Demographics and Secular Stagnation Hypothesis in Europe

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The Secular Stagnation Hypothesis and the policy debate

- Are negative real interest rates needed to equate saving and investment with full employment in Europe?
    - L.Summers: With low inflation and zero lower bound on policy interest rates it may be impossible for an economy to achieve full employment, satisfactory growth and financial stability (as low real rates increase the probability of bubbles)

- What is the best strategy to promote growth in the current macroeconomic conditions. Structural reforms or macroeconomic adjustment ?
    - structural reforms may prove detrimental if more flexibility in the labour market cannot be accommodated by the central bank with expansionary policy that cannot deliver the negative real rates necessary to restore equilibrium

Demographics and real interest rates

- The rate of growth of population has traditionally been the main concern of economist, and Alvin Hansen made no exception.
- Demographers take a different view and insist on the importance of the age structure of the population for growth and real rates.
- Demographics determines the supply of saving. In a simplified set-up where agents live three periods (young, middle-aged and old) real interest rates are determined by the supply of savings of the middle aged.
- The increase in life expectancy with lower fertility increases the supply of savings by the middle-age group, but ageing and a higher share of old age population might more than compensate this effect.
- The effect of demographics on the supply of saving is to be determined empirically

Our Paper

- In this paper we assess the importance of the age structure of population for the secular stagnation hypothesis by deriving a mortality trend from a standard model of mortality, the Lee-Carter model, and combining it with the projected age structure of population to generate long term projections for the trend in output per capita and real interest rates for euro area economies.

- Our evidence shows that demographic based projections deliver for the next twenty years a lower long-run potential growth rate but a reversion of real interest rates to their historical mean.

    - The increase in life expectancy with lower fertility increases the supply of savings, but ageing and a higher share of old age population more than compensate this effect to deliver projecter higher real rates.

Our Paper

- To further circumstantiate our empirical evidence, we assess the role of age structure on productivity and labour markets,
  - Reforms in labour and product markets are indeed associated with the age structure of the population
  - This is hardly surprising since reforms have redistributive effects, which may differ across age groups
- We conclude by evaluating the importance of our results for the debate on the best strategy to promote growth in the current macroeconomic conditions.
  - In particular we discuss the importance of our evidence for the two different views that are currently debated: the structural reforms view versus the macroeconomic adjustment view.

The Demographic Scenario for Europe

- We consider the Lee-Carter(1992) mortality model to derive a mortality trend that we will combine with the age structure of population in Europe (0-20, 20-39, 40-59 and over 60) to generate demographic driven trends for real output and real interest rates.
- We analyze fifteen European countries (Austria, Belgium, Denmark, Spain, Finland, France, Great Britain, Germany, Ireland, Italy, The Netherlands, Norway, Portugal, Switzerland and Sweden) to generate a sample of 10 euro area countries and 5 non euro area countries.
- Data on mortality for annual sample 1956-2009 are taken from the Berkeley Human Mortality Database website.

The Lee-Carter (1992) model

The Lee-Carter (1992) model consists of a system of equations for logarithms of mortality rates for age cohort x at time t, $\ln[m_{x,t}]$, and a time-series equation for an unobservable time-varying mortality index k_t:

