

[1] The existence of the constant-price estimates for the services in Fenoaltea (2005) is recalled in Battilani, Felice, and Zamagni (2014) only to note that the shares of value added these attribute to the services – "23.5 percent in 1861" and "26.8 percent in 1911" – are far below their 28 percent in 1861 and ca. 38 percent in 1911, both presumably at current prices (p. 59). The complaint about the present author's estimate for 1911 is mystifying, given that it was, like theirs, Zamagni's own "benchmark" figure (sector by sector, and *in toto*); even more mystifying is their ability to obtain 23.5 percent as the ratio of 3,231 to 9,288 (.35), in 1861, and 26.8 percent as the ratio of 7,520 to 20,253 (.37), in 1911 (Fenoaltea 2005, Table 3).

[2] The series for the services in Table 4.1 are typically not identical to their counterparts in Fenoaltea (2017), as the estimates have been further refined; but the differences are comparatively minor.

for transportation, commerce, and buildings' services are the more thoroughly recast, and given a quality rating of 3; miscellaneous services remains a sorry 1, the others rate no more than a 2, and so of course does the sector total.

The revisions are non-trivial. The extant 1911 benchmarks appear often quite seriously distorted, in both directions; but the overstatements have it, and the sector total is here reduced by 14 percent.[3] The entire series is of course shifted down by the reduction of its 1911 anchor; its path is also significantly altered, and the aggregate services series too now displays a clear Kuznets-cycle swing (Figure 4.1, panel C).

7.2 Transportation and communications

7.2.1 *Introduction*

The present author's 2005 sector series was built up as the sum of six components, each of which extrapolated the (Zamagni) "benchmark" estimates for 1911 with a suitable real index (Fenoaltea 2005, pp. 307–308 and Table B.1). The sesquicentennial 1911-price estimates appear to borrow the 2005 series for the communications subsector, but the estimates for transportation proper appear to be so complex as to defy summary (Baffigi 2015, p. 109).[4] The two extant sector series, and the new one, are illustrated in Figure 4.1, panel C1: the 2005 estimates and Baffigi's much resemble each other, save that Baffigi's series is initially lower and grows more rapidly, and is also more nearly log-linear over the later decades (perhaps incorporating the Battilani-Felice-Zamagni assumption that road transportation was tied to marketed consumption, and their priors as to the share of the latter in total consumption, Battilani, Felice, and Zamagni 2014, pp. 9–11, 16).

[3] In retrospect Istat's original "centennial" net aggregate (6,020 million lire) appears much closer to the mark than the subsequent "benchmark" net estimate (7,520 million lire) that anchors the sesquicentennial and Fenoaltea (2005) series (Rey 2000, pp. 245, 367; *Reddito nazionale*, p. 294): the latter increased the former by 25 percent, the present revised figure (6,495 million lire) is under 8 percent above Istat's.

[4] Why that one quantity series alone was borrowed from the 2005 corpus is not explained.

The new 1911-price value added series for the transportation-and-communications sector (Table 4.1, col. 19) is again the sum of disaggregated estimates; these are collected in Table 7.1 (analogous to the Table B.1 in Fenoaltea 2005). The estimates for communications (Table 7.1, col. 7) are unchanged; the transportation estimates are amended as described below.[5] As can be seen in Figure 4.1, panel C1, the revised estimates differ from their predecessors in two major ways. First, they are significantly lower: the entire series is shifted down as the 1911 benchmark is reduced from 1,126 to 957 million lire, largely through the elimination of double-counting in Zamagni's 1911-benchmark estimates (in Rey 1992) for railway and other inland transportation.[6] Second, the extrapolated series is far more sensitive to the construction cycle; this stems from the replacement, in the road-transportation component, of the extant indices based on the readily available value-added measures of commodity production by a new index that directly reflects the estimated weight of the commodities moved by the road-transportation industry.

7.2.2 *Railway transportation*

The railway-transportation series (Table 7.1, col. 1) is here doubly amended, as both the 1911 benchmark and the index of its time path are revised. The earlier series simply borrowed Zamagni's "benchmark" estimate of 454.1 million lire in 1911, obtained from firm-level data (for the State railways, *in primis*) essentially as the aggregate wage bill plus an estimated return to capital (Rey 1992, pp. 198–199). That estimate failed to recognize that the railway companies were not just transportation companies but also construction companies (maintaining, and perhaps improving, their fixed plant) and engineering works (maintaining their vehicles in specialized repair shops); to measure the transportation sector cor-

[5] With respect to the estimates in Fenoaltea (2017) only those for non-rail inland transportation have been further revised.

[6] The "benchmark" estimate of 1,126 million lire increased Istat's "centennial" estimate (988 million lire) by 13 percent (Rey 2000, p. 245); the present revision, to 957 million lire, reduces it by 3 percent, essentially confirming it.

rectly (and to avoid double counting), one must exclude the industrial value added properly (and already) attributed to construction and engineering. In 1911 estimated value added in railway construction work includes 38.9 million lire in extensions, 34.9 million in renovations and improvements, and 35.1 million in maintenance of railway track (*IIPK*, Table K.10), that in engineering 61.7 million lire in railway-vehicle maintenance (*IIPF*, Summary Table F.2), for a non-trivial total of 170.6 million lire; but that figure needs to be reduced by outsourced work, which would not be covered by Zamagni's benchmark.[7]

On the engineering side, outsourced maintenance was significant in the case of the State railways, perhaps as one of the many favors the State bestowed on the heavy engineering industry. In 1911, estimated value added in railway-vehicle maintenance totals 61.7 million lire, of which 57.5 by the State railways and 4.2 by minor railways (*IIPF*, p. 63). Averaging over the State-railway maintenance expenditure data for 1910-11 and 1911-12 (*Relazione F.S. 1911-12*, p. 253), in 1911 some 36 percent of maintenance work was outsourced; double-counted engineering value added is accordingly estimated as (.64(57.5) + 4.2) = 41.0 million lire.

On the construction side, the evidence is less clear. Maintenance appears to have been done in-house, as a standard practice (ibid., pp. 255, 260). As to improvements and new construction, some was clearly done in-house (by the State railways' 5,595 dedicated workers, ibid., p. 275, with who knows what contribution by the ordinary maintenance staff), some clearly not (given the reference to *ribassi d'asta* on expenditure on new lines, ibid., pp. 278–279). Presumably, new lines were typically built by specialized construction companies, while mere improvements, such as the doubling of track, were close to ordinary maintenance work and more likely to be done in-house; here, double-counted construction work is tentatively estimated from the above figures as all of the value added in maintenance, 65 percent of that in improvements, and none of that in extensions, for a total of (35.1 + .65(34.9)) = 57.8 million lire.

7 The State railways' wage bill, for example, includes the wages of their own repair-shop workers, but not the wages of those employed by private firms engaged in sub-contracted maintenance.

TABLE 7.1 *Value added in services, 1861-1913: transportation and communications (million lire at 1911 prices)*

	(1)	(2)	(3)	(4)	(5)	(6)	(7)
	rail transportation				other inland transp.	mari-time transp.	com-muni-cations
	rail-ways	tramways machine	horse	total			
1861	10.8	.0	.0	10.8	88.7	13.8	8.3
1862	12.4	.0	.0	12.4	96.5	14.8	10.3
1863	15.1	.0	.0	15.1	99.7	15.9	11.9
1864	17.2	.0	.0	17.2	102.4	16.9	11.9
1865	19.0	.0	.0	19.0	104.5	18.4	12.1
1866	22.2	.0	.0	22.2	95.3	19.9	12.8
1867	22.8	.0	.0	22.8	91.9	21.2	13.5
1868	26.1	.0	.0	26.1	91.5	22.6	13.7
1869	29.4	.0	.0	29.4	92.7	24.2	15.0
1870	33.8	.0	.0	33.8	96.1	26.2	15.2
1871	38.0	.0	.0	38.0	98.6	27.9	18.0
1872	43.9	.0	.0	43.9	104.6	28.5	18.2
1873	49.9	.0	.0	49.9	113.3	29.2	18.4
1874	50.6	.0	.1	50.7	117.8	30.2	16.9
1875	53.4	.0	.2	53.6	108.3	31.2	18.8
1876	58.5	.1	.4	59.0	108.3	32.4	20.6
1877	60.0	.1	.6	60.7	110.5	32.8	24.7
1878	60.4	.1	.8	61.3	113.7	32.7	26.3
1879	64.2	.6	1.0	65.8	119.0	32.7	24.1
1880	70.8	1.8	1.2	73.8	121.0	32.8	25.2
1881	73.6	3.5	1.4	78.5	125.1	33.6	28.5
1882	78.3	5.4	1.6	85.3	135.9	34.8	30.2
1883	86.7	7.0	1.9	95.6	142.2	35.9	32.2
1884	93.9	8.1	2.1	104.1	146.2	37.1	33.4
1885	96.8	8.8	2.4	108.0	154.1	37.8	34.9
1886	101.8	9.5	2.6	113.9	159.1	38.6	36.2
1887	108.5	10.2	2.9	121.6	159.9	39.8	30.0
1888	120.0	10.5	3.1	133.6	153.0	40.4	31.3
1889	125.9	11.0	3.4	140.3	154.8	40.8	32.0
1890	128.5	12.1	3.6	144.2	154.9	40.7	32.7
1891	127.7	12.9	3.9	144.5	153.0	41.4	34.3
1892	130.5	13.2	4.1	147.8	151.2	42.0	36.8
1893	137.3	13.9	4.3	155.5	151.0	42.0	39.3
1894	142.0	14.6	4.5	161.1	150.6	41.9	40.0
1895	143.9	15.1	4.7	163.7	145.8	42.4	42.3
1896	151.2	15.5	4.8	171.5	145.0	43.8	44.6
1897	160.5	16.5	4.7	181.7	148.8	45.9	48.3
1898	166.1	19.2	4.3	189.6	153.7	48.6	51.1
1899	175.7	22.4	3.7	201.8	158.8	52.6	51.2
1900	182.6	25.4	3.2	211.2	162.6	59.3	55.1
1901	188.8	29.1	2.9	220.8	171.5	66.7	60.8
1902	202.9	32.0	2.6	237.5	183.9	71.4	65.7
1903	214.4	33.3	2.4	250.1	193.1	73.8	73.7
1904	230.1	34.3	2.2	266.6	198.6	74.7	75.7
1905	235.5	36.3	1.8	273.6	213.0	75.6	72.4
1906	262.2	39.5	1.6	303.3	226.3	78.3	75.5
1907	265.0	43.8	1.3	310.1	236.1	82.0	83.4
1908	288.4	47.6	1.0	337.0	250.5	86.5	88.8
1909	308.2	52.3	.8	361.3	277.6	93.0	96.3
1910	334.3	56.3	.6	391.2	302.1	99.8	105.6
1911	355.3	60.8	.4	416.5	313.0	103.7	124.0
1912	375.8	68.2	.3	444.3	326.8	108.8	125.8
1913	401.7	75.3	.0	477.0	329.3	119.7	129.3

Source: see text.

Summing these two partial estimates, the total estimate of non-transportation value added in Zamagni's benchmark equals 98.8 million lire, for a revised railway-transportation benchmark of 355.3 million lire.

The railway-transportation series in Fenoaltea (2005), Table B.1, col. 1 extrapolated the benchmark in proportion to total passenger- and freight-car axle-kilometers (a modest correction to simple vehicle-kilometers, as the mean number of axles per vehicle changed very little). Here, the (revised) benchmark is extrapolated using the (sum of the) new series for total passenger- and freight-car vehicle-ton-kilometers (*IIPF*, Table F.41, cols. 2–3); the new series allow more directly for the vehicles' growing weight (size), and the attendant growth in their carrying capacity.

7.2.3 *Tramway transportation*

The machine-tramways transportation series (Table 7.1, col. 2) is amended much like the railway component. The 1911 benchmark of 69.7 million lire (including minor other systems, Rey 1992, p. 200) is again reduced to exclude double-counted value added, here simply identified with the maintenance component of tramway-related construction (3.5 million lire, *IIPK*, Table K.10) and engineering (5.35 million lire, *IIPF*, Summary Table F.2), or 8.9 million lire, for a revised figure of 60.8 million lire.

The extrapolation of the machine-tramway benchmark is also amended. Where the earlier series used a simple number-of-(passenger and freight) vehicles index, the new series extrapolates the benchmark in proportion to the (estimated) total weight of passenger and freight cars in service. This index is calculated as the sum of *IIPF*, Table F.42, cols. 2–6 (with a 25 percent reduction of the electric-locomotives-and-rail-cars in col. 4, to allow at once for the few locomotives and for the drive trains of the rail-cars).

The horse-tramway transportation series (Table 7.1, col. 3) is unchanged, and the rail-guided transportation total (col. 4) is again the simple sum of its components (cols. 1–3). The new total is generally well below the earlier one, but grows perceptibly faster, with an initial value just 2.3 percent, rather than 4.2 percent, of the final one.

7.2.4 *Other inland transportation*

From a national-income-accounting perspective transportation is an unusual activity. Transportation, and specifically non-rail overland transportation, is part of every (other) economic activity, much as the production of motive power is (or at least, before electricity, was) part of (near) every materials-processing activity. In theory, of course, "industries" and "production" should follow activity and product lines, and disregard mere organization; in practice, in collecting statistics individual firms simply cannot be asked to break themselves down to separate their power production, and their transportation, from their characteristic activity. In statistical practice, therefore, the "transportation industry" is defined by the production of its characteristic product *only for sale to third parties* (exactly like the power-generating component of the utilities industries).[8] By this reckoning, a carter permanently employed by a cotton firm (perhaps to move yarn from the spinning plant to the weaving plant) is part of the textile industry, and not the transportation industry.

Zamagni's "benchmark" estimate is based on the professional distribution of the population in the 1911 census (Rey 1992, p. 202): a distribution based not on firms' reports of their labor force, but on individuals' reports of their profession. The census did ask for a very detailed description; but (without having researched the issue) one suspects that the Census Bureau counted self-declared cotton-industry carters simply as carters, and that a fair proportion of the census enumerators simply took "carter" as an adequate response, thank you, next question. One suspects, in short, that the census count yields a measure closer to a transportation-activity count than to a (now) standard "transportation-industry" count. Within limits: farmers may have spent ten percent of their time as carters, but it is a safe bet that the census did not count ten percent of the self-declared farmers as carters.

[8] Because the in-house generation of power is always considered part of the consuming industry, the value added of the electrochemical industry (for example) falls, and that of the electric utilities increases, if an electrochemical firm that owns its generating plant sells it to a third party, with no change to the production processes themselves.

The 1911 benchmark, consistent by construction with the 1911 demographic census, appears correspondingly inconsistent with today's definitions of the industry. The problem stems not from (typically part-time) carting by workers in agriculture, as noted, but by carters in industry and other services. So long as the industrial and other-services benchmark estimates are also generally consistent with the demographic-census professional counts, however, the resulting figures should at least be quite consistent with each other; in the present state of the art one can be satisfied with that.

The 1911-price series for other inland transportation in Fenoaltea (2005), Table B.1, col. 5 extrapolated Zamagni's "benchmark" estimate for 1911 of 374.5 million lire: 265.7 for road transportation, 89.1 for auxiliary services, and 19.7 million for inland navigation (Rey 1992, pp. 202–203, 212). The auxiliary-services estimate includes some 30 million for the 23,237 persons in census categories 9.65–9.66: these refer to salesmen, labor agencies, and the like, and the census seems properly to have excluded them from the transportation sector (8.3). The residual of some 59 million is attributed to the 22,803 workers in census category 8.34, covering "urban porters" as well as those working at railway and shipping terminals; the estimate is extrapolated from a wage bill of 37.1 million lire (2,900 lire each) for an assumed 12,803 port workers, and 7.5 million (750 lire each) for the other 10,000, adding 10 percent for rents, insurance, and profits, and a further 20 percent for capital consumption. Longshoremen may have been a privileged lot, but it is hard to believe that they earned more than lower-level civil servants (*Sommario*, pp. 204–205; see however Rey 1992, p. 203); nor do their numbers seem to reach Zamagni's estimate, given that the provincial figures for Milan, Turin, Genoa, and Naples (ca. 3,200, 1,200, 4,000 and 4,800, respectively) suggest that a large part of those in the port cities worked the town rather than the port. A prudent estimate of the wage bill would allow for say 6,000 longshoremen at a national average of no more than 2,500 lire each, and the residual 16,800 at Zamagni's 750 lire each, for a total of 27.6 million lire. A prudent estimate of value added ends right there. These town porters were still around in the 1950s, for example to carry the suitcases of the better off from the taxi to the railway carriage: it was back-breaking work for a pittance, profits and insurance were mere dreams, and the capital they consumed was at most the shoes they wore.

The revised inland-transportation 1911 benchmark estimate accordingly adds only 27.6 million lire to Zamagni's figures for carting and inland navigation (265.7 and 19.7 million lire), for a total of 313.0 million lire.

This benchmark is here extrapolated with an improved index. The preliminary (2005) series used the movements of total 1911-price value added in commodity production; in a similar spirit, Battilani, Felice, and Zamagni (2014, p. 16) use the movements of aggregate marketed consumption.[9] What such aggregate-value-based indices miss is of course a characteristic feature of the transportation industry's costs and value added, that to a first approximation they depend on distance, and on weight rather than on value.[10] Mean distances are unknown, but unlikely to have varied much over the period at hand: animal-powered road transportation is what matters here, and it was always too expensive to be other than overwhelmingly local.[11] The (first and principal) improvement here is to use weight aggregates rather than the extant value aggregates, in essence correcting the 2005 figures to allow for differential transportation-value-added to production-value-added ratios.

The new aggregate-weight index is the total-tonnage series presented here in Table 7.2, col. 18, rescaled to set 1911 = 1. [12] Col. 18 is itself obtained as the sum of the separate estimates for agriculture (col. 1), the various industries (cols. 2–15, and, summed, col. 16), and imports (col. 17).

These disaggregated weight estimates are obtained as follows. Col. 1 refers to agriculture. Federico's benchmark calculates value added from market values rather than farmgate values (Rey, 1992, pp. 14–15); on the reasonable assumptions that transportation from farm to market was (overwhelmingly) provided by the farmers themselves, and (as noted) that the transportation labor force excluded farmers, what needs to be estimated is the subset of

[9] The neglect of investment goods, as if machinery and building materials were also brought by the stork, is again surprising.

[10] Whence of course the measurement of the (freight transportation) industry's real product in ton-kilometers (total weight times average length of haul).

[11] The transportation of passengers should be, but will not be, separately considered here.

[12] This index differs from its counterpart in Fenoaltea (2017).

TABLE 7.2 *Products using contract road haulage, 1861-1913 (million tons)*

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
	agri-	industry							
	agriculture	extractive	food	tobacco	textiles	aparel	leather	wood	metal
1861	10.355	14.555	4.015	.015	.303	.010	.025	.877	.094
1862	10.704	16.553	4.009	.015	.304	.010	.025	.744	.088
1863	10.883	17.244	4.029	.015	.319	.010	.026	.716	.073
1864	11.250	17.419	4.045	.015	.320	.010	.026	.716	.071
1865	11.754	17.785	4.052	.015	.316	.011	.027	.880	.064
1866	11.853	15.383	4.067	.015	.308	.010	.028	.956	.069
1867	11.826	14.703	4.083	.015	.307	.011	.028	.903	.070
1868	11.772	14.636	4.098	.015	.303	.010	.030	.741	.070
1869	12.361	14.663	4.132	.014	.308	.011	.029	.768	.074
1870	12.637	15.324	4.162	.015	.313	.011	.030	.822	.079
1871	12.587	15.959	4.212	.016	.324	.011	.031	.769	.072
1872	12.336	17.499	4.246	.017	.324	.012	.031	.799	.093
1873	12.501	19.941	4.285	.017	.340	.012	.030	.800	.086
1874	12.845	20.499	4.319	.018	.340	.012	.030	.774	.107
1875	12.870	17.725	4.334	.016	.328	.013	.031	.799	.105
1876	12.620	17.793	4.337	.018	.315	.013	.031	.880	.097
1877	12.683	18.401	4.347	.018	.328	.013	.032	.880	.098
1878	13.063	18.890	4.384	.017	.337	.014	.032	.880	.088
1879	13.595	19.528	4.386	.016	.334	.013	.032	.797	.129
1880	13.629	20.584	4.455	.016	.343	.014	.034	.771	.138
1881	14.042	21.296	4.547	.015	.347	.016	.034	.853	.168
1882	14.163	24.120	4.573	.015	.345	.015	.034	.881	.172
1883	14.171	25.451	4.627	.015	.365	.015	.035	.883	.206
1884	13.882	26.046	4.682	.018	.360	.016	.036	.964	.219
1885	14.094	27.196	4.748	.018	.381	.017	.038	1.074	.238
1886	14.538	27.809	4.809	.018	.389	.018	.039	1.237	.266
1887	14.755	27.129	4.870	.017	.407	.018	.039	1.290	.312
1888	14.113	27.266	4.932	.017	.414	.018	.039	1.153	.332
1889	14.083	26.925	4.955	.016	.406	.017	.039	.991	.339
1890	14.570	27.123	5.020	.017	.418	.018	.040	.993	.309
1891	15.213	27.054	5.044	.016	.411	.017	.040	.991	.264
1892	15.666	26.012	5.049	.016	.396	.017	.039	.964	.233
1893	15.511	25.963	5.091	.016	.417	.018	.039	.964	.246
1894	15.764	25.614	5.175	.016	.434	.018	.040	.990	.250
1895	15.846	23.448	5.272	.016	.460	.020	.041	1.017	.287
1896	15.786	23.533	5.316	.016	.472	.020	.041	1.097	.283
1897	15.993	24.605	5.367	.015	.481	.020	.040	1.152	.299
1898	15.929	25.012	5.432	.016	.504	.020	.040	1.259	.341
1899	16.144	26.233	5.558	.016	.517	.022	.041	1.367	.395
1900	16.358	27.102	5.666	.016	.500	.022	.041	1.315	.416
1901	16.427	28.815	5.769	.016	.514	.023	.042	1.396	.384
1902	16.824	31.219	5.903	.016	.547	.024	.042	1.452	.383
1903	16.886	33.432	6.052	.017	.548	.025	.042	1.534	.443
1904	17.294	34.996	6.066	.017	.581	.025	.042	1.564	.519
1905	17.442	37.817	6.238	.018	.587	.025	.043	1.701	.628
1906	18.210	39.692	6.510	.018	.627	.028	.044	1.757	.740
1907	18.544	41.293	6.813	.018	.692	.032	.045	1.867	.753
1908	19.138	44.031	6.998	.019	.711	.030	.045	2.032	.912
1909	18.367	50.405	6.971	.020	.715	.032	.046	2.198	1.051
1910	18.363	57.099	7.158	.020	.698	.032	.046	2.258	1.196
1911	18.186	59.965	7.171	.021	.708	.032	.046	2.180	1.187
1912	19.479	61.886	7.537	.021	.775	.034	.046	2.073	1.347
1913	21.097	61.789	7.827	.019	.783	.033	.045	2.046	1.292

Table 7.2 *(continued)*

	(10)	(11)	(12)	(13)	(14)	(15)	(16)	(17)	(18)
	industry (cont.)								
	engi-neer'g	non-met. min. pr.	chem., rubber	paper, printing	sundry mfg.	constr., utilities	total	imports	total
1861	.074	9.138	.128	.071	.002	.000	29.307	3.507	43.169
1862	.072	10.678	.130	.073	.002	.000	32.703	3.544	46.951
1863	.070	11.111	.134	.075	.002	.000	33.824	3.833	48.540
1864	.067	11.261	.139	.079	.002	.000	34.170	4.387	49.807
1865	.065	11.581	.143	.084	.002	.000	35.025	4.081	50.860
1866	.061	9.506	.147	.086	.002	.000	30.638	3.879	46.370
1867	.065	8.890	.154	.089	.002	.000	29.320	3.559	44.705
1868	.070	8.811	.164	.094	.002	.000	29.044	3.688	44.504
1869	.075	8.829	.178	.097	.002	.000	29.180	3.548	45.089
1870	.081	9.326	.190	.102	.002	.000	30.457	3.678	46.772
1871	.078	9.710	.200	.105	.002	.000	31.489	3.929	48.005
1872	.081	10.618	.211	.111	.002	.000	34.044	4.502	50.882
1873	.080	12.190	.226	.112	.002	.000	38.121	4.504	55.126
1874	.086	12.718	.250	.118	.002	.000	39.273	5.226	57.344
1875	.095	10.878	.263	.124	.002	.000	34.713	5.127	52.710
1876	.092	10.476	.292	.128	.002	.000	34.474	5.618	52.712
1877	.093	11.047	.325	.133	.002	.000	35.717	5.381	53.781
1878	.088	11.153	.357	.139	.002	.000	36.381	5.878	55.322
1879	.094	11.155	.385	.145	.002	.000	37.016	7.282	57.893
1880	.111	12.030	.417	.151	.002	.000	39.066	6.207	58.902
1881	.131	12.479	.468	.158	.002	.000	40.514	6.346	60.902
1882	.152	14.315	.506	.167	.002	.000	45.297	6.663	66.123
1883	.171	15.332	.566	.172	.002	.000	47.840	7.175	69.186
1884	.191	16.068	.637	.173	.002	.000	49.412	7.831	71.125
1885	.203	16.698	.717	.181	.002	.000	51.511	9.387	74.992
1886	.228	17.322	.780	.190	.002	.000	53.107	9.796	77.441
1887	.267	17.051	.866	.200	.002	.000	52.468	10.602	77.825
1888	.284	16.944	.914	.212	.002	.000	52.527	7.797	74.437
1889	.274	16.569	.916	.217	.003	.000	51.667	9.589	75.339
1890	.241	16.558	.997	.226	.003	.000	51.963	8.858	75.391
1891	.198	16.214	1.134	.238	.003	.000	51.624	7.600	74.437
1892	.167	15.197	1.159	.249	.003	.000	49.501	8.419	73.586
1893	.160	15.058	1.103	.261	.003	.000	49.339	8.628	73.478
1894	.168	14.940	1.114	.270	.003	.000	49.032	8.483	73.279
1895	.176	13.446	1.145	.282	.003	.000	45.613	9.481	70.940
1896	.179	13.181	1.147	.291	.003	.000	45.579	9.204	70.569
1897	.178	13.376	1.339	.299	.003	.000	47.174	9.220	72.387
1898	.188	13.468	1.481	.304	.003	.000	48.068	10.811	74.808
1899	.214	13.925	1.586	.312	.003	.000	50.189	10.953	77.286
1900	.238	14.584	1.947	.318	.003	.000	52.168	10.578	79.104
1901	.227	15.658	1.992	.322	.003	.000	55.161	11.879	83.467
1902	.218	17.475	1.976	.333	.004	.000	59.592	13.066	89.482
1903	.229	18.884	2.114	.336	.004	.000	63.660	13.418	93.964
1904	.259	20.040	2.371	.383	.004	.000	66.867	12.496	96.657
1905	.306	21.913	2.423	.448	.004	.000	72.151	14.038	103.631
1906	.384	23.463	2.549	.513	.005	.000	76.330	15.600	110.140
1907	.452	24.916	2.688	.523	.005	.000	80.097	16.268	114.909
1908	.515	26.848	3.032	.553	.005	.000	85.731	17.032	121.901
1909	.569	31.584	3.328	.584	.005	.000	97.508	19.195	135.070
1910	.611	36.417	3.601	.605	.006	.000	109.747	18.891	147.001
1911	.627	38.630	3.356	.584	.006	.000	114.513	19.617	152.316
1912	.644	39.804	3.617	.645	.006	.000	118.435	21.129	159.043
1913	.636	39.597	3.602	.655	.006	.000	118.330	20.832	160.259

Source: see text.

agricultural products that was transported, by common (or other sectors') carriers, after its first sale. To a first approximation, this subset would appear to exclude perishables (most sold directly to households, the rest likely brought by the farmers themselves to the local processing plant or railway station).

A rough estimate for 1911 is here obtained from Federico's product-specific quantity figures for 1911 (Rey 1992, pp. 4–6). The non-perishable totals would appear to include all cereals (his group 1.1: 6.50 million tons worth 1,635.4 million lire), wine (item 2.1.2: 4.29 million tons worth 1,725.4 million lire), olive oil (item 2.2.2: .20 million tons, allowing 800 grams per liter, worth 309.1 million lire), other oils (item 2.2.3: .05 million tons worth 40.8 million lire), citrus fruit (group 2.3: .74 million tons worth 95.3 million lire), nuts (items 2.4.8–10, 2.4.13, and forest-product chestnuts: .99 million tons worth 265.9 million lire), wood and related products (group 2.3 plus the corresponding forest products: 11.97 million tons, allowing 750, 500, and 400 kilograms, respectively, per cubic meter of logs, firewood, and charcoal, worth 260.5 million lire), or some 24.74 million tons worth 4332.4 million lire.

This aggregate tonnage is here reduced by a quarter, to 18.555 million tons, to allow for on-farm consumption. This assumption is similar to that used to calculate the sesquicentennial estimates for commerce (Battilani, Felice, and Zamagni 2014, pp. 10–12); but it is here of much reduced import, as the double-digit-percentage correction is applied only to a single component that is itself but a sixth or so of the relevant total (Table 4.1, cols. 1 and 18), and the net effect on the latter is limited to a low single-digit percentage.[13]

Because these transported goods are (by selection) non-perishables, one can presume that the quantities transported were themselves somewhat less variable than the current harvest. The extrapolating index is accordingly a three-year moving average

[13] The sesquicentennial estimate, drawn from Federico's early work on a small sample of household budgets, is that non-marketed consumption represented 33 percent of the total in 1911 (and 40 percent in 1871, ibid.); but the present author's sense is that these exceed the national average in a land where only one male of working age out of four worked land he (or his family) owned or rented (*Censimento demografico*, vol. 4, pp. 7–31). The share of the population that lived in dispersed housing rose slowly from 25 percent in 1861 to 28 percent in 1911 (*IIPK*, Table K.57), and points to a similar order of magnitude.

of the 1911-price harvest-corrected value added series in Table 5.1, panel A, col. 1 (with unchanged end points), and the 1911 benchmark is itself further reduced (from 18.555 to 18.186 million tons) to reflect the ratio of the smoothed harvest product to the base estimate (7,720.3/7,877). The tonnage series in Table 7.2, col. 1 is not further refined, to reflect changes in the product mix. Cyclical variations in response to changing (tariffs, ocean freight rates, and derivatively) relative prices may have been significant, but cannot be inferred from the available aggregate series. Federico's disaggregated estimates for 1891 (Rey 2000, pp. 11–17) do permit a repetition of the above calculation for 1911, which yields a total weight for the year of 16.41 million tons.[14] The 1891 ratio of estimated transported tonnage to (harvest) value added of (16.410/6,751) = .00243 tons per lira at 1911 prices is very close to the corresponding 1911 ratio of (18.555/7,877) = .00236 tons per lira, and a trend adjustment seems pointless.

Table 7.2, col. 2 refers to the weight product of the extractive industry. It is obtained as the simple sum of the 32 separate physical-product estimates, excluding only natural gas (*IIPB*, Summary Table B.1). It bears notice that in 1911 some 8.0 million tons were mine products, and 52.0 million quarry products, the bulk of them very low-grade kiln and construction materials.

Table 7.2, col. 3 refers to the weight of the food industries' relevant products. The 1911 benchmark is derived from the present author's "benchmark" estimates (Rey 1992, pp. 119–120); crudely to allow for contract milling of grain consumed on-farm, and for the direct retail distribution by artisanal producers, various production estimates are reduced (items 1.1–1.3, flour, and 3.2, cheese, by 25 percent, items 2.1, pasta, and 2.3, biscuits and pastries, by 50 percent), and some are altogether excluded (item 2.2, bread).[15] The estimates for 1891 (Rey 2000, pp. 128–129) yield a second benchmark; it is calculated as above (save that the excluded share of pasta

[14] The reported figure for firewood on p. 15 is taken to be refer to volume rather than, as indicated, to weight (as suggested by the 1911 figure right next to it, which repeats as "tons" the volume figure of the earlier volume, and the firewood figure on p. 16, explicitly referred to volume).

[15] The pure-alcohol figure in the source is doubled, assuming the commercial product was 100 proof.

is increased to 90 percent).[16] From 1891 to 1911, given these estimates, the tonnage transported seems to have grown marginally less than the food industry's value added, reflecting a rise in the share of products with a relatively high production value added per unit weight. On the further assumption that for present purposes this change was negligible in earlier years, the 1891 benchmark in Table 7.2, col. 3 is extrapolated back to 1861 in direct proportion to value added (Table 4.1, col. 3), and forward to 1913 with a ratio of tons transported to production value added that is geometrically interpolated between (and beyond) its two benchmark values.

Table 7.2, col. 4 refers to the tobacco industry; it simply extrapolates the 1911 benchmark (Rey 1992, p. 120) in proportion to the crude extant 1911-price value added series (itself a simple quantity series times a 1911-price value added coefficient: Fenoaltea 2003, Table 2 and p. 728).

Table 7.2, col. 5 refers to the weight product of the textile industries. It is obtained as the simple sum of the 34 physical-product estimates in units of weight (*IIPH*, Table H.02, cols. 8 and 10, and Summary Table H.1, cols. 3–34). For present purposes, these estimates are heir to large biases. On the one hand, textile plants were drawn to locations where power was cheap (waterfalls), and thus typically located at above-average distances from the nearest rail line; on the other, significant production was carried out in vertically integrated mills, where intermediate products traveled over negligible distances. Neither is here quantified, as they are mutually offsetting to what is, *Clio juvante*, a negligible residual.

Table 7.2, col. 6 refers to the relevant weight product of apparel industries. The production of finished textile goods was essentially artisanal (the "large" shops counted by the *Censimento industriale* in categories 6.91 and 6.92 employed just 24,000 people, against a labor force near 550,000), and presumably produced overwhelmingly to local order by the final consumer; the production of hats and caps were instead highly concentrated (*IIPH*). Col. 6 is accordingly obtained as the sum of the seven tonnage series for finished textile goods (*IIPH*, Summary Table H.1, cols. 35–41), discounted by

[16] The share of artisanal pasta presumably declined over time; the present algorithm keeps the estimated output of industrial pasta in a more nearly constant ratio to pasta exports (*Sommario*, p. 161).

90 percent, the four series for caps and hats (ibid., cols. 44–47), here attributed an average 250 grams per unit, packed for shipment, and the two for felts and straw braid (ibid., cols. 42 and 48).

Table 7.2, col. 7 refers to the relevant weight product of the leather industry, estimated as the sum of the following components. Leather output, the product of the tanneries (*IIPH*, Summary Table H.1, col. 54) is entirely included. New shoes and gloves (ibid., cols. 49–50) are allowed shipping weights (set equal to leather consumption, assuming boxing offset waste) of 1.00 and .05 thousand tons per million pairs, and discounted by 5 percent to allow for direct sales by artisans. Other leather products (ibid., col. 51), also entirely included, are similarly allowed .172 thousand tons per million lire of value added. Fur goods (ibid., col. 52) are also discounted by 5 percent to allow for direct sales by artisans. The estimate of hair and feather products (ibid., col. 53) is more complex, as production was estimated directly as 1911-price value added, with the 1911 benchmark of 4.94 million lire derived from census data. In 1911, the *Movimento commerciale* valued exported crude and processed ornamental feathers at 70 lire and 290 lire per kilogram, respectively, and crude and processed hair at 90 lire and 150 lire per kilogram, respectively; at a guess, average value added is here set at 100 lire per kilogram, or .010 thousand tons per million lire of value added (not discounted, allowing direct sales to offset the extra cost of shipping at volume rather than weight charges). The aggregate is dominated by the leather and shoe components, both relatively sturdy.

Table 7.2, col. 8 refers to the wood industry. It is again a poor series; it is here calculated by borrowing the present author's now decades-old preliminary estimate of output quantities in 1911 (1.39 million tons of finished lumber and .79 million tons of wood products, unpublished), and extrapolating their sum in proportion to the value added series in Table 4.1, col. 8.

Table 7.2, col. 9 refers to the relevant weight product of the metals industry. It is obtained as the simple sum of the 16 separate physical-product estimates (*IIPE*, Summary Table E.1), excluding rails (presumably loaded directly onto freight cars) and half of pig iron and ingot aluminum, copper, and lead (to allow for vertically integrated production).

Table 7.2, col. 10 refers to the relevant weight product of the engineering industry. It is similarly obtained from the latest disaggregated estimates (*IIPF*, Summary Table F.1), but the algorithm is slightly more complex, as it is the sum of two components. The new-production component is estimated by summing across products (ibid., cols. 1–26), altogether excluding ships and rail-guided vehicles (ibid., cols. 2–19); the resulting figure in 1911 equals 619,000 tons. The maintenance component is estimated from metal consumption in maintenance (*IIPF*, Table F.53, col. 11), doubled to allow for the occasional movement of the entire machine rather than of the replacement parts; in 1911, it adds near another 8,000 tons.

Table 7.2, col. 11 refers to the relevant weight product of the non-metallic mineral products industry. It is obtained as the simple sum of the 10 separate physical-product estimates (*IIPC*, Summary Table C.1).

Table 7.2, col. 12 refers to the relevant weight product of the chemical industry. It is obtained as the simple sum of the 98 separate physical-product estimates (*IIPD*, Summary Table D.1). The only adjustments are the exclusion of metallurgical coke (consumed in vertically integrated works), and the conversion of photographic plates from a surface measure to a weight measure (allowing 6.25 tons per thousand square meters).

Table 7.2, col. 13 refers to the paper, paper products, and publishing industries. The series is the sum of separate physical output estimates, referred respectively to rags and pulp, to paper and cardboard, and to paper products and printed matter.[17]

Table 7.2, col. 14 refers to other manufacturing. Quantity estimates are not available, and the benchmarks for 1911 are built up from the employment side; they allow a value added of 12.3 million lire to the photographic industry, and 14.2 million to the residual (Rey, 1992, pp. 171–173). The value added series are very crude; the former component is indexed by the production of photographic material (itself estimated from silver nitrate consumption), the latter is simply attributed a constant growth rate (Fenoaltea 2003, p. 729). Again grasping at straws, the former is attributed the weight of the photosensitive material produced, and the latter, *faute de mieux*, as much again in 1911.

[17] The derivation of these unpublished estimates is briefly described in Fenoaltea (2003), p. 728; a full description is available on request.

Table 7.2, col. 15 refers to the other components of industry, construction and the utilities; it is simply a null column, as neither sector's product moved (by road, or at all). Col. 16 is the total for industry (the sum of cols. 2–15).

Table 7.2, col. 17 refers in turn to imports. The 1911 benchmark near 19.6 million tons is the sum of the maritime and overland import tonnages estimated by Mauro Marolla and Massimo Roccas (Rey 1992, pp. 260, 264). Federico *et al.* (2011) report, from 1862, current-price imports, including the primary-product and manufactured-goods subaggregates (pp. 88–91), and price indices for those subaggregates (pp. 226–227); these yield deflated series that serve here as quantity indices. The import-tonnages in Fenoaltea (1983), Table 3.9, col. 2 identify 16.0 million tons of imports (out of 19.6), of which 14.9 million, or some 93 percent, were primary products; excluding coal (9.8 million tons), the primary-product share drops to 82 percent. Here, primary products are assumed to account for a round 90 percent of the 1911 total tonnage (implicitly assuming, not unreasonably, that primary products represented some three-fourths of the residual ca. 3.6 million tons); 90 percent of the Marolla-Roccas total is accordingly extrapolated using the Federico *et al.* deflated primary-product import series, the residual 10 percent using the deflated manufactured-goods import series. From 1871 to 1913 the series in col. 17 is the simple sum of the two; to allow for the exclusion from the Kingdom (and thus of its trade statistics) of Venetia through 1866, and Latium through 1870, that sum is here inflated by 13.5 percent in 1862–66 and 3.5 percent in 1867–70. Finally, the figure so obtained for 1862 is extrapolated back to 1861 using the constant-price import series in Fenoaltea (2012), Table 1, col. 5 (and thus, indirectly, Istat figures, ibid., p. 304).

Table 7.2, col. 18, is the grand total (the sum of cols. 1, 16, and 17). One notes that the distribution of transported tons is quite unlike that of value added (Table 4.1): the dominant component was provided by construction-materials industries, and the aggregate series closely follows the construction cycle.

The road-transportation index used to extrapolate the revised 1911 value added benchmark is this aggregate tonnage series, simply rescaled to set 1911 = 1.00. In principle, of course, goods of higher value per unit weight can absorb higher transportation costs, and therefore travel over longer distances, than lower-value goods. In the case at hand, the share of domestic low-value goods (agricultural, mining and quarrying, and non-metallic mineral products (Table 7.2, cols. 1, 2, and 11) in the total (col. 18) drifts down from near 80 percent in the 1860s and '70s to some 74 percent from the mid-1890s until ca. 1909, thence partly recovering to some 76 percent in 1910–13; by itself, this evidence would point to a lengthening of the average haul over the 1880s and early 1890s. On the other hand, the 1880s and early 1890s were precisely the years in which the railway net was enriched by the construction of local lines, which would tend to shorten the average haul to the nearest railway station; on balance, there are no clear grounds on which to alter the simple tonnage index one way or the other.

7.2.5 *Maritime transportation*

The maritime transportation series (Table 7.1, col. 6) is also amended: not conceptually recast, but brought up to date. The estimating algorithm, which uses a weighted sum of the sail- and steam-powered merchant fleets to extrapolate the 1911 benchmark (from Rey 1992, p. 212), is unchanged; the fleet series are no longer Istat's (*Sommario*, p. 138), but the corrected estimates by the present author (*IIPF*, Table F.24, cols. 6 and 7).

7.3 Commerce

7.3.1 *Introduction*

In the present taxonomy "commerce" is broadly defined to include hotels and restaurants and commercial services as well as trade proper (Battilani, Felice, and Zamagni 2014, p. 12; Fenoaltea 2005, p. 308). The extant series, and the new one (Table 4.1, col. 20), are illustrated in Figure 4.1, panel C2.[18] The two extant series are broadly similar, sharing the 1911 benchmark (Rey 2000, p. 365;

[18] The new series for this sector also differs from that in Fenoaltea (2017), but not by much; the main further revision is to the estimates of the imports acquired by merchants.

Battilani, Felice, and Zamagni 2014, p. 12; Fenoaltea 2005, p. 308) and growing, at least from the mid-1870s, at comparable rates. The 2005 series extrapolated the 1911 benchmark with a weighted sum of the commodity-production and transportation series; it is noticeably the smoother of the two. The sesquicentennial series apparently reproduces, using constant-price series, the Battilani-Felice-Zamagni current-price algorithm (Baffigi 2015, p. 108). The available description of the latter suggests the calculation of a "resources" total based on the Federico-Fenoaltea 2005 constant-price estimates for agriculture, mining, and manufacturing and the Istat-Vitali centennial import and indirect tax series (and price indices, to convert the constant-price estimates); the conversion of this total into a consumption series, using coefficients calculated for the benchmark years (and otherwise interpolated); the disaggregation of this last into food and non-food consumption; the reduction of both of these to allow for non-marketed (food and non-food) consumption; the calculation of the trade-proper value added series using (benchmark and interpolated) estimates of the corresponding mark-ups; and the addition of a (benchmark or interpolated) percentage to allow for hotels and restaurants (Battilani, Felice, and Zamagni 2014, pp. 12–13).[19] The sources of the sesquicentennial series' short-term variability are not clear.[20]

The new series, also illustrated in Figure 4.1, panel C2, is sharply lower than the extant ones, thanks to a careful revision to the earlier, shared 1911 benchmark: value added in 1911 here totals 1,434 million lire, well below the extant estimate of 2,708 million lire.[21] The

[19] Battilani, Felice, and Zamagni (2014), p. 12 suggests that trade-proper value added refers only to "non-food" consumption, but the text should clearly read "food and non-food," as the food mark-up is included in the benchmark estimates (Rey 2000, pp. 251–252, 364–365; also Baffigi 2015, p. 108). In fact, benchmark food and non-food consumption (and, derivatively, their ratio to the "resources" total) appear to have been borrowed from Vitali's figures in Rey (2002): see Rey (2000, p. 365).

[20] Using the data in the above-cited sesquicentennial work sheets, the short-term variation reappears in the ratio of value added in commerce to the sum of imports, net indirect taxes, and value added in agriculture, mining, and manufacturing, both at current and at constant prices.

[21] The (revised) "benchmark" estimate of 2,708 million lire increased Istat's "centennial" estimate (1,543 million lire) by 76 percent (Rey 2000, p. 245); the present revision to 1,434 million lire reduces it by 7 percent, again broadly confirming it.

new benchmark is extrapolated with an index of the (1911-price) volume actually handled by merchants; that index is more volatile than that entering the 2005 series, as it includes (highly variable) imports as well as domestic commodities, and within the latter the agricultural component is more volatile than its predecessor.

The new series also grows less rapidly than its 2005 counterpart. The latter so weighted the transportation and commodity-production series, which grew at different rates, as to yield a value added in 1891, relative to (selected) other sectors, consistent with the extant 1891 current-price benchmarks (Fenoaltea 2005, p. 308). But that calculus failed to recognize that if one compares a technologically stagnant sector (commerce) to a technologically progressive one (industry), as one goes back from the base year the ratio of the former to the latter at constant prices will exceed the corresponding ratio at current prices (Fenoaltea 1976, 2011b, 2015a). The 2005 commerce series grew at an excessive rate; the new one can be said to have removed that error.

7.3.2 *Hotels, restaurants (1911)*

The sesquicentennial estimate of hotel-and-restaurant value added in 1911 reproduces Zamagni's initial "benchmark" figure of 407.9 million lire (Battilani, Felice, and Zamagni 2014, p. 12; Rey 1992, pp. 193–195). The latter is based on the labor-force data for census categories 9.41 (hotels, boarding houses), 9.42 (room rentals), 9.43 (restaurants, diners), and 9.44 (cafés, bars). Labor income is estimated by imputing annual incomes per worker for each of the four relevant categories (male/female, owners and managers/other employees). Some imputed incomes are modest (600 lire for hired men and 400 for hired women in category 9.42, 900 and 600 respectively in 9.44); most seem frankly princely, as if the establishments were generally upscale, and the hired help mostly clerical workers rather than menials (and, in the case of women, probably part-time). The labor bill is here reestimated with what appear to be more reasonable annual averages, to wit, for owners and managers, 2,000 lire per male in hotels and boarding houses, 1,500 per other male, and half those figures for females, for a subtotal of 150.05 million lire; for other workers, 700 lire per man and half that for women, for a subtotal of 58.00 million lire, here reduced by 7 percent to allow for unemployment (3 percent) and children (4 percent, as ca. 8 percent of the work force was under 15). The labor bill works out to 204.0 million lire, well under Zamagni's 293.2 million.

To allow for capital costs Zamagni inflated that figure by 30 percent, and the result by a further 7 percent, for an additional 114.7 million lire. Here, capital costs are estimated as the rental value of the rooms themselves. The number of rooms is unknown, but can be estimated. Hotels, boarding houses, and rented rooms were attributed a labor force of some 36,000 persons (census categories 9.41–9.42); reasonably assuming that each could care for some 5 rooms, on average, the number of rooms works out to approximately 180 thousand. On the other hand, Mauro Marolla and Massimo Roccas calculated that some 1.065 million foreign travelers spent an average 25 days in Italy (Rey 1992, pp. 254–260), for a total of 26.6 million overnight stays per year, or on average some 73,000 per day. Domestic salesmen (in census category 9.65) were under 20,000; if road warriors away from home 180 days a year, they would account for a further 3.6 million overnight stays per year, or on average under 10,000 per day. Adding as much again for other domestic travelers, mean daily overnight stays come to 93,000; allowing for a mean occupancy rate of 50 percent, the corresponding number of rooms works out to some 186 thousand, serendipitously close to the alternative estimate. Here, 183,000 rooms are allowed a mean annual (cost) value of 200 lire each, a figure patterned on the rental rates calculated below (§7.6.3) for bourgeois rooms in the 40 major urban centers, for a partial total of 36.6 million lire.[22] Restaurants, cafés and the like were attributed a labor force of almost 173,000; allowing on average two persons per room, and a mean annual value of 100 lire per room, this residual component is here set at 8.6 million lire. The present estimate of hotel-and-restaurant value added in 1911 is accordingly (204.0 + 36.6 + 8.6) = 249.2 million lire rather than 407.9 million.

