A 'back of the envelope' evidence on Aging and Growth for Italy

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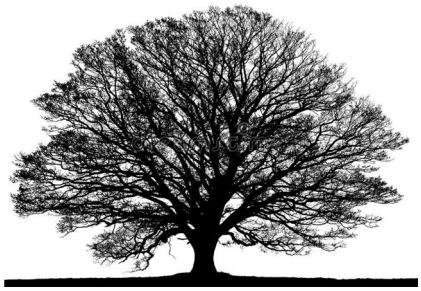
A simple very preliminary guess of how much aging can influence growth in Italy.



A premise is necessary: this is only a quick 'back of the envelope' exercise looking for a rough evidence of the impact of aging on economic growth in Italy. The basic idea comes from a recent NBER paper by N. Maestas, K. J. Mullen and D. Powell who constructed a complete macro-econometric set to investigate that linkage for Us.

This exercise is much more simplistic and consists of two groups of panel log-log regressions with variables at regional level over the period 2002-2016.

In the first group of regressions, the log of real per-capita added value (*LNrAVpc*) is regressed on: log of the incidence of people aged 65+ on total residents (*LNOver65*), employment rates (*EmployRates*), a set of regional dummies (*i.Regio*), and a temporal dummy (*Crisis*) selecting the period in which real rates of growth were hit by the double dip (2008-2014).

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. reg LNrAVpc LNOver65 EmployRate15over i.Regio Crisis, robust

Linear regression                               Number of obs     =        300
                                                F(22, 277)        =    1986.80
                                                Prob > F          =     0.0000
                                                R-squared         =     0.9870
                                                Root MSE          =     .03099
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LNrAVpc	Coef.	Robust Std. Err.	t	P>|t|	[95% Conf.	Interval]
LNOver65	-.1330117	.0588853	-2.26	0.025	-.2489314	-.0170921
EmployRate15over	.0207711	.0022079	9.41	0.000	.0164247	.0251176
Regio						
BAS	-.0651088	.0179588	-3.63	0.000	-.1004619	-.0297556
CAL	-.1626675	.0297984	-5.46	0.000	-.2213277	-.1040074
CAM	-.1272751	.0361584	-3.52	0.001	-.1984552	-.056095
EMR	.1679858	.0217856	7.71	0.000	.1250994	.2108722
FVG	.1303433	.0148611	8.77	0.000	.1010883	.1595983
LAZ	.2734963	.0160888	17.00	0.000	.2418244	.3051682
LIG	.249473	.0170251	14.65	0.000	.2159581	.2829879
LOM	.2365815	.0163377	14.48	0.000	.2044197	.2687434
MAR	.0246795	.0145021	1.70	0.090	-.0038688	.0532278
MOL	-.0217782	.0141532	-1.54	0.125	-.0496397	.0060834
PIE	.1235598	.0151434	8.16	0.000	.093749	.1533706
PUG	-.1571944	.0256351	-6.13	0.000	-.2076588	-.1067301
SAR	-.1159514	.0137401	-8.44	0.000	-.1429997	-.0889031
SIC	-.1042374	.0294822	-3.54	0.000	-.1622751	-.0461997
TAA	.1766637	.0203343	8.69	0.000	.1366344	.2166931
TOS	.1198975	.0157974	7.59	0.000	.0887992	.1509958
UMB	.01838	.0219596	0.84	0.403	-.0248489	.0616088
VDA	.2168563	.0179587	12.08	0.000	.1815034	.2522093
VEN	.0963769	.0144978	6.65	0.000	.067837	.1249167
Crisis	-.0191573	.0037974	-5.04	0.000	-.0266328	-.0116818
_cons	9.471607	.2580065	36.71	0.000	8.963705	9.97951

```
. reg LNrAVpc l.LNOver65 EmployRate15over i.Regio Crisis, robust

Linear regression                               Number of obs     =        280
                                                F(22, 257)        =    2118.98
                                                Prob > F          =     0.0000
                                                R-squared         =     0.9879
                                                Root MSE          =     .03003
```