$$
\begin{aligned}
\ln\left(m_{x,t}\right) &= a_x + b_x k_t + \epsilon_{x,t} & (1) \\
k_t &= c_0 + c_1 k_{t-1} + e_t \\
\epsilon_{x,t} &\sim NID\left(0, \sigma_\epsilon^2\right) \\
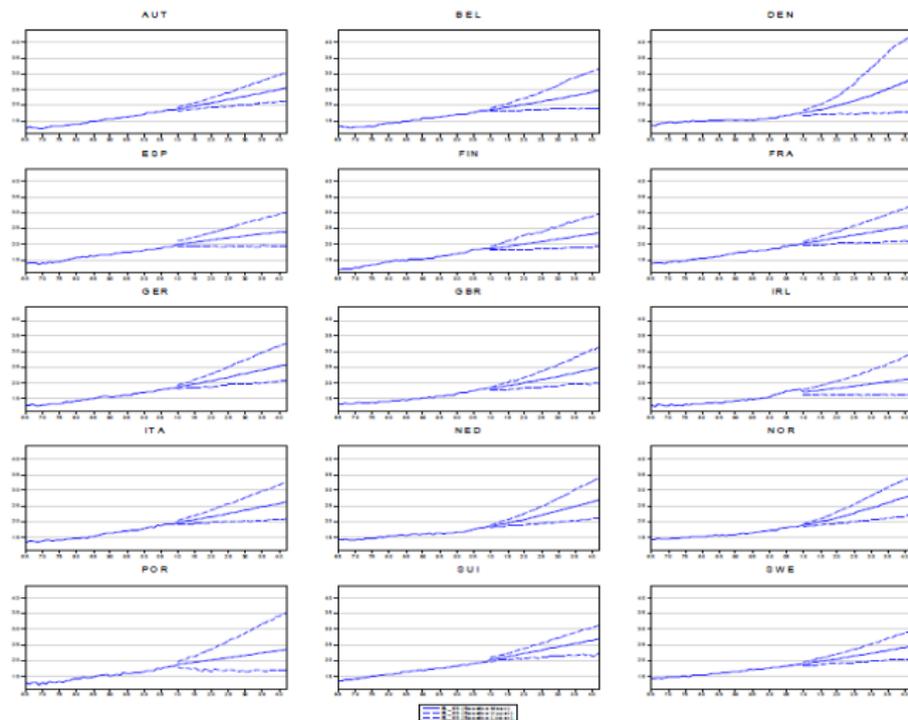e_t &\sim \text{MeanZero - Stationary Process}
\end{aligned}
$$

Four-Hours a Day
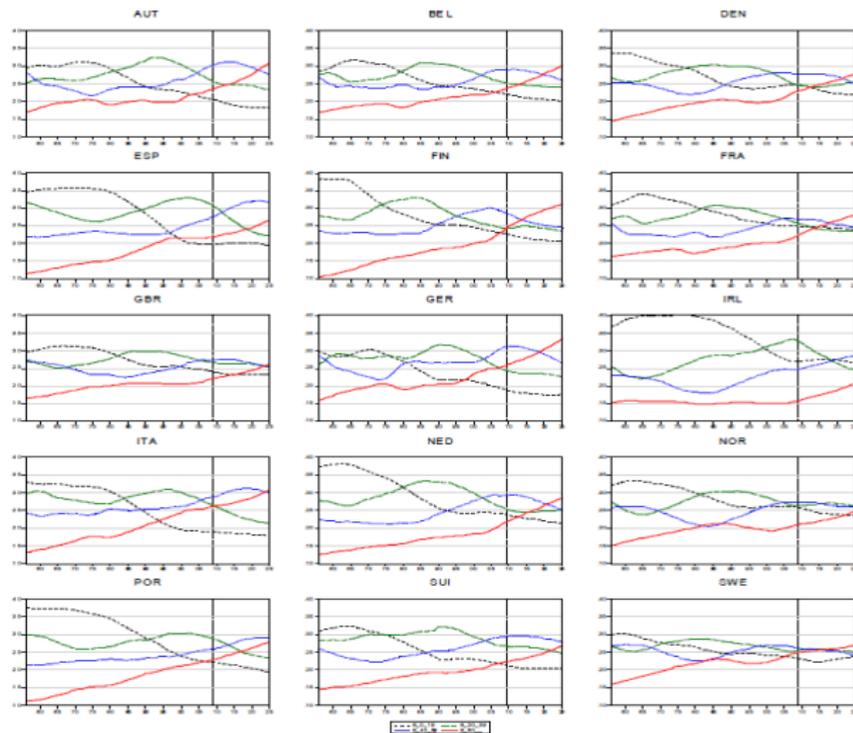

Figure1: Expected Residual Life at 65

Figure 3: Shares of total population for age group

Demographic-based projections for output and real interest rates

We then adopt a model for a panel regression in levels of the logarithm per capita GDP at PPP US dollars, $y_{i,t}$, and the real long-term interest rate, $rr_{i,t}$, on the logarithms of age shares, $a_{j,i,t}$, and the Lee-Carter country-specific mortality trend $k_{i,t}$:

$$
\begin{aligned}
z_{i,t} &= \beta_1 k_{i,t} + \sum_{j=0-19}^{60+} \beta_j a_{j,i,t} + \lambda_i + \chi_t + u_{i,t} \\
k_{i,t} &= c_{0,i} + c_{1,i} k_{i,t-1} + e_{i,t}
\end{aligned}
\tag{2}
$$

where $j = 0-19, 20-39, 40-59, 60+$, $z_{i,t} = y_{i,t}, rr_{i,t}$. The specification also includes a country fixed effect and time-dummies, the model is estimated by SURE to deal with cross-country correlations of residuals $u_{i,t}$. We use the model to project within sample and out-of-sample, the variables to our interest, by taking the age shares as exogenous and using the UN Population Division projections.

Estimation Results

Table 1: Demographic based projections for output and real interest rates
Log(GDP/capita), Seemingly Unrelated Regression (SUR),1956-2009

	Coefficient	Std. Error	t-Statistic	Prob.
$log\ a_{0-19}$	1.238014	0.049163	25.18180	0.0000
$log\ a_{20-39}$	2.139490	0.047767	44.79056	0.0000
$log\ a_{40-59}$	1.540705	0.040224	38.30345	0.0000
$log\ a_{60+}$	0.931189	0.030463	30.56808	0.0000
k_t	-0.003238	0.000218	-14.84704	0.0000

Real Interest Rate, Seemingly Unrelated Regression (SUR),1971-2014

	Coefficient	Std. Error	t-Statistic	Prob.
$log\ a_{0-19}$	19.05117	1.873710	10.16762	0.0000
$log\ a_{20-39}$	24.50064	1.975536	12.40202	0.0000
$log\ a_{40-59}$	17.96599	2.017357	8.905707	0.0000
$log\ a_{60+}$	21.73423	1.525143	14.25062	0.0000
k_t	-0.139914	0.007949	-17.60123	0.0000