[22] These round-figure commercial-building rental cost rates are to be understood as gross of maintenance costs, on the now usual grounds.

7.3.3 *Commercial services (1911)*

The second minor element of the broadly defined "commerce" sector refers to "commercial services," essentially those of brokers, agents, salesmen, and the like, which the 1911 census grouped in categories 9.64 (advertising, chambers of commerce, etc.: 373 male and 8 female owner/managers, 1,385 other males and 50 other females), 9.65 (shippers, salesmen: 7,958 male and 106 female owner/managers, 12,159 other males and 206 other females), 9.66 (emigration and placement agencies: 1,229 male and 101 female owner/managers, 1,416 other males and 62 other females), and 9.67 (brokers: 42,708 males and 603 females).

As noted above, Zamagni's initial (and never revised) estimate for transportation included the 23,237 persons in census categories 9.65–9.66 (Rey 1992, pp. 202, 213, 2000, p. 245, Battilani, Felice, and Zamagni 2014, pp. 66, 68). Her initial benchmark for commercial services was correspondingly based on the 45,127 persons in categories 9.64 and 9.67, to whom she attached a value added of 153.1 million lire (Rey 1992, p. 194). The subsequent revision to the estimates for "commerce" raised the commercial-services component to 215 million lire; the modification is not explained, but it is attached to a revised labor-force figure, said to have been borrowed from Vitali, of 63,257 persons (Rey 2000, pp. 364–365). Borrowed without due diligence: Vitali adjusted the 1911 census figures to fit the classification of a later census, and his figure sums over the 1911 census data for categories 9.64–9.67, excluding 25 percent of those in category 9.65 (Vitali 1970, pp. 306, 322–325). The revised "benchmark" estimates for transportation and commerce clearly double-count three-fourths of the workers in category 9.65, and all those in category 9.66; the value added estimates too presumably reflect a measure of double-counting.

The present estimate for these commercial services is based directly on the census data for categories 9.64–9.67, which yield totals of 52,268 male owner/managers and 14,960 other males, and 818 female owner/managers and 318 other females. Noting the near absence of children, and presuming that the "other" workers were typically clerical, the labor bill is here estimated by attributing 2,500 lire to male owner/managers and 1,800 lire to other males, and half those figures to the corresponding females, for a total of 158.9 million lire. Assuming two persons per room and a rental value of 150 lire per room, fixed capital costs are here taken to add another 5.1 million lire, for a total of 164.0 million lire rather than 215.

7.3.4 *Trade proper (1911)*

The largest component of the "commerce" sector is of course trade proper. Zamagni's initial "benchmark" estimate of value added in trade proper in 1911, of 2,333 million lire, was not census-based: it was obtained by estimating (food- and non-food) retail sales, estimating the average mark-up, and adding allowances for retail capital costs, wholesale trade, transportation, and peddlers (Rey 1992, pp. 195–197). The revised, still extant estimate reduced the total to 2,085 million lire (2,300, including 215 million for brokers); the bulk of the reduction came from the elimination of double-counted transportation, and the reduction of the non-food retail margin from 32 percent to 25 percent (Rey 2000, pp. 364–365).

But even this revised figure seems off. At first blush, it seems biased downward: by the exclusion of investment (as if builders bought supplies from the factories rather than from dealers), and again by the 33-percent allowances for non-marketed food and non-food consumption. As noted above (§7.2.4, esp. footnote 13), a reduction to exclude non-marketed food from agriculture's product is surely appropriate, but a quarter seems more reasonable than a third. The parallel reduction applied to non-food items seems instead entirely inappropriate, as the estimated industrial product already excludes non-marketed production.[23]

If one allows (as below) for the earnings of labor and fixed capital, on the other hand, the residual earnings on circulating capital imply an average inventory that is too high to be credible. The net bias of this estimate too seems clearly upward; and it may

[23] This inconsistency is characteristic of the national accounts' atheoretical, practical basis. Agricultural production is estimated from surfaces and yields, and is therefore gross of non-marketed production; industrial production data are collected from firms, and the resulting estimate is therefore net of non-marketed production.

have been introduced at various stages of the underlying calculation. Among the obvious suspects are the retail margins, borrowed directly from those registered in the 1930s; Zamagni's discussion of their likely (failure to) change over time (Rey 1992, p. 195) neglects both the impact of relative technical progress, much slower (if it occurred at all) in commerce than in commodity production and transportation, and the impact of the legislation of the 1920s, which curtailed entry and limited commercial competition.[24] Another suspect is her neglect of direct sales by artisans, still very numerous, and in some sectors dominant, in 1911. A third is her estimate of retail food sales: she allowed (perhaps to excess) for non-marketed on-farm consumption, but seems to have forgotten that until relatively recently Italians shopped for food, daily, at the farmers' market. The name of the venue says it all: the bulk of fresh produce passed directly from the cultivator to the consumer, the merchants of the national-accounts' "commerce" sector never got involved at all.

A new estimate of value added in trade proper in 1911 is accordingly generated here, by components. Its first component refers to the personnel in census categories 9.21–9.23, devoted specifically to trade: 51,852 male and 18,040 female peddlers (category 9.122), and, in other trade, 225,978 male and 84,016 female owner/managers, 73,562 male and 18,051 female white-collar workers, and 58,354 male and 10,305 female blue-collar workers (cleaning staff, porters, and the like); under 4 percent of the males, and under 3 percent of the females, were under 15. The high proportion of owner/managers points to typically small-scale operations, over half of them one-(wo)man shops, and the white-collar workers were no doubt overwhelmingly shop assistants rather than accountants and the like. Annual labor income was plausibly no more than 2,000 lire, 1,500 lire, and 700 lire for male owner/managers, white-collar

[24] Pierluigi Ciocca emphasizes that the Italian economy was, by its own lamentable standards, unusually competitive in the run-up to the Great War (Ciocca 2006, p. 342, 2007, pp. 137–163, 2008). Giordano and Zollino's quantitative analysis points to a sharp reduction in the competitiveness of the Italian economy from 1911 to the 1930s, but it is not clear whether that result is robust to their deeply flawed labor- and capital-input series (Fenoaltea 2020, footnote 58, and above, §3.4, footnote 23).

workers, and others (including peddlers), respectively, and half that for their female counterparts, for a total labor bill of 665.8 million lire.

The second component refers to the personnel also in trade, but counted elsewhere. One such refers to pharmacists ("chemists"). The census lists 15,801 males and 299 females, in census category 10.75; they are disaggregated only by age, and 2,912 males and 139 females were aged 30 or less. Allowing an annual average of 3,000 lire and 1,500 lire for male pharmacists respectively over and under 30, and half that to the corresponding females, the total labor cost works out to some 43.4 million lire. Deducting the 3.9 million lire allowed for the drugs manufactured in pharmacies and already included in the estimates for the chemical industry (*IIPD*, pp. 46–47), a net estimate of 39.5 million lire is added here.[25] The other refers to the manufacture of bread in ordinary, artisanal bakeries. Their value added is included in the food industry, save for an allowance of 20 percent of the total to exclude the personnel engaged in selling rather than baking (Rey 1992, p. 122). Given the estimate of 150.6 million lire attributed to the bread-making industry (ibid., p. 119), the value added to be recovered here is 25 percent of that, or 37.7 million lire.[26] For simplicity, this entire amount is here treated as a labor cost, for a total labor cost in trade proper of 743.0 million lire.

The third component is the return to fixed capital, in essence the (cost) rental value of the shops. The trade-proper census categories (9.1–9.3) include some 540,200 persons; adding (for simplicity) all 16,100 pharmacists (10.75) and one fifth of the 82,800 (bread) bakers, one obtains a total labor force of some 573,000 individuals. Allowing an average of 1.5 to 2 persons per room, the estimated

[25] The manufacturing estimate is based on a value added per worker that seems in retrospect too low, but is used here uncorrected to maintain consistency across sectors. The pharmacists' incomes adopted here reflect the figures cited by Zamagni (Rey 1992, p. 197), excluding the highest (for a mid-career director in a large cooperative firm, of little apparent relevance for the typical stand-alone chemist's shop).

[26] Other artisanal activities could be similarly treated, but are not: all but bread-making are here counted entirely in industry, and correspondingly excluded from the services. The revised benchmark estimates in Rey (2000, pp. 364–365), list some 686,000 workers in trade proper; the source is Vitali (1970), and it includes large numbers of artisans here already counted as industrial workers.

number of rooms equals some 286,000 to 382,000. An alternative estimate compares that labor force to that of the corresponding artisans, numbering perhaps 2.34 million.[27] Assuming an equal number of persons per room in stores and artisans' shops, the former would have accounted for one fifth or so of the available commercial space. Given the estimate of some 25.0 million residential rooms in all (§7.6.3), the number of commercial rooms may have been near one fifteenth of that (calculating, e.g., an average of 3 floors per building, with the ground floor devoted to commercial space in one fifth of the buildings), or some 1.667 million; on the above figures, one fifth of those, or some 333,000, would have been stores. This last figure, well within the range estimated above, is adopted as the point estimate. Average rents would be distributed across large and small communities much like the residential rooms, which averaged perhaps 65 lire p. a. (below, §7.6.3); given that non-residential (commercial, street-level) rooms apparently commanded rents well above the average (Battilani, Felice, and Zamagni 2014, p. 49), mean rents are here set at 130 lire p. a., for a total of 43.3 million lire.

The extant "benchmark" estimate for trade proper equals 2,085 million lire (Rey 2000, p. 365; Battilani, Felice, and Zamagni 2014, p. 12). Deducting the above estimates of labor costs (735.0 million lire) and fixed capital costs (43.3 million lire) leaves near 1,300 million lire as the return to circulating capital; at 5 to 6 percent interest, it implies a circulating capital – inventories – of 22,000 to 26,000 million lire. Summing the value of imports (3,444 million lire), value added in manufacturing (3,846 million lire, gross of maintenance work and artisanal production not handled by merchants), and (allowing for on-farm consumption but not for farmers' markets) 75 percent of (harvest) value added in agriculture (another 5,908 million lire, from Table 5.1, col. 1), one obtains a gross overestimate of annual additions to inventory of some 13,000 million lire; and even this is just 50 to 60 percent of the implied corresponding stock. The implication of the "benchmark" estimate is thus that, on average,

[27] This estimate is obtained as the *Censimento demografico* labor force in manufacturing (census categories 3, 4, 5.1, 6, 7, and 8.1), or some 3.52 million persons, less the 1.18 million in those same categories reported employed in shops with more than 10 employees (*Censimento industriale*, vol. 3).

commodities sat in merchants' warehouses, or on their shelves, for some two entire years, if not more, before they were finally re-sold. That seems much too long; by implication, as noted above, the estimated gross return to circulating capital is much too high.

The fourth component of the present estimate of value added in trade proper in 1911 is a direct estimate of the return to circulating capital, based on the likely annual gross additions to merchants' inventories. As estimated below (§7.3.5 and Table 7.3), in 1911 these equalled 10,428 million lire; this figure is obtained as recorded production plus imports less allowances for specific items presumably acquired directly by the user, and since these allowances are more likely to be understated (because of omissions) than overstated (by overvaluing the counted items), the residual estimate of the merchants' annual acquisitions is more likely too high than too low. An average holding time of three months may be a low estimate, but one of half a year would seem to be a generous one, not least because a relatively high-interest country like Italy would tend to import grain, for example, on an as-needed basis (from world-wide stocks held where interest rates were lower). Three to six months' average holding time imply an average (merchants') inventory of one-quarter to one-half that figure, or 2,607 to 5,214 million lire; taking the mid-point of that range and applying an interest rate of 6 percent, the present estimate of the annual return to circulating capital equals 234.6 million lire.

Summing over the estimated return to labor (743.0 million lire), fixed capital (43.3 million lire), and circulating capital (234.6 million lire), the present estimate of value added in trade proper equals 1,020.9 million lire. The implication is that merchants (as a group) acquired goods they paid 10,428 million lire, and resold for 11,439 million lire, for a ca. 10 percent (value added) mark-up on costs. Zamagni's estimates for 1938 allow final sales of 55,824 million lire and a total value added in commerce of 13,257 million lire (Rey 2000, pp. 276–277), implying an overall (13,257/(55,824 – 13,257)) = 31 percent mark-up on costs: treble the present figure for 1911, but not *ceteris paribus*.[28] If we assume an annual productivity increase of 3 to 4 percent in commodity production

[28] Zamagni's total final sales are her retail-sales figures, without the 5 percent deduction for peddlers.

(and zero in trade), commodity-production productivity in 1938 would have been some 2.2 to 2.9 times that in 1911.[29] At 1911 (factor) prices (and levels of competition), with 1938 technology, the goods purchased by merchants would have cost only (10,428/2.2 to 2.9) = 3,596 to 4,740 million lire; the return on circulating capital would similarly have been only (234.6/2.2 to 2.9) = 80.9 to 106.7 million lire, for a value added in commerce of (743.0 + 43.3 + 80.9 to 106.7) = some 867 to 893 million lire, and an overall value-added mark-up of (893/4,740) = 19 percent to (867/3,596) = 24 percent. If we grant that the anti-competitive legislation of the 1920s may have raised traders' margins by 50 percent, *ceteris paribus*, that 19-to-24 percent range becomes a 28-to-36 percent range, well astride Zamagni's apparently data-based figure of 31 percent in 1938. The crux of the matter is that her own estimates of trading margins in 1938 point to a much lower figure in 1911, like the one obtained here: the present estimates for 1911 are more nearly consistent with her evidence for 1938 than her own, which ignore everything that plausibly changed them over the many intervening years.[30]

7.3.5 *Commerce (1861–1913)*

The estimates of the annual 1911-price gross additions to the merchants' inventories are presented in Table 7.3, col. 1. The aggregate point-of-sale 1911-price value of the commodities that came available year by year can be approximated as the sum of aggregate value added in the production of goods (Table 4.1, cols. 1 + 18), value

[29] Broadberry, Giordano and Zollino (2011), Table 10, report a mean economy-wide (save housing) TFP growth of some 2 percent p. a. between 1911 and 1938 (Table 11 reports a lower figure, obtained however with conventional, not actual, factor shares). That would appear to be a lower bound, to the extent that their productivity estimate for 1911 is biased upward by their massive understatement of industrial employment (above, §3.4, footnote 23 and references therein), save of course for compensating errors (e. g., an underestimate of the capital stock in 1938). The technologically progressive sectors (agriculture, industry, transportation) represented some two-thirds of the economy, for a 3-percent p. a. productivity growth in the (commodity) production of interest here with 2 percent economy-wide, and near 4 percent with 2.5 percent economy-wide.

[30] For an earlier, analogous case see Fenoaltea (1988b, p. 308).

added in inland transportation (Table 7.1, cols. 4 + 5), and the value of recorded imports (below, Table 10.1, cols. 6 + 7); this aggregate grows from ca. 6,700 million lire in 1861 to 17,000 in 1911 and 18,600 in 1913. But not all of that was handled by merchants; Table 7.3, col. 1 collects the part that was, that is, the estimated production, transportation, and import series reduced by the allowances for the appropriate exclusions. These exclusions, roughly estimated, correspond in principle to the final products' value added, or gross value, depending on whether or not merchants (presumably) handled the raw materials; but the focus here is on the relevant aggregate rather than its internal distribution, and in practice the deductions are allocated as computationally convenient.

The components of the total in Table 7.3, col. 1, presented in cols. 2–10 and 16–20, are obtained as follows. Col. 2 refers to agricultural products. In 1911, on-farm consumption and direct ("farmers' market") sales may have accounted for some 42 percent of the harvest-corrected agricultural product (7,877 million lire, from Table 5.1, col. 1), a share suggested by Federico's gross-saleable-product figures (Rey 2000, p. 19), assuming that merchants acquired 100 percent of forage crops, 75 percent of cereal, citrus, meat, milk, and wood and forest products, 50 percent of wine, olive oil, industrial vegetable products (e.g., sugar beet, textile fibers), and other animal products (e.g., eggs, silk cocoons), 20 percent of vegetables, legumes, and hunting/fishing products, and 10 percent of (other) fresh fruit. The time series in col. 2 applies the residual 58-percent share to the entire harvest-corrected agricultural product series in Table 5.1, col. 1: absent a full account of Federico's sources and methods, one can do little more than that.

Table 7.3, col. 3 refers to the extractive industries. The deduction from Table 4.1, col. 2 refers to the exported metal ores, notably (Elban) iron ore and (Sardinian) zinc ore, presumably sold directly by the mine to the foreign processing plant, without the commercial organization that appears to have characterized, for example, the sulphur-mining industry. The deduction sums over zinc ore production (*IIPB*, Summary Table B.1, col. 8), as practically none was reduced in Italy, and, ignoring inventories presumably held at the mine, iron ore exports as reported by the *Movimento commerciale*, both valued in conventional terms (*IIPB*, Summary Table B.2, panel B1).

Table 7.3 *Annual additions to merchants' inventories, 1861-1913 (million lire at 1911 prices)*

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
		products acquired by merchants								
	total	agri-cult.	extrac-tive	food	to-bacco	tex-tiles	ap-parel	leather	wood	metal
1861	3,959	2,550	59	230	20	122	22	104	78	10
1862	4,117	2,665	64	230	20	118	23	105	66	9
1863	4,218	2,692	68	231	20	121	23	107	64	7
1864	4,284	2,682	68	233	20	119	23	109	64	7
1865	4,520	2,937	70	234	20	114	25	114	78	6
1866	4,582	3,064	66	235	20	117	23	116	85	7
1867	4,231	2,755	66	236	20	117	25	117	80	7
1868	4,391	2,916	67	238	20	118	24	123	66	7
1869	4,535	3,024	66	240	19	125	25	123	68	8
1870	4,718	3,190	68	243	20	128	25	124	73	8
1871	4,709	3,120	68	246	21	140	26	127	68	8
1872	4,691	2,988	74	248	23	140	27	125	71	9
1873	4,708	3,004	84	251	23	147	29	122	71	8
1874	5,048	3,242	83	254	24	149	29	122	69	10
1875	5,058	3,242	74	255	22	149	29	127	71	10
1876	4,882	3,023	79	256	24	138	31	130	78	10
1877	4,900	3,058	80	257	25	135	32	134	78	10
1878	5,241	3,288	85	259	22	143	33	134	78	9
1879	5,456	3,304	93	260	21	140	32	134	71	13
1880	5,509	3,450	95	264	22	151	34	141	68	14
1881	5,517	3,313	99	270	21	166	38	142	76	16
1882	5,846	3,609	109	272	20	166	36	143	78	17
1883	5,950	3,540	114	276	21	175	35	146	78	21
1884	5,875	3,319	112	280	24	177	38	151	86	22
1885	6,201	3,395	115	284	24	185	40	158	95	24
1886	6,632	3,696	114	289	24	192	43	163	110	27
1887	6,812	3,648	112	292	23	203	44	164	114	31
1888	6,200	3,555	115	297	23	220	42	163	102	34
1889	6,074	3,222	114	299	22	221	41	162	88	34
1890	6,352	3,625	114	303	22	229	43	165	88	31
1891	6,475	3,916	114	305	21	228	42	165	88	28
1892	6,322	3,697	115	307	22	224	42	162	86	25
1893	6,626	3,960	111	311	22	229	46	161	86	27
1894	6,430	3,801	108	318	22	252	46	164	88	28
1895	6,676	3,884	100	325	22	267	50	168	90	32
1896	6,794	4,020	102	330	21	273	52	170	97	32
1897	6,567	3,756	112	335	21	279	51	164	102	34
1898	7,096	4,037	115	341	21	293	52	167	112	37
1899	7,144	3,972	125	350	21	310	57	168	121	43
1900	7,114	3,915	128	359	22	308	58	172	117	45
1901	7,585	4,196	136	367	22	324	58	174	124	42
1902	7,620	4,023	140	377	22	339	61	173	129	42
1903	7,945	4,208	149	389	23	343	64	175	136	46
1904	8,006	4,242	152	392	23	358	65	175	139	53
1905	8,437	4,324	160	405	24	371	66	178	151	63
1906	8,844	4,318	167	425	24	402	75	182	156	74
1907	9,585	4,809	167	447	25	442	84	189	166	77
1908	9,642	4,571	173	461	26	450	80	191	180	92
1909	10,259	4,757	183	462	27	450	85	192	195	100
1910	9,973	4,239	198	477	28	433	86	195	205	109
1911	10,428	4,569	204	480	28	428	85	196	193	111
1912	10,847	4,626	212	507	29	475	90	198	184	125
1913	11,394	5,194	212	529	26	475	87	196	181	116

TABLE 7.3 *(continued)*

	(11)	(12)	(13)	(14)	(15)	(16)	(17)	(18)	(19)	(20)
	eng'g prod. not acquired by merchants					products acquired by merchants				
	ships	rolling stock	other mach.	precis. equip.	fabr. metal	engi-neer'g	other mfg.	ind. total	trans-port'n	imports
1861	25	4	6	4	134	32	103	780	96	533
1862	28	8	6	4	135	30	111	776	105	571
1863	32	8	6	4	135	30	111	782	110	634
1864	34	7	5	5	136	29	115	787	114	701
1865	37	9	6	5	137	26	118	805	117	661
1866	37	10	6	6	138	23	111	803	110	605
1867	40	8	6	6	139	25	110	803	107	566
1868	43	9	6	6	140	29	111	803	108	564
1869	43	10	7	6	142	31	115	820	112	579
1870	40	10	8	6	143	34	119	842	118	568
1871	34	11	8	7	144	33	123	860	123	606
1872	33	13	11	7	145	31	131	879	133	691
1873	42	14	13	7	145	26	140	901	146	657
1874	51	14	14	7	146	25	147	912	151	743
1875	47	15	13	7	148	31	140	908	143	765
1876	42	16	13	8	149	29	143	918	146	795
1877	39	16	13	8	150	30	148	929	150	763
1878	35	16	14	8	151	27	151	941	153	859
1879	34	18	15	8	152	29	156	949	161	1,042
1880	31	25	18	9	154	33	163	985	167	907
1881	34	31	21	9	156	37	175	1,040	174	990
1882	41	33	26	9	158	38	186	1,065	188	984
1883	42	33	29	10	159	43	196	1,105	200	1,105
1884	49	32	31	10	161	47	204	1,141	209	1,206
1885	53	35	34	10	163	47	213	1,185	219	1,402
1886	60	40	36	11	165	54	221	1,237	228	1,471
1887	59	49	40	12	168	65	225	1,273	233	1,658
1888	51	59	44	12	169	73	229	1,298	234	1,113
1889	51	54	47	13	170	71	233	1,285	239	1,328
1890	57	44	48	13	170	60	242	1,297	241	1,189
1891	56	37	46	13	170	49	248	1,288	239	1,032
1892	52	37	44	13	170	40	251	1,274	239	1,112
1893	53	37	44	13	170	40	256	1,289	244	1,133
1894	55	40	49	13	172	36	262	1,324	247	1,058
1895	59	42	54	13	173	36	265	1,355	243	1,194
1896	66	44	59	13	174	33	270	1,380	247	1,147
1897	73	51	63	13	176	25	279	1,402	257	1,152
1898	76	60	66	13	177	29	285	1,452	266	1,341
1899	98	68	75	13	179	25	298	1,518	279	1,375
1900	103	74	84	13	181	30	308	1,547	288	1,364
1901	88	75	81	13	182	35	320	1,602	301	1,486
1902	94	76	78	13	184	26	343	1,652	324	1,621
1903	95	81	83	12	185	26	363	1,714	341	1,682
1904	86	85	94	12	188	43	402	1,802	357	1,605
1905	101	94	110	12	190	48	447	1,913	375	1,825
1906	108	118	136	12	194	57	497	2,059	407	2,060
1907	108	139	155	12	197	72	524	2,193	419	2,164
1908	94	151	173	12	201	96	563	2,312	450	2,309
1909	84	142	185	12	204	126	614	2,434	491	2,577
1910	100	141	197	12	207	129	668	2,528	533	2,673
1911	125	160	202	13	210	117	689	2,531	559	2,769
1912	168	171	205	13	213	103	745	2,668	588	2,965
1913	170	169	202	13	216	101	757	2,680	609	2,911

Source: see text.

Table 7.3, col. 4 refers to the food industry, about which very little is (by the present author) currently known. An estimate of the deductibles in 1911 is derived from the author's value added estimates in Rey (1992), pp. 119–120, as follows. Value added in wheat and corn milling is reduced by 25 percent to allow for contract milling of grain for on-farm consumption. Value added in the manufacture of bread, pasta, and biscuits is reduced by 95, 50, and 70 percent, respectively, to allow for artisans' direct sales to the public; these ratios reflect the ratio of large-shop employment (*Censimento industriale*, vol. 3) to the total labor force (*Censimento demografico*, vol. 4) in categories 3.34, 3.35, and 3.56, corrected to allow for likely productivity differentials. Value added in the manufacture of cheese and conserved meat (ham, salami, etc.) is reduced by 90 percent, on the presumption that the bulk of these were actually produced by farmers and again sold directly to the public. Together, these deductions total 42 percent of the 827 million lire value added attributed to the food industry in 1911. To allow for the progressive growth of non-artisanal production an "early" benchmark is also calculated, increasing the deducted shares to 90 percent for pasta and biscuits, and 95 percent for cheese and conserved meat; with these "early" shares the deductible share of 1911 value added rises to some 46 percent. For simplicity, Table 7.3, col. 4 is the food-industry total value added (Table 4.1, col. 3) reduced by a share set equal to .42 in 1911, and extrapolated assuming a constant growth of .001 from year to year; the "early" .46 benchmark share is accordingly attributed to 1871. Food-product exports such as pasta and canned tomatoes were also significant by the end of the period at hand; they are here neglected, implicitly assuming that the exporters were in fact merchants rather than the producing firms.

Table 7.3, cols. 5 and 6, referred to the tobacco and textile industries, reproduce the corresponding value added series in Table 4.1, with no deduction: a safe enough bet for tobacco products, possibly an overestimate for textiles, at least over the later decades, as it implicitly assumes that the by then significant exports were handled by merchants rather than directly by the producing firms.

Table 7.3, col. 7 refers to the apparel industry, here restricted to the industrial production of finished textile goods on the one hand and caps and hats on the other (*IIPH*, Summary Table H.3, cols. 9 and 10). Both groups were heavily artisanal; but the production of headgear seems to have been heavily concentrated, and presumably marketed through a network of merchants, while the production of finished textile goods was very widespread and the goods were presumably sold, in large part, directly to the public. In 1911, comparing as before the latter industry's large-shop employment and labor force (census categories 6.91 and 6.92), some 90 percent of the product seems to have avoided intermediation; and that figure too was presumably marginally higher in earlier times. For simplicity, Table 7.3, col. 7 reduces the aggregate in Table 4.1 by a share of finished-textile-good total value added (*IIPH*, Summary Table H.3, col. 9) set equal to .90 in 1911, and extrapolated again assuming a constant growth of .001 from year to year (whence a share of .94 in 1871).

Table 7.3, col. 8 refers to the leather industry. The deduction with respect to Table 4.1, col. 7 includes two components, the first of which is the entire value added in shoe repair (*IIPH*, Summary Table H.3, col. 15, included as noted in Table 4.1, col. 7). The other is an allowance for the share of new goods produced by artisans and sold directly to the public, whether made to order or not; it is here very tentatively set equal to a constant 15 percent of value added in the production of new final goods (*IIPH*, Summary Table H.3, col. 14 less Summary Table H.1, col. 54, allowing 1,330 lire per ton of leather), an estimate that grows quite regularly from some 15 million lire in 1861 to 28 in 1911.

Table 7.3, col. 9 refers to the wood industry: it was essentially artisanal (even in 1911, only some 56,000 members of the 415,000-strong labor force were employed in large shops, Rey 1992, p. 143), but how and to whom the artisans sold their products is anybody's guess. To contain the possible error col. 9 is here obtained very simply as half the corresponding value added series in Table 4.1, col. 8.

Table 7.3, col. 10 refers to the metal industry; it is the series in Table 4.1, col. 9, reduced only to allow for the railway companies' (presumed) direct purchases (other deductions are taken later, in valuing metal products). The deduction applied here is the output of rails (*IIPE*, Summary Table E.1, col. 2), weighted by 69.12 lire per ton (48 lire value added per ton of rails, times 1.2 to allow for more complex pieces, plus 1.2 squared times the 8 lire per ton of pig iron, *IIPE*, section E02.04).

Table 7.3, cols. 11–16 refer to the (predominantly metal) products of the engineering industry. Cols. 11–15 refer to specific deductions, all subtracted from Table 4.1, col. 10 to obtain the net figure in col. 16. Col. 11 refers to ships; the deduction, estimated presuming that merchants were involved only in supplying wood, is the sum of the following components. The first refers to new naval vessels; it is the sum of the 13 type-specific displacement-tonnage production series (*IIPF*, Summary Table F.1, cols. 2–14), weighted by the corresponding estimates of unit values (respectively 2,000 lire for armored sail-powered fighting ships, 2,700 lire for other sail-powered fighting ships, 2,300 lire for battleships, 2,600 lire for armored cruisers, 2,800 lire for protected cruisers and the like, 3,100 lire for torpedo cruisers and the like, 3,600 lire for destroyers, 5,300 lire for submarines, 4,700 lire for torpedo boats, 1,400 lire for gunboats, 1,300 lire for tugs, 400 lire for bulk transports, and 900 lire for other auxiliaries), reduced by the estimated value of the wood consumed (*IIPF*, Table F.20, col. 6, here valued at 100 lire per ton). The second component is the value added in naval maintenance (*IIPF*, Summary Table F.1, col. 30), for simplicity not further adjusted. The third component refers to new merchant vessels; it is the sum of the two (sail, steam) gross-register-tonnage production series (*IIPF*, Summary Table F.1, cols. 15–16), weighted by the corresponding estimates of unit value (respectively 327 and 604 lire per gross ton, *IIPF*, section F02.03), again reduced by the estimated value of the wood consumed (*IIPF*, Table F.20, col. 7, here valued at 100 lire per ton). The fourth component is the value added in merchant-ship maintenance (*IIPF*, Summary Table F.1, cols. 30), augmented to include the value of replacement sails (Table 12.2, col. 3, valued at 4,000 lire per ton, §12.2.3).

Table 7.3, col. 12 refers to rail-guided vehicles; the deduction is obtained, much like col. 10, as the sum of two components. The first refers to new vehicles; it is estimated as the value of new locomotives, passenger cars, and freight cars (*IIPF*, Summary Table F.1, cols. 17–19, weighted by unit values equal respectively to 1,640, 1,400, and 690 lire per ton, *IIPF*, section F03.08), reduced by the estimated value of the wood consumed (*IIPF*, Table F.38, col. 5, again valued at 100 lire per ton). The second component refers to maintenance; it is the aggregate value added estimate (*IIPF*, Summary Table F.3, col. 10), augmented by 20 percent to allow for (directly ordered) materials.

Table 7.3, col. 13 refers to other general equipment, again including new goods and maintenance. The deducted maintenance component is simply the estimated value added (*IIPF*, Summary Table F.1, col. 43), again augmented by 20 percent to allow for (directly ordered) materials. The deducted new-product component is identified with the value of structural components, calculated as the estimated tonnage (ibid., col. 21) at 650 lire per ton (*IIPF*, section F04.06), plus, at a guess, half the value of general machinery (*IIPF*, Summary Table F.1, cols. 20 + 22), valued at 1,300 lire per ton (*IIPF*, section F04.06).

Table 7.3, col. 14 refers to precision equipment. New goods were presumably acquired, at least in the main, from specialized shops; col. 14 accordingly refers only to deducted maintenance (*IIPF*, Summary Table F.3, col. 12), augmented by 5 percent to allow for (directly ordered) materials.

Table 7.3, col. 15 refers to fabricated metal, again including new goods and maintenance. The deducted maintenance component is simply the estimated value added (*IIPF*, Summary Table F.1, col. 8); the deducted new-product component is estimated, at a guess, as 10 percent of estimated value added (ibid., col. 1).

Table 7.3, col. 16 transcribes the net estimates for the engineering industry, obtained as noted by deducting the sum of cols. 11–15 from Table 4.1, col. 10.

Table 7.3, col. 17 refers to other manufacturing, obtained from Table 4.1 as the simple sum of cols. 11–14; all these products are assumed to have been distributed by merchants, to a negligible approximation. On the other hand, the products of the construction and utilities industries did not enter the merchants' inventories; the industrial-products total in col. 18 is accordingly the simple sum of cols. 3–10 and 16–17.

Table 7.3, col. 19 refers in turn to the relevant value added in inland transportation; it is here calculated as the estimated total (Table 7.1, cols. 4 + 5), reduced by an allowance for passenger transportation (by rail). That allowance is crudely set equal to 35, 75, and 100 percent, respectively, of the value added attributed to railway, machine tramway, and horse tramway transportation (Table 7.1, col. 1, 2, and 3). The railway share reflects the passenger share of revenues (38 percent) and passenger-car share of axle-kilometers (33 percent) on the State railways, as reported in the *Annuario 1913*, pp. 233, 235; the others are no more than reasonable estimates. Other passenger transportation is neglected; and so is the carting of goods that did not enter merchants' inventories, a very small proportion of the total judging by the tonnage estimates in Table 7.2.

Table 7.3, col. 20 refers, finally, to the imports acquired by merchants; direct documentation is practically non-existent, but it is a fair presumption that major users of imports ordered them directly in international markets. The deductions from aggregate recorded imports (below, Table 10.1, cols. 6 + 7) are collected in Table 7.4, and obtained as follows.

Table 7.4, cols. 1 and 2 refer to agricultural products. Col. 1 refers specifically to vegetable and animal textile fibers. For simplicity, the quantity series used here are the readily available net import series; the negative (net export) figures are corrected to zero (as are the flax net import figures through 1900, as flax-spinning was then not yet mechanized). The source series are *IIPH*, Tables H.02, col. 3 (cotton), H.06, col. 2 (wool), and H.16, cols. 2 (jute), and 3 (flax); hemp was always exported. The corresponding 1911 import prices are respectively 1,900, 3,800, 600, and 1,300 lire per ton. Col. 2 refers instead to tobacco leaf (for the State monopoly); the quantities are those reported by the *Movimento commerciale*, valued at the 1911 import price of 1,680 lire per ton.

Table 7.4, col. 3 refers to the products of the extractive industries, and specifically to coal, excluding that already included in the above deductions for finished products of the engineering industry. It includes all the coal consumed by the railways and, at a guess, one-third the coal consumed by thermal power plants, gas-works, kilns, chemical plants, and sugar refineries. The quantity series used here are simply those in *IIPF*, Table F.51, cols. 3–4, 6, 8, and 12, and *IIPJ*, Table 1, col. 9, allowing 1,000 tons of coal per million kWh; gas coal is valued at 26,50 lire per ton, the rest at 35,65 lire per ton (Cianci 1933, p. 307).

Table 7.4, col. 4 refers to imports of tobacco products, again presumably purchased directly by the State monopoly. The quantity series is simply the aggregate of the various (and frequently reclassified) final products reported by the *Movimento commerciale*. In 1911 such imports equalled near 28 tons of cigars and cigarettes, and under 4 tons of other finished tobacco products, worth 35,000 and 7,000 lire per ton, respectively; the aggregate tonnage figure is weighted by 32,000 lire per ton, the approximate average value per ton in 1911.

TABLE 7.4 *Imports not acquired by merchants, 1861-1913 (million lire at 1911 prices)*

	(1) textile fibers	(2) tobacco leaf	(3) coal	(4) tobacco products	(5) textile semi-mfs	(6) eng'g products	(7) total
1861	25	19	4	2	35	8	93
1862	11	14	5	9	19	9	67
1863	9	6	6	10	14	12	57
1864	5	7	6	15	12	10	55
1865	6	12	7	12	21	11	69
1866	12	16	8	21	22	9	88
1867	21	19	8	1	25	9	83
1868	25	16	9	2	26	8	86
1869	28	13	10	6	30	12	99
1870	27	14	11	3	24	9	88
1871	24	19	12	4	26	14	99
1872	28	20	13	5	23	19	108
1873	46	22	15	6	33	29	151
1874	50	27	16	4	32	21	150
1875	38	30	16	7	37	13	141
1876	45	34	17	10	43	13	162
1877	53	31	17	0	40	14	155
1878	50	25	17	0	27	11	130
1879	55	25	17	0	24	11	132
1880	64	28	19	0	23	19	153
1881	69	26	20	1	41	27	184
1882	102	36	21	2	35	37	233
1883	96	16	23	1	37	42	215
1884	97	22	25	1	35	45	225
1885	125	25	26	2	37	44	259
1886	108	39	28	2	30	46	253
1887	131	27	31	2	26	51	268
1888	126	24	34	2	24	50	260
1889	148	24	36	3	28	54	293
1890	169	22	38	4	28	33	294
1891	150	23	39	3	26	19	260
1892	157	23	39	3	25	18	265
1893	167	23	41	2	26	16	275
1894	209	19	42	2	26	18	316
1895	208	27	43	1	30	24	333
1896	218	24	45	2	27	23	339
1897	233	26	46	3	24	22	354
1898	259	19	49	2	22	22	373
1899	252	21	52	2	30	39	396
1900	233	29	55	1	28	66	412
1901	265	35	59	1	34	57	451
1902	286	31	63	1	45	42	468
1903	293	31	67	1	37	47	476
1904	298	25	72	1	38	61	495
1905	314	21	77	1	36	65	514
1906	352	35	83	1	36	116	623
1907	424	33	92	1	41	174	765
1908	403	34	99	1	47	169	753
1909	376	38	109	1	47	111	682
1910	353	32	117	1	44	99	646
1911	387	33	120	1	39	95	675
1912	429	37	124	1	37	85	713
1913	414	43	128	1	35	85	706

Source: see text.

Table 7.4, col. 5 refers to textile-industry products, and specifically to the imports of thence factory-processed goods. Proceeding as above, col. 5 is obtained as the positive elements of the net-import quantity series for cotton yarn, carded wool, combed wool, woollen yarn, worsted yarn, combed jute, combed flax (after 1900), and jute yarn (but not linen yarn, as net imports did not materially increase after 1900). The source series are those in *IIPH*, Tables H.02, col. 5, H.07, cols. 3–4, 6–7, H.16, cols. 6–8 and 10. The 1911-price unit value of cotton yarn (73.24 million lire per trillion meters) is inferred from domestic production, approximating the value of output as the value of 185,700 tons of raw cotton (at 1,900 lire per ton) plus a spinning value added of 73.448 million lire, and dividing by the yarn output of 5.82 trillion meters (Table H.02, cols. 1, 3 and 9, and summary Table H.2). The other unit values, per ton, are the import values in the *Movimento commerciale 1911*: 5,400 lire for carded wool, 5,400 for combed wool, 6,500 for woollen yarn, 8,100 for worsted yarn, an estimated 650 for combed jute, 1,850 for combed flax, and 800 for jute yarn.

Table 7.4, col. 6 refers to engineering-industry products. Its first component refers to ships; it is not the value of imports, but the value of imports that happened to be included in the reported total (below, Table 10.1, col. 8). Its second component refers to railway vehicles; it is obtained as the sum of (the positive elements of the net import series in) *IIPF*, Table F.34, cols. 2, 5, and 8, again weighted by 1,640, 1,400, and 690 lire per ton, respectively. The third component refers to machine parts, imported for assembly; the base quantity series is *IIPF*, Summary Table F.1, col. 20. Imported machine parts were relatively expensive (ibid., section F04.06); at 1911 prices they are here tentatively allowed 1,800 lire per ton. The fourth component refers to assembled general machinery. The base quantity series is *IIPF*, Table F.45, col. 24; it too is here tentatively halved, and weighted by 1,300 lire per ton. The series in Table 7.4, col. 6 is the sum of these four components; precision-equipment production was small-scale, and imports too are presumed to have been handled by merchants.

The imported products of the other industries are also assumed to have been handled by merchants, to a negligible approximation; the estimated total 1911-price value of deductible imports in Table 7.4, col. 7 is the simple sum of cols. 1–6.

Table 7.3, col. 20 – the estimated 1911-price value of the imports acquired by merchants – is accordingly obtained as aggregate recorded imports (below, Table 10.1, cols. 6 + 7) less Table 7.4, col. 7. With col. 20 finally in place, one can estimate the aggregate annual additions to the merchants' inventories (col. 1) as the sum of cols. 2 and 18–20. That aggregate series here serves a twofold purpose. On the one hand, as noted above, the point estimate for 1911 serves to pin down the likely value added of the commerce-proper sector in 1911. On the other, Table 7.3, col. 1 is here used to extrapolate the estimated value added of the broad "commerce" sector in 1911, equal to (249.2 + 164.0 + 1,020.9) = 1,434 million lire; the resulting series appears in Table 4.1, col. 20.

7.4 Net banking and insurance

The two extant series for the banking and insurance sector (net of double-counted business services), and the new one (Table 4.1, col. 21), are illustrated in Figure 4.1, panel C3. In brief, the present author's 2005 series extrapolated the revised "benchmark" net sector estimate of 77 million lire in 1911 (Rey 2000, pp. 366–367) using the few census labor-force data points (adjusted by Vitali's declining share of double-counting) to determine the trend, and construction data to infer short-term movements. Baffigi's sesquicentennial series extrapolates that same benchmark, using the new (sesquicentennial) current-price series for insurance and for the banking-sector, deflated by the centennial price index. The author's new series abandons the "benchmark" estimates: it is based directly on the new current-price series, but simplifies the intermediate net/gross estimates, and deflates the net series with a wage index.[31] This new series resembles Baffigi's far more than the

[31] The new series differs from that in Fenoaltea (2017), which used Baffigi's net shares. That series also introduced a further refinement, reducing the allowance for double-counting (and inflating the "net" figure) to allow for the value added estimates obtained for various business sectors as the sum of the returns to the primary factors of production, and therefore in principle already net of purchased business services. Upon reflection, however, those estimates incorporate returns to capital extrapolated from those of other sectors, calculated as sales less raw materials less labor costs; in practice, therefore, even the value added estimates

author's own earlier estimates, as both the recent series incorporate the additional material contributed for the sesquicentennial.

The details of the matter are relatively complex. Baffigi (2015), p. 109, refers to new gross current-price series for insurance on the one hand and for banking on the other: the former taken from Battilani, Felice, and Zamagni (2014) and based on firm-level data, the latter the work of Riccardo De Bonis, Fabio Farabullini, Miria Rocchelli, and Alessandra Salvio, all of the Bank of Italy (De Bonis *et al.* 2012).[32] The gross constant-price series are said to have been obtained by deflating these current-price series using the corresponding "centennial" price index, actually a combination of the wholesale and retail price indices (Fuà 1969, p. 472). Baffigi seems not to discuss the distinction between gross and net value added.

Banking and insurance need here to be distinguished. Battilani, Felice, and Zamagni (2014) reconstructed the current-price insurance series, conserving the "benchmark" estimate of 69 million lire in 1911 (but raising that for 1891 from 21 million lire to 24 million: pp. 31–35, 71–72, Rey 2000, pp. 265, 367); Baffigi's work sheets confirm that that is the series he used, as suggested by his text. Battilani, Felice, and Zamagni (2014) include a current-price credit series (pp. 71–72), which is attributed (p. 7) simply to De Bonis *et al.* (2012); and this would sit well with Baffigi's indication that he used the De Bonis *et al.* series, taking it from Battilani, Felice, and Zamagni (2014), were it not for the fact that the series in Battilani, Felice, and Zamagni (2014) is not the lire equivalent of the euro series in De Bonis *et al.* (2012), and Baffigi's is yet another one.[33] The ratio of the Battilani-Felice-Zamagni series to the (lire) De Bonis *et al*. series is near 140 percent in the early 1860s, declines to near 80 percent in 1891–99, and then drifts back up to some 88 percent in 1910–13; that of the Baffigi series to the Battilani-Felice-Zamagni series is near 60 percent in 1861–70, drifts up to exactly 100 percent in 1891 and

that are net of business services in principle appear to include them in practice, and that refinement is here abandoned. The banking-and-insurance sector is a small one, and not much is here at stake.

[32] The reference is to the Italian version of the De Bonis *et al.* working paper, n. 26 in the Bank of Italy series; the English-language n. 26 is actually a different paper, without the value added series.

[33] The euro/lire conversion rate is the standard 1,936.27 lire/euro.

then a bit more, and returns to exactly 100 percent in 1911. The most instructive ratio is that of the Baffigi series to the (lire) De Bonis *et al*. series: a constant 82 percent in 1861–91, followed by a linear increase to 88 percent in 1911.[34] Baffigi used the De Bonis *et al.* series, but forced it through the Battilani-Felice-Zamagni 1891 and 1911 benchmarks (respectively 86 million and 219 million lire: again the "benchmark" figure for 1911, but just under the 87/88-million "benchmark" for 1891, Rey 2000, pp. 265–266, 367).

Here, the (lire) De Bonis *et al*. current-price credit series is accepted essentially as is: it is by all accounts a careful reconstruction based on direct firm-level evidence, and there is no obvious reason to force it through earlier, less robust "benchmark" figures. The only, minor modification is the exclusion of the estimates for the *Cassa Depositi e Prestiti*: this to avoid double-counting, as Battilani, Felice, and Zamagni include that institution in the government sector (De Bonis *et al*. 2012, pp. 50–54; Battilani, Felice, and Zamagni 2014, pp. 7, 69–70).[35] The current-price Battilani-Felice-Zamagni insurance series is also accepted as is, as it was by Baffigi: little is known of its actual content, and no useful correction suggests itself.

The sum of these two series is the present estimate of the sector's current-price value added, at current borders; it is tentatively converted to constant borders by inflating it by 5 percent in 1861–66 and 3 percent in 1867–70, not that this correction matters much.

The double-counted and net components of that value added raise issues of a different order, not least because the evidence that can be brought to bear is desperately thin. Istat's centennial series' net share, apparently anchored by benchmark calculations for 1871–73 and 1938 (*Reddito nazionale*, pp. 144, 232–234), displays nonsense variations in the early 1860s, relatively slow trend growth from ca. 9 percent in 1866 to ca. 13 percent in 1884, pops up to ca. 17 percent in 1887, and the again grows slowly to some 23 percent in 1910–12, slipping to 20 percent in 1913; this last dip is incongruous, as is the *upward* trend shift in the mid-1880s (when the construction boom presumably increased the share of business business). Vitali's

[34] Since the ratios among the series vary smoothly, their short-term movements are very similar, and clearly those of the De Bonis *et al*. series.

[35] The nonsense figures for the *Cassa* on p. 70 of Battilani, Felice, and Zamagni (2014) are presumably due to a copy-paste error.

constant-price series seem simply to deflate the Istat series with a combination of the wholesale and retail price indices (Fuà 1969, p. 472), maintaining their proportions (within rounding and possibly typographical error). Zamagni's initial benchmark allowed credit and insurance in 1911 a gross value added of 344 million lire and a net one of 95 million, or some 28 percent, calculated by examining the composition (households and not) of the sector's business (Rey 1992, pp. 222–223). The revised figures for 1911 reduced these to 288 and 77 million lire, respectively, for a net share of 27 percent; the corresponding 1891 benchmarks were 110 and perhaps 29 million lire (26 percent), respectively (Rey 2000, pp. 265–266, 367).[36] The present author's 2005 estimates drew on Vitali's time series in the centennial corpus; Baffigi apparently used Istat's centennial double-counted shares, forcing the series through his "benchmarks" (the new one for 1871, Vitali's "benchmark" figures for 1891 and 1911).

When all is said and done, the net share of value added can reasonably be assumed to have grown slowly over time, but its short-term variations remain unknown. Here, that share is assumed to have equaled the "benchmark" 27 percent figure in 1911, and simply half that forty years earlier, in 1871; the other years' net shares are obtained by linear interpolation and extrapolation.