LNrAVpc	Coef.	Robust Std. Err.	t	P>|t|	[95% Conf.	Interval]
LNOver65						
L1.	-.1264649	.0579561	-2.18	0.030	-.2405942	-.0123357
EmployRate15over	.0240137	.0020578	11.67	0.000	.0199614	.028066
Regio						
BAS	-.0472053	.0171801	-2.75	0.006	-.081037	-.0133736
CAL	-.1288616	.0286431	-4.50	0.000	-.1852667	-.0724565
CAM	-.0964863	.0354287	-2.72	0.007	-.1662539	-.0267187
EMR	.14058	.0205696	6.83	0.000	.1000736	.1810863
FVG	.1128599	.0142024	7.95	0.000	.084892	.1408278
LAZ	.2578217	.0164099	15.71	0.000	.2255067	.2901367
LIG	.242526	.0173448	13.98	0.000	.2083699	.2766821
LOM	.2098365	.0158192	13.26	0.000	.1786847	.2409882
MAR	.0062195	.0139127	0.45	0.655	-.021178	.0336169
MOL	-.0095643	.0141113	-0.68	0.499	-.0373528	.0182242
PIE	.1044734	.0147289	7.09	0.000	.0754687	.1334782
PUG	-.1318236	.0245609	-5.37	0.000	-.1801898	-.0834574
SAR	-.1047417	.013687	-7.65	0.000	-.1316947	-.0777888
SIC	-.0729044	.0277675	-2.63	0.009	-.1275851	-.0182237
TAA	.1393013	.0195051	7.14	0.000	.1008911	.1777114
TOS	.1022992	.0152855	6.69	0.000	.0721983	.1324
UMB	.0009821	.0228306	0.04	0.966	-.0439768	.0459411
VDA	.1930164	.0177678	10.86	0.000	.1580274	.2280054
VEN	.0711238	.0138985	5.12	0.000	.0437544	.0984933
Crisis	-.0180171	.0038471	-4.68	0.000	-.0255931	-.0104412
_cons	9.311653	.2472274	37.66	0.000	8.824803	9.798502

Results are significative and with the expected signs. A **1% increase** in the incidence of those aged 65+ can be associated with a **0.133% decrease** in real per-capita added value.

It is perfectly known and clear that added value and aging are simultaneous and endogenous to each other. From an estimation point of view, NBER paper introduces ad hoc instrumental variables following the most suitable technique. This RN stops at a much more elementary level and, as second guess, tries to check what happens if the regressor is lagged by one period (*l.LNOver65*). In this case, a 1% increase in the incidence of those aged 65+ can be associated with a **0.126% decrease** in real per-capita added value.

The second group of regressions is similar to the former one but, instead of the incidence of 65+, now the aging process is captured by regional structural dependency ratios (*LNStrcurDepen*) that represent the incidence of those aged 65+ and those aged 14- on active people (aged 15-64 years).

```
. reg LNrAVpc LNStrctDepen EmployRatel5over i.Regio Crisis, robust

Linear regression                               Number of obs     =        300
                                                F(22, 277)        =    1888.40
                                                Prob > F          =     0.0000
                                                R-squared         =     0.9879
                                                Root MSE          =     .02996
```

LNrAVpc	Coef.	Robust Std. Err.	t	P>|t|	[95% Conf.	Interval]
LNStrctDepen	-.2467756	.0507902	-4.86	0.000	-.3467595	-.1467917
EmployRatel5over	.0211256	.0016189	13.05	0.000	.0179387	.0243125
Regio						
BAS	-.0615659	.0121121	-5.08	0.000	-.0854094	-.0377224
CAL	-.1540221	.0194475	-7.92	0.000	-.1923058	-.1157383
CAM	-.1060872	.0187418	-5.66	0.000	-.1429816	-.0691929
EMR	.1674742	.0156603	10.69	0.000	.1366459	.1983025
FVG	.1262873	.0104203	12.12	0.000	.1057743	.1468003
LAZ	.2707047	.0153608	17.62	0.000	.2404661	.3009433
LIG	.2561861	.0110979	23.08	0.000	.2343391	.2780331
LOM	.2346526	.0145274	16.15	0.000	.2060545	.2632507
MAR	.0281682	.0109856	2.56	0.011	.0065424	.0497939
MOL	-.0209083	.0135251	-1.55	0.123	-.0475333	.0057167
PIE	.1224566	.0106166	11.53	0.000	.1015572	.1433561
PUG	-.1467601	.0148504	-9.88	0.000	-.175994	-.1175261
SAR	-.1332105	.0121904	-10.93	0.000	-.1572082	-.1092128
SIC	-.088459	.0173047	-5.11	0.000	-.1225245	-.0543936
TAA	.1894045	.0189872	9.98	0.000	.1520269	.226782
TOS	.1197461	.0104814	11.42	0.000	.0991128	.1403795
UMB	.0219032	.0186816	1.17	0.242	-.0148727	.0586792
VDA	.214369	.0140196	15.29	0.000	.1867704	.2419676
VEN	.0946081	.0128497	7.36	0.000	.0693126	.1199037
Crisis	-.0171373	.0036793	-4.66	0.000	-.0243801	-.0098944
_cons	10.0284	.2349732	42.68	0.000	9.565839	10.49096