Log of Per Capita real output
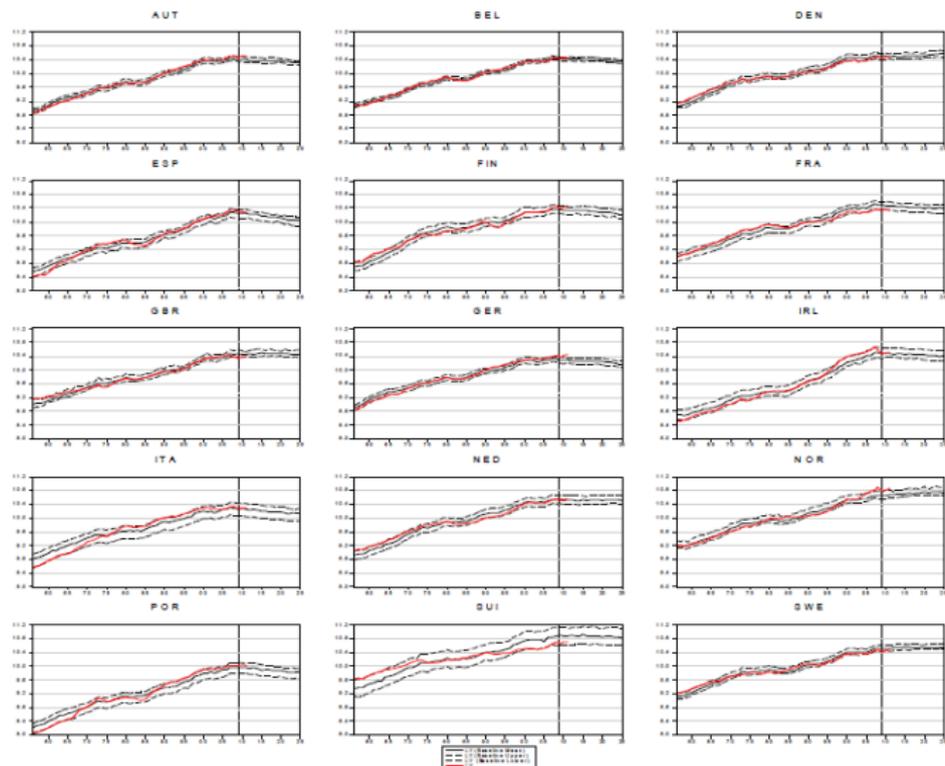
Figure 4: Demographic based projections for log per capita output
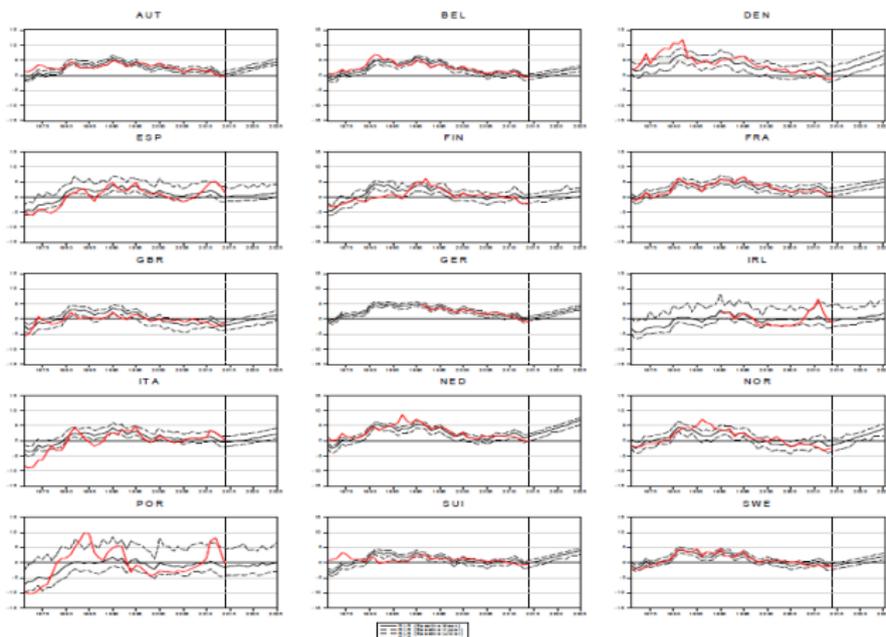
Figure 5: Demographic based projections for real long-term (10 year) rates

Age Structure, Productivity, and Labour Markets

- During the last few decades, particularly in Europe, the quest for more economic growth has often been associated with the need of structural reforms
- The pace of reforms has been heterogenous.
  - Product market regulations, as measured by the OECD index (see Conway and Nicoletti, 2006), have dropped, albeit to a different degree, in several countries