The resulting net-credit-and-insurance current-price value added series needs to be converted to a 1911-price series. Baffigi used the "centennial" deflator, as noted a mix of the wholesale and retail price indices. A purported improvement to the latter index may be found in Fenoaltea (2002b), but the more relevant question is whether it is in fact the right index to use at all. The present measures are 1911-price measures, in principle product-quantity series weighted by 1911-price value added per unit. The path of product quantity is at times observed ("tons of pig iron"), at times inferred from the path of the labor input corrected for productivity growth; when productivity growth is negligible, as (it would seem) in the case at hand, the labor-input figures are used directly (as in the present author's 2005 estimates for this particular sector, recalled in the first paragraph of this section). To maintain consis-

[36] The material in Rey (2000), pp. 265–266 is particularly murky, as the figures in the tables disagree with each other and with the text. Baffigi opted for a net value added of 28 million lire in 1891.

tency, the current-price series is here deflated by a wage series, in effect converting current values into a labor-input series; since the relevant workers were urban rather than rural, the selected deflator is the nominal industrial-wage series in Fenoaltea (2002b), Table 6, col. 1, shifted to set 1911 = 1.[37]

7.5 Miscellaneous services

The two extant series for the miscellaneous-services sector, and the new one (Table 4.1, col. 22), are illustrated in Figure 4.1, panel C4.[38] If the sesquicentennial services series are overall a step sideways, the miscellaneous-services series *uti singula* appears to be a clear step backwards.

The time series in Fenoaltea (2005) extrapolated the revised 1911 benchmark (Rey 2000, p. 368) using labor-force figures for 1871, 1881, 1901, and 1911: the last three as rendered homogeneous over time (Vitali 1970), the first reconstructed, on a comparable classification, directly from that year's census. These were grouped into four broad categories – professions; health, entertainment, and education; clergy; residual – weighted by their approximate 1911 incomes (those used to generate the 1911 benchmark), and summed to four census-date equivalent totals, which were then geometrically interpolated and extrapolated. It bears notice that the total labor force grew from census to census, but very slowly (+2.1 percent from 1871 to 1911): the significant growth of estimated constant-price value added (near +24 percent from 1871 to 1911) is due almost entirely to a composition effect, to an upward shift across skill levels, in essence to the growth of human capital (Fenoaltea 2005, pp. 309–312).

For the sesquicentennial project, Battilani, Felice, and Zamagni (2014) produced a current-price series (ibid., pp. 67–68) by mating

[37] Baffigi's cost-of-living deflator converts current values into a general basket of goods, and not, as here, into sector-specific equivalent labor (and product, absent productivity growth). Baffigi's deflator would be suited to "third-generation" (1911-price *level*) estimates, but is unsuited to his, and these, "second-generation" (1911-price) estimates (above, §3.1).

[38] The new series differs from that in Fenoaltea (2017), which did not deal separately, as the estimates now do, with the maintenance of textile goods.

disaggregated annual employment and income series. Most of their effort was devoted to the income series (ibid., pp. 36–45, where they distinguish 7 categories within the miscellaneous group). The employment series was derived from four census-year labor force benchmark figures, Vitali's from 1881 and a census-based estimate for 1871, exactly like the preceding 2005 series; to generate annual series they geometrically interpolated and extrapolated the category-specific benchmark ratios of the labor force to the total population (ibid., p. 35). Their aggregate series displays noticeable short-term variation, which can come only from the income side; its path reveals the influence of the centennial cost-of-living index.

Baffigi (2015), p. 109, indicates that he took over the Battilani-Felice-Zamagni series, and used their category-specific employment series to estimate the constant-price aggregate; those series are not in the public domain.[39] Three features of his estimate hit the eye. First, like the 2005 series, it generally grows very smoothly, as one would expect of a series built up from a mere handful of benchmarks. Second, it displays an incongruous dip and recovery between the last two benchmarks; those of us who have encountered that problem before recognize it as the common and in principle spurious result of interpolating an aggregate by summing the geometric interpolation of its components, when their growth rates are, as here, of opposite sign (above, §3.3). The third is that his benchmark 1901 and 1911 estimates are practically the same (which is what highlights the second issue just mentioned, as it would otherwise be swamped by the general increase). The (accelerated) shift in the mix towards higher-level professions is clear in the census data (Fenoaltea 2005, p. 312): that Baffigi's series fails to register it points to a computational error of some sort.

The new series returns in essence to the 2005 series, which seems sounder than Baffigi's; but it incorporates two improvements. The first improvement separates out textile-maintenance services, estimated in their own right (*IIPH*, Summary Table H.1, col. 42); the new series in Table 4.1, col. 22 is the simple sum of that maintenance series and the new estimates for the residual, derived

[39] His work sheets include the constant-price series itself as a source series. It bears notice that Baffigi did not here choose, as he did elsewhere, to deflate the current-price series by the corresponding centennial price index.

as described below. The reasons for this separation are, first, that that component (alone) contains a slow but perceptible growth in productivity, tied presumably to the diffusion of public and private wash-stands (*IIPH*); second, that Vitali (1970, p. 306) attributed to the maintenance of textile products in 1911 only some 69,000 individuals (out of over 115,000 in census category 6.95), a clear underestimate in light of the earlier census figures (the *Censimento 1901* listed some 95,000, categories XII.9–10, the *Censimento 1881* 97,000, categories III.II.3–4, the *Censimento 1871* 62,000, categories XII.9–10; *IIPH*, section H07.06).

To reflect this exclusion, the census-year labor-force estimates (from Vitali 1970, extended to 1871) in Fenoaltea (2005), Table B.2 are amended: the "residual" figures in row 5 are reduced, excluding the textile-maintenance workers Vitali counted, to 654 thousand in 1871, 631 in 1881, 616 in 1901, and 605 in 1911, the weighted sector totals in row 6 to 222 thousand in 1871, 226 in 1881, 238 in 1901, and 276 in 1911. The unweighted totals become practically flat (954 thousand in 1871, 924 in 1881, 931 in 1901, and 968 in 1911): again, growth was a matter of an improvement in composition, in the progressive skilling of the labor force.

The correction of Vitali's underestimates entails a revision of the 1911 "benchmark" value added estimate of 1,095 million lire, here again taken as a starting point.[40] The ex-textile-maintenance total is set at 1,060 million lire, reducing the "benchmark" 1,095 million lire in proportion to the reduction in the corresponding weighted total labor force (from 285,000, Fenoaltea 2005, Table B.2, col. 6, row 6, to the present 276,000); the textile-maintenance total, taken directly from the *IIPH* time series, is set at 27 million lire. The new total is 1,087 million lire, paradoxically below the estimate based on Vitali's underestimated labor force. The reason for this is straightforward: the "benchmark" estimate treated the overwhelmingly female textile-maintenance labor force as full-time workers, the present estimates (taken from *IIPH*) assume, more plausibly, that

[40] The 1911 "benchmark" estimate is based on labor-force numbers (from Vitali 1970) and inevitably rough estimates of annual earnings by profession (Rey 2000, p. 368). These last are here presumed gross of the rental value of professional offices; the text (p. 367) suggests that the estimate includes pharmacists (here included elsewhere), the table suggests otherwise.

those women were also home-makers, and "worked" (in the market) only half-time. Vitali excluded less than half the likely total, and the increase in their numbers is outweighed by the reduction in their per-capita value added.[41]

The ex-textile-maintenance 1911 benchmark is extrapolated using the above weighted-total benchmark estimates of the corresponding labor force, as was done with the comprehensive benchmark in Fenoaltea (2005); the improvement here relaxes the assumption that growth rates were constant from benchmark to benchmark, and assumes rather that they displayed some sensitivity to broader economic, and specifically labor-market, conditions.[42] Over the longer term, to be sure, rising real wages directly augmented families' capacity to invest in the children's education, and there was most likely an independent trend component to the growth of human capital. Over the shorter term, of concern here, rising *nominal* wages are a symptom of labor-market tightness, and, with that, of workers' opportunity to train, if only on the job, for positions otherwise reserved to the already better-trained; falling nominal wages, analogously, are a symptom of slack demand for labor, a situation in which people will accept positions for which they are overqualified.

The algorithm used to generate the new 1911-price series accordingly interpolates and extrapolates the ex-textile-maintenance weighted-labor-force benchmarks with the usual industrial wage series (Fenoaltea 2002b, Table 6, col. 1, 2011a, p. 125), imposing an elasticity correction rather than a trend correction (above, §2.3).[43] The equivalent-labor-force annual series so obtained is then rescaled to set 1911 = 1 and multiplied through by the ex-textile-maintenance 1911 benchmark value added figure (1,060 million lire).

[41] The "benchmark" estimate of 1,095 million lire reduced Istat's "centennial" estimate (1,141 million lire) by 4 percent (Rey 2000, p. 245); the present estimates increase the reduction to 5 percent.

[42] Fenoaltea (2017) performed a similar exercise, but the algorithm was needlessly complex.

[43] The annual growth rate of the labor force is estimated as that of the wage, scaled by the ratio of average annual labor-force growth to average annual wage growth, with both averages computed over the appropriate intercensal period (or the nearest intercensal period, when extrapolating beyond 1871–1911).

The ex-textile-maintenance 1911-price value added series so obtained is then summed to the *IIPH* textile-maintenance series; the result is the new sector series in Table 4.1, col. 22.

7.6 Buildings

7.6.1 *Introduction*

"Buildings' services" actually refers only to *residential* services, as the actual or imputed rents of non-residential structures are included in the using sector's value added (e.g., Rey 1992, p. 289). The two extant series for the buildings'-services sector, and the new one (Table 4.1, col. 23), are illustrated in Figure 4.1, panel C5. Like the sesquicentennial miscellaneous-services series, the sesquicentennial buildings-services series appears to be a step backwards.

The present author investigated the construction industry in the 1980s (Fenoaltea 1987). The sources then reviewed included the census room-count data; the estimated benchmark aggregates pointed to a rise in the medium-term growth rate of the housing stock around the turn of the century, but little else. The more useful sources were the high-frequency tax data, in particular on assessed rental values, which yielded annual new-construction and maintainable-stock series for the period at hand (*IIPK*). These data pointed to sharp cyclical movements in new construction, and an unprecedented boom in the years before the Great War (driven, it appears, not by demography but by finance, Fenoaltea 1988a): the stock series grew with typically short-lived deviations from trend, and a perceptible acceleration over its final decade or so (Fenoaltea 1987, 2005).

The "benchmark" project yielded, in the first instance, Zamagni's value added estimate for 1911. A rent pool of 1,388 million lire was obtained from a census-derived room count attributed to the present author and evidence on site-specific rents per room; allowing 121 million for maintenance and administrative expenses, value added was estimated at 1,267 million lire (Rey 1992, pp. 234–236).[44]

[44] Zamagni applied her rent figures to (a total) 21,221,000 inhabited rooms, a number obtained from the estimated total number of rooms (24,992,000) by de-

In the second round a current-price estimate was constructed for 1891; the estimate for 1911 was not revised (Rey 2000, pp. 273–275, 384–369). The 1891 estimate, we are told, transformed the 1911 room stock "with the aid of the investment series in Fenoaltea (1987)" and the 1911 average rent with that of the rent index from the same source.[45]

The present author's 2005 building-services estimates took the "benchmark" 1911 value added figure at face value, and extrapolated it in proportion to the estimated stock of private buildings maintained (not limited to, but presumably overwhelmingly dominated by, residential structures).

The sesquicentennial Battilani-Felice-Zamagni current-price series is said to mate a room-stock series – Vitali's centennial estimates "based on the census data and interpolated with the trend of the population series" (with a correction for the early border changes, Battilani, Felice, and Zamagni 2014, pp. 48–49) – and the present author's rent index.[46] The current-price series incorporates

ducting empty rooms (3,281,000) and rooms used as offices (490,000); all these figures are said to come from p. K7–19 of the present author's ms. (the ms. pages numbered "K7" are those covering chapter K07, *IIPK*, pp. 82–92; on the census-based estimates see in particular section K07.05, pp. 87–92). The cited text actually states that "empty" there *includes* offices, and that the estimated number of *inhabited* rooms is (24,992,000 – 3,281,000) = 21,711,000 (ms. p. K7–17, now *IIPK*, p. 89). The additional 490,000 rooms used as offices (explicitly attributed to the present author, Rey 1992, p. 235, footnote 37) are nowhere mentioned in the quoted source, and the origin of that figure remains obscure.

45 The room count (number of rooms) and the investment series (million 1911 lire) need to be linked by a third element, which is not specified. The source of the cited alternative – "Fenoaltea's census-based estimate for 1891" – is again mysterious.

46 The annual stock estimates in Fenoaltea (2005), like the rest of that paper, are resolutely ignored (above, §7.1); from the author's entire work on the construction industry Battilani, Felice, and Zamagni cherry-picked the noted minor bits, and set the substance aside. As had been pointed out the population series is a poor index of the housing stock: because construction appears to have been finance-sensitive rather than population-sensitive (as noted above), and again because the population series itself appears to misrepresent demographic growth, as the migration estimates used to derive annual population figures from the census benchmarks were obtained through a defective algorithm (Fenoaltea 1988a, pp. 614, 635–637).

the earlier benchmarks for 1891 and 1911, obtained from the different sources recalled above: serendipity has its limits, and something unspecified was surely bent to fit.

Baffigi sheds some light on the matter. His 1911-price series, we are told, is the current-price series, deflated by the rent index used to construct it (Baffigi 2015, p. 110): it is in principle the Vitali/Battilani-Felice-Zamagni room-stock series itself. In fact, comparing Baffigi's and Vitali's series, both reduced to index form with 1911 = 1, one finds that Baffigi's is a constant 6.25 percent above Vitali's from 1871 to 1891, and then declines to meet it by 1911. The real index undergoes a forced deceleration to incorporate the earlier benchmarks, a deceleration that obliterates the acceleration evident in the data that inform both Vitali's estimates and the present author's.[47]

In the circumstances, the sesquicentennial series does not appear to improve on its immediate predecessor (Fenoaltea 2005); but the present estimates would improve on the latter too, amending both the 1911 benchmark and the extrapolating index. The new benchmark, again based on room counts and average unit rents and loosely confirmed by the buildings-tax data, is significantly higher than Zamagni's, in part because it includes the empty rooms to which she implicitly attributed a zero shadow price. The new building-stock index is improved by the removal of a here irrelevant lag, and even more because it now captures, as the earlier aggregate did not, the changing distribution of the stock in favour of the larger cities. The new estimates are thus generally higher, and grow faster, than their 2005 counterparts.

[47] For the period at hand Baffigi's work sheets contain only the current- and constant-price series, and the rent index; as the constant-price (stock) series departs little from its trend, while the rent series displays a strong cycle, the cyclical movements of the current-price series stem overwhelmingly from the latter. What is not clear is what exactly Baffigi received from Battilani, Felice, and Zamagni, and who did what to what; a likely scenario is that they themselves forced the current-price series through the benchmarks, that Baffigi then simply deflated it with the cited index, and that the imposed deceleration was thus passed into his constant-price series. Baffigi's rent index is also something of a *curiosum*: from 1872 to 1890 it closely tracks the present author's, albeit with varying third-digit differences; from 1891 to 1910 it is exactly the present author's for the succeeding year, suggesting an uncaught data-input error.

7.6.2 *Rents in 1911: a tax-based estimate*

Since the present author's construction-industry production estimates for private buildings are derived essentially from the assessed rentals that were subject to tax (*IIPK*, chapters K09 and K10), an estimate of the rent pool in 1911 can be obtained from the evidence used to derive them.

Perhaps the simplest approach is to work from the estimates of the maintainable stock of private buildings; these assume negligible maintenance on very new buildings, and correspondingly lag the total stock by a number of years. The total mid-year stock of taxable buildings in 1911, measured by embodied 1911-price construction value added, can be derived by extending *IIPK* Table K.53, col. 30 to 1914 and 1915, using the indicated data and algorithm, and averaging the two; the result equals 3,833 million lire.[48] The total mid-year stock of exempt buildings in 1911, similarly measured, can be derived by extending Table K.58, col. 6 to 1914 and 1915, again using the indicated data and algorithm, and averaging the two; the result equals 1,765 million lire. Using the coefficients in section K09.05, construction value net of land costs is set equal to (1/.34) times value added, and gross rents to (1/15) times construction costs; allowing a further 10 percent for base land costs, the corresponding rental values total some 827 million lire for taxable structures, and 381 million lire for exempt structures, net of site rents. In the case of taxable structures, the overall ratio of actual rents to rents net of site rents can be gauged from the breakdown of (1914) assessments, which included 255.8 million lire in the leading six municipalities, 125.2 million in the other provincial capitals, and 283.6 million lire elsewhere (Table K.53, cols. 14–16). The tax authorities indicated that in 1873 rents per room were in the proportions (8 : 3 : 1) for these three groups (section K09.03, p. 119); dividing the rent totals by these figures one obtains estimates of site-rent-free room rent

[48] The maintainable-stock figures for 1914 and 1915 respectively exclude, and include, new construction through 1911. The conceptual imperfections of that average, for present purposes, are that new construction includes that on still incomplete buildings, and that the demolition rate is applied to a stock that is inappropriately shifted; but these are beauty blemishes, and matter little on an ugly face.

totals of for the three groups that assign 9 percent of the overall aggregate to the first, 12 percent to the second, and 79 percent to the residual. Multiplying 9 percent of the ex-site-rent 1911 aggregate estimated above (752 million lire) by 8, 12 percent of it by 3, 79 percent by 1, and summing, one obtains an estimate of the rental value of taxable private structures in 1911 equal to 1,546 million lire. Repeating the exercise on the assumption that by 1911 the rent-per-room ratios had grown to (10 : 4 : 1), the estimated total rises to 1,645 million lire; the lower of these two estimates is 1.9 times the ex-site-rent base, the higher 2.0 times that. Exempt structures were overwhelmingly but not exclusively rural (section K09.02; also K10.03), and should accordingly include (only) a modest quota of site rents; 5 percent is here tentatively added to the above-estimated ex-site-rent base of 381 million lire, for a total of 400 million lire for exempt structures, and 1,946 to 2,045 million lire in all private structures together.

The reduction to exclude non-residential structures is also uncertain. In the late 1880s, workshops appear to have accounted for some 10 percent of assessed rents (section K09.04, p. 127), and, by extension, of actual rents. Allowing a similar ratio for workshops in 1911, and crudely allowing as much again for other commercial space, non-residential structures are here attributed 20 percent of the taxable-structure rent pool, or 309 to 329 million lire, leaving 1,637 to 1,716 million lire to residential structures.

7.6.3 *Rents in 1911: a rooms-based estimate*

The 1911 benchmark can also be calculated, following Zamagni, from the evidence on rooms and rents per room. The basic sources are two: the 1911 census room counts (*Censimento demografico*, vol. 7), and the rich sample of urban rents provided for 1908 by Ugo Giusti (*Annuario città 1909-1910*). The census reports, for all provincial capitals and other municipalities with over 15,000 persons present – near 300 in all – the number of persons present, the number of dwelling units, their distribution by number of rooms (from 1 to 5 by unit increments, plus 6 and over), and their destination, to wit, inhabited, used for offices, and empty: all this for the municipality's major city on the one hand, and the rest of the municipality on the other.[49] These data were used (in the mid-1980s) to estimate the stock of rooms (*IIPK*, section K07.05). The major cities in the census sample included 5.616 million inhabited and .493 million other ("empty") inhabitable rooms, and 7.981 million people; the residual areas of those municipalities, 1.846 million inhabited rooms, .295 million other rooms, and 3.050 million people. Drawing on the more complete data provided by the 1881 census, the number of inhabited rooms per person in those residual areas is considered representative of the rest of the Kingdom, whence an estimated total of 21.711 million inhabited rooms (for 34.671 million people, less the estimated 0.25 percent living in boats, caves, and the like); the number of empty rooms per person appears to have been slightly (9.3 percent) higher in the rest of the Kingdom than in those residual areas, whence an estimated total of 3.281 million empty rooms (including offices), and 24.992 million inhabitable rooms in all.[50]

A marginal extension to those calculations can split out the rooms used as offices. In the census sample, the units' distribution by size points to .166 million rooms used as offices and .327 million strictly empty rooms in the major cities, and .030 million rooms used as offices and .265 million strictly empty rooms in those municipalities' residual areas. The relative magnitude of these last two figures suggests that the 2.493 million "empty" rooms attributed to the rest of the Kingdom included some .254 million offices and 2.239 strictly empty rooms. Overall, therefore, the national 24.992 million room total would include .450 million rooms used as offices, and 24.542 million residential rooms (21.711 million inhabited, and 2.831 million not).[51]

In Table 7.5, panels A and B, cols. 1 and 4 report the (sample-municipality) major-city and residual population, ordered by

[49] The rest of the municipality typically included numerous separate small towns, e.g., in the case of Rome, Ostia and Fiumicino on the nearby coast (*Censimento demografico*, vol. 1, p. 443). The residual population of Cesena is reported as 3,686, *corrige* 30,686 (ibid., vol. 7, p. 300*, vol. 1, p. 230).

[50] Absent this small correction, the estimated total number of rooms would be 24.844 million, 3.074 million of them empty.

[51] Zamagni's .490 million offices is thus neither stated nor implied by her ostensible source.

major-city population; cols. 2 and 5 report the corresponding total number of rooms, excluding only offices, cols. 3 and 6 the (strictly) empty ones.[52] Giusti provided rent ranges for 6-room elegant and modest bourgeois units, and for 1-, 2-, and 3-room working-class units for 66 cities in 1908. These data are here collapsed into two per-room figures, to wit, one for bourgeois units, and one for working-class units. On the assumption that Giusti's rent ranges correspond to size/quality ranges, and the social pyramid was nearer a ziggurat than a wedding cake, each range is reduced to the average of the end-points, with a double weight on the lower. The bourgeois average is the average of the figures for elegant and modest six-room units, divided by six, again with a double weight on the lower; the working-class average is simply an average for the three size-specific averages, weighted by the number of rooms per unit, as if there were a similar numbers of units in each size class. The resulting estimates are transcribed in Table 7.5, panels A and B, cols. 7 and 8, in roman.[53]

[52] Data entry is tedious but instructive. Ferrara, for example, includes zero office space: a signal that the census counted only the office space in inhabited (or inhabitable) dwellings, and not all office space (*Censimento demografico*, vol. 7, p. 209), implying *inter alia* that the reported number of offices cannot be used as an indicator of business activity. Units are here converted to rooms using the frequency distributions, assuming as before (*IIPK*, p. 88) an average of 7 rooms for those of 6 and more (the sample data are consistent, save in the case of, again, Ferrara: 3 units, or up to 21 rooms, may have been missed). Empty rooms are not excluded, on the (shadow-price) grounds already noted. The share of empty rooms is typically a single-digit percentage, but with outliers over 20 percent in the city (37 percent in Ragusa), and over 40 in the rest of the municipality (77 percent in Syracuse). These astonishing figures appear to reflect seasonal migration, some of it no doubt long-distance; especially in the South, however, many farm workers wintered in large agglomerations but spent the summers near the fields they worked, sleeping under rudimentary shelter (as noted by the *Censimento 1881*, *Relazione generale*, pp. XXIV, 94; the 1881 census was taken in winter, the 1911 census in summer). Conversely, as can be seen from Table 7.5, panels A and B, cols. 1–4, the number of people per room (excluding offices) was typically within a relatively narrow band (say between 1 and 2.5), but with notable exceptions among the cities (7 in Foggia) and especially in the residual municipalities (8 in Naples, 31 in Caserta, 56 in Genoa), variously suggesting permanent poverty, unhoused seasonal farm workers, and *bidonvilles* of immigrants attracted by industrial growth.

[53] The figures in italics, differently derived, are returned to below. Giusti's figures indicate, for Andria (panel A), costs ranging from 50 to 100 lire per room for bour-

The split between panels A and B reflects an investigation of the entire Giusti sample, associating the estimated average urban rents (cols. 7 and 8) to the size of the urban population (col. 1). In general, rents rise with city size, but only beyond a threshold in the neighbourhood of 35,000 people: in smaller towns rents seem not to vary systematically with size, suggesting that the built-up areas themselves were small enough practically to annul site rents, and, derivatively, that the average rent essentially reflected construction costs rather than land costs. Table 7.5, panel A accordingly covers the 40 cities with more than 35,000 people, including the (italicized) 12 not in Giusti's sample.[54] Together, their urban centers contain 3.559 million rooms, excluding offices (col. 2), or some 14.5 percent of the estimated national total (24.542 million rooms, excluding offices); these here represent only themselves.[55] Panel B covers the other 38 cities in Giusti's sample. Together, for the reason noted, they are taken to represent all other housing, urban, suburban, and dispersed, that is, the residual (24.542 – 3.559) = 20.983 million rooms.[56] The median pairs of these 38 sample rents average 82.5 lire per bourgeois room, and 49.5 lire per working-class room.

The rent pool in 1911 is accordingly estimated through the following steps. The first order of business is to estimate the 12 missing

geois housing, and 65 to 100 lire per room for working-class housing, and again for Perugia (panel B), costs ranging from 33 to 100 lire per room for bourgeois housing, and 50 to 100 lire per room for working-class housing: a curious pattern that points to error, to some form of discrimination, or significantly larger (less private) working-class rooms.

54 These are, in order, Palermo, Catania, Foggia, Messina, Taranto, Modica, Trapani, Corato, Molfetta, Barletta, Modena, and Piacenza, all but the last two Apulian or Sicilian.

55 Of these 40, 31 were provincial capitals: all save Taranto (in the province of Lecce), Andria, Corato, Molfetta, and Barletta (Bari), Modica (Syracuse), and S. Pier d'Arena, La Spezia, and Savona (Genoa). Of the other 38 provincial capitals, 14 (Pavia, Mantua, Siena, Caltanissetta, Pisa, Treviso, Ravenna, Perugia, Lucca, Reggio Emilia, Pesaro, Cuneo, Arezzo, and Grosseto) appear in panel B.

56 Panel B includes Lecco, in Giusti's sample but too small to be covered by the census room count. The estimates in cols. 1 and 4 attribute the municipality's nucleated population to the city (*Censimento demografico*, vol. 1, p. 167); urban and exurban rooms (cols. 2–3, 5–6) are estimated from the corresponding populations, borrowing the ratios registered for Como.

rent pairs in panel A. The rent pool at 1908 rents per room is then obtained by estimating the split between bourgeois and working-class rooms in each of the 40 major urban centers, and in the large residual. The resulting aggregate rent pool is then converted to 1911 rents using, *faute de mieux*, the usual rent index.

The 12 missing rent pairs in panel A, which involve around 2.6 percent of the rooms at hand, are estimated through a simple regression analysis of the other 28. The dependent variables are the bourgeois-housing rents (col. 7) on the one hand, and the working-class-housing rents (col. 8) on the other. The (common) independent variables are the regressors collected in panel C.[57] The first (col. 1) is of course the urban population (panel A, col. 1), as an indicator of city size. The second (col. 2) is an index of urban growth, calculated as the ratio of the urban center's population in 1911 to that in 1901, as reported in the *Censimento demografico*, vol. 7, p. 56*. Like the figures in col. 1, these refer to the number of persons present, and suffer from the shift in the census date from winter (1901), when seasonal migrants were mostly present, to summer (1911), when they were not. The third regressor (col. 3) is a measure of demographic pressure, the ratio of the persons present to the available rooms (panel A, col. 1/ col. 2); like the previous regressors, it is presumably distorted by the absence of seasonal migrants. The fourth regressor is accordingly the share of empty rooms in 1911 (the ratio of col. 3 to col. 2 in panel A): it should in principle offset the distortions in the preceding regressors, as a high share, for example, would point to larger winter population, a higher growth rate, season on season, and greater demographic pressure. The fifth regressor is a regional index, running from 1 to 16, rising as one moves from North to South; it should pick up the macro-regional rent gradient, if present.[58] The sixth and final

[57] Panel C includes all 40 cities in panel A. The 28 non-italicized cities are the sample that generates the regression results. The values of the regressors for the other 12 (italicized) cities are combined with the coefficients of the selected regression equations to generate the rent estimates that appear, for those (italicized) cities, in panel A.

[58] The regional indices are in the order Piedmont (1), Liguria, Lombardy, Venetia, Emilia, Tuscany, Marches, Umbria, Latium, Abruzzi, Campania, Apulia, Basilicata, Calabria, Sicily, Sardinia (16).

Table 7.5 *Urban population, residential rooms, and room rents*

Panel A: All cities over 35,000 in the urban center: population, rooms, and rents

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
	1911 census data						Giusti sample	
	urban center			residual area			lire/room, 1908	
munici-	persons	rooms ex offices		persons	rooms ex offices		bour-	working
pality	present	total	empty	present	total	empty	geois	class
Naples	621,563	397,970	8,770	56,468	6,769	840	280	237
Milan	579,385	435,257	10,741	19,815	9,151	599	167	115
Rome	504,566	355,524	10,452	37,557	14,644	729	230	171
Turin	357,473	261,487	6,599	69,633	71,056	9,191	180	109
Palermo	*279,597*	*232,354*	*13,794*	*61,491*	*52,727*	*9,915*	*174*	*122*
Florence	207,584	211,557	7,143	25,276	21,735	1,564	91	59
Catania	*203,906*	*129,896*	*6,964*	*6,797*	*19,171*	*3,149*	*154*	*107*
Genoa	173,270	277,425	11,484	98,951	1,745	167	152	120
Venice	151,485	126,918	3,454	9,234	2,420	0	157	118
Bologna	132,673	120,340	2,798	39,955	27,276	581	93	68
Bari	95,574	49,051	7,254	8,096	3,608	161	207	103
Leghorn	89,908	78,461	1,249	15,407	14,687	419	75	50
Foggia	*71,632*	*30,657*	*0*	*5,048*	*922*	*0*	*83*	*59*
Messina	*63,545*	*31,965*	*242*	*63,012*	*32,447*	*123*	*106*	*88*
Verona	62,179	51,285	1,088	19,730	14,686	707	91	46
Cagliari	55,765	36,272	546	4,336	1,908	12	92	64
Brescia	55,608	44,711	737	27,730	18,767	581	106	71
Taranto	*55,292*	*29,681*	*554*	*13,986*	*7,768*	*1,155*	*109*	*86*
Padua	52,099	46,738	1,732	44,131	21,492	1,490	156	89
Parma	51,122	38,846	3,113	788	3,267	212	81	42
Andria	50,591	28,690	1,282	2,693	1,260	0	67	73
Modica	*50,540*	*21,645*	*3,156*	*5,384*	*1,767*	*321*	*169*	*86*
Ancona	50,269	41,614	462	12,831	7,048	44	90	85
Trapani	*47,500*	*40,526*	*6,540*	*12,093*	*11,762*	*2,569*	*173*	*81*
Corato	*44,745*	*14,105*	*978*	*458*	*380*	*254*	*110*	*54*
Molfetta	*42,843*	*17,425*	*164*	*420*	*111*	*0*	*96*	*75*
Bergamo	42,715	37,711	511	12,591	3,834	159	104	55
Barletta	*41,397*	*16,694*	*503*	*2,904*	*800*	*31*	*105*	*75*
Modena	*40,526*	*34,632*	*606*	*30,397*	*19,112*	*1,444*	*84*	*53*
Ferrara	39,768	28,917	365	55,444	35,342	151	130	65
Cremona	39,506	29,515	1,580	930	7,706	314	76	50
S. Pier d'Arena	38,871	39,075	1,460	3,550	3,083	118	106	70
Novara	38,669	26,620	275	15,902	5,843	623	107	57
Vicenza	38,366	25,014	595	16,189	14,095	253	89	61
Piacenza	*38,178*	*28,735*	*862*	*364*	*174*	*4*	*99*	*66*
Alessandria	38,067	28,180	353	37,654	28,224	2,356	103	55
La Spezia	37,297	35,209	1,122	36,302	20,663	1,191	139	130
Savona	36,980	39,468	1,569	13,189	12,449	836	89	70
Como	35,390	11,405	261	8,742	24,628	1,161	94	73
Sassari	35,042	27,446	1,180	8,076	3,275	333	104	66

TABLE 7.5 *(continued)*

Panel B: Other cities in the Giusti sample: population, rooms, and rents

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
	1911 census data						Giusti sample	
	urban center			residual area			lire/room, 1908	
	persons	rooms ex offices		persons	rooms ex offices		bour-	working
municipality	present	total	empty	present	total	empty	geois	class
Monza	34,466	22,917	198	18,748	8,624	109	95	73
Pavia	34,316	24,531	1,263	5,582	7,164	337	76	55
Ragusa	33,717	4,685	1,730	3,826	2,267	1,071	89	62
Mantua	31,957	25,425	634	700	186	0	84	70
Caltagirone	30,459	20,390	5,046	12,106	7,731	4,384	39	32
Siena	30,311	31,257	559	11,362	9,288	102	65	29
Caltanissetta	29,495	16,268	2,139	11,817	5,240	1,885	111	49
Pisa	29,237	28,244	718	35,995	29,007	1,303	80	50
Chioggia	28,927	16,730	380	6,134	7,913	129	97	61
Marsala	27,337	35,161	8,904	38,114	89,336	30,509	50	26
Treviso	25,271	23,138	1,558	15,751	10,969	1,100	128	48
Castrogiovanni	24,606	15,236	357	3,706	4,755	2,362	56	28
Vercelli	24,447	13,127	176	7,456	6,731	318	81	52
Asti	23,273	19,794	683	16,420	12,105	1,417	119	54
Brìndisi	22,616	11,043	83	5,570	1,647	57	103	88
Ravenna	22,442	16,279	290	49,139	27,758	693	113	60
Terni	22,097	15,069	72	10,842	6,040	252	104	65
Perugia	22,027	20,683	503	43,778	28,956	1,542	56	71
Sestri Ponente	21,464	20,407	302	0	0	0	78	62
Lucca	21,213	26,197	1,462	54,947	61,756	7,198	57	37
Reggio Emilia	20,727	18,744	420	49,692	28,559	852	89	48
Faenza	20,177	30,256	930	19,987	13,491	815	74	43
Rimini	19,996	21,263	4,745	30,856	24,309	6,376	85	34
Prato	18,207	14,886	281	38,502	29,921	0	66	46
Busto Arsizio	17,130	12,461	142	8,499	4,813	98	104	47
Viterbo	16,982	13,817	484	6,317	4,525	446	52	36
Pesaro	16,217	14,072	264	11,131	7,310	227	197	78
Biella	16,147	13,243	96	6,372	4,140	102	102	67
Viareggio	15,477	18,120	1,924	5,651	5,432	696	81	43
Cesena	14,913	9,706	73	30,686	17,806	112	70	30
Cuneo	14,545	13,436	1,165	12,925	17,904	11,519	80	47
Arezzo	14,486	12,722	204	33,018	23,188	1,810	63	44
Imola	14,370	9,823	98	20,611	11,445	132	52	40
Civitavecchia	14,265	9,328	48	4,471	1,069	49	117	99
Pinerolo	14,005	12,071	502	5,320	3,577	447	89	54
Lecco	11,848	3,818	87	298	840	40	92	60
Spoleto	8,416	6,992	428	17,580	9,049	1,555	67	39
Grosseto	6,280	3,801	29	6,162	3,141	4	110	96

Table 7.5 *(continued)*

Panel C: All urban centers over 35,000: rent-related variables, 1911

	(1)	(2)	(3)	(4)	(5)	(6)
	persons present			empty	regio-	topogr.
munici-pality	total (000)	1911/ 1901	per room	rooms (share)	nal index	const't index
Naples	621.563	1.262	1.562	.0220	11	5.0
Milan	579.385	1.249	1.331	.0247	3	0.0
Rome	504.566	1.188	1.419	.0294	9	1.0
Turin	357.473	1.264	1.367	.0252	1	3.5
Palermo	*279.597*	*1.049*	*1.203*	*.0594*	*15*	*5.0*
Florence	207.584	1.310	.981	.0338	6	1.0
Catania	*203.906*	*1.424*	*1.570*	*.0536*	*15*	*5.0*
Genoa	173.270	1.088	.625	.0414	2	7.0
Venice	151.485	1.041	1.194	.0272	4	10.0
Bologna	132.673	1.066	1.102	.0233	5	3.0
Bari	95.574	1.321	1.948	.1479	12	5.0
Leghorn	89.908	1.056	1.146	.0159	6	5.0
Foggia	*71.632*	*1.464*	*2.337*	*.0000*	*12*	*0.0*
Messina	*63.545*	*.688*	*1.988*	*.0076*	*15*	*7.0*
Verona	62.179	1.002	1.212	.0212	4	2.0
Cagliari	55.765	1.146	1.537	.0151	16	7.0
Brescia	55.608	1.157	1.244	.0165	3	1.0
Taranto	*55.292*	*1.156*	*1.863*	*.0187*	*12*	*7.0*
Padua	52.099	1.011	1.115	.0371	4	0.0
Parma	51.122	1.077	1.316	.0801	5	0.0
Andria	50.591	1.041	1.763	.0447	12	0.0
Modica	*50.540*	*1.063*	*2.335*	*.1458*	*15*	*7.0*
Ancona	50.269	1.472	1.208	.0111	7	7.0
Trapani	*47.500*	*1.075*	*1.172*	*.1614*	*15*	*6.0*
Corato	*44.745*	*1.094*	*3.172*	*.0693*	*12*	*0.0*
Molfetta	*42.843*	*1.075*	*2.459*	*.0094*	*12*	*5.0*
Bergamo	42.715	1.025	1.133	.0136	3	2.5
Barletta	*41.397*	*1.025*	*2.480*	*.0301*	*12*	*5.0*
Modena	*40.526*	*1.425*	*1.170*	*.0175*	*5*	*0.0*
Ferrara	39.768	1.110	1.375	.0126	5	0.0
Cremona	39.506	1.070	1.339	.0535	3	0.0
S. Pier d'Arena	38.871	1.158	.995	.0374	2	7.0
Novara	38.669	1.306	1.453	.0103	1	0.0
Vicenza	38.366	1.278	1.534	.0238	4	3.0
Piacenza	*38.178*	*1.062*	*1.329*	*.0300*	*5*	*3.0*
Alessandria	38.067	1.059	1.351	.0125	1	2.0
La Spezia	37.297	.974	1.059	.0319	2	7.0
Savona	36.980	1.258	.937	.0398	2	7.0
Como	35.390	1.104	3.103	.0229	3	1.0
Sassari	35.042	1.070	1.277	.0430	16	0.0

Table 7.5 *(continued)*

Panel D: Regression results, bourgeois-housing rents

Dependent variable: bourgeois-housing rents (panel A, col. 7)

Coefficients and *t*-statistics:

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
		persons present			empty	regio-	topogr.	
specifi-cation	con-stant	total	1911/1901	per room	rooms (share)	nal index	const't index	adj'd R sq'd
(1)	89.8 (1.48)	.249 (6.44)	−34.8 (−.07)	11.0 (.72)	483.6 (2.03)	−.240 (−.16)	3.61 (1.68)	.616
(2)	66.5 (5.52)	.230 (6.95)			482.1 (2.24)		2.99 (1.55)	.650
(3)	75.9 (7.09)	.239 (6.73)			484.4 (2.19)			.630
(4)	83.0 (8.07)	.234 (6.31)					3.02 (1.45)	.594

Panel E: Regression results, working-class-housing rents

Dependent variable: working-class-housing rents (panel A, col. 8)

Coefficients and *t*-statistics:

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
		persons present			empty	regio-	topogr.	
specifi-cation	con-stant	total	1911/1901	per room	rooms (share)	nal index	const't index	adj'd R sq'd
(1)	67.1 (1.46)	.208 (7.09)	−42.7 (−1.05)	12.4 (1.06)	95.8 (.53)	.630 (.54)	5.11 (3.15)	.678
(2)	40.2 (4.24)	.200 (7.36)			134.2 (.79)		4.39 (2.89)	.684
(3)	54.0 (5.80)	.198 (6.41)			137.5 (.66)			.591
(4)	44.8 (6.01)	.198 (7.37)					4.39 (2.91)	.689

Table 7.5 *(continued)*

Panel F: All urban centers over 35,000: rent-pool estimates (1911, at 1908 prices)

	(1)	(2)	(3)	(4)	(5)	(6)
munici-	domestic	bourg.	work'g-cl.	rent pool (million lire)		
pality	servants	rooms	rooms	bourg.	work'g-cl.	total
Naples	27,563	95,095	302,875	26.627	71.781	98.408
Milan	29,230	103,488	331,769	17.282	38.153	55.435
Rome	24,399	84,794	270,730	19.503	46.295	65.798
Turin	18,781	62,100	199,387	11.178	21.733	32.911
Palermo	8,920	29,217	203,137	5.084	24.783	29.867
Florence	13,379	45,550	166,007	4.145	9.794	13.939
Catania	4,474	15,847	114,049	2.440	12.203	14.643
Genoa	11,283	33,236	244,189	5.052	29.303	34.355
Venice	6,563	22,948	103,970	3.603	12.268	15.871
Bologna	7,195	22,904	97,436	2.130	6.626	8.756
Bari	2,900	10,032	39,019	2.077	4.019	6.096
Leghorn	3,203	10,687	67,774	.802	3.389	4.191
Foggia	891	3,102	27,555	.257	1.626	1.883
Messina	1,399	3,783	28,182	.401	2.480	2.881
Verona	2,696	8,537	42,748	.777	1.966	2.743
Cagliari	2,843	9,866	26,406	.908	1.690	2.598
Brescia	2,785	8,358	36,353	.886	2.581	3.467
Taranto	659	2,133	27,548	.232	2.369	2.601
Padua	3,756	10,421	36,317	1.626	3.232	4.858
Parma	2,799	10,000	28,846	.810	1.212	2.022
Andria	340	1,193	27,497	.080	2.007	2.087
Modica	981	3,362	18,283	.568	1.572	2.140
Ancona	1,261	4,078	37,536	.367	3.191	3.558
Trapani	1,159	3,749	36,777	.649	2.979	3.628
Corato	195	698	13,407	.077	.724	.801
Molfetta	283	1,014	16,411	.097	1.231	1.328
Bergamo	1,960	6,253	31,458	.650	1.730	2.380
Barletta	283	985	15,709	.103	1.178	1.281
Modena	2,275	6,435	28,197	.541	1.494	2.035
Ferrara	2,016	5,144	23,773	.669	1.545	2.214
Cremona	2,136	7,601	21,914	.578	1.096	1.674
S. Pier d'Arena	628	2,166	36,909	.230	2.584	2.814
Novara	1,155	3,552	23,068	.380	1.315	1.695
Vicenza	1,746	5,353	19,661	.476	1.199	1.675
Piacenza	1,288	4,615	24,120	.457	1.592	2.049
Alessandria	1,194	3,230	24,950	.333	1.372	1.705
La Spezia	1,201	3,257	31,952	.453	4.154	4.607
Savona	1,029	3,217	36,251	.286	2.538	2.824
Como	1,739	5,640	5,765	.530	.421	.951
Sassari	1,478	4,823	22,623	.502	1.493	1.995

NB: the domestic servants in col. 1 refer to the entire municipality.

Table 7.5 *(continued)*

Panel G: Distribution of the resident population, by municipality size, census years

municipality population (1971 borders)	(1) distribution of the resident population by municipality size (thousand persons) 1861	(2) 1871	(3) 1881	(4) 1901	(5) 1911	(6) urban share 1911	(7) urban scale factor
1. over 700,000	0	0	0	0	1,453	.83	.830
2. 600,000 to 699,999	0	0	0	621	0		.800
3. 500,000 to 599,999	0	0	535	528	519	.97	.770
4. 400,000 to 499,999	484	489	0	422	881	.60	.740
5. 300,000 to 399,999	0	0	354	1,017	339	.82	.710
6. 200,000 to 299,999	510	1,395	1,059	237	674	.80	.680
7. 150,000 to 199,999	879	165	362	343	179	.74	.658
8. 100,000 to 149,999	221	231	354	295	470	.66	.643
9. 80,000 to 99,999	178	267	187	453	363	.55	.632
10. 60,000 to 79,999	269	396	605	884	1,123	.54	.626
11. 40,000 to 59,999	777	617	576	849	948	.62	.620
12. under 40,000	22,352	23,742	24,819	27,323	28,892		
13. Total	25,671	27,301	28,861	32,983	35,842		

Panel H: Distribution of the major-city population, by municipality size, census years

municipality population (1971 borders)	(1) distribution of the major-city population by municipality size (thousand persons) 1861	(2) 1871	(3) 1881	(4) 1901	(5) 1911	(6) rent/ room 1911
1. over 700,000	0	0	0	0	1,206	187
2. 600,000 to 699,999	0	0	0	497	0	171
3. 500,000 to 599,999	0	0	412	414	400	151
4. 400,000 to 499,999	358	362	0	312	652	133
5. 300,000 to 399,999	0	0	251	722	241	116
6. 200,000 to 299,999	347	949	720	161	458	100
7. 150,000 to 199,999	578	109	238	226	118	88
8. 100,000 to 149,999	142	149	228	190	302	81
9. 80,000 to 99,999	112	169	118	286	229	77
10. 60,000 to 79,999	168	248	379	553	703	74
11. 40,000 to 59,999	482	383	357	526	588	71
12. under 40,000	23,484	24,932	26,148	29,096	30,945	51
13. Total	25,671	27,301	28,861	32,983	35,842	
14. 1911-price rent index	.899	.904	.915	.955	1.000	

Source: see text.

regressor is a crude index of the topographic constraints on urban growth, rising from 0 for apparently unconstrained cities ("in a featureless plain") to 10 for cities totally hemmed in (by escarpments or, as in the extreme case of Venice, by water); it was obtained by a simple inspection of the present-day map, and estimating, by eye, the share of the old center's circumference which was subsequently built up.[59]

The regression results are collected in panels D (bourgeois rents) and E (working-class rents). In both panels, the city-size variable (col. 2) displays considerable significance, as expected, and comfortingly stable coefficients across specifications. Again in both panels, the urban-growth variable (col. 3), the demographic-pressure variable (col. 4), and the regional-gradient variable (col. 6) appear thoroughly useless, the first of these surprisingly so. The contribution of the topographic-constraint variable (col. 7) is instead marginal in the case of bourgeois rents, and much more significant in that of working-class rents; this suggests that the upper classes readily found space in the city's core (itself perhaps defined by their presence), and that the limits to urban expansion were suffered by the workers who crowded around them. The share-of-rooms-empty variable (col. 5), which should correct for (working-class) seasonal migration, is instead somewhat surprisingly useless in the working-class-rent equations, and even more surprisingly, *not* useless in the bourgeois-rent equations. This last result is tied to the city of Bari, where no less than 15 percent of the rooms were empty (panel C, col. 4), and bourgeois rents (but not working-class rents) were, for the city's size, remarkably high (panel A, cols. 7 and 8).[60] On the other hand, a number of the rents to be estimated refer to cities much like, and often physically close to, Bari itself, much less an outlier in the company of those 12 than among the 28 in the regression sample. With only limited misgivings, therefore, the missing 12 rent pairs are estimated from the data in panel C using panel D, equation (2) for bourgeois rents,

[59] The estimate for Bergamo is particularly weak, as it is not clear whether the indicated rents refer to the hemmed-in *città alta* or the essentially unconstrained city in the plain.

[60] If Bari is removed from the sample the share-empty coefficient in panel D, equation (2) becomes negative, with a t near −.4.

and panel E, equation (4) for working-class rents. The resulting estimates appear, in italics, in panel A, cols. 7 and 8.

As here averaged, the city-specific bourgeois-room rents in Giusti's sample range from under 1.00 to over 2.50 times the corresponding working-class-room rents, with a median ratio in excess of 1.50: the rent pool depends heavily on the housing mix, documented neither by Giusti nor by the census housing data. Here, the mix is estimated from the data on domestic servants in the *Censimento demografico*, vol. 4. It is initially assumed that modest 6-room bourgeois units averaged 1.25 servants, and elegant ones twice as many; further assuming as before that there were two modest units for each elegant one, the average number of bourgeois rooms per servant works out to 18/5 = 3.6. The data and estimates for the 40 largest urban centers are collected in Table 7.5, panel F. Col. 1 transcribes the reported number of domestics in the entire municipality; the figures for the city proper are not available. Col. 2 transcribes the estimated number of bourgeois rooms in the major urban center. It is the simple average of two alternative estimates. The first is simply the number of domestics in the municipality (col. 1), times 3.6; it implicitly assumes that the municipality's upper classes were concentrated entirely in the major city. The second is that first estimate, multiplied by the major city's share of the municipality's population (panel A, col. 1/(col. 1 + col. 2)); it assumes an equal proportion of domestics, and upper-class individuals, in the major city and the rest of the municipality. Col. 3 transcribes the estimated number of working-class rooms in the major urban center; it is obtained by deducting the estimated number of bourgeois rooms (col. 2) from the total number of rooms in the urban center (panel A, col. 2). Cols. 4 and 5 are the major-city bourgeois and working-class rent pools, obtained as the product of room numbers (cols. 2 and 3) and the corresponding rents per room (panel A, cols. 7 and 8); their sums are transcribed in col. 6.[61]

[61] The bourgeois rent pool is typically 15 to 35 percent of the total. The upside outlier is Como, virtually an upper-class enclave; the downside outliers reasonably include such towns as Andria, Barletta, Corato, and Molfetta, all near Bari, and S. Pier d'Arena near Genoa. The use of equation (2) in panel D does not appear to have generated obvious distortions.