Results appear significative and with the expected signs as well. A **1% increase** in the structural dependency ratio can be associated with a **0.246% decrease** in real per-capita added value. Taking the one-period lag slightly changes the estimate to a **reduction by 0.262%** in added value.

```
. reg LNrAVpc l.LNStrctDepen EmployRatel5over i.Regio Crisis, robust

Linear regression                               Number of obs     =        280
                                                F(22, 257)        =    1963.84
                                                Prob > F          =     0.0000
                                                R-squared         =     0.9889
                                                Root MSE          =     .02881
```

LNrAVpc	Coef.	Robust Std. Err.	t	P>|t|	[95% Conf.	Interval]
LNStrctDepen L1.	-.2623618	.0529255	-4.96	0.000	-.3665847	-.1581389
EmployRatel5over	.0240904	.001567	15.37	0.000	.0210046	.0271762
Regio						
BAS	-.0454319	.0123448	-3.68	0.000	-.0697417	-.0211222
CAL	-.1241461	.0196582	-6.32	0.000	-.1628578	-.0854344
CAM	-.0802396	.0202062	-3.97	0.000	-.1200305	-.0404487
EMR	.1428659	.0156213	9.15	0.000	.1121039	.1736278
FVG	.1101146	.0106579	10.33	0.000	.0891267	.1311025
LAZ	.254104	.0153617	16.54	0.000	.2238532	.2843549
LIG	.2527662	.0116418	21.71	0.000	.2298407	.2756916
LOM	.2084415	.0144757	14.40	0.000	.1799354	.2369475
MAR	.0117701	.0112102	1.05	0.295	-.0103055	.0338457
MOL	-.0090916	.0139609	-0.65	0.515	-.0365839	.0184007
PIE	.1049395	.0107878	9.73	0.000	.0836957	.1261833
PUG	-.1252565	.015025	-8.34	0.000	-.1548444	-.0956687
SAR	-.1262836	.0125482	-10.06	0.000	-.150994	-.1015733
SIC	-.060752	.0170651	-3.56	0.000	-.0943572	-.0271467
TAA	.153904	.018678	8.24	0.000	.1171227	.1906854
TOS	.1042645	.0107092	9.74	0.000	.0831755	.1253535
UMB	.0065238	.0196425	0.33	0.740	-.0321569	.0452046
VDA	.1916821	.0143317	13.37	0.000	.1634595	.2199047
VEN	.0697746	.0125442	5.56	0.000	.0450721	.0944772
Crisis	-.0160224	.0036839	-4.35	0.000	-.0232769	-.0087679
_cons	9.962393	.2500796	39.84	0.000	9.469926	10.45486

This first very rough evidence confirms the widespread idea that aging is associated with slowing down economies. On average in Italy the share of aged over 65 increased by 17.4% from 2002 to 2016, approximately 1.2% per year, implying an **annual slowing down of 0.15%** in real per-capita added value. On average in Italy the structural dependency ratio increased by 12.2% from 2002 to 2016, approximately 0.9% per year, implying an **annual slowing down of 0.23%** in real per-capita added value.

The slowing down can be seen as that part of growth that Italy lost (*i.e.* was not able to concretize) because of aging, that means because population composition did not remained constant but continuously evolved into an older one.