Product Market
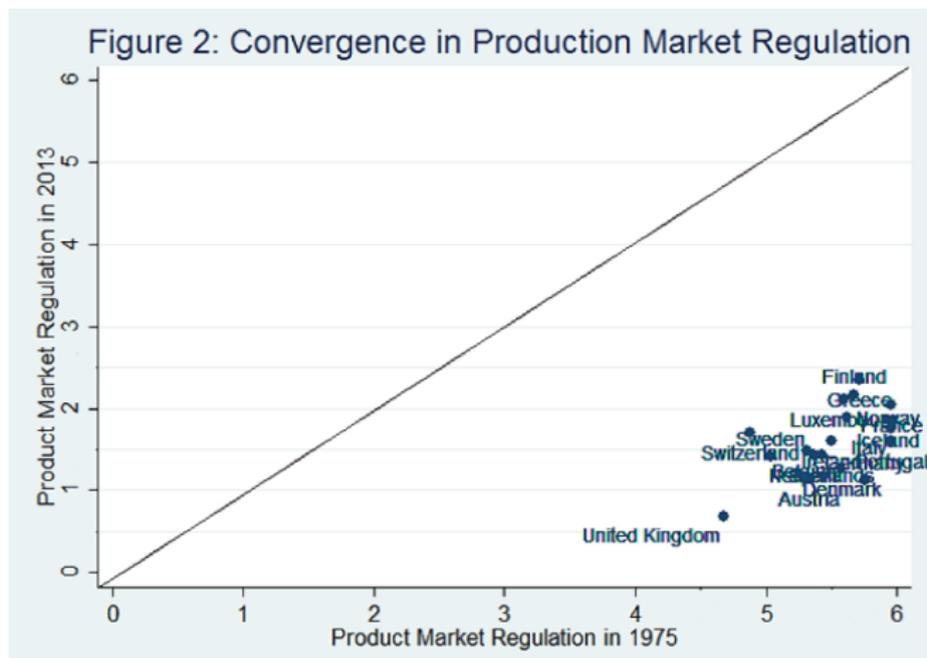
Figure 2: Convergence in Production Market Regulation

Age Structure, Productivity, and Labour Markets

- During the last few decades, particularly in Europe, the quest for more economic growth has often been associated with the need of structural reforms

- The pace of reforms has been heterogenous.
  - Product market regulations, as measured by the OECD index (see Conway and Nicoletti, 2006), have dropped, albeit to a different degree, in several countries
  - Liberalization of the labor market, as measured by the EPL index (OECD, 2006) has instead proved to be more difficult to achieve.
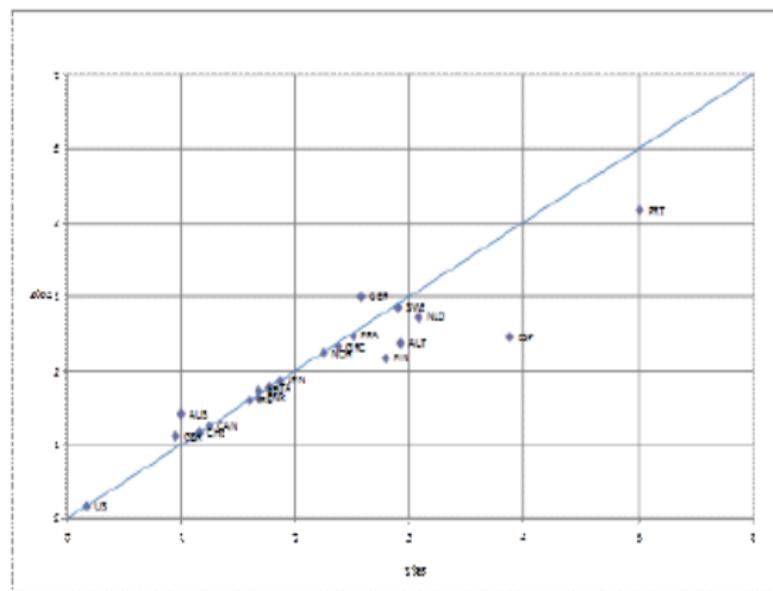
Labour Markets