Together, these 40 urban centers are attributed 668,463 bourgeois rooms and 2,890,558 working-class rooms; the corresponding rent pools sum to 113.846 and 332.918 million lire, yielding averages of 170 and 115 lire per room, respectively, and 446.764 million lire in all. The total number of domestic servants was reported at 483,209, yielding 1,739,552 bourgeois rooms in all, for a residual 1,071,089 bourgeois rooms elsewhere. Given the estimated total number of rooms (24,542,000, excluding offices), the number of working-class rooms elsewhere works out to 19,911,890 (24,542,000 total rooms, less 1,739,552 total bourgeois rooms, less 2,890,558 working-class rooms in the 40 major urban centers); applying the median rents estimated above (respectively 82.5 lire per bourgeois room, and 49.5 lire per working-class room), the residual rent pools work out to 88.365 and 985.639 million lire, respectively, and 1,074.003 million lire for the two together. Adding this last to the above figure for the 40 major cities, the total rent pool in 1911 is estimated equal to 1,520.8 million lire at 1908 rental rates. Dividing that figure by .898 (the value of the usual rent index in 1908, with 1911 = 1), one obtains an estimate of the rent pool in 1911 of 1,694 million lire.

This result is as noted sensitive to the weighting of bourgeois and working-class rooms, and therefore, given the present algorithm, to the estimated number of bourgeois rooms per servant. If modest 6-room bourgeois units are attributed the minimal 1.00 servant each rather than 1.25, and elegant units 2.00 servants rather than 2.50, assuming as before that there were two modest units for each elegant one the average number of bourgeois rooms per servant works out to 18/4 = 4.5 rather than 3.6; working through the calculations as above, the estimated total rent pool in 1911 rises to 1,712 million lire. Allowing instead a probably excessive 1.50 servants per modest unit and 3.00 per elegant one, bourgeois rooms per servant fall to 3.0, and the estimated total rent pool in 1911 falls to 1,681 million lire. The estimates are not unduly sensitive to the assumed number of servants per bourgeois dwelling, and the entire range from 1,681 to 1,712 million lire is contained in the 1,637 to 1,716 million lire calculated from the buildings-tax data.

The value added estimate selected here is the central room-based rent-pool estimate of 1,694 million lire. From the rent pool Zamagni deducted 98 million lire for maintenance (the present author's 103 million lire for private buildings, less 5 percent for non-residential structures), and a further 23 million for administrative costs (Rey 1992, p. 237). This last, small deduction is here rejected, as the corresponding income is not clearly counted elsewhere (and the rent pool is in any case largely imputed); and so is the maintenance deduction, as maintenance is here considered an investment rather than an operating cost (above, ch. 2A).[62]

7.6.4 *Buildings (1861–1913)*

The 2005 building-services series extrapolated the 1911 benchmark in direct proportion to the stock-maintained series, already derived to serve as an index of the maintenance activity counted as part of the construction industry. That stock-maintained series assumed negligible maintenance on very new buildings, and corresponds essentially to the extant stock, lagged a few years; that lag is here removed, and the (un)shifted series better tracks the stock actually in service. Here, the starting point is the 1911-price series for (construction value added) in the maintenance of private structures (*IIPK*, Table K.58, col. 8; Fenoaltea 1987, Table 4, col. 4), itself a constant (.012) times (the construction value added embodied in) the stock to be maintained. The first step is to extend that series, with the data and algorithms provided, to 1917; the added estimates for 1914–1917 equal 66.9, 68.8, 70.8, and 72.7 million lire, respectively. The second step removes the estimated losses from the earthquake at the end of 1908; this is done by adding .7 million lire (.012 times the estimated stock lost, 52.7 million lire of taxable structures and 6.5 million lire of exempt structures) to the figures for 1909–1917. The third step shifts the series 3.5 years backwards, so that the revised estimate for 1911 is obtained from the original ones for 1914 (which reflects new construction through 1910) and

[62] The revised estimate of residential structures' value added in 1911 (1,694 million lire) is some 34 percent above the Zamagni/sesquicentennial benchmark of 1,267 million lire, and 59 percent above Istat's centennial estimate of 1,067 million lire. With respect to Fenoaltea (2017) the benchmark is revised (again to correct the improper treatment of maintenance); the extrapolating algorithm (§7.6.4) is unchanged.

1915 (which includes new construction in 1911).[63] The fourth step deducts .7 million lire from the shifted estimates for 1909–1913, thus reintroducing the earthquake losses. The fifth step converts the resulting series into an index, with 1911 = 1; thanks to these modifications, the peaks in the stock's growth rate now coincide with the peaks in new construction. From 1861 to 1911, it may be noted, the stock increased by some 63 percent.

The final and at least conceptually more significant improvement to the series involves its disaggregation. The 1987/2005 stock series was constructed to track construction-industry value added in maintenance, which can be presumed roughly constant, in real terms, per standard unit, regardless of its location: a room is a room is a room. For present purposes, however, location matters, as the services of a room in the heart of a major city are worth far more than those of an otherwise identical room in the suburbs or in a smaller agglomeration.

The disaggregation and weighted reaggregation of the shifted room-stock series is based in turn on Istat (1977), Table 1, which reports, for every census date, the resident population of each municipality (*comune*) that was a provincial capital in 1971, at 1971 borders, and the residual population, by province and region.[64] All the municipalities and provinces in that table that were part of the Kingdom in 1911 enter the present sample. No data are provided for 1861 for the municipalities and provinces that were annexed between 1861 and 1871; those municipalities' population, and their provinces' residual population, in 1861 are here estimated assuming a constant growth rate from 1861 through 1871 to 1881.[65] An exception is made for the city of Rome, annexed in 1870, and thence the

[63] To be entirely logical, the estimated demolitions should be separately shifted; but these are a small constant times a slowly growing stock, and the error introduced by the present short-cut can be presumed immaterial.

[64] Istat (1977), Table 1, includes the corresponding figures for the population present at the census date. These are not used here, as housing demand seems more closely tied to residence than to presence. The sample includes the 69 provincial capitals of 1911, and 21 others that obtained that status in later years.

[65] The 1861 data include obviously partial data for the population outside the provincial capital in the province of Mantua, and in the provinces of Latium (other than Rieti, then part of Umbria). These are ignored, and estimated as if they were missing altogether.

national capital; its population in 1861 is directly estimated as 90 percent of that a decade later.

The outcome of the present algorithms is collected in Table 7.5, panel G. Rows 1–11, cols. 1–5 group the population of the sample municipalities at each census date, by size class: the upward drift over time, which justifies the present exercise, is obvious. It must also be noted that the sample in question is exhaustive in the upper reaches, but not in the lower ones: many small towns which never became provincial capitals were surely larger than many that were, or became so in later years.[66] Row 13 refers in turn to the total population. From 1871 to 1911 the transcribed total is the simple sum of the totals reported in Istat (1977), Table 1 for the regions present over those years, with the figures for Venetia augmented by the provincial totals for Pordenone and Udine (later transferred to Friuli-Venezia Giulia).[67] In 1861, the regional figures are amended, before being summed, to allow for missing or partial data.[68] Row 12 is the residual, obtained as the total in row 13 minus the sum of the figures in rows 1–11.

Col. 6 estimates the share of the municipalities' population that was actually in their major cities in 1911. For simplicity, it is calculated using the major cities' present-population figures in panels A and B, col. 1, and dividing the appropriate sum by the corresponding figure in panel G, col. 5.[69] These ratios vary widely

[66] The extreme case is the smallest municipality in the sample, what is now Latina: in the period at hand a village of a few hundred in the Pontine marshes, a town only after the latter were drained, between the Wars.

[67] Because the northeastern border changed over time, so did the borders of the corresponding municipalities; the present corrections are approximate, and the totals in line 13 differ from the actual census figures, but by less than 1 percent.

[68] The total for Lombardy is amended to replace the partial figure for the province of Mantua by the estimated figures for that town and the rest of that province. The total for Venetia (plus Pordenone and Udine) is obtained as the sum of the estimates for the major town, and the residual, of each province. The total for Latium is replaced by the sum of the data for the capital city and residual province of Rieti, and the corresponding estimates for the capital cities and residuals of the other provinces.

[69] The largest class, for example, consists in 1911 of Naples and Milan, with a combined major-city population of 1.201 million, against a (1971-border) municipal population of 1.453 million, for a ratio of .83. The urban population of towns that

from city to city, depending on the extent to which the countryside was inhabited (which in places it tended not to be, for example in Latium, and Apulia), and of course on the variations in municipal boundaries from 1911 to 1971 (whence for example a ratio of just .37 for Genoa, which absorbed S. Pier d'Arena and more in 1926). In general, however, and as one would expect, col. 6 reveals a tendency for the ratio to rise across size classes.

Panel H is accordingly a *reprise* of panel G, with the figures scaled to more nearly reflect the actual capital-city population of the major municipalities. The scale factor, transcribed in panel G, col. 7, is a monotonic one, loosely derived from col. 6 (and corresponding in principle to its systematic element); for further simplicity, it is applied equally to all the census years. The figures in panel H, rows 1–11, cols. 1–5 are the corresponding figures in panel G, thus scaled. Row 12 is obtained, as before, as the total in row 13 minus the sum of the figures in rows 1–11; one notes that the share of that residual (small-town and dispersed) population declined monotonically from 91 percent in 1861 to 86 percent in 1911.

Panel H, col. 6 transcribes the estimated cross-section rent index, at 1911 prices.[70] It ignores differences in crowding, differential constraints on urban growth, and more, and looks only to city size. Repeating the regressions in panels D and E with population-present (panel C, col. 1) as the sole regressor, one obtains constants equal to 92.6 and 58.7, and slope coefficients of .233 and .196, for bourgeois and working-class rents, respectively. Averaging these in proportion to the 668,463 bourgeois rooms and 2,890,558 working-class rooms obtained in panel F, the average rent works out to 65.07 + .203 times urban population. The estimates in col. 6, rows 1–11 are obtained from this formula, with the urban population calculated as the mid-point of the municipal population range times the urban scale factor in panel G, col. 7.[71] The corresponding estimate in row 12 is instead obtained directly as the weighted average

do not appear in panels A and B (e.g., Reggio Calabria and Pistoia in line 10) are taken directly from the *Censimento demografico*, vol. 7.

[70] The rents in col. 6 are actually derived from Giusti, and therefore 1908 rents; but only their relatives matter here, so a scalar inflation to 1911 levels is pointless.

[71] The largest is open-ended; its mid-point is set at 725 thousand, returning the actual 600-thousand average for the cities of Naples and Milan.

of the above estimates for the residual (1,071,089 bourgeois rooms at 82.5 lire each, and 19,911,890 working-class rooms at 49.5 lire each).[72]

Panel H, row 14 transcribes the estimated values of the constant-price diachronic rent index that captures the effect of the redistribution of the population. It is obtained by weighting rows 1–12 of cols. 1–5 by the cross-section rent index in col. 6, summing the resulting figures and dividing the resulting sums by the totals in row 13, and finally rescaling the resulting ratios so that 1911 = 1. From 1861 to 1911, it would appear, the redistribution of the population raised the constant-price value of the stock of buildings by some 11 percent, augmenting the estimated 63-percent increase in the stock itself.

The revised estimate of the 1911-price value added by residential buildings appears in Table 4.1, col. 23. It is obtained as the product of the rent index in panel H, row 14, geometrically interpolated between the estimated benchmarks and extrapolated to 1913, the new stock index described above, and of course the 1,694 million lire estimate derived for 1911 itself.

7.7 Government services

7.7.1 *Introduction*

The two extant series for the government-services sector, and the new one (Table 4.1, col. 24), are illustrated in Figure 4.1, panel C6.[73] The 2005 series extrapolated the 1911 “benchmark” figure in Rey (2000) using an annual index that geometrically interpolated and extrapolated four census-year data points: the labor-force estimates for 1881, 1901, and 1911 provided by Vitali (1970), and a comparable figure constructed for 1871. As was noted at the time

[72] This average is less than the constant of the equation that generates the estimates in rows 1–11; it may be noted that that constant folds in the effect of topographical constraints, and that the sample of Italy’s larger cities includes a disproportionate number of coastal ones.

[73] The new series is the only services-sector series unchanged from Fenoaltea (2017).

the preceding centennial series (Fuà 1969) incongruously dropped by a quarter from 1861 to 1880 before climbing back to a reasonable end-point, suggesting deflation by a price index that grew much too rapidly over the first half of the period at hand, and not rapidly enough over the second (Fenoaltea 2005, pp. 292–296); the simple monotonic growth of the 2005 series seemed far more nearly right.

The derivation of the sesquicentennial series is in its own context something of an exception. In the first place, the current-price series was reconstructed directly from budget expenditure data (Battilani, Felice, and Zamagni, 2014, pp. 51–55): it did not combine a quantity series and a price series, and thus left Baffigi with no "real" indicator at all. Baffigi, looking elsewhere, turned to the public-sector employment estimates of Broadberry, Giordano, and Zollino (Baffigi 2015, p. 110); these are a constant (.8686) share of their corresponding labor-force figures, themselves no more than linear interpolations of the usual few census data points, somewhat modified, as explained below, with respect to Vitali's (Broadberry, Giordano, and Zollino 2011, pp. 43–46, Tables A3–A4). In the second place, again exceptionally, Battilani, Felice, and Zamagni did not tie their current-price series to the earlier "benchmark" figures (in Rey 2000); but (once again) Baffigi did. For present purposes the upshot is that the 2005 and the sesquicentennial 1911-price series share the earlier 1911 benchmark, and extrapolate it with similar data and methods: as Figure 4.1 confirms they are horses of much the same color.[74]

Neither is a candidate for stud: neither series contains more than a handful of observations, and neither even gets them right. The problem here stems from the census count of serving draftees, who may have reported their normal occupation rather than their current one. The 2005 series simply borrowed (and extrapolated) Vitali's corrected labor-force figures (Vitali 1970, pp. 330–331). That these were *not* corrected for this particular misreporting (ibid., pp. 262–271) was simply overlooked; if one corrects them using Vitali's data for the military (ibid., p. 265), as documented below, the intercensal growth rates from 1881 to

[74] As already noted (§4.1, footnote 6), Baffigi's series at *current* borders is log-linear from 1861 to 1881, and his constant-border series' breaks in 1866–67 and 1870–71 appear to be spurious.

1901, and again from 1901 to 1911, practically double. But these significant changes in the growth rate of the aggregate are tied to equally significant changes in its composition, in the share of draftees, by monetary value the lowest class of public employees; for present purposes the resulting increases must correspondingly be tempered.

Broadberry, Giordano, and Zollino (2011, p. 44) noted the problem the present author overlooked, and cited Vitali in support; but they apparently got the solution backwards, and excluded recruits from the military to redistribute them to their permanent occupation rather than the other way round.[75] As Figure 4.1, panel C6 again confirms they modified the 2005 series in the wrong direction, decreasing its intercensal growth rate where they should have increased it (and vice-versa). The sesquicentennial series incorporates their error, and is accordingly (once again) even poorer than its immediate predecessor.

The new series accordingly aims to introduce multiple improvements. The census-year benchmarks are recalculated, to allow both for omitted draftees and at least for the more conspicuous changes in the composition of the relevant labor force; and the revised benchmarks are interpolated and extrapolated using deflated current-price series that incorporate evidence of short-term fluctuations. The new series reduces measured growth over the early decades, and increases it over the later ones; and it picks up war-related and Kuznets-cycle deviations from trend the earlier series altogether missed. But the method is heuristic, the results tentative – as in the case of agriculture, and for exactly the same reasons: the available aggregate series (here at current prices) is of unknown content, but a recalculation *ab initio* is too ambitious a project to be taken on here.

[75] They claim to be following Vitali, but Vitali's interest was in the professional distribution of the labor force, corrected for the distortion introduced, for his purposes, by compulsory military service; Broadberry, Giordano, and Zollino were working toward productivity measures, and in that context it makes no sense at all to replace the number actually working by the number that would have been working absent military service (not that this matters much, next to the much deeper deficiencies of their reconstruction, Fenoaltea 2020, footnote 58 and references therein).

7.7.2 *Time-series evidence*

Evidence of short-term movements (of prices and quantities together) is contained in the current-price series. Baffigi's work sheets contain an initial current-price series (which he then forces through the old benchmarks) attributed to Battilani, Felice, and Zamagni (2014).[76] This series, adjusted to eliminate border changes, is transcribed in Table 7.6, panel A, col. 1; one notes that the estimate for 1911 is 1,239 million lire, close but not identical to the 1,247 million (from Rey 2000) of the sesquicentennial series.[77] As can be seen from the corresponding graph in Figure 7.1, panel A, this is a user-friendly series: a bit messy in the 1860s, what with Unification in 1861 and war in 1866, but otherwise a classic Kuznets-cycle path, exactly as one would expect (Fenoaltea 2020, p. 91).

The rub is its deflation. In essence, the aggregate would appear to combine three main components: the salaries of career public servants (affected less by market forces than by the ruling classes' capacity to extract the rents it retained or distributed as patronage); the (presumably near-market) wages and salaries paid other civilian public employees; and the value of the income, largely in kind, provided to the lower ranks of the military.

A salary index for the first group is readily compiled. The *Sommario*, pp. 204–205, reports the annual salaries of 11 grades of State employees, ranging down from director general to doorman and gofer: 5 grades refer to the "directors' career," 3 to the "executives'

[76] There is a reason for this guarded language. The "Battilani, Felice, and Zamagni" series in Baffigi's work sheets closely tracks the figures for 1861–1906 in Battilani, Felice, and Zamagni (2014), p. 69, but not the corresponding figures for 1907–13 on p. 70. These last appear internally inconsistent (as the whole is not the sum of the parts), and, component by component, inconsistent with those on the preceding page. Moreover, the relevant graph (p. 57) illustrates a series that is consistent with Baffigi's aggregate (here in Table 7.6, panel A), and not with the published figures on p. 70. There are therefore good reasons to dismiss the published figures on p. 70 as errors that escaped the authors' proofreading, and to accept Baffigi's version of their series as the correct one.

[77] The series in Baffigi's work sheets is at current borders. To approximate a constant 1871–1913-border series, his figure for 1871 is here brought back to 1861 in proportion to the borders-of-today series in Battilani, Felice, and Zamagni (2014), p. 69.

career," and 3 to the "auxiliaries' career."[78] These move broadly together (and in steps), so the specific weighting scheme should not unduly influence the results; here, they are given what are considered not unreasonable weights (respectively, from first to last, 1, 4, 15, 30, 30, and 10 each for the other 6). The sum of the weighted series is the current-price salary pool of a 140-man cohort of the indicated composition; to smooth out its steps a three-year moving average is taken (leaving the end-points unchanged), and the smoothed series is rescaled to set 1911 = 1. The resulting index of career-State-civil-service salaries is transcribed in Table 7.6, panel A, col. 2.

For other civilian employees there is no comparable record. The urban/industrial wage index in Fenoaltea (2011a), p. 125 is a starting point, but no more than that, as it refers specifically to unskilled labor, and a large share of the workers in question were no doubt in clerical positions. Over the long term, the skill premium (for literacy and more) presumably declined; over the medium term, the earnings of the skilled reflected prosperity and depression like those of the unskilled, but only the latter were directly sensitive to the long swing in the openness of the economy and the attendant swing in the equilibrium land/labor and wage/rental ratios. Here, the unskilled-wage index is rescaled to set 1911 = 1. An alternative index is derived from the latter, assuming it varied, in relative terms, half as much, year on year; it accordingly grows less from end to end, and deviates less from its trend. These two indices are then simply averaged together; the result is transcribed in Table 7.6, panel A, col. 3.

Of the military, the officer class boasted better social origins even than the upper civil service, and was if anything even better treated (e.g., *Annuario 1884*, pp. 371, 408); there is no reason to believe their relative status changed, and for time-series purposes the career-civil-service index calculated above can serve for the officer class as well. The rank-and-file were instead fed, clothed, and housed, and received a small daily allowance. For the income

[78] These were not a single career in three parts but separate, parallel careers: each had an entry-point rank for young people, who could seek a career commensurate with their educational (and social) qualifications. "Executive" retained its etymological connotation of subordination: directors direct, executives execute.

Table 7.6 *Value added in services, 1861-1913: government*

Panel A: Time-series evidence

	(1) value added at current prices (million lire)	(2) indices of remuneration (1911 = 1) career state civil service	(3) other civilian employment	(4) military rank & file	(5) rent index (1911 = 1)
1861	317	.702	.578	.724	.433
1862	377	.702	.580	.712	.437
1863	414	.702	.584	.704	.441
1864	422	.702	.588	.685	.445
1865	446	.702	.593	.696	.449
1866	644	.702	.598	.729	.453
1867	438	.702	.605	.767	.458
1868	458	.702	.609	.758	.463
1869	415	.702	.614	.748	.468
1870	435	.702	.620	.774	.473
1871	445	.718	.627	.844	.482
1872	471	.749	.633	.884	.492
1873	482	.781	.633	.913	.502
1874	473	.796	.634	.870	.513
1875	450	.796	.634	.843	.524
1876	440	.839	.641	.820	.535
1877	455	.881	.646	.852	.546
1878	471	.924	.650	.873	.557
1879	466	.924	.654	.873	.571
1880	463	.948	.657	.856	.586
1881	486	.972	.660	.849	.600
1882	484	.996	.664	.825	.615
1883	507	.996	.668	.802	.631
1884	529	.996	.675	.770	.646
1885	547	.996	.685	.755	.663
1886	583	.996	.703	.754	.679
1887	625	.997	.717	.762	.696
1888	679	1.000	.727	.775	.684
1889	700	1.002	.730	.791	.673
1890	689	1.003	.724	.802	.661
1891	672	1.003	.722	.799	.655
1892	661	1.003	.718	.785	.648
1893	641	.974	.719	.758	.642
1894	622	.914	.716	.750	.635
1895	627	.854	.712	.751	.629
1896	654	.823	.712	.768	.635
1897	646	.823	.722	.773	.641
1898	653	.823	.740	.779	.648
1899	664	.823	.762	.787	.654
1900	677	.823	.780	.796	.661
1901	684	.832	.790	.809	.667
1902	695	.851	.799	.819	.674
1903	709	.869	.817	.823	.681
1904	722	.878	.837	.837	.698
1905	739	.878	.860	.848	.733
1906	782	.878	.881	.866	.784
1907	851	.888	.906	.888	.839
1908	901	.919	.934	.925	.898
1909	971	.959	.956	.950	.943
1910	1,050	.990	.978	.971	.971
1911	1,239	1.000	1.000	1.000	1.000
1912	1,279	1.000	1.021	1.021	1.030
1913	1,366	1.000	1.039	1.036	1.061

TABLE 7.6 *(continued)*

Panel B: Census-year benchmark estimates

	(1) 1911	(2) 1901	(3) 1881	(4) 1871	(5) 1861
A. Disaggregated figures (thousands)					
1. career civil servants	59.9	57.8	61.8	48.3	37.7
2. schoolteachers	92.3	82.5	67.8	44.7	29.5
3. other civilian	126.6	123.7	108.8	88.6	72.2
4. military officers	15.0	15.5	12.9	13.7	14.7
5. other military	412.0	270.5	169.9	179.4	232.9
B. Totals (thousands)					
6. Vitali (with census military)	537	472	403	333	275
7. Vitali (with actual military)	711	554	426		
8. Broadberry, Giordano, Zollino	318	289	251	188	141
9. new, simple	706	550	421	375	387
10. new, weighted	1,238	1,048	876	739	690

C. Average annual intercensal growth rates (percent)				
11. Vitali (with census military)	1.30	.79	1.93	1.93
12. Vitali (with actual military)	2.53	1.32		
13. Broadberry, Giordano, Zollino	.96	.71	2.93	2.93
14. new, simple	2.53	1.35	1.16	–.31
15. new, weighted	1.68	.90	1.72	.69

	(1) 1911	(2) 1901	(3) 1881	(4) 1871	(5) 1861
D. Estimated 1911-price value added, by group (million lire)					
16. career civil servants	233.0	224.8	240.3	187.8	146.6
17. schoolteachers	207.3	185.3	152.3	100.4	66.3
18. other civilian	286.5	279.9	246.2	200.5	163.4
19. military officers	58.3	60.3	50.2	53.3	57.2
20. other military	453.2	297.6	186.9	197.3	256.2
E. Implied current-price value added, by group (million lire)					
21. career civil servants	233.0	185.2	229.1	132.7	101.0
22. schoolteachers	207.3	143.9	99.5	61.3	37.2
23. other civilian	286.5	226.6	209.8	168.4	93.7
24. military officers	58.3	49.7	47.8	37.6	39.4
25. other military	453.2	240.7	158.7	166.6	185.5
26. total	1,238	846	745	567	457
27. ratio to panel A, col. 1	1.00	1.24	1.53	1.27	1.44

NB: The figures in Vitali (1970) cover only the years 1911, 1901, and 1881; the corresponding figures for 1871 and 1861 in row 6 are the extrapolated figures in Fenoaltea (2005).

Source: see text.

in kind, the working-class cost-of-living index in Fenoaltea (2011a), p. 128 is borrowed here, rescaled to set 1911 = 1. The monetary allowance is here assumed to have tracked, more or less, the wages of the unskilled; as about half the recruits were farm boys (*Annuario 1911*, p. 327), the indices of unskilled-workers' wages in agriculture and industry in Fenoaltea (2011a), p. 125 are here simply rescaled to set 1911 = 1 and averaged together. Further assuming, simply but as will be seen below not unreasonably, that in 1911 the monetary and in-kind payments were of a similar magnitude, the cost-of-living and the synthetic wage index are also simply averaged together. The resulting series is transcribed in Table 7.6, panel A, col. 4.

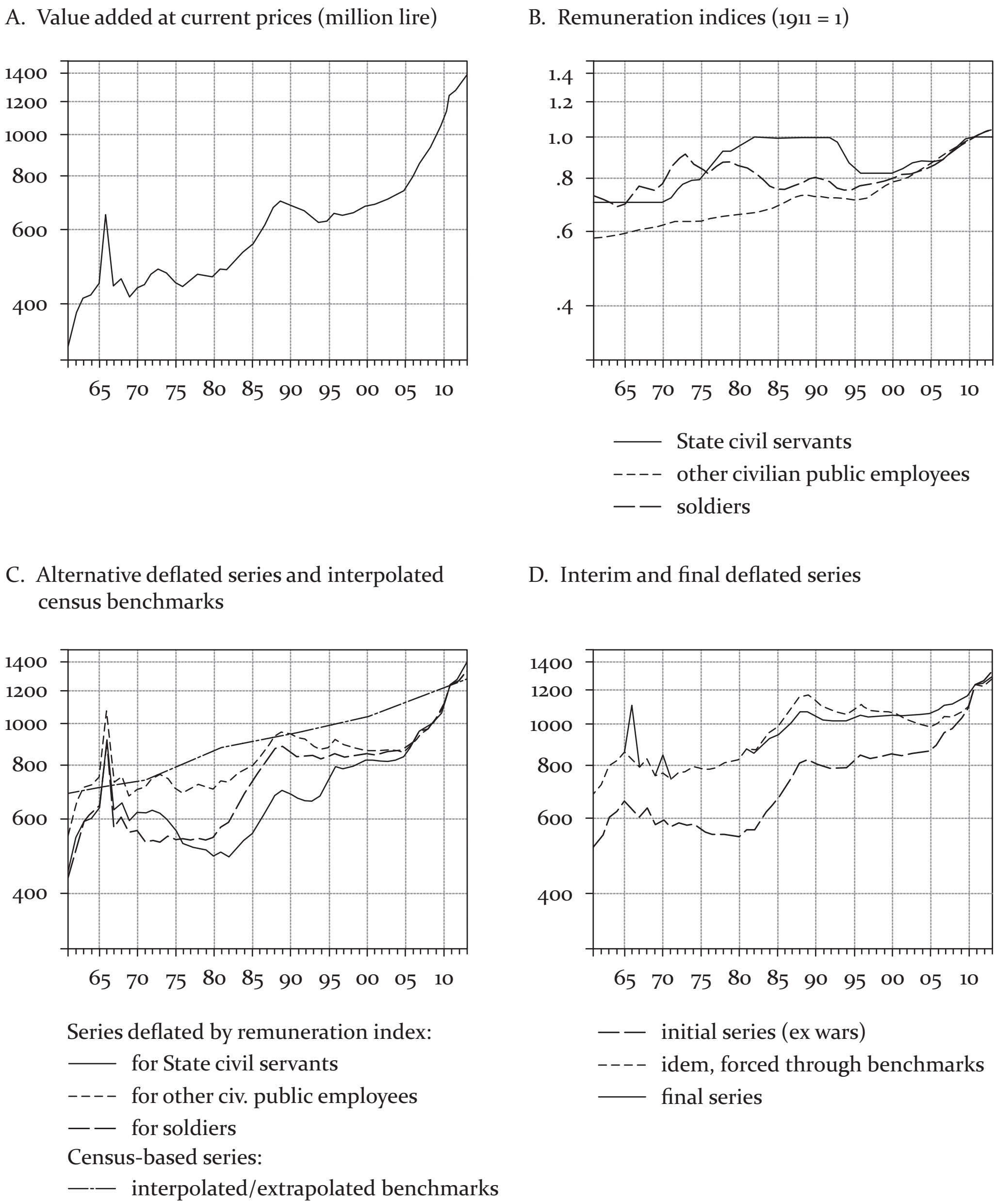
Figure 7.1, panel B illustrates these three remuneration indices. The soldiers' remuneration index contains the cost-of-living index, dominated by world commodity prices (and barriers to trade); it goes its own way. The market wage and public-salary indices display very different trends, but a somewhat similar long cycle, presumably because the long swing in capital flows and therefore the constraints on public spending largely paralleled that in the openness of the economy and therefore the demand for labor (Fenoaltea 2012, Figure 2). Figure 7.1, panel C illustrates the series that emerges if the entire current-price series is deflated by each of these three price indices in succession. The index for career civil servants, derived from Istat's *Sommario*, returns a deflated series much like Istat's own (Fenoaltea 2012, Figure 3), suggesting that that is how that particular camel got its incongruous hump.[79] Clearly, the salary data are relevant to the upper strata of public employment, but only to those.

Value added in government services conventionally includes labor costs and the (largely imputed) rental value of buildings.[80]

[79] And incongruous it is, as this is not a scenario like the A.M.A. restricting entry to drive up the incomes of those remaining: when the budget allowed the upper classes extracted additional rents by increasing both public-service salaries and public-service employment, and a sustained opposite movement of the two makes no sense at all. When the budget allowed, and perhaps when it did not: what is striking is the rise in remuneration even in the early 1870s, when the Right was struggling to balance the budget and "cutting expenditure to the bone."

[80] Logically, of course, it should include the rental value of all public assets, from roads to stocks of weapons; but these are here set aside. Recommended wear for national income accounting excludes a thinking cap.

Figure 7.1 *Value added in services, 1861–1913: government*



The readily available index in *IIPK*, Table K.53, col. 26 is here again pressed into service. That index begins in 1872; it is here extrapolated back to 1861 assuming an annual increase of 2 percent in 1871 and '72, as in the immediately following years (all years of significant inflation), and 1 percent before that. For convenience this index is also transcribed in Table 7.6, panel A (col. 5).

7.7.3 *Census-year benchmarks*

The censuses of course provide evidence directly in real terms, unaffected by price changes, and typically in enough detail to document the sector's changing composition; allowing also for price movements, the aggregate current-price series can in principle be reverse-engineered.

The construction of the census-year benchmarks is documented in Table 7.6, panel B. Part A (rows 1–5) disaggregates the labor force (initially for 1871 and later, as the 1861 census data require a different exercise). Rows 1–3 count the civilian labor force, distinguishing career civil servants (who include the handsomely rewarded upper reaches of State administration), schoolteachers not in private institutions, and other public personnel. Both the latter groups presumably earned near-market incomes; the former were very largely female, the latter male.[81] Row 1 sums over categories 10.11, 10.17, and 10.83 in 1911, XXIII.1 and XXIX.3 in 1901, IX.1 and IX.4 in 1881, and VIII.1 and VIII.6 in 1871. Row 2 is taken from category 10.61 in 1911 and XXVI.1 in 1901, and the sum of categories XIII.1 and XIII.2 in 1881, and XII.1 and XII.2 in 1871; following Vitali (1970), the census figures are reduced by a uniform 15 percent to allow for instructors at private institutions. Row 3 sums over cate-

[81] The United Nations' *ISIC* counts public and private education together (category 931, part of 93, social and related community services), separate from public administration and defense (category 91). The inclusion of public education in government services is a peculiarity of the Italian reconstructions: mandated by Istat (1959), it was followed by Vitali (1970), the "benchmark" project (Rey 1992, 2000), and subsequent work. It is maintained here, despite its patent absurdity: if for the purposes of classifying economic activity who pays trumps what the payee is paid for, a thoroughgoing Soviet economy would have no agriculture, no industry, and no services other than government services.

gories 7.45 and 10.12–10.16 in 1911, XXIII.2–XXIII.6 in 1901, IX.2–IX.3 and IX.5–IX.16 in 1881, and VIII.2–VIII.5 and VIII.7–VII.16 in 1871. For simplicity the present figures ignore Vitali's minor further adjustments to allow, for example, for military doctors and veterinarians.

Rows 4 and 5 count the military labor force, again distinguishing officers (who include the handsomely rewarded flag ranks) from other ranks (dominated by simple draftees). The figures for 1911, 1901, and 1881 are those to be found in Vitali (1970), p. 265. The figures for 1871 are from the *Annuario 1886*, pp. 978, 980, which report 12,551 serving army officers and 169,980 others on active army duty in 1871, and 1,173 serving navy officers; annual figures for other naval ranks begin only in 1872, but these point to a total of some 9,400 in 1871.

The 1861 census is a much poorer source.[82] For present purposes the only useful data appear to be the aggregate count of 130,597 individuals in "public administration," and 240,044, subject to the usual misreporting, in "internal and external security." The figures for 1861 in part A are tentatively obtained as follows. In rows 1–3, col. 5, the present estimates simply assume the same growth rate over the first decade as over the second. Their sum is 6.7 percent over the census figure: close enough to a reasonable allowance for the change in geographic coverage that further modification seems pointless. The military are more than usually difficult to gauge. The earliest

[82] The *Censimento 1861* appears to report the distribution of the labor force only in *Parte I*, pp. 78–106, thematically more often than systematically. An initial table (p. 79) distinguishes 3 branches of agriculture (vegetable, animal, and "related"), mining, manufacturing, commerce, the professions, clergy, public administration, internal and external security, property-owners, servants, the poor, and those without a profession. Subsequent tables distinguish, within mining, extraction and processing (p. 90); within manufacturing, 9 professions (p. 94; these occupation-specific figures sum to under half the manufacturing total); within commerce, wholesale trade, retail trade, and transportation (p. 97); within the professions, only the medical ones (p. 98; these figures sum to 8 percent of the professional total); and within the clergy, the regular and the secular (p. 101). Broadberry, Giordano, and Zollino detail the reallocation from the 1861 census categories to their own (Broadberry, Giordano, and Zollino 2011, p. 49); the difficulty is that their numerical "census" categories are of their own making, and inadequately explained. Many are relatively obvious, but others are mystifying (e.g., their fifth through ninth category within the professions, where the census has four and at most one other, residual one).

data, again in the *Annuario 1886*, pp. 978, 980, list 13,938 officers and 227,170 men serving in the army in 1865 (and far more in the war-year 1866); for the navy, 762 officers are listed for 1862 (against 850 plus in the next few years), and 8,773 men are listed for 1872 (when the number of officers had risen to 1,173). Here, the estimated number of officers in 1861 is simply the sum of those somewhat later figures; the estimated number of men, the reported army figure for 1865, augmented by 5,764 in the navy in 1862, as suggested by the figures for naval officers. The resulting total is accepted here, and duly appears in row 5. It is some 3 percent below the census figure. The latter should no doubt be increased by a double-digit percentage to allow both for its limited geographic coverage and for the underreporting of draftees, and at the same time reduced, one suspects by a similar magnitude, to exclude the here irrelevant "internal security" component; any further tweaking of the figure obtained here is as likely to increase its error as to reduce it.

Part B presents the relevant totals, from the earlier literature (rows 6–8) and from the new estimates in part A (rows 9–10). Row 6 reports the national figures for 1911, 1901, and 1881 in Vitali (1970), used directly by the 2005 series, and the extrapolated figures for 1871 and 1861 of that self-same series. Row 7 reports Vitali's totals, corrected using his own data for the serving military.[83] Row 8 transcribes the "full-time-equivalent" figures, that omit most of the military (and a fixed share of the residual labor force), in Broadberry, Giordano, and Zollino (2011), Table A4. Row 9 is the simple sum of rows 1–5.

Row 10 sums over rows 1–5, weighted by plausible relative unit incomes (salaries, wages, and income in kind for the serving other ranks) and rental costs in 1911; the estimates are derived as follows. In 1911, the total compensation of the 140-man cohort of career civil servants described above yields an average of 3,700 lire per person; it is here applied to those public servants (row 1) and, by extension, to military officers (row 4).[84] Other civilian workers

[83] The corrections subtract from the totals in row 6 the military component as reported by the census (160, 204, and 253 thousand in 1881, 1901, and 1911, respectively), and add back in the actual numbers in the Army and Navy (183, 286, and 427 thousand, respectively).

[84] The appropriate adjustment is unknown; it would require documentation of the actual numbers at the different pay scales.

other than schoolteachers (row 3) were mostly male; assuming a preponderance of white-collar workers, they are here allowed 60 percent of that, or 2,200 lire per person. Schoolteachers were entirely white-collar, but 65 percent were female; a somewhat lower average, here set at 2,000 lire, seems not inappropriate. The average value of the food, clothing, and shelter, and monetary allowances for the military "other ranks" is even more difficult to pin down. Perhaps the most useful starting point is Zamagni's estimate of 277 lire as the annual cost of food, at 1911 prices, for an adult male (Rey 1992, p. 230). This figure may bear reduction, given the bulk purchasing of the military, but must be increased, perhaps to 500 lire, to include clothing and shelter; and the monetary remuneration was probably not far from that much again (in the early 1880s it was near 1.0 lire per day for enlisted men, and more for non-coms, *Annuario 1884*, p. 376). An overall round figure of 1,000 lire is adopted here, for simple soldiers; adding 10 percent to allow for non-coms, average compensations is here set at 1,100 lire.

The corresponding rent for the offices (or other working space) of these public employees is at best an educated guess. Here, career civil servants and military officers are allowed 189 lire each (an average of one room each, valued at the 170 lire obtained above for the 40 major urban centers in 1908, converted to 1911 prices using the usual rent index). Schoolteachers are allowed (class)rooms averaging 30 percent more, or 246 lire each. Other civilian workers, allowing for those who shared an office and those who lacked one altogether, are allowed one third of the figure attributed career civil servants, or 63 lire each; and nothing (in addition to their "shelter," above) is allowed to the troops.

The weighted sums in row 10 are accordingly obtained as (3.7 + .189) times rows 1 and 4, plus (2.0 + .246) times row 2, plus (2.2 + .063) times row 3, plus 1.1 times row 5. In 1911, the compensation component totals 1,193 million lire, the rent component 45 million lire; the latter practically matches the earlier estimate of 44 million lire which Zamagni derived from budget data (Rey 1992, p. 232), while the sum of the two practically matches the current-price value added figure of 1,239 million lire in panel A, col. 1. This result reflects what may be called iterative serendipity: the central point is simply that the present disaggregation, at 1911 prices, sits well with the current-price time-series figure for that year.

Part C (rows 11–15) presents the intercensal average annual growth rates implied, *seriatim*, by rows 6–10. Row 11 refers to Vitali, as published and extended by the 2005 series. The growth rate from 1861 to 1871 is by assumption equal to that from 1871 to 1881; as can be seen in Figure 4.1, it is marked by a strong deceleration after 1881, and a partial recovery after 1901. Row 12 refers to Vitali, as corrected for the misreporting of recruits; the correction sharply increases the growth rate in both 1881–1901 and 1901–1911. Row 13 refer to the Broadberry-Giordano-Zollino figures used by the sesquicentennial series; as can again be seen in Figure 4.1, the growth rates vary even more than in the 2005 series. Broadberry, Giordano, and Zollino calculated an 1861 benchmark from that year's census (above, footnote 82); by happenstance or by design, their figures too generate a growth rate from 1861 to 1871 equal to that from 1871 to 1881. Row 14 refers to the new unweighted totals; these point to a monotonic increase in the growth rate from intercensal period to intercensal period. Row 15 refers to the new weighted total, and documents the usefulness of disaggregation: it recovers the deceleration in 1881 and acceleration in 1901 of the 2005 series (row 11), and a previously unsuspected acceleration in 1871 is now also apparent. Compared to the 2005 estimates, the new ones mildly reduce long-term growth; measured growth is sharply reduced over the 1860s, mildly reduced over the 1870s, mildly increased over the 1880s and '90s, and significantly increased after 1901 (from rows 11 and 15).[85]

The weighted physical totals in row 10 (virtually) reproduce the current-price value added estimate in 1911; the figures for the other years are therefore the corresponding estimates of value added at 1911 prices. The time series obtained by interpolating and extrapolating the census-year benchmarks in row 10 – a series analogous to those in the preceding literature – is also illustrated in Figure 7.1, panel C.

Panel B, part D (rows 16–20) presents the components of row 10 at each benchmark year, calculated as described above. The changes in the aggregate's composition, over time, are significant, and warrant the present exercise.

[85] From 1861 to 1911 the 2005 series produced an increase of 95 percent (row 6). The Broadberry, Giordano, and Zollino (and sesquicentennial) series upped that to 126 percent (row 8); the new benchmarks yield 79 percent.

Part E (rows 21–25) presents in turn the current-price components implied by the above disaggregation and the price indices in panel A. Category-specific indices of value added per person, at current prices, are computed as weighted sums of the remuneration indices and the rent index in panel A, cols. 2–5, using the weights implied by the above estimates. For career civil servants, and officers, the index is accordingly calculated as .95 (col. 2) + .05(col. 5); for teachers, as .89(col. 3) + .11(col. 5); for other civil servants, as .97(col. 3) + .03(col. 5); for other military, as 1.0(col. 4). Category-specific estimates of value added per unit are then obtained as the product of the resulting indices, all equal to 1 in 1911, and the value per unit in 1911 estimated above (3,889 lire for career civil servants and officers, 2,246 lire for teachers, 2,263 lire for other civil servants, and 1,100 lire for other military). The resulting figures at the census benchmarks are then multiplied by the corresponding numbers in panel B, part A, and transcribed in the appropriate rows of part E.

Part E, row 26, transcribes the sums of these disaggregated estimates. In 1911 the figures in part E simply repeat those in part D, and as already noted they sit well with the current-price time series in panel A, col. 1. Not so the earlier benchmarks: as Figure 7.1, panel C had warned us to expect, those further census-derived current-price benchmarks lie above the current-price time series, by varying but always impressive margins (panel B, part E, row 27). Nor can these alternative estimates easily be reconciled: the budget-based current-price value added series here borrowed from the sesquicentennial corpus cannot be verified, replicated, or improved, and the census-based benchmarks do not seem amenable to radical revision, as no reasonable tinkering with the present weights and indices could much affect them.

7.7.4 *Government services (1861–1913)*

In the circumstances, it seems prudent to anchor the desired constant-price series to the 1911-price benchmark estimates, which are derived from the census data with limited manipulation, and to use the expenditure series, and the deflators, as heuristic guides to their interpolation and extrapolation.

The procedure adopted here first generates an initial deflated series, then forces it through the census benchmarks, and finally revises it, *ad hoc,* to eliminate patent incongruities. The initial series is generated as follows. First, the current-price figures for the 1860s are adjusted. The 1861 figure is suspect, as Unification occurred in that very year, and the State budget need not have covered the entire territory over the entire year; the present adjustment is to replace the figure in Table 7.6, panel A, col. 1 by the arithmetic average of that figure and the one for the following year. For practical purposes, too, the 1866 war-spike is (temporarily) removed from the current-price series; here, the figure in Table 7.6, panel A, col. 1 for 1866 is replaced by a simple average of those for 1865 and 1867, for a net reduction of 202 million lire.[86] Second, the category-specific benchmark figures in panel B, part E, rows 21–25 are converted into shares of the totals in row 26; the procedure of course assumes that these estimates' relative magnitudes, if not their absolute values, are at least approximately correct. Third, these benchmark shares are linearly interpolated (and extrapolated to 1913). Fourth, year after year, each category-specific share series is multiplied by the corresponding category-specific index of value added per unit described above, and the results are summed into a synthetic deflator. Fifth, the resulting index is used to deflate the ex-war current-price series. The initial deflated series so obtained is illustrated in Figure 7.1, panel D.

The initial deflated series is then forced through the 1911-price census-year benchmarks, in the usual way. The resulting series is also illustrated in Figure 7.1, panel D. From 1861 to 1881 the results seem reasonable enough: the slowly rising trend of the current-price series is converted to a relatively flat one, and the current-price cycle of the early 1870s is mitigated by the broadly parallel cycle in the cost of living (and the cost of maintaining the troops). This series is accordingly accepted, with only two corrections. The first reintroduces the 1866 war spike. At current prices, 202 million lire were removed; deflated by the value-added-per-person indices (those underlying panel B, part E) for officers and other military, with weights equal to (1/12) and (11/12), respectively, these are

[86] The later, African wars were colonial expeditions; these presumably did not involve mobilization, and do not warrant similar adjustments.

equivalent to 278 million lire. The second is another war spike, apparently missed by the current-price series, added in 1870, the year Rome was wrested from the Pope. The *Annuario 1884*, p. 348, lists 320,885 non-officers serving at the end of September of that year, or twice as many as in 1881; since the campaign was brief, only 75 million lire, at 1911 prices, are added here.

Over the later decades, on the other hand, that series yields a long decline from the late 1880s, through the turn of the century, to 1905. It is then heir to the same criticism as the centenary Istat series (footnote 79): when times were flush public employment and its remuneration rose together, and vice versa; the sustained opposite movements in the deflated series (essentially an employment series) and the current-price series (Figure 7.1, panel A) from 1895 to 1905 make no sense at all. The source of this nonsense is strictly speaking not the forcing of the initial series to match the benchmarks themselves, but the smooth distribution of the census-year discrepancies over the entire interbenchmark periods. That smooth distribution boasts computational convenience, and reflects if one will the "flat priors" that come with ignorance; what the results are telling us is that the assumptions that would justify it are unwarranted, and our priors are best revised.

The revision of the estimates proceed as follows. To avoid much cumbersome repetition, the current-price value added series will be referred to as *V*, the initial deflated series as *X*, that series forced ("smoothly") through the benchmarks as *Y*, and the (final) revised series as *Z*. Between 1901 and 1911, constant-price value added almost surely grew monotonically, and at increasing rates, like *X* and *V* itself. Here, *Z* is obtained by extrapolating the 1901 benchmark forward to 1913 at annual rates uniformly equal to 43 percent of those displayed by *X* (incidentally recovering the 1,239 million lire benchmark in 1911): in essence, both *Y* and *Z* force *X* through the benchmarks, but where *Y* rotates *X* (turning slow growth into decline), *Z* merely flattens it (so growth, however slow, remains growth).

Between 1881 and 1901, some arbitrariness is inevitable. From 1894 to 1901, both *X* and *V* grow quasi-monotonically, and neither displays a break in 1901 itself; over those years, therefore, *Z* is obtained with the same algorithm as used in 1901-13. The resulting estimate for 1894 equals 1,015 million lire, some 16 percent above the 1881 benchmark (against nearer 20 percent for *Y*, 28 percent for *V*, and no less than 40 percent for *X*). The further backward extrapolation is complicated by the intervening cycle, as all the available series point to sustained growth to 1889, and then decline. Real growth under the fiscally lax governments of the Left (in power from 1878) is not constrained by reasonable expectations; but the real decline was surely constrained, and something can be made of that.

From 1889 to 1894, salaries were cut, wages and maintenance costs fell (Figure 7.1, panel B); but outright firing was politically even more damaging than pay cuts, so the real reduction in civilian employment was probably close to that allowed by mere attrition, surely no more than a very low percentage per year. The military were more flexible, but data are scarce; in 1898 serving soldiers were practically twice those serving in 1881, and the path of the number of serving officers suggests that the army grew from 1881 to 1889, and then essentially leveled off (*Annuario 1884*, p. 346, *1900*, pp. 1072, 1081). With military personnel accounting for some 30 percent of value added in those years (panel B, part E), annual real attrition is here estimated at a round 1 percent of the total, for a cumulated reduction from 1889 to 1894 of 5 percent, and a reasonable near-equal division of the 11-percent decline in *V* into a real change and a price change. In 1889, therefore, 1911-price value added is here estimated as (1,015/.95) = 1,068 million lire: 22 percent above the 1881 benchmark, or again half the 44 percent increase in *V* (and against 47 and 34 percent increases in *X* and *Y*, respectively). From 1881 to 1894, *Z* is obtained by forcing *X*, in the ordinary way, from the 1881 benchmark through that estimate for 1889 to that for 1894.

The impact of these revisions is also illustrated in Figure 7.1, panel D. The final estimates are transcribed directly in Table 4.1, col. 24, and illustrated (also) in Figure 4.1, panel C6.

8

GROSS DOMESTIC PRODUCT

8.1 GDP and net indirect taxes

Table 4.1, col. 26 reports the sum of the value added estimates for agriculture (col. 1), industry (col. 18), and the services (col. 25); the quality rating of just 2 is inevitable. The GDP series in col. 28 is that total-value-added figure, further augmented by the net-indirect-taxes series in col. 27.

The net-indirect-taxes series in col. 27 is unchanged from Fenoaltea (2005). As explained at the time (ibid., p. 310) it is Vitali's "centennial" series, merely rescaled to fit his "benchmark" estimate for 1911 in Rey (1992); no further work has been done on it, and it warrants a quality rating of 1.[1] The 2005 and sesquicentennial series are illustrated together in Figure 4.1, panel D: they appear to be much the same series, with the latter anchored to the "centennial" current-price estimate (Istat's 1,568 million lire) rather than the lower "benchmark" figure used here.[2] From 1871

[1] The outliers in the mid-1860s are suspect, as it is hard to see how indirect taxation could have been imposed at sharply varying rates.

[2] Vitali's benchmark in Rey (2002) reproduced the unrevised Istat figure, apparently through an oversight, whence its recovery by Baffigi. Small discrepancies remain. The present series simply rescaled the centennial constant-price series. Baffigi's work sheets suggest he forced the centennial current-price series through the Rey (2002) benchmark in 1891 and a new benchmark for 1871, and then deflated it using the ratio of the centennial constant-price and current-price series. Why this procedure yielded year-to-year variations that differ (albeit little) from those generated by the centennial constant-price series (incorporated here), interbenchmark trends aside, is not clear. These apart,

to 1911, the discrepancy between the two series is of the order of 1 percent of GDP.

Col. 28 transcribes the estimates of (so-called) GDP, the sum of cols. 26 and 27; the latter is a mere adjunct to the former, and their sum earns the sempiternal, unflattering quality rating of 2. These estimates are illustrated, with their immediate predecessors, in Figure 4.1, panel E. Panel F illustrates the relative correction introduced by the present revision, highlighting the reduction in GDP after the turn of the century; panel G illustrates to the same scale the major sectors' value added, and panel H their annual growth rates, highlighting their relative contribution to the fluctuations of GDP itself.

The per-capita GDP figures obtained from the GDP series in panel E and the population series in Fenoaltea (2005), Table 1, col. 1 are illustrated in Figure 3.1. We thought the 1890s had been a period of very slow per-capita growth, but growth nonetheless; it now appears as a period of no growth at all.

8.2 The composition of GDP: allowing for changes in relative prices

The composition of GDP at 1911 prices can be computed from the series in Table 4.1; but it is not a particularly useful exercise, as save for 1911 itself it is simply based on the wrong prices, those of 1911 rather than those of the year in question. It yields results that are basically meaningless, somewhat as if one calculated the age distribution of the native-born and that of immigrants, and combined them using native-born and immigrant proportions borrowed from some other time and place: the result is simply *not* the age distribution of the entire population.

To obtain meaningful sector shares (of total value added, indirect taxes are here irrelevant) we would need current-price value added estimates, those that pave the way to the third-generation estimates (§2.4 and §3.1); the available second-generation esti-

the discrepancy between the two series drifts from about half of one percent of GDP in the early 1870s to about one percent in the early 1890s, and back to about half that in 1911.

mates are simply inadequate. At present, all one can do is tweak the second-generation estimates, allowing for their known sources of bias (§3.1), to obtain conjectural third-generation levels and shares; this is done here, simply repeating the analogous calculation in Fenoaltea (2011b). The results are collected in Table 4.2 and illustrated in Figure 4.2.

The share series (Table 4.2, cols. 4–6) are obtained first, through a simple enough algorithm. The "benchmark" corpus yielded 1911 shares at current prices, and 1891 shares at both current and 1911 prices. The twentieth root of the ratio of the 1891 current-price share to the 1891 1911-price share is an estimate, for each major sector, of the annual change in shares, as between current and constant prices; sector-specific share-correction series are generated by using those annual rates to extrapolate 1911 = 1.00. From 1881 to 1913 the corrected shares in Table 4.2 are the product of the sector shares at 1911 prices and the corresponding share-correction factor, barely rescaled to sum to one; from 1861 through 1880 they are the shares so obtained for 1881, extrapolated back to 1861 in direct proportion to the 1911-price sector shares and similarly barely rescaled. The underlying assumption is that industry's share rises, going back in time, because it experienced faster productivity growth than the other sectors did – but only from 1881 (or so), with the first sustained industrial boom; prior to that it presumably remained overwhelmingly artisanal, and its productivity growth did not exceed that of agriculture or the services [3]

8.3 The composition of GDP: an *ISIC*-based redistribution

As noted above (§4.1), the present production-side value added estimates in Table 4.1 respect the Italian accounting conventions used by their immediate predecessors, which differ in places from the *ISIC*; this enhances comparability within the national literature,

[3] It may be noted that this use of the "benchmark" estimates does not require that they got the sector shares right, but only that they were sufficiently consistent to get the relative changes in sector shares approximately right. A recalculation of the 1891 current-price benchmark to obtain figures directly comparable to those for 1911 would eliminate this particular source of error, but would cost far more than it seems to be worth.

and limits it in the international literature. This last is unfortunate; an *ISIC*-based recalculation of major-sector levels and shares (of total value added) is presented here in Table 4.3. It is no more than a first approximation, because a close reading of the *ISIC* can raise blood pressure and anticipate dementia; some things may have been missed, but the big-ticket items should all be allowed for, and not only those.

The exercise does not touch the estimates of value added in agriculture, indirect business taxes, or GDP; what it involves is the transfer of a number of activities, and the corresponding value added, from industry to the services. The estimates of the elements so transferred are collected for convenience in Table 8.1.

Table 8.1, col. 1 refers to printing and publishing, as the *ISIC* (now) considers the production of books, newspapers, and the like a service (group 58, in section J, Information and communication). In the author's estimates, still preliminary and not in the public domain, the paper sequence is represented by three series, that refer respectively to pulp, paper, and paper products. The pulp and paper products physical-output series are extrapolated from the paper series in the usual way, allowing for input-output ratios and international trade (§2.2, §2.3), and allowing too for the share of paper directly consumed as such (a constant 60 percent of the available total, as suggested by data for 1911); the paper series is built up from output data in 1907 and 1909–13 and benchmark estimates for 1862, 1876, 1896, 1903 and 1906 derived from data on the stock of paper-making machines, interpolating the missing values. Value added in paper products is estimated as the sum of five components: some 60 million lire of newspapers, from 10.4 million lire of newsprint; equal tonnages of stationery, other paper products, and books, worth 18, 54, and 90 million lire, respectively, from paper worth 34.8 million lire; and 8 million lire of cardboard products, from 3.8 million lire of cardboard. Inflating raw material costs by some 12.2 percent (from a total of 49 million lire to 55 million) to allow for power, inks, glue, and other omitted items, value added in printing and publishing is here estimated as 48.3 million lire in newspapers, and 77.0 million lire in books; the value added series in Table 8.1, col. 1 is their sum (125.3 million lire), extrapolated in proportion to the "paper products" series described above.

Table 8.1 *In pursuit of the ISIC: transfers from industry to the services (million lire at 1911 prices)*

	(1)	(2)	(3)	(4)	(5)	(6)
	printing & pub'g	shoe repair	repair of metal cons. durables			
			fab. met.	machin.	precis.	total
1861	12.14	58.54	2.9	.0	3.6	77.18
1862	12.63	58.53	3.0	.0	3.9	78.06
1863	12.63	59.52	3.0	.0	4.1	79.25
1864	13.11	61.39	3.0	.0	4.5	82.00
1865	14.08	64.56	3.0	.0	4.9	86.54
1866	14.57	69.01	3.1	.0	5.1	91.78
1867	15.06	69.58	3.1	.0	5.3	93.04
1868	16.03	71.13	3.2	.0	5.5	95.86
1869	16.51	69.98	3.2	.0	5.8	95.49
1870	17.48	71.22	3.2	.0	6.0	97.90
1871	17.97	70.11	3.2	.0	6.2	97.48
1872	18.94	68.90	3.3	.0	6.4	97.54
1873	18.46	68.30	3.3	.0	6.6	96.66
1874	20.40	68.96	3.3	.0	6.8	99.46
1875	21.37	70.86	3.3	.0	6.9	102.43
1876	22.34	73.12	3.4	.0	7.2	106.06
1877	22.34	74.48	3.4	.0	7.4	107.62
1878	23.80	75.69	3.5	.0	7.6	110.59
1879	24.28	76.67	3.5	.0	7.9	112.35
1880	25.74	78.90	3.6	.0	8.1	116.34
1881	27.20	79.58	3.6	.0	8.4	118.78
1882	28.65	79.76	3.6	.0	8.7	120.71
1883	30.11	80.88	3.7	.0	9.0	123.69
1884	32.05	84.28	3.7	.0	9.4	129.43
1885	34.48	87.79	3.7	.0	9.9	135.87
1886	36.42	90.97	3.8	.0	10.4	141.59
1887	38.37	90.87	3.8	.0	11.0	144.04
1888	39.82	91.79	3.9	.0	11.5	147.01
1889	41.28	92.48	4.0	.0	11.8	149.56
1890	43.71	94.42	4.0	.0	11.9	154.03
1891	45.65	94.15	4.1	.0	12.1	156.00
1892	48.08	92.27	4.1	.1	12.2	156.75
1893	49.54	90.86	4.1	.1	12.3	156.90
1894	51.48	92.07	4.2	.2	12.4	160.35
1895	53.91	93.32	4.2	.3	12.4	164.13
1896	55.85	94.41	4.3	.4	12.3	167.26
1897	57.31	92.43	4.4	.5	12.2	166.84
1898	57.79	92.69	4.4	.6	12.1	167.58
1899	59.74	92.82	4.5	.8	12.1	169.96
1900	60.22	95.39	4.5	1.0	12.1	173.21
1901	61.68	97.28	4.6	1.1	11.9	176.56
1902	64.11	98.07	4.7	1.4	11.7	179.98
1903	65.08	98.51	4.7	1.6	11.6	181.49
1904	75.76	98.69	4.8	2.0	11.6	192.85
1905	89.85	99.55	4.9	2.3	11.5	208.10
1906	104.90	101.09	4.9	2.7	11.4	224.99
1907	108.30	103.42	5.0	3.3	11.3	231.32
1908	114.62	105.10	5.2	3.9	11.3	240.12
1909	121.90	105.46	5.2	4.8	11.2	248.56
1910	127.73	105.07	5.3	6.4	11.1	255.60
1911	125.30	105.57	5.5	8.4	11.1	255.87
1912	139.87	106.33	5.6	10.3	11.1	273.20
1913	141.33	106.63	5.8	12.3	11.1	277.16

Source: see text.

Table 8.1, col. 2 refers to the repair of shoes (and other leather products), in the *ISIC* as category 9523 (in section S, other service activities); it is transcribed directly from *IIPH*, Summary Table H.1, col. 55.

Table 8.1, cols. 3–5 refer to minor maintenance activities, of consumer durables (other than houses, counted as construction, and textile products, already counted in the services). These refer to production the *ISIC* counts as consumption rather than investment (§2A.3: there is method in their madness), and are accordingly derived below, in the calculation of the expenditure side. Col. 3 refers to value added in the maintenance of fabricated metal (including the sharpening of knives); col. 4, to that in the maintenance of general equipment (vehicles, sewing machines); col. 5, to that in the maintenance of precision equipment (including, signally, the repair of clocks and watches). These series transcribe, for convenience, Table 12.4, cols. 1, 3, and 5.

Table 8.1, col. 6 is the sum of cols. 1–5, the total value added transferred from industry to the services. It represents a cut to industry rising (with cyclical variations) from some 5 percent at Unification to 6 percent in the late 1890s, and declining back to ca. 5 percent in 1913, and a boost to the services growing relatively steadily from some 3 percent at Unification to 4 percent in the last few years of the *belle époque*.

The *ISIC*-style estimates of 1911-price value added in industry and the services are transcribed in Table 4.3, cols. 2–3, and the resulting sector shares in cols. 5–6; the impact of the reclassification can be seen in Figure 4.3.

III

REVISED SECOND-GENERATION ESTIMATES: THE EXPENDITURE SIDE

9

GROSS DOMESTIC PRODUCT

The revised expenditure-side estimates of GDP are collected above in Table 4.4 and illustrated in Figure 4.4.[1] As recalled above (e.g., §4.2) these estimates are obtained by disaggregating the production-side estimates of GDP. Table 4.4 is laid out in the usual manner, as if the GDP series in col. 7 were obtained from the components in cols. 1–6; in fact, that series simply transcribes Table 4.1, col. 28.

These estimates, like those in Fenoaltea (2012) and, *de facto*, Baffigi (2011) consider maintenance net production which is included in GDP (as opposed to canceling out, as intermediate production). With that proviso the present expenditure-side estimates are United-Nations-standard estimates; in that they differ from Baffigi's, which were based on Vitali's "benchmark" expenditure side that *excludes* from investment the maintenance of equipment (and the acquisition of naval vessels), and therefore, again *de facto*, counts those as consumption (above, §3.3, footnote 16).

The following chapters describe the derivation of the estimates of the various expenditure-side components of GDP; they are taken up in the order imposed by the procedure that generates them.

[1] These are a *reprise* of those in Fenoaltea (2018a), modified only to reflect the updating of the production side.

10

EXPORTS AND IMPORTS

The aggregate export and import series transcribed in Table 4.4, cols. 5 and 6 are constructed in Table 10.1.

In Table 10.1, cols. 1 and 6 refer to 1911-price exports and imports, as derived, from 1862 to 1913, from the Federico *et al.* (2011) database. These differ slightly from their preceding versions (Fenoaltea 2012, Table 1, cols. 4 and 5): where the latter were obtained by deflating total exports on the one hand and total imports on the other by the corresponding price indices, the present export and import series are obtained by separately deflating primary products and manufactures by their specific price indices (Federico *et al.* 2011, pp. 226, 228), and then summing the results. The Federico *et al.* (2011) database excludes 1861; the present figures for that year in cols. 1 and 6 are obtained from those for 1862, using as indices the corresponding 2012 estimates (and, indirectly, Istat series, Fenoaltea 2012, p. 304).

Cols. 2 and 7 are very tentative corrections for border changes.[1] In 1871, of the national male population over 15, Latium accounted for 3.5 percent, Venetia for 9.8 percent (Fenoaltea 2011, p. 206); on this simple basis, the exports and imports of the missing regions are estimated, in the first instance, as 15.3 percent of the Kingdom's figures in 1861–66 and 3.6 percent in 1867–70. But these initial estimates attribute to Latium and Venetia the same reduced exports, and bloated imports, that the Kingdom owed to

[1] Reckoning by indivisible years, the Kingdom included Venetia only from 1867, and Latium only from 1871. Baffigi (2015, 2017) appears to have scaled up the Kingdom's total exports and total imports by some 5 percent in 1867–70, to allow for Latium, and 16 percent in 1861–66, to allow for both Latium and Venetia.

Table 10.1 *Exports and imports, 1861-1913 (million lire at 1911 prices)*

	(1)	(2)	(3)	(4)	(5)
			exports		
	reported total	Latium, Venetia	reported ships	naval ships	merchant ships
1861	396.8	72.7		.0	.5
1862	465.5	78.4	.0	.0	.5
1863	526.8	86.5	.0	.0	1.1
1864	476.9	87.6	.0	.0	.3
1865	462.6	84.7	.0	.0	.5
1866	525.9	86.6	.0	.0	.5
1867	580.8	21.8	.0	.0	1.5
1868	628.7	22.6	.0	.0	1.2
1869	643.0	23.3	.0	.0	1.6
1870	606.9	22.3	.0	.0	1.9
1871	855.1		.0	.0	1.4
1872	766.9		.0	.0	4.8
1873	744.9		.0	.0	3.2
1874	692.7		.0	.0	7.1
1875	820.6		.0	.0	2.7
1876	832.7		.0	.0	2.1
1877	710.4		.0	.0	1.6
1878	902.3		.0	.0	2.7
1879	951.6		.0	.0	2.4
1880	1,036.9		.0	.0	1.6
1881	1,139.0		.2	.0	1.9
1882	1,158.1		.1	.0	.7
1883	1,200.4		.2	.0	.8
1884	1,139.0		.3	.0	1.1
1885	1,031.1		3.6	.0	2.6
1886	1,139.0		.3	.0	2.0
1887	1,191.1		.3	.0	3.4
1888	1,133.9		.0	.0	3.7
1889	1,062.2		.6	.0	4.0
1890	980.4		.3	.0	2.3
1891	1,031.2		.0	.0	4.2
1892	1,117.4		.0	.3	3.4
1893	1,137.0		.0	1.2	2.9
1894	1,284.2		.0	6.7	7.2
1895	1,257.7		.6	18.4	3.0
1896	1,324.3		17.9	25.5	2.4
1897	1,418.1		23.8	25.0	4.0
1898	1,549.0		42.6	14.1	5.5
1899	1,704.0		3.7	7.9	6.8
1900	1,604.9		3.0	4.5	4.8
1901	1,693.2		2.0	7.4	5.8
1902	1,802.5		1.3	22.8	4.7
1903	1,796.6		1.7	25.3	6.6
1904	1,920.8		39.8	4.9	10.1
1905	2,048.9		22.2	4.7	7.3
1906	2,154.7		8.6	1.9	7.3
1907	2,064.1		.7	3.7	5.8
1908	1,976.2		1.0	7.1	4.8
1909	2,099.9		.9	6.8	1.9
1910	2,185.3		.7	6.9	3.2
1911	2,241.2		27.6	3.9	3.3
1912	2,426.6		6.7	1.2	12.6
1913	2,501.4		5.2	2.6	6.4

Table 10.1 *(continued)*

	(6)	(7)	(8)	(9)	(10)	(11)
	imports					
	reported total	Latium, Venetia	reported ships	naval ships	merchant ships	It.-flag freights
1861	553.5	72.7		9.3	3.1	9.7
1862	559.4	78.4	.0	20.1	3.1	10.7
1863	604.3	86.5	.0	25.6	6.7	10.8
1864	668.6	87.6	.1	18.0	1.7	12.1
1865	644.8	84.7	.0	10.6	3.4	13.1
1866	606.6	86.6	.0	4.6	1.1	14.3
1867	627.6	21.8	.0	.0	2.4	15.5
1868	627.7	22.6	.0	.0	1.5	16.0
1869	654.2	23.3	.0	.0	2.3	16.8
1870	633.6	22.3	.0	.0	4.4	18.4
1871	705.1		.0	.0	2.6	19.7
1872	799.2		.0	.0	3.5	20.5
1873	807.8		.0	.1	5.5	20.9
1874	893.2		.0	.0	2.8	20.3
1875	906.3		.0	.0	2.0	20.1
1876	956.5		.0	.0	1.7	21.5
1877	918.4		.0	.0	1.5	22.5
1878	989.3		.0	.0	2.4	23.2
1879	1,174.4		.0	.2	5.2	23.6
1880	1,060.3		.0	.3	4.7	23.3
1881	1,173.8		3.9	.5	10.1	21.1
1882	1,216.8		3.0	2.8	7.8	21.6
1883	1,320.0		4.3	4.2	8.2	22.1
1884	1,431.2		8.9	4.2	8.0	23.4
1885	1,661.1		7.0	7.7	4.9	23.2
1886	1,723.6		10.4	6.1	13.3	23.6
1887	1,925.5		2.2	15.8	10.0	24.6
1888	1,372.9		2.3	7.9	8.9	24.6
1889	1,620.8		4.3	1.8	6.4	25.1
1890	1,482.5		.7	.0	4.9	24.2
1891	1,292.0		.0	.0	6.4	23.3
1892	1,376.9		.1	.0	3.2	24.1
1893	1,407.8		.0	.0	4.5	24.3
1894	1,373.6		.1	.0	7.5	22.5
1895	1,526.8		2.5	3.8	11.5	23.6
1896	1,486.4		1.7	.0	11.6	26.0
1897	1,506.1		3.4	.0	18.0	27.6
1898	1,713.5		3.4	.0	19.3	29.5
1899	1,771.2		6.2	1.3	25.3	32.4
1900	1,775.9		10.3	4.4	31.2	37.1
1901	1,936.9		6.8	2.1	19.1	42.2
1902	2,088.7		4.3	.2	13.8	44.7
1903	2,158.4		2.9	.0	9.7	46.4
1904	2,100.1		2.3	2.2	12.6	45.6
1905	2,338.6		6.7	6.0	15.7	44.9
1906	2,682.6		11.2	1.8	22.5	47.4
1907	2,929.2		9.4	.0	24.8	49.9
1908	3,062.2		13.4	.0	26.9	53.2
1909	3,258.5		5.2	.0	31.0	58.4
1910	3,318.5		10.9	2.4	26.6	57.6
1911	3,443.8		9.7	.3	36.3	58.0
1912	3,677.9		13.8	6.1	46.7	66.2
1913	3,617.4		25.3	1.4	59.5	75.7

Source: see text.

its massive capital imports. Those regions' trade was presumably far more nearly balanced; here, for simplicity, the initial estimates of their exports and imports are simply averaged together, and that average is transcribed in both cols. 2 and 7.

Cols. 3–5 and 8–10 tentatively correct the data in the *Movimento commerciale* itself. Before 1881 that source appears to omit sea-going ships (but to count trivial quantities of vessels for internal navigation, at least in 1862–76), while in later years it apparently continues to omit imports of naval vessels, and to count poorly what it does count (Fenoaltea 2018c); the Federico *et al.* (2011) database inherits these apparent errors and omissions.[2] Cols. 3 and 8 are the ship-related *Movimento commerciale* value figures in the database (Fenoaltea 2018c, Table 6, panel A, cols. 3 and 6), deflated by the appropriate Federico *et al.* (2011) manufactured-goods price indices. Cols. 4–5 and 9–10 are estimates based on high-quality ship-specific sources, taken from Fenoaltea (2018c): cols. 4 and 9 from Table 1, respectively cols. 54 and 55 (from 1861), cols. 5 and 10 from Table 5, respectively col. 10 and col. 11 (from 1865; both are extrapolated back to 1861 in proportion to net imports, col. 12 minus col. 9 in that same Table 5).

Col. 11 is a further correction, of a different order, applied to the import series alone. Because imports are valued c.i.f., the import figures include the value of the transportation services as well as the (embarkation) value of the goods themselves; and those services were in fact imported only if performed by foreign-flag carriers. *IIPF*, Table F.26, transcribes reported port movements; despite their faults (ibid., section F02.05), they are here taken at face value. The net tonnage of Italian-flag arrivals is reported there, distinguishing sail and steam (cols. 6 and 8), as is that of Italian-flag international arrivals (cols. 10 and 12).[3] The sail and steam figures are summed to obtain total tonnages for Italian-flag

[2] The Federico *et al.* data-base also mismeasures the physical units of the ships it does count, as ships' tons (units of internal volume) are taken to be units of weight: the reported quantities are multiplied by 10, and said to be in quintals.

[3] The missing data for 1897–1900 in cols. 10 and 12 are here estimated. The 1896 figures are extrapolated in proportion to total arrivals (col. 8), with the annual growth of the latter series so rescaled, in each case, as to interpolate the reported figures for 1901.

total and international arrivals, whence total domestic-arrival tonnages are obtained as a residual. The international- and domestic-arrival tonnages are then summed with weights of 10 and 1, respectively (at a guess, the relative trip lengths). The international share of that sum is calculated (it equals near 70 percent in the 1860s and '70s, and then nearer 60 percent), and applied to the estimated value added in maritime transportation (Table 7.1, col. 6). The figures in col. 11 are the resulting estimates of value added in Italian-flag international navigation, here identified, for simplicity, directly with the relevant value.[4]

Aggregate 1911-price exports and imports, transcribed in Table 4.4, cols. 5 and 6, are obtained from Table 10.1: the export series as col. 1 + col. 2 – col. 3 + col. 4 + col. 5, the import series as col. 6 + col. 7 – col. 8 + col. 9 + col. 10 – col. 11.

It may be worth adding, for the record, that the above-noted corrections to the figures in the *Movimento commerciale* may well not go far enough. When the trade figures include seagoing vessels they nonetheless continue to exclude imported naval vessels, presumably because they were bought by and for the King's navy; one suspects that engines and weapons imported to be added to naval hulls under construction in Italy were also "privileged" and not counted. Similar considerations apply to imports for the King's army. The import statistics count rifles and pistols, and (at least, but maybe only) in the early 1860s apparently include military rifles (Fenoaltea 2020, footnote 12); but no trade category refers to, or appears to cover, such strictly military weapons as cannon, machine guns, and the like. Our published sources do not appear to speak to these issues, and even archival research may be unable to resolve them all.

[4] Materials costs, notably fuel costs for steam transportation, were significant, but coal was of course imported.

11

PUBLIC CONSUMPTION

Public consumption is here identified with the absorption by the public sector of non-durables, as logic requires (and the United Nations now accept, *SNA*, p. 123); the acquisition of durable goods by the public sector, as by firms, is here considered investment, as is their maintenance.[1]

The earnings of public employees are the largest component of public consumption, and the residual consumption of goods and services is plausibly tied to their number. The public-consumption series in Table 4.4, col. 4 is simply the government-services value added series in Table 4.1, col. 24, suitably scaled up.

The 1911 government-services value added estimate incorporated there, 1,239 million lire, comes from Battilani, Felice, and Zamagni (2014); comfortingly, it is closely confirmed by the centennial-corpus estimate of 1,217 million lire, derived from the same public budgets (*Reddito nazionale*, pp. 149–154, 238). The corresponding purchases of (consumption) goods and services are less easily ascertained. Zamagni presented an estimate for 1911 of 831 million lire (Rey 1992, p. 233; also Rey 2000, p. 369), without, however, a single word to clarify its content. More usefully, the *Reddito nazionale* includes an estimate of the value of public goods and services (1,939 million lire), which is explicitly said to be the

[1] Vitali's estimates, apparently informed by the standard conventions of the day, count the increment in public roads, for example, as investment, and the increment in other public durables as consumption (Vitali in Rey 1992, pp. 314–315), an absurdity up with which one cannot put. The convention that attributes consumer durables to consumption rather than to investment is equally absurd, but here accepted, albeit with a bad conscience.

sum of public-sector labor costs (in essence, value added) and the cost of currently consumed materials (*materiali di servizio*), clearly excluding investment goods (ibid., pp. 152–153, 240).[2] Here, the cost of current materials is set equal to the difference between Istat's goods-and-services figure (1,939 million lire) and their value added estimate (1,217 million lire), or 722 million lire.

The present public-consumption series in Table 4.4, col. 4 accordingly scales up the production-side value added series by a factor of ((1,239 + 722)/1,239).

[2] Following the Italian conventions of the day, which made more sense than those since imposed by the hegemonic powers, the (1957) *Reddito nazionale* distinguished between intermediate and final public goods and services, and excluded the former from public consumption and GDP; and this is why the estimate of *G* (827 million lire, p. 261) falls short, as the present estimate cannot, of the corresponding public-sector value added estimate.

12

FIXED INVESTMENT

12.1 Introduction

Fixed investment – simply "investment," through the rest of this chapter – is here estimated by summing the investment-good components of production, activity by activity, and the analogous components of international trade; all components are measured at 1911 prices, the production figures (normally) in terms of value added, exports and imports in terms of value. The order in which these are considered reflects the logical sequencing of the estimates themselves.

12.2 Investment goods: industry

12.2.1 *Introduction*

The (fixed) investment component of industry's product is estimated first; the time series obtained here are presented, by industry group, in Table 12.1.

12.2.2 *The extractive industries*

Table 12.1, col. 1 refers to the extractive industries. The annual physical product of each of the 32 identified goods (*IIPB*, Summary Table B.1) is weighted by the conventional 1911-price unit value added (ibid., Summary Table B.2, panel B1).[1] Of the resulting value

[1] In another absurdity, as noted (§2.5, footnote 27) the national accounts conventionally measure the "value added" of the extractive industries by the value of

Table 12.1 *Industrial value added flowing into investment, 1861-1913 (million lire at 1911 prices)*

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
	ex-	manufacturing							
	extractive	textiles, apparel[a]	leather[a]	wood[a]	metal	engineer'g	non-met. min. pr.	chem.	rubber[a]
1861	38	20	4	185	5	171	40	7	0
1862	42	21	4	173	4	176	46	7	0
1863	45	22	4	171	2	180	48	7	0
1864	45	22	3	171	2	180	49	7	0
1865	47	22	3	197	1	184	50	7	0
1866	42	22	1	201	2	185	41	7	0
1867	45	22	2	189	2	189	39	7	0
1868	49	22	4	164	2	196	39	7	0
1869	51	22	3	168	3	201	40	7	0
1870	50	23	5	178	3	202	42	6	0
1871	51	23	4	170	3	198	43	7	0
1872	56	23	5	177	4	200	47	8	0
1873	63	26	5	184	3	207	55	8	0
1874	64	24	6	182	5	217	57	8	0
1875	58	24	2	178	4	220	49	7	1
1876	59	22	5	188	4	215	47	8	0
1877	60	23	6	188	4	214	50	8	1
1878	59	23	7	188	3	209	50	8	0
1879	62	22	7	176	7	214	50	8	1
1880	70	22	7	176	8	226	55	8	0
1881	72	22	9	191	10	242	58	9	1
1882	77	22	11	204	11	257	65	9	1
1883	81	22	11	208	14	268	70	10	1
1884	83	21	10	222	15	280	73	10	2
1885	84	21	12	241	17	290	76	10	2
1886	85	21	13	268	21	312	79	11	2
1887	84	22	12	275	26	336	77	11	3
1888	83	22	10	255	31	351	76	12	3
1889	84	22	12	228	33	350	75	11	4
1890	85	20	10	226	29	337	76	12	4
1891	83	19	8	224	24	317	75	12	2
1892	82	18	11	217	20	302	71	12	3
1893	80	16	9	214	23	303	71	12	4
1894	80	14	9	217	23	310	70	11	6
1895	74	14	8	212	26	322	64	11	6
1896	74	14	10	222	26	334	63	11	6
1897	77	13	9	232	28	345	65	13	7
1898	79	13	10	248	32	364	66	13	7
1899	84	14	10	266	37	399	69	14	7
1900	88	15	11	260	39	425	72	13	7
1901	92	14	12	275	37	414	77	13	6
1902	100	13	12	289	36	410	86	13	7
1903	105	13	13	305	41	420	93	16	6
1904	109	14	15	313	47	444	99	17	5
1905	114	14	17	338	57	489	108	19	6
1906	124	14	18	353	69	554	116	20	10
1907	131	13	18	375	72	606	123	21	7
1908	134	12	18	406	86	642	132	22	13
1909	142	12	19	443	97	662	154	26	12
1910	158	14	19	465	104	685	177	29	15
1911	164	16	18	460	104	718	189	32	21
1912	174	16	18	447	120	759	195	35	32
1913	173	16	17	441	114	757	195	41	16

Table 12.1 *(continued)*

	(10) total manuf.	(11) construc-tion	(12) utili-ties	(13) total	(14) investment share of industry[b]
1861	432	285	0	755	.45
1862	431	324	0	797	.47
1863	434	336	0	815	.47
1864	434	331	0	810	.47
1865	464	334	0	845	.48
1866	459	287	0	788	.45
1867	450	262	0	757	.44
1868	434	259	0	742	.43
1869	444	253	0	748	.43
1870	459	267	0	776	.44
1871	448	275	0	774	.43
1872	464	294	0	814	.44
1873	488	325	0	876	.46
1874	499	336	0	899	.46
1875	485	293	0	836	.44
1876	489	284	0	832	.43
1877	494	292	0	846	.44
1878	488	297	0	844	.43
1879	485	305	0	852	.43
1880	502	329	0	901	.44
1881	542	340	0	954	.45
1882	580	387	0	1,044	.47
1883	604	412	0	1,097	.47
1884	633	423	0	1,139	.48
1885	669	434	0	1,187	.48
1886	727	444	0	1,256	.48
1887	762	437	0	1,283	.48
1888	760	439	0	1,282	.48
1889	735	423	0	1,242	.47
1890	714	418	0	1,217	.46
1891	681	410	0	1,174	.45
1892	654	389	1	1,126	.44
1893	652	375	1	1,108	.43
1894	660	374	1	1,115	.42
1895	663	321	1	1,059	.40
1896	686	307	1	1,068	.40
1897	712	311	1	1,101	.40
1898	753	308	2	1,142	.40
1899	816	313	3	1,216	.41
1900	842	323	4	1,257	.42
1901	848	339	5	1,284	.41
1902	866	368	6	1,340	.42
1903	907	386	7	1,405	.42
1904	954	405	10	1,478	.43
1905	1,048	433	11	1,606	.44
1906	1,154	460	13	1,751	.44
1907	1,235	484	17	1,867	.44
1908	1,331	513	20	1,998	.45
1909	1,425	586	24	2,177	.47
1910	1,508	661	27	2,354	.48
1911	1,558	697	32	2,451	.49
1912	1,622	713	37	2,546	.49
1913	1,597	707	42	2,519	.48

[a] value [b] ratio of col. 12 to col. 13; the numerator is swollen by the value of the raw materials included in cols. 2, 4, and 9.

Source: see text.

added, the investment-good share is set equal to 50 percent for the mineral fuels (ibid., Summary Table B.1, cols. 1–4), 100 percent for the non-precious metal ores excluding mercury and pyrite (ibid., cols. 5–8, 11–12, and 15–16), again 100 percent for asphalt rock (ibid., col. 22) and all quarry products (ibid., cols. 28–32), and zero otherwise.[2] Over the period at hand quarry products dominate the resulting total, with a 71 percent share of the cumulative total; the main metal ores accounted for another 25 percent.

12.2.3 *The manufacturing industries: food and tobacco*

The food and the tobacco industries are here assumed to have produced only consumer goods, and do not appear in Table 12.1. Some slaughterhouse by-products are an exception; these are recovered in the leather-industry estimates below.

12.2.4 *The manufacturing industries: textiles and apparel*

Table 12.1, col. 2 refers to the textile and apparel industries together; this series is derived in Table 12.2. These too are essentially consumer-goods industries, with, however, some here relevant exceptions, notably within the hemp industry. The investment goods considered here are (hemp) rope, sailcloth, and tarpaulins; for simplicity (so that the agricultural-investment-good estimates below can simply ignore hemp), the entire value of these final products is counted here in col. 2.

The rope component is obtained easily enough: the output series is ready-made (*IIPH*, Summary Table H.1, col. 31, transcribed in Table 12.2, col. 1), and at 1911 prices rope is valued at 1,250 lire per ton (ibid., section H05.08).

output, excluding minor items (e.g., purchased fuel for the pumps) but not the value of the principal raw material (the goods below ground that are extracted). Here, the conventional measure is conveniently close to a value measure (excluding as noted purchased fuel, here counted elsewhere).

[2] This is of course an approximation. Most retained sulphur (from sulphur ore and pyrite) was used for sulphuric acid and thence fertilizer; comparatively small quantities, here neglected, entered the manufacture of explosives and thus (again in part) mining and quarrying.

Table 12.2 *Hemp-industry investment-good products, 1861-1913 (thousand tons)*

	(1) rope	(2) sails for new vessels	(3) replacement sails	(4) tarpaulins
1861	15.2	.055	.271	.017
1862	15.8	.071	.274	.017
1863	16.1	.084	.279	.018
1864	16.3	.107	.281	.018
1865	16.3	.128	.301	.018
1866	16.1	.141	.328	.019
1867	15.9	.171	.345	.019
1868	15.8	.195	.369	.019
1869	15.7	.198	.399	.020
1870	16.2	.170	.434	.020
1871	16.4	.143	.460	.021
1872	16.6	.139	.468	.021
1873	18.5	.158	.461	.021
1874	17.2	.185	.456	.022
1875	16.8	.178	.468	.022
1876	15.9	.125	.499	.022
1877	16.4	.078	.517	.023
1878	16.1	.056	.518	.023
1879	15.7	.040	.512	.024
1880	15.7	.029	.503	.024
1881	15.6	.031	.492	.025
1882	15.5	.035	.481	.025
1883	15.7	.033	.473	.026
1884	14.8	.027	.465	.026
1885	15.0	.024	.455	.027
1886	15.5	.019	.444	.027
1887	15.9	.011	.419	.028
1888	16.5	.018	.389	.028
1889	16.3	.042	.358	.029
1890	14.9	.057	.337	.029
1891	14.1	.044	.336	.030
1892	13.4	.034	.331	.030
1893	11.9	.024	.323	.031
1894	10.4	.013	.316	.031
1895	9.7	.010	.308	.032
1896	10.0	.008	.296	.032
1897	9.3	.009	.288	.033
1898	9.4	.014	.290	.034
1899	10.2	.019	.297	.034
1900	11.0	.019	.305	.035
1901	10.0	.034	.306	.036
1902	9.3	.058	.301	.036
1903	9.5	.042	.307	.037
1904	10.3	.018	.313	.038
1905	10.1	.017	.302	.038
1906	10.0	.020	.288	.039
1907	9.2	.020	.277	.040
1908	8.5	.017	.269	.040
1909	8.9	.015	.263	.041
1910	10.4	.013	.259	.042
1911	11.6	.011	.251	.043
1912	11.6	.015	.234	.043
1913	12.2	.020	.218	.044

Source: see text.

The sail component is altogether more tentative, at every stage. First, output is estimated in proportion to domestic demand alone, as if international trade were negligible. Demand was presumably both for new ships and for replacement, but the relevant coefficients are not easy to pin down. The *Enciclopedia italiana*, vol. 24, p. 360 reports some figures for large metal-hulled sailing vessels; the *Melbourne* is attributed 1,953 square meters of sail and a displacement of 3,500 tons, the *Preussen* 11,580 displacement tons and 5,080 gross register tons, whence, assuming everything scales, some 1.3 square meters of sail per gross register ton (and per net ton as well: in the case of sailing ships net tons are only a few percentage points under gross tons, and the present margin of error is greater than that).

The weight of sailcloth is also uncertain. The *Movimento commerciale* does not identify hemp cloth by weight per unit area, but it does suggest that the heaviest yarn was of the order of 7,000 meters per kilogram (tariff category 143a), and that a square piece of cloth 5 mm. on the side might contain some 30 threads (tariff category 151a1). One square meter would thus contain 6,000 linear meters of yarn, or (6/7) = .86 kilograms of cloth; assuming seagoing vessels carried a full set of spare sails, a 1,000-gross-register-ton sailing vessel would come equipped with 2,600 square meters of sails weighing some (2.6)(.86) = 2.2 tons. Table 12.2, col. 2 transcribes the estimated weight of the sails for new ships, obtained simply as 2.2 (tons of sails per thousand gross tons) times the gross tonnage constructed (*IIPF*, Table F.21, col. 4); the 25,000 gross tons constructed in 1861, for example, correspond to just 55 tons of sails. Table 12.2, col. 3 transcribes the estimated weight of the replacement sails. Assuming that a (double) set of sails lasted 4 years, on average, the production of replacement sails for the extant fleet is calculated from the total (net) tonnage of the latter (ibid., Table F.24, col. 6) by deducting the above (gross) tonnage of the new vessels and multiplying the residual by .25 times 2.2 (tons of sail per thousand gross tons). In 1861, for example, the (517,000 – 25,000) = 492,000 tons of old ships are taken to have been (partly) reequipped with some 271 tons of sails. Sailcloth is here valued at 4,000 lire per ton (from the export prices for hemp cloth, *Movimento commerciale* tariff category 151a1).

Table 12.2, col. 4 transcribes the estimated weight of the tarpaulins produced, essentially for carters, again neglecting international trade. In 1911, the *Censimento demografico* reports some 234,000 men (and a handful of women) in category 8.31, "road transportation," which includes drivers of animals and (all) vehicles, and stable hands; the *Censimento 1901* reported in category XVII.10 some 125,000 carters, muleteers, and stable hands. Here, very tentatively, the number of carters is set equal to 100,000 in 1900, and attributed an average of 3 kilograms of tarpaulins (4 square meters at 1 kilogram each, for 75 percent of the carters), for a tarpaulin stock of some 300 tons in 1900. That stock is further assumed to have increased 2.5-fold from 1861 to 1911 (the approximate increase in the road-transportation series, Table 7.1, col. 5, ignoring the cyclical movements tied to construction materials that did not, in the main, need to be covered); the estimated stock in 1900 is accordingly extrapolated at the corresponding growth rate (near 1.85 percent p. a.). Annual tarpaulin production (Table 12.2, col. 4) is estimated very simply as the annual increment in the stock plus (assuming a ten-year life) one tenth of the previous year's stock; reassuringly, the quantities involved seem trivial. Tarpaulins are here valued at 3,800 lire per ton (*Movimento commerciale*, tariff category 153a).

Table 12.1, col. 2 is the sum of the four series in Table 12.2, weighted by, respectively, 1,250, 4,000, 4,000, and 3,800 lire per ton. Again (perhaps) reassuringly, the first component (ropes) always accounts for at least nine-tenths of the total.

12.2.5 *The manufacturing industries: leather*

Table 12.1, col. 3 refers to the leather industry.[3] The estimates of the investment component of its product cannot be anything but crude; but the evidence points here to small values, so even large relative errors remain small in absolute terms and not overly disturbing in the larger scheme of things. The relevant production would seem to be that of saddlery and belting, to which *IIPH* attributes a value added of some 17.2 million lire in 1911 (section H09.05); the tanned leather consumed is estimated in turn at some 4,200 tons (section H09.09), worth perhaps another 2.0 million lire

[3] These estimates differ from those in Fenoaltea (2018a), as they take advantage of the newly compiled second-generation estimates for the leather industry.

(using the import price for *Movimento commerciale* category 627, tanned leather n.e.c., rather than the lower export price, apparently dominated by sole leather). Allowing for ancillary materials, the saddlery-and-belting value product in 1911 is here estimated at some 19.5 million lire.

The investment component of that value product is anybody's guess. Belting was worth about one third less, per ton, than harnesses (*Movimento commerciale* categories 645 and 651), implying that roughly equal tonnages would have left belting with some 40 percent of the value product, and harnesses some 60 percent, of which perhaps 50 for "business" horses and 10 for "household" horses (less numerous, §12.3.4 below, and much less intensively used; military horses, the fewest in number, *Annuario 1913*, p. 401 and plausibly the least intensively used, are ignored). The present guess is accordingly that in 1911 leather investment goods included some 8 million lire of belting, and 10 million lire of harnesses and the like. These are again estimates of value rather than value added, so that the earlier stages of production need not be considered in their own right.

The harness component is here extrapolated using the road-transportation series (Table 7.1, col. 5). Assuming a ten-year life, the index of harness demand in year *t* is calculated as the increment in that series from *t – 1* to *t*, plus 10 percent of its value in *t – 1*; the missing figure for 1861 is simply set equal to that obtained for 1862. The resulting index is then rescaled to set 1911 = 10 (million lire at 1911 prices). The extrapolation of the belting series is similarly adventurous. The *Censimento industriale*, vol. 4, p. 522 lists a total of 1.6 million primary horsepower in use (in the part of industry it covered), of which 1.0 million converted to electricity; excluding categories 3 (where power use was dominated by milling, which did not use belting) and 8 (dominated by the utilities), these figures fall to .53 and .19 million horsepower, suggesting that in 1911 some 36 percent were converted to electricity, a figure comparable to the 39 percent obtained for category 6 (textiles) alone. *IIPF*, Table F.51, col. 15 reports annual estimates of coal (or coal-equivalent) used to raise steam to drive industrial and agricultural machinery; to allow for the replacement of belting by wiring, that series is here reduced by 2 percent in 1894, 4 percent in 1895, and so on through 36 percent in 1911 to 40 percent in 1913. Proceeding as before but assuming a six-year life, the index of belting demand in year *t* is calculated as the increment in that amended series from *t – 1* to *t*, plus one sixth of its value in *t – 1*; the missing figure for 1861 is simply set equal to that obtained for 1862. The resulting index is then rescaled to set 1911 = 8 (million lire at 1911 prices). The sum of these two series is the present tentative estimate of 1911-price value of leather-investment-good production.

12.2.6 *The manufacturing industries: wood*

Table 12.1, col. 4 refers to the wood industry: a largely artisanal, poorly documented industry, like the leather industry, but, unlike it, not dominated by the new production and maintenance of consumer durables, and above all not yet adequately researched. The wood industry is here taken to coincide with 1911-census categories 3.1 ("wood") and 3.2 ("wood-like materials"), excluding 3.22 "straw ware" (essentially braid and hats, here included in the apparel industry). In 1911, it is attributed a value added of 386 million lire, of which 344 million for its labor force (over 415,000, again overwhelmingly male) and 42 million to capital (Rey 1992, pp. 143–145).

Two basic stages of production are usefully distinguished: the production of lumber from timber, and that of the industry's final products from lumber. The first stage corresponds to census category 3.11, "initial processing of wood" (sawmills and more, *Censimento demografico*, vol. 4, p. 8), with some 19,000 workers. The analogous data in the *Censimento industriale* (vol. 4, pp. 508–509, 520–521) attribute to that category over 40 percent of the wood industry's horsepower, but implicitly, given the simplicity of the machinery, a lower share of the return to the industry's capital. On this slim evidence, the production of lumber is here attributed a value added of 30 million lire, leaving 356 million to that of wood products from lumber.

The consumer-good component of the latter may be gauged from the detailed labor-force figures in the *Censimento demografico* (vol. 4, pp. 8–9). The labor force in categories 3.12 (small ware, mostly consumer goods: 16,700), 3.17 (furniture: 60,100), 3.18 (musical instruments: 3,200), 3.21 (caneware: 19,800), and 3.25 (brooms: 2,300) totals 102,000. These figures suggest that in 1911 a quarter or so of wood-products value added, or some 89 million lire, was generated in the production of consumer durables (which are also investment goods, of course, but not so recognized by the standard conventions to which this paper reluctantly conforms), and 267 million lire in that of producer durables ("investment goods").

As luck would have it, the *Movimento commerciale* suggests that trade in wood and wood products was overwhelmingly in timber and lumber (and firewood), and that trade in finished products was, in comparison, negligible; the investment content of wood-products consumption can accordingly be estimated from domestic production alone. With accuracy *ultra vires*, the present estimates aim at least for simplicity: domestic production is here estimated directly in value terms, so that the value added in producing the raw materials need not be considered in its own right.