Figure 7: Labor Market Reforms

Age Structure and Product Market Regulation

Table 3: Product Market Regulation

VARIABLES	pmr	transport	communication	energy	pmr	transport	communication	energy
Lagged dependent	0.793***	0.765***	0.832***	0.849***	0.799***	0.756***	0.827***	0.860***
	(0.0383)	(0.0502)	(0.0340)	(0.0387)	(0.0383)	(0.0524)	(0.0374)	(0.0393)
L.crisisgap	-0.0512	-0.00766	-0.0804*	-0.0128	0.0649**	0.000217	-0.0961*	0.00287
	(0.0333)	(0.0467)	(0.0470)	(0.0696)	(0.0320)	(0.0468)	(0.0495)	(0.0690)
emu	1.079***	1.399**	0.474	2.202	1.084***	1.582***	0.293	2.618*
	(0.277)	(0.542)	(0.365)	(1.403)	(0.291)	(0.546)	(0.388)	(1.555)
single market	-0.0874**	-0.169**	0.0304	4.398	0.129***	-0.176**	0.0520	-0.475
	(0.0427)	(0.0821)	(0.0579)	(3.549)	(0.0487)	(0.0834)	(0.0639)	(1.025)
L.openness	-0.0407	0.257**	-0.272**	0.828***	-0.163**	0.173	-0.311**	-0.816***
	(0.0844)	(0.123)	(0.126)	(0.247)	(0.0827)	(0.125)	(0.130)	(0.265)
L.gdplog	0.452***	0.623**	0.184	0.737	0.435***	0.685***	0.0734	0.955
	(0.137)	(0.258)	(0.184)	(0.749)	(0.142)	(0.261)	(0.194)	(0.855)
L.right	-0.0229	-0.0148	-0.00961	0.0312	-0.00256	0.00900	-0.000974	0.0160
	(0.0165)	(0.0284)	(0.0241)	(0.0434)	(0.0165)	(0.0275)	(0.0277)	(0.0389)
Linear trend	0.0202***	0.0294***	-0.00941*	-0.141				
	(0.00508)	(0.00820)	(0.00570)	(0.107)				
Mortality trend					0.00444*	0.00508	0.00606	0.00198
					(0.00241)	(0.00410)	(0.00400)	(0.00788)
share_20_39	-3.302***	-4.070***	-0.914	13.36***	3.109***	4.089***	-0.465	-14.44***
	(0.650)	(1.244)	(0.813)	(4.722)	(0.646)	(1.229)	(0.856)	(5.124)
share_40_59	-7.710***	-8.778***	-5.436***	10.23***	6.502***	8.675***	-5.051***	-10.30***
	(1.615)	(2.521)	(1.961)	(3.349)	(1.442)	(2.541)	(1.916)	(3.551)
share_60_plus	-0.623	0.817	-2.199**	-3.485	-0.295	1.008	-2.317**	-3.260
	(0.672)	(1.192)	(1.106)	(4.301)	(0.687)	(1.220)	(1.137)	(4.301)
Constant	-8.773**	-13.34**	-2.295	-12.75	-8.783**	-15.18**	0.526	-18.84
	(3.429)	(6.468)	(4.792)	(20.63)	(3.647)	(6.583)	(5.112)	(23.91)
Number of countries	18	18	18	18	15	15	15	15
Country fixed effects	yes	yes	yes	yes	yes	yes	yes	yes
Year fixed effects	yes	yes	yes	yes	yes	yes	yes	yes
Observations	509	445	509	235	453	430	453	220
R-squared	0.990	0.979	0.983	0.987	0.991	0.980	0.983	0.989