Cianci (1933) reports the price of pine beams in 1911 as 65 lire per cubic meter, or some 110 lire per ton (Colombo, 1919, p. 61).[4] In 1911, the *Movimento commerciale* assigns a price of 650 lire per ton to generic wood products (category 560), 800 lire per ton to spools (561), 850 lire per ton to ordinary vehicle parts (559), 1,050 lire per ton to flooring (542) and 1,600 lire per ton to ordinary wood furniture (543). Tentatively allowing a 900-lire-per-ton average and 25 percent weight losses, and using Cianci's lumber price, a ton of output may have consumed lumber worth near 150 lire, whence, with a further small allowance for other costs, a value added in the neighborhood of 720 lire per ton of output, or 80 percent of value. The 1911 benchmark estimate of the value of investment-goods production (and consumption) in 1911 is accordingly 125 percent of the corresponding value added estimate, or some 334 million lire; the corresponding estimate of the value of consumer goods equals 111 million lire. For future reference, in quantitative terms the total value of 445 million lire corresponds to some .49 million tons of output, consuming .66 million tons of lumber worth an estimated 72.5 million lire.

In principle, of course, the consumption- and investment-good value benchmarks should be differently extrapolated; but there is

[4] The *Sommario*, p. 181, reports the price of railway ties at an incongruously low 56.2 lire per ton; one suspects an inappropriate conversion from volume units to weight units.

little useful evidence with which to distinguish their time paths, not least because the cyclical movements of the consumer-goods component may well have been dominated by the alternating fortunes of the wealthy classes, and the path of luxury-good consumption (e.g., that of precious-metal products, *IIPF*, Table F.54, col. 4) much resembles that of the wood industry's estimated aggregate product (Table 4.1, col. 8). The assumption that the two components moved together seems as good as any, and the above investment-good benchmark is accordingly extrapolated in direct proportion to the production series (Table 4.1, col. 8). The resulting estimates are transcribed in Table 12.3, col. 1.

These estimates of the 1911-price value of the finished investment goods produced by the wood industry are to be complemented by estimates of the lumber consumed as such by other investment-good industries, notably engineering and construction.[5] The engineering-industry component is practically ready-made, as that industry's lumber consumption (for ships and railway vehicles) has been estimated. Table 12.3, col. 2 is the sum of those tonnage estimates (*IIPF*, Table F.20, col. 10, Table F.38, col. 5, Table F.41 col. 6, Table F.42, col. 9), simply multiplied by the above-cited price of lumber (110 lire/ton). For future reference, in 1911 the total tonnage is just over 68,000 tons, for a value of some 7.5 million lire.

The construction-industry component is instead very tentatively estimated here, starting with a quantity figure for 1911. As noted above, the census data point to a value added in lumber production near 30 million lire. The price of lumber is set, as above, at 110 lire/ton. The difficulty is that part of the lumber was derived from rough-hewn logs, which the *Movimento commerciale* valued at 65 lire per ton (category 524), and part from imported squared-off or cut logs, valued at 95 lire per ton. In producing lumber from rough-hewn logs, allowing a 20 percent weight loss, the margin between the price of lumber and the cost of the raw material was some 29 lire per ton of lumber; deducting one-fifteenth of that for energy and other costs value added can be estimated at some 27 lire per ton. In producing lumber from squared-off logs, on the other

[5] The construction industry also consumed lumber in the form of finished wood products (e.g., doors and window frames incorporated in buildings), which are covered by Table 12.3, col. 1.

TABLE 12.3 *Value of wood-industry investment-good products, 1861-1913 (million lire)*

	(1) finished wood products	(2) lumber consumed: engineering	(3) lumber consumed: construction
1861	134.1	2.6	48.2
1862	114.2	3.5	54.9
1863	109.9	4.0	56.9
1864	109.9	4.6	56.0
1865	135.0	5.5	56.5
1866	146.2	5.8	48.6
1867	138.4	6.3	44.4
1868	113.4	7.1	43.8
1869	117.7	7.3	42.8
1870	126.3	6.4	45.2
1871	117.7	5.5	46.6
1872	122.0	5.4	49.8
1873	122.9	6.1	55.0
1874	118.5	6.9	56.9
1875	122.0	6.7	49.6
1876	135.0	5.1	48.1
1877	135.0	3.6	49.4
1878	135.0	2.9	50.3
1879	122.0	2.5	51.6
1880	117.7	2.7	55.7
1881	130.7	3.1	57.6
1882	135.0	3.3	65.5
1883	135.0	3.1	69.8
1884	148.0	2.7	71.6
1885	164.4	2.7	73.5
1886	189.5	3.0	75.2
1887	197.3	3.3	74.0
1888	176.5	3.7	74.3
1889	152.3	3.7	71.6
1890	152.3	3.2	70.8
1891	152.3	2.7	69.4
1892	148.0	2.6	65.9
1893	148.0	2.4	63.5
1894	151.4	2.2	63.3
1895	155.8	2.2	54.3
1896	167.9	2.3	52.0
1897	176.5	2.5	52.7
1898	193.0	3.0	52.1
1899	209.4	3.5	53.0
1900	201.6	3.7	54.7
1901	213.7	4.1	57.4
1902	222.4	4.5	62.3
1903	235.4	4.3	65.3
1904	239.7	4.2	68.6
1905	260.5	4.3	73.3
1906	269.1	5.6	77.9
1907	286.4	7.0	81.9
1908	311.5	7.6	86.8
1909	336.6	6.9	99.2
1910	346.1	6.6	111.9
1911	334.0	7.5	118.0
1912	317.6	8.3	120.7
1913	313.2	8.1	119.7

Source: see text.

hand, allowing a 3 to 4 percent weight loss, the margin between the price of lumber and the cost of the raw material was near 12 lire per ton of lumber, pointing to a value added of perhaps 11 lire per ton.

Imports of squared-off logs rose significantly, from .9 million tons 1904 to 1.2 million tons in 1913, but the length of time they were left to season in unknown; here, in round figures, the resulting lumber output in 1911 is estimated to have been near 1.1 million tons, for a value added near 12 million lire. This estimate leaves a residual value added of 18 million lire for lumber from rough-hewn logs; at the 27 lire per ton estimated above, the implied output is some .7 million tons, for a total of 1.8 million tons, with an aggregate value of 198 million lire.[6]

Of that, from the preceding estimates, wood products are estimated to have consumed lumber worth some 72.5 million lire, the engineering industry lumber worth another 7.5 million lire; the value of the implied residual consumed by the construction industry was accordingly some 118 million lire. For simplicity, this benchmark is here extrapolated in direct proportion to the value added of the construction industry (here transcribed in Table 12.1, col. 10); the resulting figures are transcribed in Table 12.3, col. 3.

The value of the wood industry's investment goods, transcribed in Table 12.1, col. 4, is simply the rounded sum of Table 12.3, cols. 1–3.

12.2.7 *The manufacturing industries: metalmaking and engineering*

12.2.7.1 Introduction

Table 12.1, cols. 5 and 6 refer to the metalmaking industry and the engineering industry, respectively. Like the wood industry, the engineering industry produced durables – including consumer durables, which are here to be (artificially) excluded; the metal industry supplied the raw material. Unlike the wood industry, the metal and engineering industries have been extensively researched (*IIPE, IIPF*), but not with an eye to this particular distinction. Table 12.1, cols. 5 and 6, must accordingly be constructed; the estimates of

[6] The quantity estimate sits well with the evidence that the State railways handled 1.7 million tons of lumber in 1911 (Fenoaltea 1983, p. 79).

the industry aggregates are given (Table 4.1, cols. 9 and 10), those of the consumer-goods components are collected in Table 12.4.[7]

The engineering industry comprised four major subgroups, producing, respectively, fabricated metal ("hardware"), general equipment ("ordinary" – non-precision – machines, including ships and railway vehicles, and structural components), precision equipment, and precious-metal products. The structure of the industry in 1911 is documented by the census data, here collected in Table 12.5 (extracted from *IIPF*, Table F.01); as argued elsewhere, the best guide to actual employment (at the peak of the boom) is provided by the labor-force totals in col. 2.[8] The detailed description of each category's content (e.g., *Censimento demografico*, vol. 4, pp. 12–14) is an invaluable guide to the goods actually produced, albeit not always, for present purposes, an adequate one. In the case of fabricated metal, for example, the largest categories refer to blacksmiths (4.31) and other smiths (4.32); they are said to cover those employed doing what those smiths do, which is of little help.

12.2.7.2 Fabricated metal

Consumer-good fabricated-metal maintenance is estimated as follows. For 1911, the *Censimento demografico*, vol. 4 reports some 9 million persons over age 10 working in agriculture, under 5 million

7 The engineering-industry investment-good estimates in Table 12.1 include value added in new production, and in maintenance; Vitali's estimates, apparently informed by the then standard conventions, exclude maintenance (Rey 1992, pp. 314–315). The estimates in *IIPF* are sufficiently detailed to allow alternative calculations.

8 See Fenoaltea (2015a). The industrial-census totals in col. 4 are much lower, as they tabulate only the questionnaires sent to workshops (with at least two workers) separate from the owner/manager's residence, and correspondingly exclude much artisanal production; they remain useful, as the horsepower data are a guide to capital intensity. It may be noted that the two censuses used the same categories, save that the industrial census placed vertically integrated shops in separate categories (with an ω in the appropriate position). Not included in Table 12.5 are the workers the industrial census attributed to shops integrated across the major branches of engineering (14,321), engineering and metalmaking (29,286), metal-processing and wood-working (10,980), and metal-processing and construction or construction materials (4,371).

Table 12.4 *Metalmaking- and engineering-industry consumer-good value added, 1861-1913 (million lire at 1911 prices)*

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
	engineering							
	fabricated metal		general equipment		precision equip't		precious	metal-
	maint.	new p'n	maint	new p'n	maint.	new p'n	metalw.	making
1861	2.9	15.3	.0	.0	3.6	.6	11.8	5.0
1862	3.0	15.3	.0	.0	3.9	.6	12.1	5.0
1863	3.0	15.3	.0	.0	4.1	.7	12.3	5.0
1864	3.0	15.3	.0	.0	4.5	.8	12.5	5.0
1865	3.0	15.3	.0	.0	4.9	.7	12.1	5.0
1866	3.1	15.2	.0	.0	5.1	.7	11.3	5.0
1867	3.1	15.5	.0	.0	5.3	.7	10.7	5.1
1868	3.2	15.8	.0	.0	5.5	.7	11.4	5.2
1869	3.2	16.0	.0	.0	5.8	.8	12.0	5.2
1870	3.2	16.4	.0	.0	6.0	.8	12.8	5.4
1871	3.2	16.3	.0	.0	6.2	.8	12.7	5.3
1872	3.3	16.4	.0	.0	6.4	.9	13.0	5.4
1873	3.3	16.3	.0	.0	6.6	.8	12.7	5.3
1874	3.3	16.6	.0	.0	6.8	.9	12.7	5.4
1875	3.3	17.1	.0	.0	6.9	.9	12.8	5.6
1876	3.4	17.1	.0	.0	7.2	1.0	13.0	5.6
1877	3.4	17.3	.0	.0	7.4	1.1	12.7	5.7
1878	3.5	17.2	.0	.0	7.6	1.1	12.2	5.6
1879	3.5	17.5	.0	.0	7.9	1.2	12.2	5.7
1880	3.6	18.1	.0	.0	8.1	1.2	12.9	5.9
1881	3.6	18.9	.0	.0	8.4	1.4	13.6	6.2
1882	3.6	19.6	.0	.0	8.7	1.5	14.2	6.4
1883	3.7	20.3	.0	.0	9.0	1.7	13.8	6.6
1884	3.7	21.1	.0	.0	9.4	1.7	14.3	6.9
1885	3.7	21.6	.0	.0	9.9	1.9	14.5	7.1
1886	3.8	22.6	.0	.0	10.4	2.1	15.5	7.4
1887	3.8	24.1	.0	.0	11.0	2.3	15.4	7.9
1888	3.9	24.7	.0	.0	11.5	2.1	15.1	8.1
1889	4.0	24.3	.0	.0	11.8	1.8	14.1	7.9
1890	4.0	23.0	.0	.1	11.9	1.9	13.8	7.5
1891	4.1	21.6	.0	.0	12.1	2.0	13.9	7.1
1892	4.1	20.6	.1	.2	12.2	2.1	14.4	6.8
1893	4.1	20.4	.1	.5	12.3	2.3	14.7	6.8
1894	4.2	20.6	.2	.6	12.4	2.0	14.7	6.8
1895	4.2	20.7	.3	.6	12.4	2.1	14.8	6.9
1896	4.3	20.7	.4	.5	12.3	2.0	15.2	6.9
1897	4.4	20.6	.5	.6	12.2	2.2	15.6	6.8
1898	4.4	20.9	.6	.9	12.1	2.3	16.2	7.0
1899	4.5	21.6	.8	1.2	12.1	2.6	16.3	7.3
1900	4.5	22.2	1.0	.9	12.1	2.8	17.0	7.4
1901	4.6	22.1	1.1	.6	11.9	2.6	16.8	7.3
1902	4.7	22.0	1.4	1.0	11.7	3.1	17.1	7.4
1903	4.7	22.4	1.6	1.4	11.6	3.1	17.0	7.6
1904	4.8	23.2	2.0	1.7	11.6	3.5	17.5	7.9
1905	4.9	24.3	2.3	1.7	11.5	3.6	17.9	8.2
1906	4.9	26.1	2.7	3.0	11.4	3.7	19.2	9.0
1907	5.0	28.0	3.3	5.3	11.3	3.9	20.7	10.0
1908	5.2	29.7	3.9	7.4	11.3	4.1	23.4	10.8
1909	5.2	31.4	4.8	10.2	11.2	4.3	23.7	11.8
1910	5.3	32.7	6.4	15.2	11.1	4.8	25.1	12.9
1911	5.5	33.4	8.4	20.0	11.1	5.1	25.5	13.8
1912	5.6	34.3	10.3	20.5	11.1	5.5	26.3	14.2
1913	5.8	34.6	12.3	19.8	11.1	5.6	24.6	14.3

Source: see text.

working in industry, and 27 million persons in all; of these last, those engaged in "family production" were perhaps 40 percent (a woman and a girl in a family of 5 over age 10). Daily hours spent handling metal tools averaged perhaps near 8 for agricultural workers (allowing for the time spent tending animals and the like), as many again for industrial workers (allowing for the factory workers that tended machines), and just 1 for family workers; and an index of roughness of use set equal to 1 for family production (cooking) may equal 3 for industry, and say 120 percent of that, or 3.6, for agriculture. Together, these coefficients point to a relative maintenance burden per person over age 10 equal to 72 per person in agriculture and 60 per person in industry, against 1 per person at large; together with the census figures recalled above, they suggest that of total fabricated metal maintenance activity some 66 percent was devoted to agricultural tools, 31 percent to industrial tools, and just 2.8 percent to household equipment. Similar calculations using the same weights and the corresponding data from the earlier censuses yield shares equal to 71, 27, and 2.6 percent, respectively, in 1901, and 73, 25, and 2.3 percent, respectively, in 1871.[9]

The successive shares of the maintenance total thus attributed to agriculture (73, 71, and 66 percent) are very close to corresponding shares attributed to blacksmiths (73, 70, and 68 percent, from *IIPF*, Summary Table F.1); this sits well with the assumption that the blacksmiths' maintenance activity and the maintenance of agricultural tools essentially coincided (*IIPF*, section F04.10). At the same time, the successive consumer-goods shares of all fabricated-metal maintenance (2.3, 2.6, and 2.8 percent), applied to the corresponding totals (140.67, 177.12, and 195.05 million 1911 lire, *IIPF*, Summary Table F.3), yield shares of fabricated-metal maintenance excluding blacksmiths (37.87, 52.64, and 62.37 million 1911 lire, ibid., Summary Table F.1) that grow only from 8.54 to 8.75 and finally 8.76 percent. For simplicity, the estimates of consumer-good value added in fabricated-metal maintenance transcribed in Table 12.4, col. 1 are obtained by linearly interpolating these last percentage shares, and applying them to aggregate fabricated-metal maintenance, net of blacksmiths'.

[9] The 1881 census notoriously overcounted female "industrial" employment (Vitali 1970, pp. 31–43), and was not used.

The corresponding consumer-good new production shares are even more tentative. Excluding smithing, the fabricated-metal group is here identified with category 4.3 net of 4.31 and 4.32, plus 4.52 (weights and scales, mostly traditional steelyards rather than machines). Using the labor-force figures in Table 12.5 and allocating to consumer goods 100 percent of categories 4.36 (base-metal medals and coins), 4.37 (base-metal tableware, kitchenware) and 4.39 (knife-grinding, presuming that those who used knives professionally sharpened their own), 90 percent of 4.33 (metal furniture and metal signs), 50 percent of 4.35 (cables, springs, tin cans) and 4.38 (cutting tools from knives to sickles and swords), 10 percent of 4.34 (general hardware, covering everything from nails to hairpins), and 5 percent of 4.311 (a residual that includes plating and enameling) and 4.52 (weights and scales), one obtains an overall consumer-goods share of the fabricated-metal group, excluding smiths, equal to 48 percent of the labor force and, by extension, of value added. The value added estimates for this sub-group equal 62.83 million lire in all, of which 8.65 in maintenance (*IIPF*, Tables F.03, F.46) and, implicitly, 54.18 million lire in new production; consumer goods are attributed 48 percent of the total, or some 30.2 million lire in all. Allowing consumer-goods maintenance 8.76 percent (as above) of the 8.65 million lire maintenance figure, or some .8 million lire, the residual attributed to this group's value added in the new production of consumer goods equals some 29.4 million lire, or a not unreasonable 54 percent of the sub-group's new-good total.

Blacksmithing (4.31) and other smithing (4.32) are attributed in 1911 a value added of 216.66 and 68.18 million lire, respectively, of which 132.68 and 53.72, respectively, in maintenance (*IIPF*, Tables F.03, F.46) and, implicitly, 83.98 and 14.46 million lire in new production. Blacksmiths' new production would appear to have involved very few consumer goods, other smiths' perhaps rather more; here, very tentatively, consumer goods are attributed 3 percent of blacksmiths' new production and 10 percent of other smiths', or another 4.0 million lire. The total value added in the new production of fabricated-metal consumer goods in 1911 is accordingly set equal to 33.4 million lire.

The corresponding time series is transcribed in Table 12.4, col. 2. The new-production figure for 1911 is here extrapolated in proportion to total fabricated-metal value added, including maintenance (ibid., Summary Table F.3, col. 14): that series shares the cyclical movements of new production, but with the cycle, essentially related to new construction (Fenoaltea 2020), dampened by the maintenance component. Reasonably enough, next to the population figures in the *Sommario* (p. 39, col. 1), it implies a per-capita value added rising from .61 1911 lire in 1871 to .66 in 1881, .68 in 1901, and .96 in 1911, the only census year that was in fact a long-cycle peak.

12.2.7.3 General equipment

Table 12.4, cols. 3 and 4 refer in turn to the general equipment component of the engineering industry (ordinary machinery and structural components); in Table 12.5 this group corresponds to all of the industries in category group 4.4, plus those in categories 4.54, 4.55, 4.57, and 4.58 (*IIPF*, chapter F01). The only category producing consumer goods of any significance would appear to be 4.43, bicycles and automobiles; the production of sewing machines, in particular, appears to have been negligible (ibid., p. 118), but the stock of such machines was obviously maintained.[10] The estimates for group 4.4 excluding ships and railway vehicles total 79,900 workers, 32,750 horsepower, and a value added of some 162 million lire, of which 96 million labor costs and 66 million capital costs (ibid., Tables F.02 and F.03). In category 4.43 alone the censuses counted near 16,800 workers (none of them artisans, oddly, given those engaged in our own day in bicycle assembly and repair) and some 4,100 horsepower (Table 12.5); these figures suggest that bicycles and automobiles accounted for some 21.0 percent of the above labor cost and 12.5 percent of the above capital cost, for a total value added of some 28 million lire. The "large" shops (with over 10 employees) alone employed approximately 8,900 persons

[10] All ships (seagoing vessels), including naval ones, are here considered (private or public) investment goods (above, §4.2, footnote 11). Once again, the estimates in *IIPF* are sufficiently detailed to allow alternative calculations (for ships; other armaments are not distinguished). Trucks, apparently few in number (ibid., p. 119) are not here explicitly considered.

TABLE 12.5 *Reported labor force and factor employment in engineering in 1911*

census category		(1) *Censimento demografico* (labor force)	(2)	(3) *Censimento industriale* (total) employment	(4)	(5) unduplicated horsepower in use	(6)
code	content	blue-collar	total[a]	blue-collar	total	primary	electric
4.31	blacksmiths, wrought iron work	86,879	150,582	20,230	50,302	3,653	1,218
4.32	coppersmiths, tinsmiths, braziers	29,736	49,168	10,104	19,435	853	2,099
4.33	metal furniture	5,717	7,318	5,064	6,085	44	357
4.34	general hardware	7,431	8,856	5,930	6,807	1,326	1,401
4.35	cables, springs, tin cans	5,500	7,259	3,717	4,548	1,168	809
4.36	ordinary-metal medals and coins	127	176	17	27	18	
4.37	ordinary table- and kitchen-ware	2,239	2,761	1,958	2,262	699	212
4.38	knives, scissors, swords	1,871	3,027	1,272	1,996	535	245
4.39	knife-grinders	1,710	3,922	275	812	34	202
4.310	ordinary bullets, shot, fuses, cases	503	*551*	260	300	86	58
4.311	enamelware, other metal objects	3,045	4,316	2,272	3,125	243	917
4.3ω	(4.31–4.311)			2,269	2,745	329	436
4.3	fabricated metal products	144,758	237,936	53,368	98,444	8,970	7,972
4.41	structural components, machinery	49,245	*61,692*	46,020	58,087	11,237	14,362
4.42	rail-guided vehicles	44,120	*48,147*	42,049	45,747	17,889	15,284
4.43	bicycles, automobiles	12,809	*16,781*	11,843	15,556	674	3,432
4.44	shipyards and boatyards	28,932	*31,347*	26,151	28,227	8,407	8,566
4.45	aircraft	1,286	*1,434*	403	460	61	118
4.4ω	(4.41–4.45)			7,348	7,925	1,325	2,831
4.4	heavy equipment, machinery	136,392	*159,401*	133,814	156,002	39,593	44,593
4.51	optical and precision instruments	1,226	1,722	734	1,002	92	260
4.52	common weights and scales	1,980	2,995	1,537	2,275	39	162
4.53	clocks and watches	3,861	8,801	1,468	2,417	161	218
4.54	business machines	145	*226*	97	131	1	13
4.55	electrical apparatus	7,717	*8,715*	7,157	7,884	259	2,753
4.56	metal musical instruments	922	1,234	622	771	20	69
4.57	firearms, grenades, torpedoes	9,551	*11,316*	8,093	9,244	4,196	3,564
4.58	other apparatus and equipment	10,571	*13,453*	10,294	12,798	1,450	4,390
4.59	goldsmiths and silversmiths	13,487	21,064	7,993	11,051	64	711
4.510	precious-metal medals and coins	285	446	227	277	25	45
4.5ω	(4.51–4.510)			434	659		67
4.5	light equipment, precious-metal products	49,745	69,972	38,656	48,509	6,307	12,252

[a] the italicized figures include no artisans.

Source: *Censimento demografico*, *Censimento industriale*.

and 3,400 horsepower (*IIPF,* Table F.01), pointing to a value added near 18 million lire; assuming that new production occupied all the large shops and a fifth of the residual, 20 million lire are here attributed to the new production, and 8 million lire to the maintenance, of cars and bicycles.

These figures are here extrapolated as follows. In 1911, the circulating stock of metal road vehicles can be estimated, in units of weight, near 17,300 tons of bicycles, and 11,400 tons of automobiles and motorcycles (*IIPF*, p. 119). The annual tonnage of circulating bicycles is estimated, allowing 20 kilograms per bicycle, from the number taxed (ibid., Table F.51, col. 21), smoothed and shifted by calculating the stock in year *t* as the sum of .25 times that taxed in years *t* and *t* – 2 and .5 times that number in year *t* – 1. The annual tonnage of circulating motor vehicles is instead estimated on the simple assumption that that stock increased by a third from year to year (so that, working backwards, the stock becomes negligible around the turn of the century). The sum of these two tonnage series is used to extrapolate the 8-million-lire maintenance benchmark. The 20-million-lire new-production benchmark is instead extrapolated using the sum of the annual increments in those circulating-stock tonnages, reduced by the corresponding net imports (ibid., Table F.45, col. 11). The annual new-production estimates so obtained are transcribed in Table 12.4, col. 4; the maintenance series in col. 3 sums over these estimates for cars and bicycles, and separate estimates for the maintenance of sewing machines, obtained as follows.

The national production estimates allow sewing-machine maintenance in 1911 one third the maintenance burden of bicycles, or some 1.6 million lire (= 8 million lire × .33 × (17,300/(17,300 + 11,400))), and extrapolate that benchmark in proportion to the estimated stock (*IIPF*, section F04.10 and Table F.51, col. 20). As noted there sewing machines appear to have been largely household goods, but the apparel industry's smaller share (perhaps a quarter?) was surely used far more intensively (by a factor of 10?), suggesting that households accounted for something near a quarter of the overall maintenance burden. Table 12.4 accordingly includes an allowance for the maintenance of household sewing machines equal to .4 million lire in 1911, again extrapolated in proportion to the estimated stock.

12.2.7.4 Precision equipment

Table 12.4, cols. 5 and 6 refer to precision equipment; in Table 12.5 this group corresponds to the industries in categories 4.51, optical and precision instruments, 4.53, clocks and watches, and 4.56, metal musical instruments. To a first approximation clocks and watches can be considered consumer goods (ignoring tower clocks), metal musical instruments investment goods (of bands and orchestras); optical and precision instruments involved a mix, as they include eyeglasses as well as specialized investment goods.

The clock-and-watch value added series are ready-made: *IIPF*, Summary Table F.1, cols. 24 and 25, times 8,000 and 15,000 lire per ton, respectively, cover new production, and col. 45 covers maintenance. In 1911, estimated value added equals 3.6 million lire in new production, and 10.6 million lire in maintenance.

The eyeglasses series must instead be teased out. The ready-made estimates are for categories 4.51 (optical and precision instruments) and 4.56 (metal musical instruments) together; in 1911 they are attributed labor costs of 3.56 million lire and capital costs of 2.37 million lire, for a value added of 5.93 million lire, of which 4.57 in new production and 1.36 in maintenance (*IIPF*, Tables F.03, F.46). The labor-force and horsepower figures for categories 4.51 and 4.56 in Table 12.5 (cols. 2, 5 and 6) suggest that the former category accounted for some 60 percent of the labor costs and 80 percent of the capital costs, for a total of some 4.0 million lire. Absent useful evidence, eyeglasses are tentatively allowed a value added of 1.5 million lire in new production, and .5 million lire in maintenance. There is no reason to attribute to the new production (maintenance) of eyeglasses the violent (growth) cycle attributed to all precision instruments (ibid., cols. 23 and 44); for simplicity, both the new production and the maintenance value added attributed to eyeglasses are extrapolated at the 1861-to-1911 growth rate attributed to the maintenance of all precision instruments.[11]

[11] That growth rate (the fiftieth root of 1.36/.23, near 3.6 percent p.a.) is a multiple of the demographic growth rate, implying a rapid diffusion of eyeglasses among the poorer strata as incomes grew. The precision-instrument maintenance estimates may well grow excessively rapidly, but the absolute figures are too small to be worth revising.

The sums of these estimates of value added in the maintenance, and in the new production, of clocks and watches on the one hand and eyeglasses on the other are transcribed in Table 12.4, cols. 5 and 6.

12.2.7.5 Precious-metal products

Table 12.4, col. 7 refers to consumer-goods precious-metal products. The aggregate value added estimates appear in *IIPF*, Summary Table F.3, col. 6 (attributed entirely to new production); at a guess, the consumer-good component is calculated as a constant 80 percent of that aggregate, leaving the balance as investment goods for Church and State.

12.2.7.6 All engineering

The investment-good value added attributed to the engineering industry, transcribed in Table 12.1, col. 6 is of course the industry aggregate (Table 4.1, col. 10) less the sum of Table 12.4, cols. 1–7.

12.2.7.7 Metalmaking

The investment-good value added attributed to the metalmaking industry, transcribed in Table 12.1, col. 5 is the corresponding industry aggregate (Table 4.1, col. 9) less the consumer-good component, here estimated as if it came entirely out of domestic metal output (and imported metal went entirely into investment goods). The metalmaking component of precious-metal ware is ignored: the raw material came presumably from stock, and was of course conserved in the final product.

For non-precious metals the ratio of metalmaking value added to engineering value added in any particular branch of new production can be expressed as the product of two coefficients, metalmaking value added per ton of metal and tons of metal per ton of engineering product (the input-output ratio), divided by a third one, engineering value added per ton of output. At 1911 prices ferrous metalmaking value added per ton of metal, including the reduction of the ore, equaled some 100 lire per ton (*IIPE*, section

E02.04). The standard coefficients in *IIPF*, Table F.46 for fabricated metal, general equipment, and precision instruments, respectively, are input-output ratios of 1.35, 1.25, and 2.5, and values added per ton of output of 415, 900, and 16,500 lire. Together, these yield metalmaking value added to engineering value added ratios equal to some .325, .139, and .015, respectively.

The ratio of metalmaking value added to engineering value added in maintenance is similarly obtained, again using 100 lire per ton of metal, and, directly, the ratio of tons of metal consumed in maintenance to the corresponding engineering-industry value added. Again using the estimates in *IIPF*, Table F.46 (cols. 1 and 3, rows 5, 11, and 14), one obtains metalmaking value added to engineering value added ratios equal to .003 in the maintenance of fabricated metal, .012 in the maintenance of general equipment, and .001 in the maintenance of precision instruments.

The consumer-goods component of metalmaking value added in Table 12.4, col. 8 is accordingly obtained as the sum of cols. 1–6, weighted by .003, .325, .012, .139, .001, and .015, respectively.[12] The investment-good value added attributed to the metalmaking industry, transcribed in Table 12.1, col. 5 is thus the industry aggregate (Table 4.1, col. 9) less Table 12.4, col. 8.

12.2.8 *The manufacturing industries: non-metallic mineral products*

Table 12.1, col. 7 refers to the non-metallic mineral products industry. The production estimates distinguish eight kiln products – plaster, lime, cement, bricks and tiles, terra cotta, ceramic, glass, and other products (essentially cement and plaster objects) – and two other products – cut/carved marble, and other processed stone, sand, and earth (*IIPC*).

The investment component of the industry's aggregate 1911-price value added is here calculated in three parts. The first includes all the value added attributed to plaster, lime, cement, and bricks and tiles (*IIPC*, Summary Table C.1, cols. 1–4 and Summary Table C.2). The second includes a part of that attributed to terra cotta, ceramic,

[12] The precision-instrument figures could be increased to reflect the use of non-ferrous metals, but the effect of that correction would be trivial.

and glass calculated as 22.5 percent of their 1911 total, or 13.15 million lire, extrapolated with the corresponding construction-related index (ibid., section C02.06 and Table C.07, col. 1). The value added attributed to the other kiln products is excluded altogether; the third part of the investment component includes all the value added attributed to the other (non-kiln) products (ibid., Summary Table C.3, col. 2).

The sum of these three components is transcribed in Table 12.1, col. 7. The tonnages of terra cotta, ceramic, and glass were a minuscule share of the total (under one percent in 1911, ibid., Summary Table C.1), and the corresponding extractive-industry value added is here neglected.

12.2.9 *The manufacturing industries: chemicals*

Table 12.1, col. 8 refers to the chemical industry. The chemical industry was small but complex, and its non-traditional, non-artisanal component was quite well documented, especially over the later part of the period at hand; the reconstruction of its production (*IIPD*) distinguishes 98 separate products. Most of these, however, including both traditional components (soaps) and modern ones (fertilizer), were or flowed into consumer goods; for simplicity, only a limited subset is here attributed to investment, and measured as usual by 1911-price value added (calculated from the physical units in *IIPD*, Summary Table D.1, and the unit value added weights in Summary Table D.2).

Specifically, the value added of the chemical industry here attributed to investment is that attributed to the following products and product groups: of the principal acids group, soda nitric acid (Summary Table D.1, col. 2), used largely for explosives; the entire explosives group (ibid., cols. 10–13); the entire coloring-materials group, excluding only natural dyestuffs (ibid., cols. 14–20 and 22); of the electrochemicals and gases group, arc nitric acid (ibid., col. 25) and carbon electrodes (ibid., col. 44); of the other inorganic chemicals group, saltpetre (ibid., col. 64); and all of the coal and petroleum products group, excluding only briquettes (ibid., cols. 89 and 91–97). The resulting estimates run from some 7 million lire p. a. in the 1860s to a peak of some 41 million in 1913.

12.2.10 *The manufacturing industries: rubber*

Table 12.1, col. 9 refers to the rubber industry. The rubber industry was a very small industry, with an estimated peak value added of under 13 million lire in 1912 (*IIPD*, Summary Table D.3, col. 15), but it produced a complex mix of consumer and investment goods (*Censimento demografico*, vol. 4, p. 19, category 7.111). The present very tentative estimates of its investment component assume that the latter equaled two thirds of the industry's value added, net (from the 1890s) of that attributable to bicycle and motor-vehicle tires.

The circulating stock of circulating bicycles and motor vehicles was calculated above (§12.2.7), in units of weight. Annual tire consumption in units of weight is here calculated, in the case of bicycles, at 10 percent of the weight of the bicycles themselves (allowing for example 20 kg per bicycle, 2 kg for the tires, and replacement once a year); in that of motor vehicles, at 2.4 percent of the weight of the motor vehicles (allowing for example one ton per automobile, 16 kg for a set of tires, and replacement 1.5 times per year). These estimates imply a tire consumption of some 2,000 tons in 1911, and 2,700 tons in 1913, here attributed, like other rubber products, a value added of 1,780 lire/ton (*IIPD*, Summary Table D.2).

Again to obviate more complex calculations, Table 12.1, col. 9 is directly the estimate of the value of those investment goods, rather than their value added. The prices of rubber goods varied widely; an average of 10,000 lire per ton seems reasonable (ibid., section D05.03), and Table 12.1, col. 9 is simply two thirds of the industry's value added excluding that attributed to tires, scaled up by (10,000/1,780).

12.2.11 *The manufacturing industries: paper, printing and sundry manufacturing*

The paper, printing and sundry manufacturing industries are here assumed to have produced negligible quantities of investment goods, and do not appear in Table 12.1.

12.2.12 *The manufacturing industries: aggregate manufacturing*

Table 12.1, col. 10 transcribes the estimated investment content of the entire manufacturing group's product; it is simply the sum of cols. 2–9.

12.2.13 *Construction*

Table 12.1, col. 11 refers to the construction industry. Its entire value added (including that in maintenance, ch. 2A) is attributed to investment; the present series accordingly reproduces the corresponding production series (Table 4.1, col. 16).

12.2.14 *Utilities*

Table 12.1, col. 12 refers to the utilities. The water and gas industries appear to have supplied, in essence, consumer goods; the product of the electric utilities needs instead to be allocated. The investment component would appear to consist in the main in the power supplied to the durable-goods industries. The *Censimento industriale*, vol. 4, reports the power of the electric motors in use running on purchased power; the figures reported for categories 2.1 (mining), 2.2 (quarrying), 3.1 (wood products), 4 (metal and metal products), and 5 (construction and construction materials) total approximately 150,000 horsepower. Most of these presumably operated intermittently, suggesting that a mean of 2,000 hours per year should not be far wrong; total power consumption in durable-goods production thus works out to some 300 million kWh. In 1911 the electric utilities generated just over 1,000 million kWh (*IIPJ*, Summary Table J.1, col. 1 and 2); here, the electric utilities' investment component is simply estimated as a constant 30 percent of their total value added (*IIPJ*, Summary Table J.3, col. 1).

Neglecting gas and water, as indicated, the resulting figures are attributed directly to the utilities as a whole, and transcribed in Table 12.1, col. 12.

12.2.15 *All industry*

Table 12.1, col. 13, reports the total for industry (the sum of cols. 1 and 10–12). Col. 14 reports, as a *curiosum*, the share of industrial value added (Table 4.1, col. 18) represented by the investment component estimated here (Table 12.1, col. 13, for this purpose slightly swollen by the inclusion of agricultural raw materials); interestingly, it was near 50 percent at the long-investment-cycle peaks (1865, 1874, 1888, 1911–12), and nearer 45 percent in "normally" poor years (1868–71, 1875–80), but fell to near 40 percent during the worst of the end-of-the-century crisis (1896-97).

12.3 Investment goods: agriculture

12.3.1 *Introduction*

Table 12.6 transcribes the contribution of agriculture to (fixed) investment: estimated, for the reasons noted, not as a share of domestic production, to which net imports must then be added, but directly as the aggregate value of investment-goods consumed.

Agriculture produces, in the main, consumer goods. There are, on the face of it, five (first-order) exceptions: the raw materials (such as timber) entering the production of industrial investment goods, which can here be ignored as they have been included in the industrial estimates above; the fuels (firewood, charcoal) used notably in the processing of metallic and non-metallic minerals; the "urban" animals provided to the transportation sector (and the military); investment in on-farm improvements; and the increments in the herds of livestock.

12.3.2 *On-farm improvements*

The least troublesome component is the value added in on-farm improvements, estimated as such on the production side (Table 5.1, panel A, col. 4); it here transcribed for convenience in Table 12.6, col. 1.

12.3.3 *Fuel*

Charcoal was something of a specialty fuel, used where its chemical purity was of value. Firewood was instead the main traditional source of inanimate energy (surpassed by coal early in the twentieth century, Bardini 1998, pp. 21–23); but it was used

Table 12.6 *Agricultural production flowing into investment, 1861-1913 (million lire at 1911 prices)*

	(1) on-farm improve-ments	(2) fire-wood	(3) char-coal	(4) off-farm horses private	(5) off-farm horses public	(6) herd incre-ments	(7) total
1860							
1861	17	17	6	8	3	34	85
1862	35	19	6	8	3	37	108
1863	35	19	5	7	3	27	96
1864	52	19	5	7	3	21	107
1865	0	19	4	7	3	35	68
1866	17	16	5	2	3	37	80
1867	0	16	5	4	3	24	52
1868	17	15	5	5	3	7	52
1869	35	15	4	6	3	17	80
1870	35	15	5	7	3	27	92
1871	17	16	4	6	3	30	76
1872	17	17	5	8	3	26	76
1873	70	20	6	9	3	44	152
1874	87	22	6	8	3	4	130
1875	105	18	6	3	3	15	150
1876	122	17	4	6	2	32	183
1877	122	18	3	7	9	0	159
1878	192	18	3	8	2	0	223
1879	157	18	3	9	2	38	227
1880	157	18	4	8	4	34	225
1881	140	19	6	9	4	27	205
1882	157	20	5	11	4	24	221
1883	105	20	5	10	4	57	201
1884	140	20	4	10	4	80	258
1885	122	20	4	11	4	59	220
1886	157	20	3	11	4	34	229
1887	35	18	3	9	4	39	108
1888	0	17	3	7	4	31	62
1889	0	17	3	10	4	3	37
1890	87	17	3	9	4	–10	110
1891	105	17	3	8	4	–4	133
1892	122	16	3	8	4	42	195
1893	70	16	2	9	4	58	159
1894	35	16	2	9	4	69	135
1895	105	14	2	7	4	17	149
1896	122	14	2	8	4	26	176
1897	105	14	2	10	4	24	159
1898	87	14	3	10	4	–7	111
1899	35	14	4	11	4	–43	25
1900	105	14	5	11	4	–22	117
1901	140	15	3	13	4	–8	167
1902	157	16	3	15	4	36	231
1903	87	18	3	14	4	77	203
1904	52	19	2	13	4	59	149
1905	122	20	2	17	4	20	185
1906	140	20	2	17	4	49	232
1907	157	21	2	17	4	71	272
1908	140	22	2	19	4	198	385
1909	105	25	1	25	4	13	173
1910	122	28	1	25	4	25	205
1911	105	29	1	22	4	25	186
1912	175	30	1	23	4	–4	229
1913	175	30	1	20	5	5	236

Table 12.6 *(continued)*

	(8)	(9)	(10)	(11)
	herd stock estimates			
	sheep (Fenoaltea)	bovines (Federico)	goats (Federico)	pigs (Federico)
1860	6,268	4,011.4	1,473.5	921.9
1861	6,797	4,063.3	1,479.3	889.7
1862	7,430	4,112.9	1,492.0	879.8
1863	7,699	4,128.6	1,581.4	993.4
1864	7,704	4,174.3	1,689.9	971.5
1865	8,113	4,217.0	1,892.7	979.8
1866	8,606	4,259.5	1,910.0	1,026.2
1867	8,994	4,284.8	1,890.2	1,058.9
1868	9,211	4,293.1	1,821.9	1,051.6
1869	9,121	4,325.2	1,809.6	1,097.9
1870	9,030	4,354.1	2,059.1	1,199.0
1871	9,352	4,391.7	2,173.6	1,224.0
1872	9,549	4,441.8	2,190.5	1,208.5
1873	9,900	4,492.4	2,096.6	1,360.8
1874	9,510	4,483.6	2,063.2	1,543.5
1875	9,151	4,534.7	2,173.6	1,524.3
1876	9,159	4,602.8	2,289.6	1,505.6
1877	9,150	4,639.6	2,208.4	1,362.9
1878	8,633	4,688.0	2,061.5	1,314.8
1879	8,844	4,764.0	1,965.2	1,323.5
1880	9,130	4,783.0	2,016.0	1,492.4
1881	8,596	4,831.1	2,106.2	1,661.8
1882	8,343	4,917.0	2,139.8	1,572.2
1883	8,650	5,024.4	2,209.2	1,566.2
1884	9,061	5,154.9	2,271.1	1,662.4
1885	9,375	5,287.6	2,311.5	1,561.9
1886	9,566	5,371.8	2,294.0	1,484.4
1887	9,529	5,426.4	2,291.7	1,639.8
1888	9,764	5,453.0	2,297.9	1,770.9
1889	9,768	5,446.7	2,238.1	1,845.3
1890	9,344	5,471.3	2,152.8	1,765.9
1891	9,202	5,484.1	2,218.6	1,684.2
1892	9,454	5,524.9	2,335.3	1,825.9
1893	9,562	5,582.2	2,423.5	2,102.2
1894	9,721	5,694.5	2,410.2	2,249.4
1895	10,199	5,736.4	2,483.4	2,090.1
1896	10,862	5,811.7	2,515.4	1,835.9
1897	11,030	5,849.3	2,472.3	1,872.0
1898	10,502	5,829.8	2,325.1	2,059.4
1899	9,807	5,780.4	2,233.8	2,047.9
1900	9,452	5,772.2	2,233.6	1,953.7
1901	9,154	5,763.1	2,343.2	1,966.7
1902	9,028	5,809.5	2,480.0	2,114.1
1903	9,541	5,902.8	2,502.7	2,332.2
1904	9,991	5,990.5	2,484.4	2,415.0
1905	10,134	6,051.3	2,512.9	2,302.8
1906	10,533	6,134.2	2,664.3	2,281.2
1907	11,008	6,213.2	2,715.0	2,507.8
1908	11,163	6,607.4	2,671.0	2,689.8
1909	11,754	6,590.1	2,591.0	2,772.4
1910	12,252	6,628.2	2,582.0	2,723.9
1911	12,446	6,695.4	2,553.0	2,626.7
1912	12,257	6,687.1	2,536.8	2,671.8
1913	12,401	6,689.5	2,486.7	2,690.5

Source: see text.

overwhelmingly for domestic heating and cooking, so for present purposes the aggregate figures are essentially useless.

A more useful guide to the appropriate orders of magnitude is provided by the detailed fuel-consumption data for 1865 in the *Statistica mineraria*. These are collected in Table 12.7, ignoring mineral fuels (and, in one case, straw); the occasional volume figures are converted at the rate of .4 tons per cubic meter of firewood, and .2 tons per cubic meter of charcoal (Colombo 1919, pp. 60–61). The totals come to some .80 million tons of firewood (almost all in kilns), and .09 million tons of charcoal (all in metal-processing). The source's coverage is partial, as some industries are omitted (and others, like the bronze industry, appear covered very partially); but even allowing for that the totals in 1865 are small next to Federico's domestic-production totals for 1911 (7.5 million tons of firewood and .42 million tons of charcoal, Rey 2000, p. 17, converted as above).

The present investment-firewood series takes the 1865 benchmark of .80 million tons, and values it at Federico's 1911 average value (177 million lire/7.5 million tons), for a total of 19 million lire at 1911 prices. This figure is extrapolated using the product of two indices. One is simply the 1911-price value added of the kiln products industry (*IIPC*, Summary Table C.3, col. 1), converted to set 1865 = 1. The second is an *ad hoc* index, also with 1865 = 1, that aims to capture the displacement of wood by mineral fuels, presumably as the local price of the latter was reduced by the development of inland railways and tramways (but not by the water-competing coastal routes). Since the inland secondary lines were built mainly between 1880 and 1895, and the (less important) tramways spread mostly from the turn of the century, this second index is tentatively so constructed as to decline by 2 percent p. a. in the 1860s and 1870s, then by 5 percent p. a. from 1880 to 1895, and then by 3 percent p. a. The resulting series is transcribed in Table 12.6, col. 2.

The investment-charcoal series is similarly constructed. The 1865 benchmark is calculated as .09 million tons valued at Federico's 1911 average value (18.5 million lire/.42 million tons), for a total of 4 million lire at 1911 prices. Ignoring minor consumers, 84 percent of that is attributed to the iron industry, and 16 percent to the copper industry, and specifically, again for simplicity, to the reduction of the corresponding ore. The pig iron and ingot copper series

TABLE 12.7 *Firewood and charcoal investment-goods consumption data, 1865*

industry	source pages	(1) firewood consumption (tons)	(2) charcoal consumption (tons)
Metal industries			
iron	pp. 30-31	4,053	68,860
copper	pp. 42-43	1,040	12,873
lead	pp. 44-45	124	3,079
zinc	pp. 54-55	1,480	0
mercury	pp. 54-55	0	114
nickel	pp. 54-55	1,138	446
bronze	pp. 54-55	110	14
total		7,945	85,386
Construction-materials industries			
asphalt	pp. 56-57	256	0
binders and fired clays	pp. 82-83	695,327	0
ceramics	pp. 84-85	23,090	0
glass and glass beads	pp. 88-89	64,442	0
total		783,023	0
Grand total		790,968	85,386

Source: *Statistica mineraria.*

are those in *IIPE*, Summary Table E.1, cols. 1 and 8, respectively. Both series display a long period of stasis, and then a tenfold and more increase in production that seems to correspond to the transition from traditional charcoal-based techniques to modern coal-and-coke-based techniques. Here, charcoal-based pig iron production is assumed to equal total production from 1861 (26,551 tons) through 1901 (15,819 tons), and then to have declined by 10 percent p. a. (to under 4,500 tons in 1913); charcoal-based ingot copper production is assumed to equal total production from 1861 (947 tons) through 1886 (408 tons), and then to have declined by 10 percent p. a. (to under 25 tons in 1913). These last two series are rescaled to set 1865 = 1, weighted by 4 million lire times .84 and .16, respectively, and summed. The resulting series is transcribed in Table 12.6, col. 3.

12.3.4 *Off-farm animals*

Baffigi (2015), p. 145 considers investment in agricultural goods dominated by that in animals, mainly horses, for urban services. His 1911 benchmark is taken from Vitali, whose flow estimate refers back to Federico's stock estimate of "441,000" private animals; drawing on a near-contemporary animal census, Federico actually counted 328,100 "urban" horses (only 272,100 of them working horses, the rest foals or at stud) and 115,800 donkeys and mules, plus 52,000 (mostly horses) belonging to the State (Rey 2000, pp. 50, 316).

There are in fact three reasons to consider the private stock figures in the literature much overstated. First, Federico appears to have counted all the animals in the major *municipalities*, including their rural areas (whence the significant share of colts and stud horses, presumably not "urban" at all). Second, there is no allowance for the saddle and coach horses of the urban well-to-do. According to the *Censimento demografico*, vol. 4, p. 26, some 240,000 of Italy's males above age 10 declared themselves too rich to work (category 11.11). This moneyed aristocracy was based in urban *palazzi* with still-visible stables and coach houses: the number of horses that were private "consumption" goods, and irrelevant to "investment" (which conventionally excludes consumer durables) easily exceeded 100,000. Third, the *Censimento demografico* (ibid., p. 20) reports just 234,000 workers, almost all male, in category 8.31, "road transportation," which includes drivers of animals and vehicles, and stable hands; deducting perhaps 4,000 drivers of motor vehicles, 46,000 stable hands (20 percent of the residual), and 40,000 coachmen in private service (one for every six "rich" males), the number of public-transportation horse (and other equine) drivers falls to some 144,000.[13] They can hardly have averaged significantly more than one horse each, for an estimated stock of transportation-sector working animals of perhaps 150,000.