Robust standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

Table 4: Labor Market Regulation

VARIABLES	epl	eplt	eplr	tradeun	epl	eplt	eplr	tradeun
Lagged dependent	0.891***	0.909***	0.851***	0.923***	0.886***	0.903***	0.848***	0.942***
	(0.0389)	(0.0366)	(0.0986)	(0.0166)	(0.0431)	(0.0409)	(0.0992)	(0.0114)
L.crisisgap	0.0101	-0.00183	0.0207	-0.0321	0.00936	-0.00388	0.0207	0.0839
	(0.0225)	(0.0414)	(0.0142)	(0.154)	(0.0226)	(0.0411)	(0.0144)	(0.148)
emu	0.526*	0.669	0.251	-2.735	0.900**	1.416**	0.191	-2.066
	(0.274)	(0.486)	(0.218)	(2.719)	(0.394)	(0.709)	(0.255)	(2.142)
single market	0.00930	0.0323	-0.00683	-0.0281	0.00850	0.0312	-0.00791	-0.259
	(0.0319)	(0.0610)	(0.0116)	(0.322)	(0.0321)	(0.0614)	(0.0120)	(0.195)
L.openness	-0.0103	0.0240	-0.0204	-0.00858	-0.0758	-0.103	-0.0101	-0.326
	(0.0523)	(0.0892)	(0.0356)	(0.813)	(0.0614)	(0.101)	(0.0386)	(0.549)
L.gdplog	0.201*	0.300	0.0106	-1.456	0.392**	0.689**	-0.0237	-1.016
	(0.122)	(0.229)	(0.0916)	(1.361)	(0.183)	(0.348)	(0.103)	(1.090)
L.right	0.00732	0.0197	-0.00353	-0.0322	0.00112	0.00561	-0.00373	-0.250*
	(0.0152)	(0.0285)	(0.00908)	(0.147)	(0.0140)	(0.0254)	(0.00892)	(0.109)
Linear trend	-0.00666**	-0.0115*	0.00172	0.0864**				
	(0.00315)	(0.00594)	(0.00272)	(0.0341)				
Mortality trend					-0.00381	-0.00830	0.000977	-0.00207
					(0.00330)	(0.00637)	(0.00147)	(0.0185)
share_20_39	-1.372**	-1.857	-0.830	6.170	-1.919**	-2.960*	-0.739	7.732
	(0.694)	(1.209)	(0.582)	(5.715)	(0.898)	(1.661)	(0.660)	(5.309)
share_40_59	-0.350	-0.110	-0.993	17.06	-0.900	-1.290	-0.921	20.08**
	(1.445)	(2.636)	(0.670)	(10.35)	(1.682)	(3.187)	(0.736)	(8.549)
share_60_plus	-1.467*	-1.992	-1.531	19.97***	-1.380*	-1.786	-1.548	23.08***
	(0.804)	(1.348)	(1.307)	(5.852)	(0.782)	(1.293)	(1.344)	(5.276)
Constant	-4.628	-7.174	0.659	35.44	-9.734**	-17.55**	1.598	20.77
	(3.020)	(5.746)	(2.474)	(36.47)	(4.587)	(8.753)	(2.715)	(28.63)
Number of countries	18	18	18	18	15	15	15	15
Country fixed effects	yes	yes	yes	yes	yes	yes	yes	yes
Year fixed effects	yes	yes	yes	yes	yes	yes	yes	yes
Observations	360	360	360	507	343	343	343	452
R-squared	0.985	0.975	0.993	0.998	0.987	0.978	0.993	0.999