Here, that 1911 stock figure is extrapolated in proportion to the estimated tonnage moved by road (Table 7.2, col. 18), and the

[13] This estimate is broadly confirmed by the here more detailed *Censimento 1901* (vol. 4, p. 144): some 64,000 coachmen (and other, minor groups, category XVII.9) and some 125,000 carters, muleteers, and stable hands (category XVII.10), from which private coachmen and stable hands are to be deducted.

annual intake is estimated in year *t* as the increment in the stock from *t – 1* to *t* (for expansion) plus .15 times the stock in *t – 1* (for replacement, tentatively assuming a 7-to-8-year working life, Federico in Rey 1992, p. 58, footnote 254), with the intake obtained for 1862 attributed to 1861 as well. The 1911-price value of that intake is calculated allowing 800 lire per animal (from the export price of horses, *Movimento commerciale 1911*, category 1055). The resulting private-horse investment series is transcribed in Table 12.6, col. 4; fortunately, it too does not exceed low double-digits.

State-owned horses are public capital goods, and the corresponding flow is not to be excluded from investment.[14] The estimates of the State-purchased component are even more tentative. As noted, Federico estimated a stock of 52,000 horses (and other equines) belonging to the State. Most were presumably in the military, a presumption confirmed by the figures for the Army's theoretical establishment: 40,410 in 1907, 43,824 in 1912, 45,424 in 1913 (*Annuario 1905-07*, p. 1015, *1912*, p. 337, *1913*, p. 401). The readily-available *Annuario* provides additional data only in the earliest editions, in the *Annuario 1878* (part 1, p. 88) and *1884* (p. 291), which report annual purchases from 1873 to 1881 (an average of 3,700 p. a., ranging from under 1,500 to over 10,700).[15] Without using further information, the present estimates of the horses purchased by the State is very tentatively obtained as follows. From 1861 to 1872, the number is set at a constant 4,000 p. a.; from 1873 to 1881, as the number of military purchases (*Annuario 1884*, p. 291), augmented by 600 p. a. for other services; from 1882 to 1907, 4,700 p. a.; from 1908 to 1912, 5,400 p.a., and in 1913, 6,300, with these last figures capturing the expansion suggested by the *Annuario 1905-07*, *1912*, and *1913*, cited above. These figures are then weighted as before by 800 lire per animal.

The resulting public-horse investment series, a mere single-digit affair, is transcribed in Table 12.6, col. 5. Given its poor quality, it is

[14] See above, §4.2, footnote 11. Here too, the provision of separate estimates allows recalculation with different criteria.

[15] A second table reports, by breed, what appear to be exceptional replacement purchases. These averaged some 900 in 1874 and 1875 but 2,400 in 1874–81; they are here presumed to be a specification of, rather than an addition to, the cited reported purchases.

more of a tentative allowance to be added to the private-horse series in col. 4 than a separate estimate in its own right; the two series are here kept separate only to facilitate the exclusion from investment of its public component, by those who may wish to do so.

12.3.5 *Herd increments*

Investment in herd increments is here estimated very roughly, from the first differences in the herd-stock estimates for sheep, bovines, goats, and pigs transcribed in Table 12.6, cols. 8–11; horses, rabbits, and barnyard fowl are simply ignored. The sheep-herd series is that estimated by the present author (Fenoaltea 2000, Table 1, col. 6); the other three were kindly provided by Giovanni Federico, a gift horse for which one can only be grateful.

The first differences are weighted by the unit prices indicated or suggested by the *Movimento commerciale*: 25 lire each for sheep and goats (categories 1064 and 1065), 450 for bovines (against 710 for oxen, 460 for cows, and 250 for calves, categories 1059, 1061, and 1063, respectively), and 100 lire for pigs (against 28 to 165 lire per animal, depending on its weight, categories 1066–1070).

The resulting series is transcribed in Table 12.6, col. 6. Its outlier in 1908 comes from the jump in the bovine herd; it may be correlated with that year's massive return migration from the United States.

12.3.6 *All agriculture*

Table 12.6, col. 7 transcribes the aggregate estimate of agricultural value added flowing into investment; it is the simple sum of cols. 1–6. As noted, these estimates include the relevant import component.

12.4 Investment goods: exports and imports

12.4.1 *Introduction*

The investment content of exports and imports is derived in Table 12.8, again improving on the algorithms used in Fenoaltea

(2012). Table 12.8 is organized, like the Federico *et al.* (2011) database, by *SITC* category. *SITC* categories 0 and 1 refer to food, drink, and tobacco, and are here irrelevant. Categories 4, 5 and 9 refer to animal and vegetable oils, to chemicals, and to a residual, respectively; their investment-good content is assumed negligible.

12.4.2 *The investment content of SITC category 2*

SITC category 2 refers to crude (non-fuel) materials, agricultural and mineral. The agricultural (inputs to) investment goods, relevant in principle, are here ignored, as they have already been allowed for above. The mineral (inputs to) investment goods are instead to be counted; because fuel-poor Italy was a high-cost processor of ores (its own, and *a fortiori* anybody else's), only the export side is considered here.

Table 12.8, cols. 1–4 transcribe the exported quantities of mineral ores (of iron, lead, copper, and zinc, ignoring minor items), as reported from 1862 by the *Movimento commerciale*; these are here valued directly at their 1911 export prices (respectively 18, 180, 80, and 140 lire per ton, categories 654, 656, 657, and 660).[16] Cols. 5–8 transcribe the reported exports of marble, respectively in blocks, thick slabs, thin slabs, and unspecified products (worth respectively 80, 105, 112.5, and 550 lire per ton in 1911, categories 890, 892, 895b, and 895c; minor items are again ignored).[17] The difficulty here is that cols. 6 and 8 go back only to 1874 (and that in the five-year retrospective in the *Movimento commerciale 1878*, adapted to the new tariff), and col. 7 to 1883; before 1888 col. 8 includes marble tiles (later separately counted, and worth 80 lire per ton in 1911, category 895a; some 3,800 tons were exported in 1888), and before 1883 it includes thin slabs as well. The upshot is that the estimated 1911-price value of these marble exports is the simple 1911-price-weighted sum of the reported quantities only from 1888; in earlier years, a measure of chaining is introduced,

[16] The apparently small quantities of pyrite included to 1900 by the iron-ore figures are here ignored.

[17] Category 910b, stone and ores n.e.c., is also ignored: exports were significant, but largely offset by imports.

Table 12.8 *Investment-good exports and imports, 1861-1913*

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
	exports of mine and quarry products (thousand tons)							
						marble slabs		other
	iron ore	lead ore	copper ore	zinc ore	block marble	thick	thin	worked marble
1861								
1862	5.1	3.7	1.7	.0	20.4			
1863	5.6	7.3	1.2	.0	39.6			
1864	6.9	17.9	1.8	.0	21.7			
1865	.7	.7	1.0	.0	40.9			
1866	18.1	25.2	2.7	.0	49.6			
1867	31.6	22.7	3.5	18.7	56.6			
1868	24.5	23.4	4.5	6.9	69.3			
1869	54.1	24.7	3.1	72.0	49.7			
1870	40.6	16.0	8.2	71.3	54.5			
1871	45.3	14.5	6.0	50.7	57.4			
1872	168.5	17.0	4.2	60.4	53.3			
1873	161.9	21.4	4.7	56.6	63.4			
1874	203.4	17.8	7.9	63.1	73.1	3.9		18.9
1875	191.1	18.5	9.1	64.5	63.3	4.1		18.6
1876	197.7	28.5	8.1	66.6	48.1	4.3		15.5
1877	236.7	27.5	9.6	78.3	51.5	4.5		13.0
1878	162.4	29.2	12.1	53.4	46.4	4.5		19.8
1879	213.6	22.8	7.9	62.2	51.3	3.8		44.1
1880	399.7	18.0	11.3	85.3	71.6	3.4		33.6
1881	285.4	17.2	11.0	70.9	52.7	3.6		40.8
1882	206.0	19.0	8.3	102.4	66.6	2.6		41.0
1883	203.7	20.9	9.5	106.4	58.7	2.0	24.8	30.3
1884	166.6	15.9	12.9	89.6	61.0	2.5	26.4	24.1
1885	150.6	16.6	10.9	103.5	58.2	1.9	27.0	24.3
1886	123.5	5.9	9.2	82.1	52.1	1.3	33.3	20.7
1887	171.6	10.3	11.8	82.5	54.9	1.4	39.5	14.1
1888	130.7	7.7	9.9	90.1	53.1	1.4	37.4	9.9
1889	183.3	7.4	9.0	107.1	61.8	1.6	44.0	13.1
1890	136.7	8.2	9.9	80.8	68.4	.9	40.7	10.2
1891	202.3	7.3	10.1	104.7	69.4	.6	32.6	13.7
1892	124.8	6.7	12.7	119.3	77.8	1.3	42.3	8.0
1893	156.3	5.6	12.7	113.2	72.8	1.1	38.6	9.8
1894	159.2	6.4	7.9	123.3	78.8	1.0	35.4	8.8
1895	164.4	6.6	5.9	111.2	75.5	.8	42.4	9.0
1896	187.1	4.7	3.6	115.5	80.8	1.3	49.6	11.0
1897	207.6	4.7	2.4	133.1	83.1	1.6	46.5	11.8
1898	217.6	4.5	2.4	130.1	88.4	4.0	45.2	13.1
1899	234.5	3.1	1.1	140.1	98.5	6.2	51.9	15.0
1900	170.3	4.0	1.2	111.3	91.7	4.5	45.2	16.1
1901	121.6	4.0	.0	103.0	96.6	3.7	47.2	15.5
1902	209.1	3.3	.0	114.9	113.0	2.4	54.0	18.8
1903	98.3	5.0	.0	116.4	130.3	3.9	58.5	16.9
1904	2.6	5.5	.0	126.4	131.1	3.9	58.1	16.0
1905	11.4	4.3	.1	117.8	132.8	5.1	67.7	16.4
1906	1.8	8.4	.2	144.2	148.6	4.7	67.2	16.7
1907	26.0	3.2	.2	142.3	164.5	4.2	81.2	16.7
1908	35.7	2.0	.2	122.5	155.4	3.0	72.9	16.3
1909	.0	1.0	.2	123.9	156.9	3.0	76.4	12.7
1910	8.9	4.1	1.0	127.3	169.4	4.2	91.3	16.0
1911	24.9	15.8	.1	133.5	180.5	2.7	104.5	16.4
1912	12.3	17.1	.2	152.8	200.0	2.3	110.9	16.0
1913	9.7	17.0	.3	144.6	182.9	1.9	105.8	14.2

Table 12.8 *(continued)*

	(9)	(10)	(11)	(12)	(13)	(14)
	net imports (million lire at 1911 prices)					
	SITC cat. 2	*SITC* cat. 3	*SITC* cat. 6	*SITC* cat. 7	*SITC* cat. 8	total
1861	–3.3	5.6	28.0	22.5	4.0	57
1862	–4.1	5.6	28.5	34.3	4.0	68
1863	–7.8	4.8	35.1	45.2	4.3	82
1864	–6.9	6.7	30.5	30.7	6.5	68
1865	–6.7	5.5	29.6	27.9	5.0	61
1866	–12.9	6.0	25.7	15.9	4.2	39
1867	–16.5	5.6	29.9	12.9	4.9	37
1868	–17.0	6.5	27.3	11.6	4.4	33
1869	–23.6	7.1	37.1	16.7	5.5	43
1870	–22.9	10.6	36.0	13.8	3.9	41
1871	–20.1	8.6	36.3	18.2	4.3	47
1872	–23.3	11.5	38.1	22.1	6.2	55
1873	–25.1	10.6	39.3	37.8	6.5	69
1874	–27.9	11.6	46.8	23.3	6.1	60
1875	–27.3	11.6	48.0	18.0	6.8	57
1876	–27.3	16.1	47.2	18.7	6.4	61
1877	–29.2	14.7	51.6	20.7	7.1	65
1878	–26.4	14.5	39.8	16.3	5.3	50
1879	–34.2	17.0	49.5	19.1	4.2	56
1880	–38.8	19.8	54.6	29.2	5.2	70
1881	–35.1	24.3	72.2	40.6	5.7	108
1882	–39.3	26.7	87.1	52.8	6.6	134
1883	–43.5	29.5	95.5	57.2	6.6	145
1884	–37.7	33.0	92.5	54.9	8.5	151
1885	–39.2	38.3	92.8	55.9	9.0	157
1886	–32.3	38.4	102.3	60.4	11.6	180
1887	–32.3	47.6	123.1	80.6	25.1	244
1888	–31.2	51.1	116.1	68.5	19.8	224
1889	–37.6	52.2	102.1	62.3	15.0	194
1890	–31.8	56.1	81.3	44.0	12.7	162
1891	–37.2	50.3	65.9	27.3	9.2	116
1892	–36.7	49.4	60.1	24.7	9.0	107
1893	–36.4	47.8	65.0	24.5	9.2	110
1894	–37.1	60.1	64.7	19.9	7.1	115
1895	–36.0	54.7	62.4	27.9	8.0	117
1896	–38.9	51.4	64.5	18.0	10.6	106
1897	–41.9	53.5	64.0	17.3	14.0	107
1898	–42.9	55.9	68.1	30.8	20.3	132
1899	–47.1	61.0	84.3	61.3	21.1	181
1900	–41.2	62.8	90.1	108.1	23.4	243
1901	–39.3	61.1	84.9	78.0	24.5	209
1902	–46.2	68.7	98.6	42.0	24.9	188
1903	–45.7	70.8	97.9	43.9	27.8	195
1904	–45.0	76.3	99.7	84.6	30.6	246
1905	–45.3	84.1	106.7	101.7	37.4	285
1906	–50.9	102.4	159.3	170.4	57.7	439
1907	–52.9	111.5	209.8	244.4	62.3	575
1908	–48.1	115.6	217.8	235.5	70.9	592
1909	–46.0	126.7	203.2	175.6	62.7	522
1910	–51.9	130.0	205.6	149.2	74.2	507
1911	–57.5	138.0	211.6	150.4	77.9	520
1912	–62.2	144.3	236.3	143.8	85.8	548
1913	–58.0	148.2	214.3	136.4	85.7	527

Source: see text.

as follows. In 1888, unspecified marble products and tiles together totaled 13,700 tons and, at 1911 prices, 5.749 million lire; in 1883–87, therefore, the tonnages in col. 8 are attributed a unit value reduced to 420 lire per ton. In 1883, again, unspecified marble products (including tiles) and thin slabs together totaled 55,100 tons and, at 1911 prices, 15,516 million lire; in 1874–82, therefore, the tonnages in col. 8 are attributed a unit value further reduced to 282 lire per ton. In 1874, the estimated 1911-price value of these marble exports equaled 15,587 million lire; *faute de mieux*, this figure is extrapolated back to 1862 in proportion to col. 5, in effect assuming a constant mix of block and variously processed marble.

The estimated 1911-price value of the *SITC* category 2 exports covered by cols. 1–8 is of course the sum of the separate figures for metal ores and for marble, obtained as just described. Neglecting imports, as noted, from 1862 Table 12.8, col. 9 simply reports these exports, with a negative sign, as net imports. The 1861 figure is estimated directly as 80 percent of that calculated for 1862.

12.4.3 *The investment content of SITC category 3*

SITC category 3 refers to mineral fuels; its investment content is here estimated directly, relying on recently compiled estimates of mineral-fuel (coal or coal-equivalent, henceforth simply "coal") tonnages used, by sector, in *IIPF*, Table F.51.

An estimate of coal used for steam power to drive (non-transportation) machinery *CSM* is obtained as the sum of Table F.51, cols. 1 (net imports of coal) and 2 (other mineral fuels), less the sum of cols. 3, 4, 6, 8, 10–12, and 14 (in order, railway consumption, gas-works' consumption, consumption not for steam in kilns, chemical works, metalmaking, engineering, and sugar refining, respectively, and consumption for electric lighting).[18] In 1911, judging from the horsepower data, the investment-good categories (3.1, 4, and 5) used some 44 percent of the steam power in use, net of the utilities (category 8.1); that share falls to 39 percent if

[18] Table F.51, col. 15 ("net coal for steam") is not used directly, as it is corrected for the growing fuel economy of steam engines, and the declining incidence of transmission losses.

one allows consumer goods 13 percent of category 4 (metalmaking and engineering, from Table 12.1, cols. 5 and 6 and Table 4.1, cols. 9 and 10). For simplicity, *ICSM* (the investment component of *CSM*) is here obtained as *CSM* times an estimated investment share equal to .39 in 1911, and extrapolated in proportion to Table 12.1, col. 14 (approximately, as noted, the investment share of industrial production). The investment coal used directly for heat *ICDH* is estimated in turn as the sum of Table F.51, col. 6 (kilns) and, again allowing for consumer goods, 87 percent of cols. 10 (metalmaking), and 11 (engineering). Finally, the investment component of the coal consumed by railways *ICRR* is calculated as the total in Table F.51, col. 3 times the investment share of railway transportation (rising from .25 in 1861–71 to .28 in 1881–1913) estimated in §12.5.1.1 below. In 1911, coal used for investment *IC* = *ICSM* + *ICDH* + *ICRR* equals some 4.17 million tons, against net imports of 9.77 million tons (Table F.51, cols. 1 + 2).

In 1911, according to Federico *et al.* (2011, pp. 86, 94), *SITC* category 3 net imports were worth 323.9 million lire. Investment net imports are estimated from the above tonnages as (4.17/9.77) of that, or some 138 million lire. Table 12.8, col. 10, is that benchmark, extrapolated in proportion to *IC*.

12.4.4 *The investment content of SITC category 6*

SITC category 6 refers to manufactures other than machinery and transportation equipment, including consumer goods such as textiles. For simplicity, the investment component is here identified directly with metals and simple metal products ("hardware"), and its 1911-price value is estimated from physical net imports, weighted by 1911 unit values taken from the *Movimento commerciale.* The tonnage series are taken from *IIPE*, Table E.03, cols. 1–7 (ferrous metals), Table E.04, col. 2 (aluminum), Table E.06, col. 4 (copper), Table E.09, col. 1 (lead) and col. 2 (antimony), Table E.11, col. 2 (tin), Table E.12, col. 2 (zinc), and *IIPF*, Table F.45, cols. 2–9 (semi-finished non-ferrous metals, metalware).[19] The seven ferrous

[19] Net exports of tin cans are not ignored, as they would otherwise inflate domestic investment.

metal products (Table E.03) are assigned lire-per-ton values of 90 (category 664), 85 (663), 325 (665a), 650 (668), 125 (674), 150 (683), and 170 (675/676), respectively; as for the other metals (Tables E.04 to E.12), aluminum is assigned 1,550 lire per ton (category 774), copper 145 (730), lead 370 (757), antimony 760 (780), tin 4,800 (762), zinc 650 (769). The semi-finished non-ferrous metals (Table F.45, cols. 2–5) are assigned lire-per-ton values of 2,350 (category 775), 1,900 (731/732), 3,600 (752), and 750 (770); the four metalware groups (Table F.45, cols. 6–9), lire-per-ton values of 1,150 (category 708), 950 (721/724), 840 (716b), and 3,250 (746).

The resulting net-import totals are transcribed in Table 12.8, col. 11; to allow for purchases in anticipation of the 1888 tariff hike, imports worth 20 million lire are here transferred from 1887 to 1888.

12.4.5 *The investment content of SITC category 7*

SITC category 7 refers to (non-precision) machinery and transportation equipment. Net imports of investment goods are calculated directly as the sum of partial figures for ships, rail- and tramway vehicles, and other machinery. Net imports of ships are taken from Table 10.1, as the difference between imports (cols. 9 and 10) and exports (cols. 4 and 5). Net imports of railway vehicles are obtained by summing the tonnages of locomotives, passenger cars, and freight cars, each weighted by the corresponding unit value in 1911 (respectively 1,640, 1,402.5, and 690 lire per ton: *IIPF*, Table F.34, cols. 2, 5, and 8, and section F03.08). Net imports of other machinery sum separate 1911-price-weighted tonnage series for machine parts and assembled machines. The tonnage series are those in Fenoaltea (2020), Table 2, cols. 2 and 3 (which transfer some imports from 1887 to 1888, to allow for inventory accumulation in anticipation of the increases in tariffs, *IIPF*, section F04.09, also Table F.45, col. 24 and Table F.52, col. 2), with the latter reduced by the tonnage of consumer goods: road vehicles (ibid., Table F.45, col. 11), and an estimated 75 percent (above, §12.2.7.3) of sewing-machine imports (ibid., Table F.51, col. 19). The 1911 value weights equal 1,000 and 1,300 lire per ton, respectively (ibid., section F04.06).

The resulting net-import totals are transcribed in Table 12.8, col. 12.

12.4.6 *The investment content of SITC category 8*

SITC category 8 includes precision equipment. For simplicity, net imports of investment goods are identified directly with the tonnages in Fenoaltea (2020), Table 2, col. 4, and valued at 22,000 lire per ton (*IIPF*, section F04.06). Precious-metal products are ignored, on the presumption that Church and State were supplied from (long-established) domestic sources.

The resulting net-import totals are transcribed in Table 12.8, col. 13.

12.4.7 *The investment content of trade*

Table 12.8, col. 14 transcribes the estimated investment content of Italy's external trade; the aggregate is the simple sum of the partial figures in cols. 9–13.

12.5 Investment services

12.5.1 *Introduction*

The estimated investment component of value added in the services is presented, by activity group, in Table 12.9.

12.5.2 *Transportation and communications*

12.5.2.1 Introduction

Table 12.9, col. 1, refers to the investment component of the transportation-and-communications sector; it is the sum of the partial estimates transcribed in Table 12.10, cols. 1–4.

12.5.2.2 Railway and tramway transportation

Table 12.10, col. 1, refers to rail- and tramways. The railway component is estimated by multiplying the estimated value added (Table 7.1, col. 1) by a coefficient that equals .25 in 1861–71, then rises

Table 12.9 *Services value added flowing into investment, 1861-1913 (million lire at 1911 prices)*

	(1) trans-port-ation	(2) commerce	(3) net banking and ins.	(4) misc. ser-vices	(5) total	(6) investment share of services
1861	58	47	0	13	118	.038
1862	67	48	0	16	131	.041
1863	72	49	0	17	138	.042
1864	72	48	1	16	137	.041
1865	75	51	0	17	143	.041
1866	66	46	1	14	127	.034
1867	63	46	1	12	122	.036
1868	64	45	1	12	122	.036
1869	66	46	1	12	125	.037
1870	70	48	1	12	131	.037
1871	75	48	1	12	136	.040
1872	82	52	1	13	148	.042
1873	92	57	1	16	166	.047
1874	96	57	1	17	171	.047
1875	88	53	1	14	156	.043
1876	89	54	1	13	157	.044
1877	94	56	1	13	164	.045
1878	93	53	1	13	160	.043
1879	94	55	1	13	163	.043
1880	103	59	2	15	179	.047
1881	111	68	2	16	197	.051
1882	124	76	2	19	221	.056
1883	133	81	2	21	237	.059
1884	141	85	3	22	251	.061
1885	146	89	3	23	261	.062
1886	152	98	4	24	278	.064
1887	150	108	4	23	285	.065
1888	155	106	4	24	289	.066
1889	153	102	5	23	283	.064
1890	154	96	4	22	276	.062
1891	153	85	4	21	263	.059
1892	149	80	4	19	252	.057
1893	151	80	4	18	253	.056
1894	153	81	3	18	255	.057
1895	146	79	3	16	244	.054
1896	147	80	3	15	245	.053
1897	152	82	3	16	253	.055
1898	156	89	3	16	264	.056
1899	166	102	4	18	290	.061
1900	178	112	4	20	314	.065
1901	188	110	4	20	322	.065
1902	206	112	5	21	344	.069
1903	221	119	5	23	368	.072
1904	236	131	6	25	398	.076
1905	249	147	7	28	431	.081
1906	269	180	8	33	490	.089
1907	289	207	9	36	541	.094
1908	310	221	11	39	581	.099
1909	346	226	11	43	626	.103
1910	389	237	15	49	690	.111
1911	421	241	17	52	731	.113
1912	433	249	20	54	756	.113
1913	443	240	19	53	755	.109

Source: see text.

by .003 p. a. to .28 in 1881, and then again remains constant. This coefficient is itself obtained from other, data-based coefficients. The first refers to the split between passenger and freight revenue (and, by assumption, value added). Freight is here taken to have accounted for a share equal to 50 percent in 1861–71, by assumption; to have grown by one percentage point p. a. to 60 percent in 1881, closely mimicking the shares yielded by the annual data for 1872–81 for passenger revenue and total revenue (whence freight revenue is obtained as a residual) in the *Annuario 1884*, pp. 661, 667; and thence to have maintained a 60 percent share, as suggested by the comparable data in the *Annuario 1886*, pp. 414–415, for 1884, the *Annuario 1900*, pp. 688–691, for 1897, and the *Annuario 1913*, p. 235, for 1911. The investment-good share in freight traffic is courageously assumed constant, and equal to 40 percent; this round figure is derived from the tonnages transported in 1911 (Fenoaltea 1983, Table 3.9), allowing investment 100 percent of the building-materials and metal tonnage, plus 20 percent of the fuel tonnage, and none of the food, fertilizer, textile, chemical, and paper tonnages.[20] The overall coefficient for railways proper allows investment a uniform 10 percent of the passenger share (from 1881, 4 percent of the total), plus 40 percent of the freight share (from 1881, 40 percent of 60 percent, or another 24 percent of the total, whence the overall 28-percent coefficient). The tramway component is calculated as a simple 12-percent share of their estimated value added (Table 7.1, cols. 2 plus 3), on the assumption that they were always primarily, but not exclusively, people-movers.

12.5.2.3 Other inland transportation

Table 12.10, col. 2 refers to other inland transportation, in essence road transportation; the investment-good road-transportation estimates parallel the aggregate road-transportation estimates (§7.2.4).

[20] The fuel moved by rail was overwhelmingly coal, some 40 percent of which, on the above estimates, served investment production. That percentage is here halved, on the assumption that the most coal-intensive commodity-producing industries chose coastal locations to minimize their fuel costs; a disproportionate share of the railways' coal ton-kilometers presumably served urban gas lighting plants, here considered producers of consumption goods.

Table 12.10 *Transportation and communications services value added flowing into investment, 1861-1913 (million lire at 1911 prices)*

	(1) rail transport.	(2) other inland transp.	(3) maritime transp.	(4) communications
1861	3	48	3	4
1862	3	55	4	5
1863	4	58	4	6
1864	4	58	4	6
1865	5	60	4	6
1866	6	50	4	6
1867	6	47	4	6
1868	7	46	5	6
1869	7	47	6	6
1870	8	49	6	7
1871	10	51	6	8
1872	11	56	7	8
1873	13	64	7	8
1874	13	67	8	8
1875	14	58	8	8
1876	16	56	8	9
1877	16	59	8	11
1878	16	59	7	11
1879	18	59	7	10
1880	20	64	8	11
1881	21	67	10	13
1882	23	76	11	14
1883	25	81	12	15
1884	28	85	12	16
1885	28	89	12	17
1886	30	92	13	17
1887	32	91	13	14
1888	35	90	15	15
1889	37	88	13	15
1890	38	88	13	15
1891	38	86	14	15
1892	39	81	13	16
1893	41	80	13	17
1894	42	80	14	17
1895	43	73	13	17
1896	45	72	12	18
1897	47	73	13	19
1898	49	74	13	20
1899	52	78	15	21
1900	55	82	18	23
1901	57	87	19	25
1902	61	96	21	28
1903	64	104	22	31
1904	69	110	24	33
1905	71	120	26	32
1906	78	130	28	33
1907	80	140	32	37
1908	87	150	33	40
1909	93	174	34	45
1910	100	198	40	51
1911	107	209	44	61
1912	113	216	42	62
1913	122	215	44	62

Source: see text.

Table 12.11 transcribes the estimates of the investment-good tonnages actually moved.

Table 12.11, col. 1, which refers to agricultural goods, concerns in fact only firewood, charcoal, and timber. The firewood and charcoal estimates are obtained simply as the benchmark tonnages of .80 and .09 million tons, respectively, in 1865 (above, §12.3.3), extrapolated using the corresponding constant-price value added series (Table 12.6, cols. 2 and 3, respectively). The timber series is itself the sum of three components, based on the estimates derived above in §12.2.6. The lumber used to produce investment wood goods is estimated as the 1911 benchmark of (.75 × .66) million tons, extrapolated in proportion to Table 12.3, col. 1; the lumber used by the engineering industry is estimated as above (§12.2.5); and the lumber used by the construction industry is the implicit 1911 benchmark (118 million lire, divided by 110 lire/ton), extrapolated in proportion to Table 12.3, col. 3. These lumber-tonnage estimates are summed, and scaled up by 12 percent to approximate a mix of rough-hewn and squared-off logs. Table 12.11, col. 1 transcribes the sum of these firewood, charcoal, and timber estimates.

The investment-good series for industry are calculated like those in Table 12.1, albeit in tonnage rather than value-added terms. Table 12.11, col. 2, for the extractive industries, thus sums 50 percent of the tonnages of mineral fuels, here excluding natural gas (*IIPB*, Summary Table B.1, cols. 1–3), 100 percent of those of the non-precious metal ores excluding mercury and pyrite (ibid., cols. 5–8, 11–12, and 15–16), again 100 percent for asphalt rock (ibid., col. 22) and all quarry products (ibid., cols. 28–32). The food and tobacco industries are ignored, as before; here, the textile and apparel industries are also ignored, as the relevant tonnage (Table 12.2) is, in the present context, insignificant. Similar considerations apply to the leather industry. Its investment value was estimated above at some 18 million lire in 1911 (Table 12.1, col. 3); with belting worth some 9,000 lire per ton (*Movimento commerciale* category 651 and above, §12.2.5), the implied tonnage is again negligible.

Table 12.11, col. 3 transcribes the estimates of the wood industry's investment-good tonnage. Here, that tonnage is estimated as the sum of the lumber tonnage calculated as described above (with reference to col. 1) and, assuming a separate shipment, the

Table 12.11 *Non-rail inland transportation of investment goods, 1861-1913 (million tons)*

	(1) agri-culture	(2) industry: extrac.	(3) industry: wood	(4) industry: metal	(5) industry: eng'g	(6) industry: n.m.m.p.	(7) industry: chem.[a]	(8) imports	(9) total
1861	1.6	11.6	.8	.0	.0	9.1	.0	.3	23.4
1862	1.7	13.6	.8	.0	.0	10.6	.0	.3	27.0
1863	1.7	14.1	.8	.0	.0	11.1	.0	.4	28.1
1864	1.7	14.3	.8	.0	.0	11.2	.0	.3	28.3
1865	1.7	14.7	.9	.0	.0	11.5	.0	.3	29.1
1866	1.6	12.1	.9	.0	.0	9.4	.0	.2	24.2
1867	1.5	11.4	.8	.0	.0	8.8	.0	.2	22.7
1868	1.5	11.3	.8	.0	.0	8.8	.0	.2	22.6
1869	1.4	11.4	.8	.0	.0	8.8	.0	.3	22.7
1870	1.5	12.0	.8	.0	.0	9.3	.0	.3	23.9
1871	1.5	12.6	.8	.0	.0	9.6	.0	.3	24.8
1872	1.6	13.8	.8	.0	.0	10.6	.0	.4	27.2
1873	1.8	16.0	.9	.0	.0	12.1	.0	.4	31.2
1874	1.9	16.7	.9	.1	.0	12.6	.0	.5	32.7
1875	1.7	14.3	.8	.0	.1	10.8	.0	.4	28.1
1876	1.6	13.8	.8	.0	.1	10.4	.0	.5	27.2
1877	1.6	14.5	.8	.0	.1	11.0	.0	.5	28.5
1878	1.6	14.6	.8	.0	.0	11.1	.0	.4	28.5
1879	1.6	14.7	.8	.1	.1	11.1	.0	.5	28.9
1880	1.6	15.9	.8	.1	.1	11.9	.0	.6	31.0
1881	1.8	16.6	.9	.1	.1	12.4	.0	.7	32.6
1882	1.9	18.9	1.0	.1	.1	14.2	.0	.9	37.1
1883	1.9	20.1	1.0	.1	.1	15.2	.0	.9	39.3
1884	1.9	21.1	1.1	.2	.1	16.0	.0	1.0	41.4
1885	2.0	21.9	1.1	.2	.2	16.6	.0	1.1	43.1
1886	2.0	22.8	1.2	.2	.2	17.2	.1	1.1	44.8
1887	1.9	22.3	1.2	.2	.2	16.9	.1	1.3	44.1
1888	1.9	22.1	1.2	.3	.2	16.8	.1	1.4	44.0
1889	1.8	21.7	1.1	.3	.2	16.4	.0	1.3	42.8
1890	1.8	21.9	1.1	.2	.2	16.4	.1	1.1	42.8
1891	1.8	21.6	1.0	.2	.1	16.1	.1	.9	41.8
1892	1.7	20.4	1.0	.2	.1	15.0	.1	.8	39.3
1893	1.6	20.3	1.0	.2	.1	14.9	.1	.9	39.1
1894	1.6	20.2	1.0	.2	.1	14.8	.1	1.0	39.0
1895	1.5	18.3	.9	.2	.1	13.3	.1	1.1	35.5
1896	1.5	18.0	.9	.2	.1	13.0	.1	1.1	34.9
1897	1.5	18.3	1.0	.2	.1	13.2	.1	1.1	35.5
1898	1.5	18.6	1.0	.3	.1	13.3	.1	1.2	36.1
1899	1.6	19.3	1.1	.3	.2	13.7	.1	1.5	37.8
1900	1.6	20.3	1.1	.3	.2	14.4	.1	1.7	39.7
1901	1.7	21.8	1.1	.3	.2	15.4	.1	1.6	42.2
1902	1.8	24.3	1.2	.3	.2	17.2	.1	1.6	46.7
1903	1.9	26.3	1.2	.4	.2	18.6	.2	1.6	50.4
1904	2.0	28.0	1.3	.4	.2	19.7	.2	1.7	53.5
1905	2.1	30.5	1.4	.5	.2	21.6	.3	2.0	58.6
1906	2.2	32.7	1.5	.7	.3	23.1	.3	2.7	63.5
1907	2.3	34.8	1.5	.7	.4	24.5	.3	3.4	67.9
1908	2.4	37.3	1.7	.8	.4	26.4	.2	3.6	72.8
1909	2.7	43.7	1.8	.9	.5	31.1	.4	3.4	84.5
1910	3.0	50.3	2.0	1.1	.5	35.8	.5	3.2	96.4
1911	3.1	53.2	2.0	1.0	.5	38.0	.5	3.4	101.7
1912	3.1	55.1	2.0	1.2	.5	39.1	.6	3.6	105.2
1913	3.1	54.8	2.0	1.1	.5	38.9	.7	3.5	104.6

[a] includes rubber.

Source: see text.

wood-products tonnage obtained as the 1911 benchmark (.75 × .49) million tons, extrapolated in proportion to Table 12.3, col. 1.

Table 12.11, cols. 4 and 5 refer to the metal and engineering industries' investment tonnages; both are obtained as the corresponding aggregate tonnage (Table 7.2, cols. 9 and 10) less the consumer-good component (explicitly or implicitly) estimated above (§12.2.7). The deducted consumer-good metal tonnage is simply the consumer-good value added in Table 12.4, col. 8, divided by 100 lire per ton. The deducted consumer-good engineering tonnage is in turn calculated as the sum of a fabricated-metal new-production component and a general-equipment new-production component (ignoring the here trivial quantities related to maintenance, precision equipment, and precious metal products); the two components are simply the value added series in Table 12.4, cols. 2 and 4, divided by 415 and 900 lire (of value added) per ton, respectively.

Table 12.11, col. 6 refers to the investment tonnage of non-metallic mineral products. The series, calculated analogously to the corresponding value added series described above (§12.2.8), is the sum of two components. One component, taken directly from the production estimates, sums the tonnage estimates for plaster, lime, cement, bricks and tiles, and non-kiln products (*IIPC*, Summary Table C.1, cols. 1–4 and 9–10). The other takes 22.5 percent of the 1911 tonnage of terra cotta, ceramic, and glass (ibid., cols. 5–7), or about .085 million tons, and extrapolates it in proportion to the corresponding construction-related index (ibid., Table C.07, col. 1).

Table 12.11, col. 7 refers to the investment tonnage of chemical and rubber goods together, again calculated analogously to the corresponding value added series described above (§12.2.9–10). The chemical component thus sums, from the output estimates in *IIPD*, Summary Table D.1, the estimates for soda nitric acid (col. 2), the entire explosives group (cols. 10–13), the entire coloring-materials group, excluding natural dyestuffs (cols. 14–20 and 22), arc nitric acid (ibid., col. 25), carbon electrodes (col. 44), saltpetre (col. 64); and all of the coal and petroleum products group, excluding only briquettes (cols. 89 and 91–97). The (tiny) rubber component is correspondingly calculated as two thirds of the industry's product net of the tire component, estimated as above.

The investment tonnage of other industries is (presumably) zero or negligible.

Table 12.11, col. 8 refers to imports, specifically those not already counted. For simplicity, their tonnage is calculated as the estimated total tonnage of imports using road haulage (Table 7.2, col. 17), times the ratio of the 1911-price value of investment-good imports (Table 12.8, col. 15) to the 1911-price landed value of all imports (Table 4.4, col. 6 plus Table 10.1, col. 11).

Table 12.11, col. 9, the total investment tonnage, is the simple sum of cols. 1–8. In 1911, it equals 66.8 percent of the aggregate tonnage (Table 7.2, col. 18); the present estimate accordingly attributes to investment a 1911 benchmark value added of 66.8 percent of the corresponding total (313 million lire, §7.2.4), or 209 million lire.

Table 12.10, col. 2 is that 209-million lire benchmark, extrapolated in proportion to Table 12.11, col. 9.

12.5.2.4 Maritime transportation

Table 12.10, col. 3, is the estimated investment component of maritime transportation. Col. 3 is obtained as the sum of separate estimates for international and domestic navigation, both obtained as shares of the corresponding value added (respectively Table 10.1, col. 11, and Table 7.1, col. 6 less Table 10.1, col. 11; see above, ch. 10).

In the case of domestic navigation, the investment share of value added is estimated equal to that in road transportation net of imports ((Table 12.11, col. 9 – col. 8) / (Table 7.2, col. 18 – col. 17)).

In the case of international navigation, the relevant share is again that of the investment goods not already included in the production figures; it is here set equal to the ratio of the 1911-price value of investment-good imports (Table 12.8, cols. 10–13) to the 1911-price landed value of all imports (Table 4.4, col. 6 plus Table 10.1, col. 11), as in the derivation of Table 12.11, col. 8 (§12.5.2.3).

12.5.2.5 Communications

Table 12.10, col. 4, is the estimated investment component of communications. On the presumption that agriculture was relatively little involved with modern communications, and more generally for lack of a better idea, it is calculated as a share of the estimated value added in communications (Table 7.1, col. 7) equal to the (approximate) share of investment in industrial production (Table 12.1, col. 14).

12.5.3 *Commerce*

Table 12.9, col. 2, refers to the investment component of the commerce sector; it is here estimated very tentatively. The production-side commerce estimates (§7.3.5) extrapolate a 1911 benchmark of 1,434 million lire, based on an estimated merchants' intake, in that year, of goods worth 10,428 million lire.

A series estimating the merchants' annual intake of investment goods is calculated here as the sum of the investment goods estimated above, excluding those presumably not handled by merchants. The agricultural component thus takes from Table 12.6 the sum of cols. 2–5 (to the exclusion, therefore, of on-farm improvements and herd increments). The industrial component is derived from the aggregate investment estimates, with suitable adjustments. The estimates for mining include Table 12.1, col. 1, less the exported ores (Table 12.8, cols. 1–4, weighted by 18, 180, 80, and 140 lire per ton, above, §12.4.2, and extrapolated to 1861 in proportion to Table 12.8, col. 9) but not the exported marble. The estimates for textiles and apparel are those in Table 12.1, col. 2, but exclude sails (Table 12.2, cols. 2–3, weighted by 4,000 lire per ton, §12.2.4), presumably custom-made, and, to allow for other direct sales by artisans, 25 percent of the residual. The estimates for leather and wood are similarly obtained as 75 percent of the (value) aggregates in Table 12.1, cols. 3 and 4, respectively. The estimates for metals are the aggregates in Table 12.1, col. 5, reduced by the value added in rail production (*IIPE*, Summary Tables E.1 and E.2), on the presumption that rails were ordered directly from the factory. On similar grounds, assuming that merchants were not involved in maintenance or in selling new ships or railway vehicles, the estimates for the engineering industry include only the new-production estimates for fabricated metal, general equipment (here ex ships and railway vehicles), precision instruments, and precious-metal products (*IIPF*, Summary Table F.3, cols. 1 and 4–6) less the corresponding consumer-good components (Table 12.4, cols. 2, 4, 6, and 7). The estimates for the non-metallic mineral products, chemical, and rubber industries include Table 12.1, cols. 7–9 in full. The import component is similarly conceived: the estimates equal the investment aggregate in Table 12.8, col. 14, less estimated imports of ships (Table 10.1, cols. 9–10) and of rails (the tonnages in *IIPE*, Table E.03, col. 6, valued at the *Movimento commerciale* 1911 price of 150 lire per ton).

The sum of these three components yields the estimates of the merchants' annual 1911-price intake of investment goods. In 1911, these three components sum to 1,751 million lire, against a total intake, recalled above, of 10,428 million lire. Here, the investment component of value added in commerce (Table 12.9, col. 2) is estimated as (1,751/10,428) times the sector's value added of 1,434 million lire in 1911, or 241 million lire, and extrapolated using the annual-investment-good-intake series just described.

12.5.4 *Net banking and insurance*

Table 12.9, col. 3, is the estimated investment component of net banking and insurance. For simplicity, and in the absence of obviously better indicators, it is here estimated as the sector's net value added (Table 4.1, col. 21), times the ratio of value added in investment-commodity-production (Table 12.1, col. 13 plus Table 12.6, col. 7) to value added in all commodity production (Table 4.1, col. 1 plus col. 18).

12.5.5 *Miscellaneous services*

Table 12.9, col. 4, is the estimated investment component of miscellaneous services: difficult to gauge, but surely a small part of the total, as the listed professions point overwhelmingly to consumption. The *Censimento demografico*, vol. 4, category 10.92, lists 12,125 "engineers, architects, etc." (including 23 women, bless their hearts). Allowing each of them 4,000 to 4,500 lire (including allowances for office space, assistants, etc.), their value added can be estimated at some 52 million lire. This point estimate is here tentatively extrapolated in proportion to the combined new-production value added in construction and, in the engineering industry, in ships, railway vehicles, and general equipment (*IIPK*, Summary Table K.1, cols. 4, 10, and 12; *IIPF*, Summary Table F.3, cols. 2–4).

12.5.6 *Other services*

The investment content of other services is considered nil. This makes perfect sense in the case of the services of buildings, as the estimates refer in fact only to residential space (while the value of commercial space was counted in the corresponding activity, ch. 7).

It makes less sense in that of government services, as the design and procurement bureaus of the military and public-works departments should logically be considered engaged in investment; but these were a minimal part of the public sector, and are neglected here as well, with (once more) a bad conscience but good precedent.

12.5.7 *All services*

Table 12.9, col. 5, is the estimated investment component of all services; it is the simple sum of cols. 1–4. Col. 6 reports, as a *curiosum*, the share of services value added (Table 4.1, col. 25) represented by the investment component estimated here. That share was small; it too followed the construction cycle, rising, as measured, from some 4 percent in the 1860s and '70s to 6 percent in the late 1880s, dropping back to 5 percent in the mid-1890s, and then surging to over 10 percent on the eve of the Word War.

12.6 Total fixed investment

Total fixed investment is estimated as the sum of the separate estimates for agriculture (Table 12.6, col. 7), industry (Table 12.1, col. 13), the services (Table 12.9, col. 5), and international trade (Table 12.8, col. 14). The resulting series is transcribed in Table 4.4, col. 2.

13

PRIVATE CONSUMPTION AND TOTAL INVESTMENT

The estimates of private consumption and of total investment are transcribed in Table 4.4, cols. 1 and 3, respectively; they are derived as follows.

Deducting from total resources (GDP plus imports) their identified uses (public consumption, fixed investment, and exports), one is left with a residual that includes private consumption C and inventory investment I_i. Without a doubt, that residual is dominated by consumption; but it is relatively volatile, with a mean absolute change of some 3.4 percentage points (twice the end-to-end growth rate), and extreme changes of over 8 percentage points in both directions. This high volatility clearly suggests that our residual's year-to-year movements were significantly affected by inventory flows: as one would in fact expect, despite the opportunities offered by international trade, in the presence of fluctuating harvests and, at times, anticipated tariff increases.

The obvious procedure, adopted here, is to take a smoothed version of the residual as its consumption component, and to attribute the residual variation to inventory investment. The practical problem here is that the residuals of the smoothing process approach a zero mean, implying negligible long-term inventory investment: an implication that seems reasonable enough for the inventories that are held to smooth consumption, but not for the inventories of goods held because production and distribution both take time. The present algorithm accordingly involves a direct estimate of production-and-distribution inventory investment I_{ipd}, and its subtraction from the residual $(C + I_i)$ to obtain a net residual that includes only consumption C and consumption-smoothing inventory investment I_{ics}. Consumption is then estimated as the smoothed version of that net residual; the residuals from that smoothing process are identified with I_{ics}, I_i is estimated as $I_{ics} + I_{ipd}$, and total investment I as $I_f + I_i$.[1]

Investment in the production inventory of goods-in-process is estimated, simply and no doubt simplistically, as follows. In the case of agriculture that (year-end) inventory is simply set to zero, as if the productive process were started and completed between January and December; the annual change in that inventory is also, therefore, set to zero. Inventory investment is also set to zero in the case of construction and the utilities; in the case of construction, it may be recalled, value added and therefore fixed investment already allow for the period of production, and count a half-completed road, for example, as half a completed road. In mining and manufacturing, the production process is taken to average half a year, so the average inventory of goods-in-process is estimated as a quarter of a year's output; the corresponding inventory (dis)investment is here calculated simply as a quarter of the annual change in value added. In 1861, absent information on 1860, this inventory investment is simply set to zero; in 1862–1913, it is estimated in year t as a quarter of Table 4.1, $(\text{col. } 2 + \text{col. } 15)_t - (\text{col. } 2 + \text{col. } 15)_{t-1}$.

Investment in the distribution inventory of goods-for-sale (which includes imports) is in turn calculated from the annual estimate of the 1911-price value of the goods handled by merchants (Table 7.3, col. 1). Since goods were there assumed to be held in stock an average of 4.5 months (§7.3.4), merchants' inventory investment is estimated, in 1862–1913, as (4.5/12) times the annual increment in the estimate of the 1911-price value of the goods they handled; in 1861 it is again set equal to zero.

The estimate of production-and-distribution inventory investment I_{ipd} is the sum of these two series. The cumulation of I_{ipd} equals some 3,500 million lire (80 percent of it attributed to merchants, 20 percent to industry); it equals some 27 percent of the end-to-end increment in GDP, which does not seem unreasonable.

The next step is the smoothing of the net residual $(C + I_i - I_{ipd})$. We lack strong priors, let alone shared ones, as to the appropriate

[1] To reabsorb any rounding error, total investment I (Table 4.4, col. 3) is actually obtained as $GDP - C - G - X + M$.

volatility of consumption in post-Unification Italy (and presumably any priors at all concerning the volatility of inventory investment). Here, consumption is so estimated as to limit its extreme annual variations to under 5 percent. The selected algorithm applied to the net residual takes, where it can, a five-year moving average, with triangular weights (.4 on the current year, .2 on the immediately preceding and succeeding, and .1 on those twice removed); for the second and penultimate year, a three-year average (with the weights rescaled to .5 on the current year and .25 on each neighboring year); for the first and last years, an average with the only neighbor (with a weight of .75 on the current year and .25 on the neighbor).

The net residual, thus smoothed, serves as the consumption series transcribed in Table 4.4, col. 1. The extreme variations attributed to consumption do not seem unreasonable. On the down side, the greatest decline is 1.0 percent (in 1867), the next ones near 0.5 percent (in 1888 and 1889), against a mean demographic growth rate near .7 percent p. a. (between the censuses of 1871 and 1911, from the *Sommario*, p. 39, col. 1). On the up side, the peak increment is some 4.5 percent, in 1907 (the year GDP growth also peaked, at 6.7 percent); the next highest is 4.1 percent in 1913 (the end point, where the smoothing process essentially fails), the others do not exceed 3.3 percent.

As noted, the difference between the raw and smoothed net residual is taken as the estimate of consumption-smoothing inventory (dis)investment I_{ics}; it is added to production-and-distribution inventory investment I_{ipd} to obtain total inventory investment I_i (in Table 4.4, the difference between col. 3 and col. 2).

IV

THE COMPOSITION OF FIXED INVESTMENT

14

DISAGGREGATED FIXED INVESTMENT AT 1911 PRICES

14.1 The available 1911-price investment series

Table 14.1 collects the 1911-price value estimates of aggregate fixed investment (col. 1, from Table 4.4, col. 2), of its directly identifiable components (cols. 2–14), and more (cols. 15–17); to keep the number of components within bounds these are already subaggregated as far as the literature allows.[1] In general, it will be recalled, the production estimates for goods that were a long time a-building distribute the value added estimates over the corresponding period, and so do the "fixed" investment value estimates (as opposed to counting the investment in a yet-uncompleted railway or battleship as inventory investment, attributing its entire value to fixed investment in the year of completion, and in that year reducing inventories by the cumulation of prior investment).[2]

[1] The present estimates include maintenance. The latter is attributed to the construction and engineering industries alone; and ships and railway vehicles apart the engineering industry is here defined as a metal-processing activity. The wood-processing industry also produced durables, but its maintenance activity is not here separated out. The maintenance of the wooden elements of structures is included in the construction industry; wooden tools are not amenable to the sharpening and reforging typical of metal tools, and to a first approximation when broken or worn out they are replaced rather than repaired. Wood machines (e.g., a water wheel) may well undergo repair; that activity is undocumented, and here neglected.

[2] Because investment goods that involve inordinately long production processes are thus counted on an accrual basis, the complementary estimates of inventory investment include only changes in the inventories of final goods (to smooth consumption), and ordinary goods in process and held for sale (because production and distribution take time).

Table 14.1 *Extant investment series, 1861-1913 (million lire at 1911 prices)*

	(1) total fixed	(2) by and in agr.	(3) construction new	(4) construction maint.	(5) horses, harn's	(6) ships new	(7) ships maint.	(8) railway veh's new	(9) railway veh's maint.
1861	1,015	51	396	162	15	32	10	7	2
1862	1,104	72	482	170	15	46	11	11	3
1863	1,131	62	492	174	13	59	11	15	4
1864	1,122	73	490	174	13	49	11	11	4
1865	1,117	35	490	175	13	47	11	11	5
1866	1,034	54	387	175	5	39	12	10	5
1867	968	24	337	180	8	37	13	7	5
1868	949	24	327	178	10	40	14	8	6
1869	996	52	320	180	12	39	16	8	7
1870	1,040	62	341	181	13	36	17	7	8
1871	1,033	47	364	183	12	28	17	12	8
1872	1,093	43	401	185	15	24	17	13	10
1873	1,263	114	476	186	17	38	17	21	11
1874	1,260	91	502	192	15	40	17	13	11
1875	1,199	120	404	190	7	39	18	7	12
1876	1,233	154	376	193	11	32	18	6	13
1877	1,234	122	387	199	19	29	18	7	13
1878	1,277	192	388	202	13	24	18	4	13
1879	1,298	195	399	202	15	25	19	7	14
1880	1,375	191	440	208	15	22	19	15	16
1881	1,464	167	469	208	17	31	19	20	17
1882	1,620	181	559	215	21	39	20	26	18
1883	1,680	162	607	216	19	41	20	28	20
1884	1,799	220	632	215	18	47	20	19	22
1885	1,825	181	659	218	20	50	21	19	22
1886	1,943	191	671	227	20	64	21	24	24
1887	1,920	74	635	232	17	69	21	40	26
1888	1,857	31	619	239	13	50	22	47	29
1889	1,756	3	585	245	18	42	23	47	30
1890	1,765	77	586	246	17	47	23	22	31
1891	1,686	101	572	248	15	44	25	8	31
1892	1,680	164	524	249	15	36	26	7	31
1893	1,630	128	503	252	17	37	28	6	32
1894	1,620	104	498	251	17	32	29	9	33
1895	1,569	122	393	254	13	35	30	10	34
1896	1,595	148	361	259	15	32	30	11	35
1897	1,620	129	363	263	18	43	32	15	37
1898	1,649	80	356	266	19	57	33	23	39
1899	1,712	–8	365	266	20	90	34	30	41
1900	1,931	83	391	262	20	108	37	47	43
1901	1,982	132	428	265	23	73	40	49	45
1902	2,103	193	490	271	26	57	41	35	48
1903	2,171	164	533	275	25	50	40	41	51
1904	2,271	111	573	281	23	62	40	47	54
1905	2,507	142	635	285	29	88	39	47	56
1906	2,912	189	690	284	29	99	41	89	61
1907	3,255	228	742	286	29	99	42	149	63
1908	3,556	338	805	292	32	84	44	132	69
1909	3,498	118	973	298	42	79	46	101	73
1910	3,756	147	1,137	309	42	91	47	78	78
1911	3,888	130	1,201	324	36	126	48	93	82
1912	4,079	171	1,225	330	38	177	52	96	87
1913	4,037	180	1,199	338	34	188	58	84	92

Table 14.1 *(continued)*

	(10) fab. met. maint.	(11) equip. maint.	(12) mach., new	(13) instr., new	(14) precious metalw.	(15) fab. m., new[a]	(16) wood prod's[a]	(17) serviices[a]
1861	171	2	11	4	3	*24*	*134*	*118*
1862	172	2	10	4	3	*29*	*114*	*131*
1863	173	2	8	4	3	*27*	*110*	*138*
1864	174	2	6	6	3	*30*	*110*	*137*
1865	175	3	11	4	3	*27*	*135*	*143*
1866	177	3	8	4	3	*23*	*146*	*127*
1867	178	3	11	4	3	*26*	*138*	*122*
1868	180	3	11	4	3	*28*	*113*	*122*
1869	181	4	16	5	3	*31*	*118*	*125*
1870	182	4	12	3	3	*37*	*126*	*131*
1871	183	4	13	4	3	*34*	*118*	*136*
1872	184	4	18	6	3	*35*	*122*	*148*
1873	186	5	22	5	3	*32*	*123*	*166*
1874	187	5	22	4	3	*36*	*119*	*171*
1875	188	5	20	5	3	*42*	*122*	*156*
1876	190	6	21	5	3	*41*	*135*	*157*
1877	191	6	21	5	3	*40*	*135*	*164*
1878	193	7	19	3	3	*37*	*135*	*160*
1879	194	7	18	2	3	*38*	*122*	*163*
1880	196	8	28	4	3	*49*	*118*	*179*
1881	197	9	35	4	3	*62*	*131*	*197*
1882	198	10	43	4	4	*78*	*135*	*221*
1883	200	11	44	4	4	*93*	*135*	*237*
1884	201	11	50	5	4	*104*	*148*	*251*
1885	203	12	56	4	4	*111*	*164*	*261*
1886	204	13	54	6	4	*129*	*190*	*278*
1887	206	14	66	20	4	*154*	*197*	*285*
1888	208	15	70	16	4	*166*	*177*	*289*
1889	209	16	75	11	3	*154*	*152*	*283*
1890	211	16	77	8	3	*126*	*152*	*276*
1891	213	16	67	4	3	*92*	*152*	*263*
1892	214	17	63	4	4	*69*	*148*	*252*
1893	215	17	63	4	4	*62*	*148*	*253*
1894	217	17	71	1	4	*61*	*151*	*255*
1895	219	17	91	1	4	*61*	*156*	*244*
1896	221	17	101	3	4	*55*	*168*	*245*
1897	222	17	96	6	4	*51*	*177*	*253*
1898	224	18	104	12	4	*54*	*193*	*264*
1899	226	18	134	10	4	*67*	*209*	*290*
1900	228	18	168	12	4	*78*	*202*	*314*
1901	230	18	150	16	4	*78*	*214*	*322*
1902	232	19	136	16	4	*73*	*222*	*344*
1903	234	20	145	18	4	*81*	*235*	*368*
1904	236	22	178	22	4	*93*	*240*	*398*
1905	238	23	218	26	4	*105*	*261*	*431*
1906	240	25	290	47	5	*135*	*269*	*490*
1907	243	28	350	53	5	*185*	*286*	*541*
1908	245	30	392	64	6	*236*	*312*	*581*
1909	247	31	364	58	6	*272*	*337*	*626*
1910	250	31	361	67	6	*277*	*346*	*690*
1911	253	33	346	66	6	*291*	*334*	*731*
1912	256	34	330	68	7	*299*	*318*	*756*
1913	259	35	299	68	6	*300*	*313*	*755*

[a] gross of elements in cols. 2–14.

Source: see text.

Table 14.1, col. 2 refers to the investment by agriculture in agriculture itself, that is, to improvements and herd increments. It is the simple sum of Table 12.6, cols. 1 (improvements) and 6 (herd increments), without further adjustment.

Cols. 3–4 refer to investment in structures, in new construction and maintenance, respectively; these estimates are in principle exhaustive. The new-construction value figures in col. 3 are taken directly from Fenoaltea (1988a), Table 1, col. 5. The maintenance value figures in col. 4 are estimated as the sum of the value added estimates for the maintenance of railways, other public works, and private structures (*IIPK*, Summary Table K.1, respectively cols. 7, 11, and 13), divided by the corresponding ratio of value added to value (an estimated .6 throughout, ibid., sections K05.04, K06.05, and K09.06).

Cols. 5–9 refer to the other identifiable components of investment in transportation systems: col. 5 to investment in off-farm horses (including those for the army, with all due respect to the cavalry) and harnesses, cols. 6–9 to new-equipment and maintenance investment in ships and in rail- (and tram)way rolling stock. These estimates fall short of an exhaustive tally of investment in vehicles, as they omit the boats and carts produced by the ill-documented wood-products industry.

Col. 5 thus covers investment in off-farm horses and, for convenience, their complementary harnesses. Its first component is the simple sum of Table 12.6, cols. 4 (civilian) and 5 (military); its second, the 1911-price value-of-harnesses series obtained as described above (§12.2.5).

Col. 6 (investment in new ships) is the simple sum of the separate (1911-price-value-of-purchases) estimates for naval and merchant vessels in Fenoaltea (2018c), Table 1, col. 56 and Table 5, col. 12. Col. 7 (investment in ship maintenance) is similarly the sum of two components. The first refers to naval vessels; it is obtained as the value added series (*IIPF*, Summary Table F.1, col. 30), divided by .5 (to allow for the relatively high cost of upgrading equipment, ibid., section F02.04 and the public budgets there cited). The second refers to merchant vessels; it is obtained as the sum of the three partial value added series (ibid., Summary Table F.1, cols. 31–33), divided by a more conservative .6.

Col. 8 (investment in new railway rolling stock) is obtained as the sum of separate net import and production series for locomotive, passenger car, and freight-car tonnages (*IIPF*, Table F.34, cols. 2, 5, and 8 and Table F.38, cols. 1–3) weighted by 1911-price values per ton (respectively 1,640, 1,402.5, and 690 lire per ton: ibid., section F03.08). Col. 9 (investment in railway rolling stock maintenance) is a value aggregate that sums over the nine components of the corresponding value added series, which refer respectively to the locomotives, passenger car, and freight cars of the railways, the electric tramways, and the steam tramways. The three railway-vehicle components are the value added series (ibid., Summary Table F.1, cols. 34–36), each divided by the estimated ratio of value added to value (locomotives, 25.38/30.22; passenger cars, 13.39/16.07; freight cars, 18.69/24.38, ibid., section F03.09). For simplicity, and in the absence of more direct evidence (ibid., section F03.10), the tramway-vehicle value added series (ibid., Summary Table F.1, cols. 37–42) are here scaled up using these self-same ratios; the extension of the first from steam power to electric power is a stretch, but as the relevant electric-tramway value added figure peaks at some 4 million lire it should not introduce significant error.

Cols. 10–15 refer to investment in the other products of the (metal-processing) engineering industry. Cols. 10 and 11 refer to investment in maintenance, respectively of fabricated metal (in the main, tools) on the one hand, and of other (general and, negligibly, precision) equipment on the other. Col. 10 (investment in fabricated-metal maintenance) is aggregate value added in fabricated-metal maintenance (*IIPF*, Summary Table F.3, col. 8), net of the consumer-good component (Table 12.4, col. 1), scaled up assuming a ratio of value added to value equal to .75. Col. 11 (investment in general-equipment and precision-equipment maintenance) sums over two components. The general-equipment series is obtained from the corresponding value-added aggregate (*IIPF*, Summary Table F.3, col. 11), net of the consumer-good component (Table 12.4, col. 3), again assuming a ratio of value added to value equal to .75; the precision-equipment maintenance series is similarly obtained from the corresponding value-added aggregate (*IIPF*, Summary Table F.3, col. 12), net of the consumer-good component (Table 12.4, col. 5), assuming a ratio of value added to value equal to .9. As it turns out, the precision-equipment value estimates are always insignificant, and col. 11 captures in fact the maintenance of general equipment (ordinary machinery) alone.

Cols. 12–14 cover investment in new products: in general equipment (ordinary industrial and agricultural machinery) and in precision equipment (precision instruments) – net, in both cases, of those installed in ships – and in precious-metal products (these last measured by value added rather than value, to be net of metal-inventory disinvestment).

Col. 12 (investment in new general equipment, i.e., ordinary machinery) is derived in Table 14.2. Table 14.2, col. 1 transcribes the estimated tonnage of such machines produced and imported (Fenoaltea 2020, Table 1, cols. 3 plus 4, Table 2, col. 3); cols. 2 and 3, the estimated tonnage of motor vehicles and bicycles acquired, estimated as described in §12.2.7.3 (the motor-vehicle series is a stock estimate for 1911 extrapolated to 1891–1913 assuming constant growth, the bicycle series is based on licensing-fee data); col. 4 is obtained as col. 1 less cols. 2 and 3, and thus tracks the tonnages of investment goods alone. This last series, however, remains gross of the (propulsion and other machinery) incorporated in ships, and therefore already counted in Table 14.1, col. 6 (and, in the case of replacement equipment, col. 7). In the case of merchant steamships, one can with some confidence allow .1 tons of propulsion and other machinery per gross ton built (*IIPF*, section F02.03); assuming negligible replacement use, and that imported ships were fully outfitted, the estimated annual tonnage of merchant-ship machinery acquired transcribed in Table 14.2, col. 5 is derived as the estimated gross tonnage built (Fenoaltea 2018c, Table 5, col. 5) times .1 tons per gross ton. Table 14.2, col. 6 transcribes the estimates of the machinery (including weapons) incorporated in new naval ships; for simplicity, it is obtained as the sum of the type-specific deadweight-tonnages-constructed series in *IIPF*, Table F.16, cols. 1–13, variously weighted, as suggested by sample data (ibid., Table F.17), by .03 (cols. 12–13), .1 (cols. 1–2 and 11), .2 (cols. 3–5), .3 (cols. 8 and 10), .4 (col. 6), .5 (col. 7), and .6 (col. 9). Table 14.2, col. 7 transcribes the estimates of the machinery (including weapons) incorporated in existing naval ships, as they were maintained and progressively improved. For simplicity these figures are obtained as the estimated tonnage of metal-hulled naval vessels maintained (*IIPF*, Table F.23, col. 11), times .2 (the rough overall average for new ships) divided by 20 (the assumed life, in years, of the equipment). Col. 8 is the investment tonnage in col.

Table 14.2 *Investment-good machinery series, 1861-1913 (thousand tons)*

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
	general equipment								precis. equip't	
					ship machinery					
						naval vessels				
	gross purchases	motor vehicles	bicycles	investment goods	merch. vessels	new	maint.	net inv't goods	total pur-ch'd	purch'd for ships
1861	8.69	.00	.00	8.69	.00	.50	.06	8.13	.220	.042
1862	8.59	.00	.00	8.59	.00	.54	.07	7.98	.220	.046
1863	7.05	.00	.00	7.05	.02	.70	.07	6.26	.233	.058
1864	5.28	.00	.00	5.28	.02	.72	.07	4.47	.338	.060
1865	9.63	.00	.00	9.63	.04	.80	.08	8.71	.271	.067
1866	7.03	.00	.00	7.03	.07	.75	.09	6.12	.225	.065
1867	9.37	.00	.00	9.37	.04	.72	.10	8.51	.251	.063
1868	9.12	.00	.00	9.12	.07	.70	.13	8.22	.232	.065
1869	12.89	.00	.00	12.89	.20	.58	.18	11.93	.280	.064
1870	9.99	.00	.00	9.99	.14	.48	.23	9.14	.206	.058
1871	10.26	.00	.00	10.26	.02	.33	.27	9.64	.225	.046
1872	14.53	.00	.00	14.53	.02	.25	.29	13.97	.316	.041
1873	18.34	.00	.00	18.34	.26	.80	.29	16.99	.332	.091
1874	18.45	.00	.00	18.45	.35	1.26	.29	16.55	.314	.129
1875	16.93	.00	.00	16.93	.12	1.18	.29	15.34	.348	.114
1876	17.60	.00	.00	17.60	.02	1.34	.29	15.95	.330	.123
1877	17.95	.00	.00	17.95	.02	1.61	.29	16.03	.361	.143
1878	16.23	.00	.00	16.23	.07	1.40	.29	14.47	.281	.129
1879	15.46	.00	.00	15.46	.07	1.42	.29	13.68	.237	.131
1880	22.70	.00	.00	22.70	.05	1.19	.30	21.16	.286	.114
1881	28.88	.00	.00	28.88	.17	1.35	.32	27.04	.312	.131
1882	35.43	.00	.00	35.43	.16	1.94	.33	33.00	.358	.176
1883	36.50	.00	.00	36.50	.16	2.06	.35	33.93	.362	.186
1884	41.49	.00	.00	41.49	.18	2.72	.39	38.20	.453	.240
1885	46.89	.00	.00	46.89	.05	3.29	.44	43.11	.482	.282
1886	45.99	.00	.00	45.99	.03	4.21	.49	41.26	.605	.354
1887	55.67	.00	.00	55.67	.12	4.24	.55	50.76	1.255	.363
1888	58.15	.00	.00	58.15	.16	3.28	.67	54.04	1.029	.302
1889	61.84	.00	.00	61.84	.09	2.95	.81	57.99	.792	.285
1890	64.08	.00	.00	64.08	.45	3.12	.95	59.56	.674	.321
1891	56.49	.01	.00	56.48	.60	2.93	1.10	51.85	.498	.323
1892	52.66	.01	.07	52.58	.24	2.81	1.28	48.25	.481	.315
1893	53.42	.02	.20	53.20	.19	2.82	1.46	48.73	.491	.328
1894	60.05	.02	.26	59.77	.32	2.87	1.59	54.99	.389	.346
1895	75.11	.03	.26	74.82	.52	2.95	1.68	69.67	.430	.365
1896	83.67	.04	.25	83.38	.94	3.22	1.76	77.46	.554	.406
1897	81.31	.05	.26	81.00	1.72	3.45	1.86	73.97	.723	.458
1898	88.58	.07	.36	88.15	3.17	3.03	1.99	79.96	1.031	.487
1899	114.41	.09	.48	113.84	5.25	3.74	2.10	102.75	1.081	.622
1900	141.98	.12	.42	141.44	6.05	3.69	2.15	129.55	1.191	.650
1901	125.53	.16	.39	124.98	4.05	3.06	2.17	115.70	1.247	.534
1902	114.33	.21	.51	113.61	2.45	4.03	2.16	104.97	1.271	.550
1903	121.14	.29	.62	120.23	2.28	4.44	2.13	111.38	1.407	.573
1904	147.41	.38	.70	146.33	3.26	3.79	2.09	137.19	1.544	.555
1905	179.50	.51	.65	178.34	3.69	5.13	2.05	167.47	1.866	.668
1906	236.05	.68	.76	234.61	4.11	5.45	2.01	223.04	2.826	.703
1907	282.08	.90	1.03	280.15	4.02	4.91	1.97	269.25	3.071	.657
1908	312.53	1.20	1.05	310.28	2.77	4.07	1.96	301.48	3.478	.549
1909	290.93	1.60	1.49	287.84	2.55	3.27	2.00	280.02	3.104	.485
1910	292.32	2.14	3.32	286.86	2.02	4.92	2.06	277.86	3.633	.594
1911	285.20	2.85	4.28	278.07	2.14	7.43	2.19	266.31	3.816	.796
1912	277.04	3.80	2.85	270.39	3.83	10.25	2.41	253.90	4.190	1.084
1913	254.28	5.07	2.04	247.17	4.39	9.72	2.71	230.35	4.196	1.086

Source: see text.

4, less the sum of the shipboard machinery in cols. 5–7; it is the estimated investment in agricultural and industrial machinery, measured in tons. Those tonnages are then assigned a unit value of 1,300 lire (*IIPF*, section F04.06); the resulting 1911-price value series is transcribed in Table 14.1, col. 12.

Table 14.1, col. 13 (investment in new precision instruments) is also derived in Table 14.2. For simplicity, the aggregate tonnage consumed is estimated as production plus net imports (Fenoaltea 2020, Table 1, col. 5 plus Table 2, col. 4), and the consumer-good component is simply neglected; these figures appear in Table 14.2, col. 9. Table 14.2, col. 10 transcribes the estimated shipborne tonnage; grasping at straws, it is estimated as 3.5 percent of the merchant marine's general equipment tonnage (Table 14.2, col. 5) plus 7.5 percent of the navy's (Table 14.2, cols. 6 plus 7). Table 14.1, col. 13 is the residual tonnage (Table 14.2, col. 9 less col. 10), valued at 22,000 lire per ton (*IIPF*, section F04.06).

Table 14.1, col. 14 (investment in new precious-metalware) is a crude estimate. Again neglecting the value of the raw materials to avoid dealing with changes in the related inventories of metal, these figures are simply estimated total value added (*IIPF*, Summary Table F.3, col. 19) less the estimated consumer-good component (Table 12.4, col. 7).

Table 14.1, col. 15 refers to investment in new fabricated metal (hardware), but it is a horse of a different color, as the present figures remain gross of the hardware absorbed by the construction industry (and others, e.g., shipbuilding): it partly duplicates the other series in the table, and cannot be simply added to them. To highlight this peculiarity, the figures in col. 15 are presented in italics. Col. 15 is estimated as the aggregate tonnage produced and imported (Fenoaltea 2020, Table 1, col. 1, Table 2, col. 1), valued at 810 lire per ton (*IIPF*, section F04.06), less the implied value of the estimated consumer-good component (the value added figures in Table 12.4, col. 2, divided by 415/810).

Table 14.1, col. 16 refers to investment in wood products. These figures are in italics, like those of col. 15, and for exactly the same reason: they are gross of the components absorbed by other investment, in particular in structures. Col. 16 simply transcribes the value estimates in Table 12.3, col. 1.

Table 14.1, col. 17 transcribes the estimated investment value added of the services group, here considered, for simplicity, as a single aggregate. These figures too are italicized, as they too contain the transportation and intermediation costs that burdened the raw materials of the commodity-producing (and maintaining) industries, and are therefore already included, to that extent, in cols. 1–16. But they are not entirely double-counted, for the estimated values of new mobile final goods other than vehicles (in essence, those covered by cols. 12–16) are essentially at f.o.b. prices (at the border or the factory), and exclude the cost of domestic transportation and intermediation. It also bears notice that from end to end the contribution of the services grew near sevenfold, where total (fixed) investment barely quadrupled: a disparity that reflects the improvement in transportation, and the increase in transportation (and in the complexity of commercial distribution) that accompanies the concentration of production where it is in fact cheapest. Col. 17 simply transcribes the extant value added estimates (Table 12.9, col. 5).

14.2 Intermediate 1911-price estimates

Table 14.3 presents some manipulations of the time series in Table 14.1. Col. 1 is the ratio of Table 14.1, col. 17 (investment services) to the sum of Table 14.1, cols. 3–16. It is not a ratio of distribution costs to production costs, for as just explained the denominator includes the distribution costs of raw materials and intermediate goods, and double-counts some production costs; but it should serve as a rough index of such a ratio, and in that light comfort can be taken both from its rough doubling from 12 percent in 1861 to 23 percent in 1913, and from the mildness of its deviations from a steady trend (Figure 14.1).

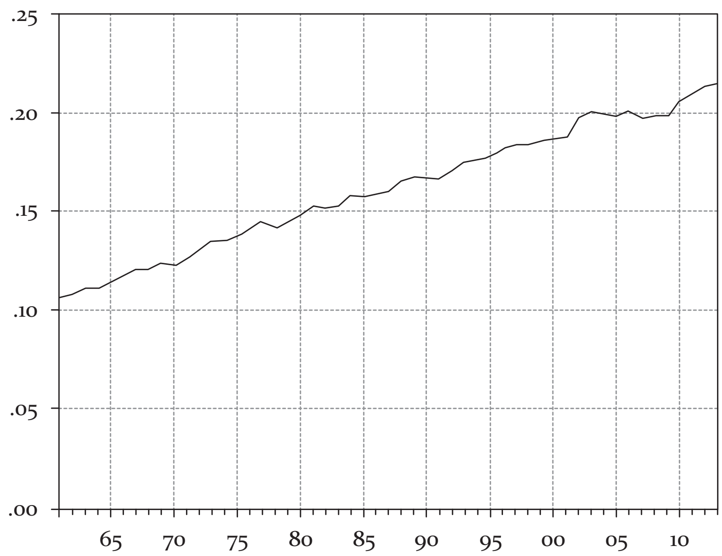
Col. 2 is instead the difference between aggregate fixed investment in Table 14.1, col. 1 and its properly identified components in cols. 2–14; this residual corresponds to the sum of cols. 15–17 (hardware, wood products, services), net of the components of these last already counted in cols. 2–14. Recalling the content of Table 14.1, cols. 15–17, specified above, Table 14.3, col. 2 covers, in essence, metal tools (f.o.b.); wood tools and machines (again f.o.b.); the distribution costs of the preceding; and the distribution costs of the other finished mobile goods in Table 14.1, to

TABLE 14.3 *Derivative investment-related series, 1861-1913*

	(1)	(2)	(3)	(4)	(5)	(6)
	(Table 14.1, col. 17) / (Table 14.1, cols. 3–16)	investment (million lire at 1911 c.i.f. prices)				
		net, not identified	in identified mobile goods	in fabricated metal and wood products		ratio of col. 5 to col. 4
				gross	net	
1861	.121	149	49	234	133	.57
1862	.122	103	48	213	87	.41
1863	.126	111	42	206	97	.47
1864	.127	106	42	211	92	.44
1865	.129	134	47	246	118	.48
1866	.127	152	30	255	142	.56
1867	.128	158	39	248	145	.58
1868	.132	141	43	215	126	.59
1869	.133	153	55	228	134	.59
1870	.135	171	48	251	154	.61
1871	.138	155	50	236	137	.58
1872	.143	170	66	247	146	.59
1873	.145	162	74	245	135	.55
1874	.147	158	70	246	132	.54
1875	.147	181	56	260	160	.62
1876	.150	205	64	282	181	.64
1877	.153	214	77	282	185	.66
1878	.151	198	61	276	175	.63
1879	.153	198	61	258	175	.68
1880	.157	210	81	272	179	.66
1881	.161	268	97	317	230	.73
1882	.161	282	118	350	236	.67
1883	.164	304	118	378	257	.68
1884	.168	335	129	421	283	.67
1885	.167	356	140	459	300	.65
1886	.168	420	140	533	364	.68
1887	.168	496	179	587	424	.72
1888	.173	494	174	580	423	.73
1889	.176	449	182	521	374	.72
1890	.176	401	179	474	327	.69
1891	.177	339	152	417	276	.66
1892	.179	326	148	372	264	.71
1893	.182	324	152	363	260	.72
1894	.183	337	161	367	269	.73
1895	.185	346	190	378	265	.70
1896	.187	358	215	390	266	.68
1897	.188	375	217	399	282	.71
1898	.188	414	244	433	309	.71
1899	.192	482	297	488	353	.72
1900	.194	510	362	497	352	.71
1901	.197	509	345	522	357	.68
1902	.206	535	332	538	385	.72
1903	.210	571	353	581	410	.71
1904	.212	618	419	615	426	.69
1905	.210	677	510	673	444	.66
1906	.213	823	687	748	507	.68
1907	.211	938	806	869	569	.65
1908	.212	1,023	913	1,013	604	.60
1909	.214	1,062	872	1,130	660	.58
1910	.221	1,112	897	1,174	691	.59
1911	.226	1,144	864	1,190	734	.62
1912	.228	1,208	847	1,180	804	.68
1913	.231	1,197	783	1,179	821	.70

Source: see text.

FIGURE 14.1 *Approximate index of the ratio of distribution costs to production costs at 1911 prices, 1861-1913*



wit, horses and harnesses (col. 5) and new engineering-industry general equipment, precision instruments, and precious-metal products (cols. 12–14).

Col. 3 transcribes the c.i.f. estimates of investment in those four product groups, obtained as the sum of the f.o.b. estimates in Table 14.1, cols. 5 and 12–14 inflated by a distribution margin itself calculated as simply four times the margin-proxy in Table 14.3, col. 1 (and accordingly rising from 48 percent of the f.o.b. value in 1861 to 92 percent in 1913). Possible differences between the product groups are ignored: ordinary machinery appears to have incurred relatively high transportation costs (Giordano 1864, p. 419), but this was likely offset by the relative proximity of consumers and producers, both disproportionately northern.

Col. 4 transcribes the analogous c.i.f. estimates of gross investment in fabricated metal and wood products, including those incorporated in structures, ships, etc.; these are obtained just like col. 3 from the sum of the corresponding f.o.b. estimates, here those in Table 14.1, cols. 15 and 16. Of that sum, it may be noted, the wood-products component is the major one, albeit by a cyclically variable (and slowly declining) margin: it accounts for some four fifths of the total in the 1860s and '70s, dips over the boom of the 1880s to just over one half, recovers to near four fifths around the turn of the century, and drops again to near half over the boom of the *belle époque* (suggesting that of the two the fabricated-metal industry was much the more closely tied to construction, cf. Fenoaltea 2020).

Col. 5 transcribes the analogous c.i.f. estimates of investment in fabricated metal and wood products, net of those incorporated in structures, ships, etc.; these are obtained as a residual, much like that in col. 2, save that total fixed investment (Table 14.1, col. 1) is reduced by its properly identified components uniformly valued c.i.f. (still Table 14.1, cols. 2–4 and 6–11, as these are immobile goods, but for the mobile goods Table 14.3, col. 3 rather than Table 14.1, cols. 5 and 12–14). No attempt is made here to disaggregate this residual into its own components: *il faut quand même un peu de pudeur*.

Col. 6, finally, reports the ratio of col. 5 to col. 4, that is, the implied share of fabricated metal products and wood products that were final goods in their own right (tools, wood machines), and not goods incorporated in structures or ships. Col. 5 is a residual that inherits all the blemishes of its parent series, and neither it nor col. 6, obviously, can be taken *au pied de la lettre*.[3] Col. 6 serves here as a test of the intrinsic reasonableness of col. 5 itself; and the latter would seem to pass that test, as the share of truly final goods grows from ca. half to over two thirds over the initial decades of the period at hand, and then remains roughly constant. What drives that path cannot be determined; but it bears notice that investment in metal machinery grew especially rapidly (Table 14.1, col. 12), and it is reasonable to imagine similarly rapid growth in investment in wood machinery (or in the wood components of mixed-material machines), at least until the coming of cheap steel altered the mix of cost-minimizing materials.

[3] The early dip-and-recovery after 1861 looks much like the mirror-image of estimated construction of new private structures (Fenoaltea 1988a), derived in those years from a very small (and, the present results suggest, perhaps unrepresentative) sample; see *IIPK*, ch. K.08 and section K10.02.

14.3 The disaggregation of investment at 1911 prices

A user-friendly summary of the estimates of investment at 1911 (c.i.f.) prices appears above as Table 4.5. Cols. 1 and 2 disaggregate total fixed investment (Table 14.1, col. 1) to distinguish maintenance from investment in new goods. Col. 1 is the sum of Table 14.1, cols. 4, 7, and 9–11; col. 2 is the residual, equivalent to the sum of Table 14.1, cols. 2–3, 6, and 8 and Table 14.3, cols. 3 and 5.

Cols. 3–10 decompose fixed new-good investment at 1911 (c.i.f.) prices. Col. 3 refers to investment by and in agriculture (improvements, herd increments); it simply transcribes Table 14.1, col. 2. Cols. 4 and 5 relate to new construction; the total in Table 14.1, col. 3 is here decomposed to separate private structures (Fenoaltea 1988a, Table 1, col. 5) from other construction (transportation systems, other social overhead capital). Col. 6 refers to investment in off-farm horses and harnesses; it is Table 14.1, col. 5, scaled up by (1 + 4(Table 14.3, col. 1)) to approximate c.i.f. values, as described above. Col. 7 refers to transportation systems' mobile hardware, ships and railway vehicles (Table 14.1, cols. 6 and 8). Col. 8 refers to general and precision machinery together (the sum of Table 14.1, cols. 12 and 13, again scaled up to c.i.f. values). Col. 9 refers to tools, of metal and wood, and wood machines (again valued c.i.f.: Table 14.3, col. 5). Col. 10, finally, refers to display goods (precious-metalware, Table 14.1, col. 14, again brought up to c.i.f. values). Together, within rounding error, cols. 3–10 sum to col. 2.

The estimates in Table 4.5, at constant prices, document the movements of quantities; they are illustrated in Figure 4.5.[4] Over the half-century from 1861 to 1911 population increased by some 40 percent (*Sommario*, p. 39). Against that, we see a doubling of the quantity of maintenance work (col. 1), and of social-overhead new construction (col. 5); closer to a trebling in the quantity of investment by and in agriculture (col. 3) and in off-farm horses and harnesses (col. 6), and in display goods (col. 10); a near five-fold increase in aggregate investment in new goods (col. 2); a near sixfold increase in the quantity of new private structures (col. 4), social-overhead vehicles (col. 7), and tools-plus-wood machines

[4] Investment in precious-metal display goods, poorly reconstructed but certainly trivial, is not illustrated.

(col. 9); and nearer a thirty-sixfold increase in the quantity of (other) metal equipment (col. 8).

Three time series display idiosyncratic paths. Aggregate investment in maintenance (col. 1) is practically a steadily-rising trend. Aggregate investment by and in agriculture goes much its own way, growing in the 1870s but generally stagnating from 1880, with occasional brief collapses (in the late 1880s when tariff increases and the tariff war with France halted conversions to vineyards, again around the turn of the century when herds were apparently culled, Table 12.6), and an upside outlier in 1908 (tied to a 6 percent increase in the herds' overall value at 1911 prices, twice the next highest figure, ibid.). Aggregate investment in (metal) machinery (col. 7) grew very rapidly, with brief setbacks at roughly decadal intervals; this path has been established only recently (Fenoaltea 2020), and has yet to be explained.

Aggregate investment in new goods (col. 2) followed the Kuznets-cycle long swing of construction activity, established and analyzed decades ago (Fenoaltea 1988a; also 2011a, ch. 2). On the evidence that was brought to bear it seems tied to international finance: first to the willingness to invest specifically in Italy in the immediate aftermath of Unification (until the fiascos of 1866), and then to variations in the more general willingness to invest in the periphery, with no specifically Italian features at all (until, perhaps, the victorious war with Turkey, not by chance on the very eve of the World War). As has been pointed out this path is largely shared by the private and public components of investment in structures (Figure 4.5); the main difference is over the late 1880s, as private construction collapsed immediately the bubble burst in 1887 (and then partly recovered), while public construction fell a bit later and more slowly, as declining capital imports and the spreading crisis curtailed the State's own capacity to borrow and spend.

A similar long swing is found here, unsurprisingly, in investment in vehicles (col. 7). Over the long upswing from the mid-1890s it displays two idiosyncratic intermediate peaks, the first around the turn of the century (due it would seem to merchant-shipping subsidies and to the electrification of tramways), the second in 1907 (and patently tied to the renovation of the railway system after the creation of the State railways in 1905). The long swing is also found here, most interestingly, in investment in tools and wood machines (col. 9): the medium-term path follows a relatively steady trend, save for the characteristic marked upswing through most of the 1880s, and the ensuing decline.[5]

The inclusion of wood machines may curb this series' growth rate, especially over the later decades; but judging by the path of investment in metal machinery the sharp cycle over the 1880s and early 1890s was not in machinery at all, but in tools. But that the cycle in investment in tools should parallel that in structures is not self-explanatory: if the tools were needed to build the structures they should have moved not like the structures series but like its first derivative, the need for *added* tools being greatest not when construction peaked, but as it expanded most rapidly.[6]

To this old dog, the most likely explanation does not require a new trick. The vagaries of investment in Italy appear to be explained not by variations in output, but by variations in the desired capital/output ratio (Fenoaltea 1969). That ratio, and therefore investment, may have varied with investors' confidence (ibid.: the "political cycle" hypothesis, since abandoned), or, more convincingly, with the supply and cost of capital (Fenoaltea 1988a, 2011a, ch. 2).[7] The State borrowed from the public and from leading banks, at home and abroad, builders borrowed from banks; the artisans who used and bought tools presumably could not. Their source of finance, one presumes, was their retained earnings; and if that is so it is not surprising that they should have invested most in adding to their stock of tools when the *level*, and not the growth rate, of their activity was at a peak.

The productivity-enhancing motivation for such investment may bear comment. Machinery is obviously labor-saving, in industrial

[5] The upswing in the 1880s may be overstated, but not entirely fictitious: see above, §4.3, footnote 17.

[6] Tool use and replacement naturally follow the structure-investment cycle, but tool purchases as a whole would not unless tools were so short-lived as to behave as raw materials.

[7] The early "political cycle" hypothesis was based on the then-available "engineering" series, which grew fairly regularly across the 1860s and '70s, while the "Old Right" held sway, boomed with Depretis, fell with Crispi, and boomed again with Giolitti. The subsequently-derived construction series were the first to document the parallel long swing in construction, and the sharp cycle of the early 1870s, which didn't fit that hypothesis at all.

factories, in agriculture, in artisans' shops too, as when a sewing machine replaced a hand-held needle. Tools save labor from time immemorial, sewing with a needle is much easier than sewing without one; but the evidence here points to an increase in the stock of tools *per worker*, and this investment saves labor in subtler ways. One imagines here two typical scenarios. One is that of a carpenter, say, passing from a single hammer to a battery of differentiated hammers, calibrated to the size of the nail that must be driven. The other is that of a five-person tailor's shop, say, passing from a single pair of scissors to five: the tool is no longer shared, each worker now has one, and work is no longer interrupted as one worker waits for another to finish using the tool and hand it over.

15

DISAGGREGATED FIXED INVESTMENT AT THE 1911 PRICE LEVEL

15.1 Allowing for changes in relative prices

There is something deeply wrong-headed with examining the composition of a value aggregate calculated, and disaggregated, with inappropriate relative prices. That is why the disaggregated 1911-price figures in Table 4.5 are a poor guide to the actual composition of investment; and that is of course (yet another reason) why we want our "real" measures to maintain a constant price *level*, but to reflect *current* relative prices (i.e., why we want the not-yet-available "third-generation" estimates rather than the present "second-generation" interim figures: above, §3.1). Conceptually, the problem is that if we use constant (1911) prices, as we go back in time the technologically more progressive activities are increasingly undervalued relative to the less progressive ones; the conceptually simple solution is to correct the various constant-price series to reflect relative technical progress.

In general, of course, the best evidence we have of relative technical progress is the evolution of relative prices; but credible price series are not yet available (e.g., §3.5, footnotes 28, 31), and their construction here is *ultra vires*. In the interim the practical solution is to lower one's standards, and to accept a quick-and-dirty calculation that is at least a step in the right direction.

The results of such a calculation are presented in Table 4.6, organized exactly like Table 4.5, but differently derived from Tables 14.1 and 14.3. The basic algorithm is as simple as could be: the various components of fixed investment are divided into two categories only, to separate goods and activities that benefited from (significant) technological progress from those that did not.

In the case of the latter, the 1911-price series are taken over as they are. In the case of the former, heroically, a uniform correction is applied: assuming a productivity growth rate τ, with V_k identifying the 1911-price estimate and V_t the corrected estimate for the year t, $V_t/V_k = (1 + \tau)^{(1911 - t)}$. Here, τ is set equal to 2.44 percent per year, an evidence-based figure used in generating the production estimates for the engineering industry (*IIPF*, section F04.11); in 1861, the resulting correction V_t/V_k equals approximately 3.34.

Here, the new production of metal vehicles, machines, tools, and display goods is considered technologically progressive; cols. 7–10 in Table 4.6 are accordingly cols. 7–10 in Table 4.5, multiplied through by V_t/V_k. Other new production – agricultural improvements, breeding, harness-making, construction – is considered technologically stagnant; cols. 3–6 in Table 4.6 accordingly reproduce cols. 3–6 in Table 4.5. In Table 4.6, col. 2 (total investment in new goods) is the simple sum of cols. 3–10. Correcting for the progressive cheapening of the investment goods, from 1861 to 1911 investment in metal machines (col. 8) increased nearer elevenfold than thirty-sixfold, total investment in new goods (col. 2) nearer threefold than fivefold.

The derivation of the maintenance series in Table 4.6, col. 1 is more complex. In general, maintenance is a manual process, essentially devoid of technical progress; the major exception is the maintenance of ships and railway vehicles, carried out in ever-more-capital-intensive yards and shops similar to those used to produce those vehicles in the first place. Table 4.6, col. 1 is accordingly the sum of two components. One is Table 4.5, col. 1, reduced by the sum of Table 14.1, cols. 7 and 9; the other is the latter sum, multiplied through by V_t/V_k. At 1911 prices (Table 14.1), from 1861 to 1911 the maintenance of ships and railway rolling stock grew over tenfold, other maintenance less than doubled; as one goes back in time the component that gets scaled up is an ever smaller part of the total. Total maintenance is accordingly not much affected: from 1861 to 1913 it grows by a factor of 2.1 at 1911 prices (Table 4.5), at the 1911 price *level* (Table 4.6) that factor is reduced only marginally, to 2.0.

15.2 The burden of the evidence

Figure 4.6 illustrates the estimated composition of investment, as derived from Table 4.6; the composition of investment at 1911 prices, from Table 4.5, is also illustrated, to bring out the attendant distortion. Panel A illustrates the share of new-product investment in total investment; since the maintenance component is close to a simple trend, the path of that share is similar to the path of new-product investment itself (Figure 4.5, panel A2), characterized, as usual, by the long cycle. At 1911 prices, cyclical movements apart, the share of new-product investment appears to be generally rising; in fact, it appears to have been more nearly constant, with a mid-cycle value between 70 and 75 percent. Figure 4.6, panel B illustrates, in separate graphs to avoid clutter, the path of the major components of new-product investment.

The share of agricultural improvements and breeding varied widely, typically between 5 and 15 percent, but with a maximum near 17 percent in 1878 and 1879 (well under the 23 percent of the 1911-price series), and minima near zero in 1889 and 1899. The share of private structures also displayed sharp cyclical variations. Over the period at hand its trend value seems to have risen by a few percentage points, from perhaps 11 percent to 15 percent over fifty years; the 1911-price series point to a mild decline rather than a mild increase.

The next two graphs illustrate the share of investment in fixed social-overhead infrastructure, and in largely complementary horses, ships and rolling stock (Table 4.6, cols. 5–7); going back in time the correction for changes in relative prices would reduce the former, and increase the latter. The net effect on the two together is dominated of course by the major component, fixed infrastructure; over time the joint share of these social-overhead investments declined from some 40 percent and more (and not 50 percent and more, as the 1911-price series would have it) to 25-to-30 percent.

A clear upward trend is instead evident, as expected, in the share of machinery. That share was apparently over 6 percent in 1861 (and not half that, as the 1911-price series suggest), and grew and grew to over 20 percent in 1913; it peaked at some 30 percen t in 1907-08, after which machinery investment fell while construction continued to increase.

The share of tools (and wood machinery) displays short-term variations that, for the reasons recalled above (§4.3, footnote 17 and §14.3, footnote 5), cannot be taken altogether seriously. Over the longer term it appears to have drifted down from some 30–35 percent over the later nineteenth century to nearer 25 percent by the eve of the Great War; the 1911-price series would have it drifting *up*, and then flattening out.

The share of investment in precious-metal display goods was ever trivial, by either measure, and is not illustrated. As calculated, it declined relatively smoothly to near one half of one percent in 1911 from in 1861 little more than that at 1911 prices, and little more than one percent at approximate current prices.

Figure 4.6, panel C takes a closer look at the composition of productivity-enhancing new-good investment, which here excludes investment in agricultural improvements and herd increments (and in off-farm horses), in private structures (essentially housing), in precious-metal display goods, and in naval vessels (Table 4.6, cols. 3, 4, 6 and 10, and V_t/V_k times Fenoaltea 2018c, Table 1, col. 56); its three components are investment in (other) infrastructure and related vehicles excluding naval vessels, in metal machines, and in tools and wood machines (Table 4.6, respectively cols. 5 plus 7, reduced by the just-noted naval ship figures, col. 8, and col. 9), with the *caveat* that infrastructure still includes fortifications and more, and machinery weapons.

Figure 4.6, panel C illustrates the shares of investment in (for brevity) "infrastructure," "machinery," and "tools" in their joint total. Tools emerge as long the largest single component: they remained near 40 to 50 percent of the total from Unification through the turn of the century, only to the dip to some 30 percent in 1908, and recover to some 35 percent in 1913. Infrastructure was long a close second: from 1861 to the early 1890s it drifted down from over 40 percent to just under that, only to drop sharply to less than 30 percent and finally partly recover to just over 35 percent in 1913. Machinery, by the same token, was long a distant third, roughly doubling from under 10 percent in 1861 to 20 percent in 1894; it then soared to 30 percent and more, peaked well in first place with an over-40 percent share in 1908, and then drifted back down to a third-place 30 percent in 1913.

It would be well to refine the underlying series, to remove military weapons as well as naval ones, to remove from infrastructure fortifications and prestige projects (like the hideous, and hideously expensive, Victor Emmanuel monument in Rome). How far one could actually go in that endeavor is not clear; but the endeavor itself is here again *ultra vires*, and all one can say is that the share of tools would presumably appear even larger, once the other series were cleaned up and scaled down.

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Printed July 2020
Tipografia Casma, Bologna

Reconstructing the Past

Revised Estimates of Italy's Product, 1861–1913

Economists consider historical measurement mere "data-gathering," suitably farmed out to apprentices. The reconstruction of an economy's past is more nearly akin to the restoration of an ancient temple or a medieval cathedral, subtle, challenging work that requires a panoply of skills, a familiarity with the surviving evidence, and an intuition that can be acquired only through experience. This book discusses the requisite methodology – a methodology that does not inform the extant world-wide corpus of historical national accounts, which scream to be recast – and revises, yet again, the estimates for Italy's economy from Unification to the Great War. The new time series remove serious distortions, notably in the estimates for the services, and incorporate the fruits of recent research.

Stefano Fenoaltea obtained his Ph.D. in economics at Harvard University. He taught for over thirty years in the United States, and then for near twenty more in Italy; he is now a Fellow of the Fondazione Luigi Einaudi in Turin. He is best known for his early contributions to the economics of institutions (ancient and modern slavery, medieval agriculture), and for his life-long quantitative reconstructions, and reinterpretations, of Italy's economy from Unification to the Great War. He has been a member of the Institute for Advanced Study, a Guggenheim Fellow, and a consultant to the Istituto centrale di statistica and to the Bank of Italy; he is listed in *Who's Who in the World*.

Cover image: Temple ruins, Selinunte. Photograph by Giovanni Crupi (1859-1925)

ISBN 978-88-32139-02-0