Robust standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

Table 5: Welfare State

VARIABLES	uegen	skgen	pgen	uegen	skgen	pgen
Lagged dependent	0.838***	0.860***	0.931***	0.837***	0.856***	0.933***
	(0.0319)	(0.0475)	(0.0211)	(0.0318)	(0.0482)	(0.0212)
L.crisisgap	0.210**	0.0431	0.0136	0.205**	0.0412	0.00985
	(0.0911)	(0.0606)	(0.0626)	(0.0890)	(0.0609)	(0.0629)
emu	0.886	1.206*	0.693	1.161	1.536*	0.656
	(0.957)	(0.722)	(0.861)	(1.064)	(0.800)	(0.786)
single market	0.318***	-0.107	-0.166*	0.312***	-0.104	-0.165*
	(0.106)	(0.0718)	(0.0849)	(0.105)	(0.0721)	(0.0849)
L.openness	-0.198	-0.0913	-0.0908	-0.184	-0.0976	-0.116
	(0.277)	(0.261)	(0.195)	(0.278)	(0.264)	(0.198)
L.gdplog	0.343	0.515	0.279	0.502	0.695	0.254
	(0.489)	(0.390)	(0.435)	(0.559)	(0.441)	(0.393)
L.right	-0.00762	0.0517	0.0951**	-0.00956	0.0522	0.0895**
	(0.0518)	(0.0502)	(0.0380)	(0.0545)	(0.0524)	(0.0391)
Linear trend	-0.0264*	0.0226**	0.00219			
	(0.0142)	(0.0111)	(0.00933)			
Mortality trend				-0.00808	-0.00643	0.00244
				(0.00772)	(0.00617)	(0.00676)
share_20_39	2.419	0.992	0.105	1.738	0.393	0.228
	(1.884)	(2.151)	(2.039)	(1.912)	(2.073)	(1.941)
share_40_59	10.20***	2.475	-1.288	10.20***	2.522	-0.996
	(3.886)	(2.911)	(3.688)	(3.870)	(2.879)	(3.751)
share_60_plus	10.47***	5.695**	0.159	10.29***	5.684**	0.135
	(2.398)	(2.520)	(2.164)	(2.368)	(2.490)	(2.145)
Constant	-12.91	-14.86	-6.638	-17.03	-19.61	-6.065
	(12.99)	(10.50)	(11.17)	(14.90)	(11.92)	(10.12)
Number of countries	18	18	18	15	15	15
Country fixed effects	yes	yes	yes	yes	yes	yes
Year fixed effects	yes	yes	yes	yes	yes	yes
Observations	464	463	450	449	448	435
R-squared	0.981	0.989	0.960	0.980	0.988	0.958

Age Structure and Reforms

- Product Markets: A larger share of individuals in working age (20-39 and 40-59) is associated with more reforms.
- Labor Market: Employment protection (for temporary contracts) drops as the share of the young individuals (20-39) increases. Union density positively correlated with share of the elderly.
- Welfare State: More "older" working population (40-59) associated with more generous Unemployment Benefits; more Sick Pay Insurance with more elderly. No effect on Pensions.

The Political Economy of the Age Structure of Population

- Structural reforms or macroeconomic adjustment?
- Our evidence suggests that there may be political economy motivations to support one school of thought or the other. These motivations are likely to differ across generations.
- Structural reforms in the labor and product markets,have clear redistributive consequences.
  - Labor market liberalizations may increase hiring, but reduce production for insiders
  - Less generous unemployment benefits reduce insurance for protected workers.
  - Product market deregulations reduce economic rents. If elderly workers in protected sectors extract more rents, again an age cleavage may emerge.
- The same age divide in the preferences for welfare state retrenchment, since in most countries – particularly in Southern Europe – current social spending is massively targeted to the elderly.

The Political Economy of the Age Structure of Population

- Structural reforms should obtain the political support of the young generations, but they most likely get the opposition of the elderly (insiders).
- Neo-Keneysian macroeconomic adjustments, on the other hand, may be less divisive, if all generations benefit from more public spending and easier access to credit.
  - Given the large influence that elderly and insiders have on the political process that allocates public resources, these macroeconomic adjustments would most likely benefit the older generations
  - Moreover, our evidence on real rates and demographics structure does not support the concern of the existence of a negative equilibrium real rates that cannot be achieved in the presence of a zero lower bound on policy rates.

Conclusions

- Demographic based projections deliver for the next twenty years a lower long-run potential growth rate but a reversion of real interest rates to their historical mean. Within this framework, polices for growth become feasible (no secular stagnation) and of crucial importance

- The implementation of such reforms will not be facilitated by the age structure of population. In a world of ageing population, structural reforms should obtain the political support of the young generations, but they will most likely get the opposition of the elderly.

- It should thus not be surprising if the older countries – in terms of share of elderly people – lean more towards macroeconomic adjustments, whereas younger nations – again in terms of population share, are more supportive of structural reforms.