



*Center for Household Financial Stability*  
*Economic Briefing*

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# Demographics and Growth

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William R. Emmons  
Federal Reserve Bank of St. Louis  
[William.R.Emmons@stls.frb.org](mailto:William.R.Emmons@stls.frb.org)

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# Demographics and Growth

- **J. Bullard, C. Garriga and C. Waller (2012): “Demographics, Redistribution, and Inflation”**
  - An older population prefers (a) low inflation, (b) high real interest rate and (c) low investment, which reduces growth.
  - Key mechanism: “Tobin effect” connecting financial and real assets.
  - OECD data (1960-2013) support (a) and (c) but not (b).
- **D. Ikeda and M. Saito (2014): “The Effects of Demographic Changes on the Real Interest Rate in Japan”**
  - Compare the roles of productivity, demographics and fiscal policy.
    - Very large decline in real interest rate since early 1990s (-600 bps excluding 2007-09).
    - Drivers: (1) slower TFP growth, (2) lower working-age share, (3) falling land prices.
  - TFP dominates growth and real rate; working-age share matters less.
- **Outlook for U.S. real interest rates, investment and growth**
  - CBO average annualized real-GDP growth forecast through 2025:  
TFP (1.0%) + Hours (0.6%) + Capital services (0.6%) = 2.2% (1.5% per cap).
  - Real interest rates starting 2020: 1.4% (3-month T-Bill), 2.6% (10-yr Trsy).
  - Caution: CBO is very optimistic about employment-to-population ratio.

TFP = Total  
Factor  
Productivity

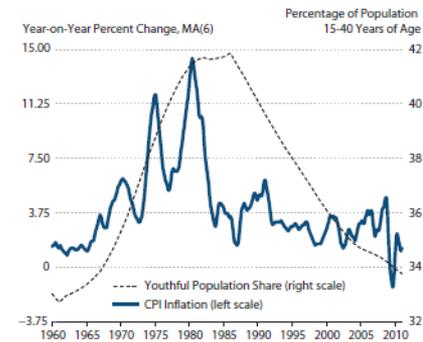


# *J. Bullard, C. Garriga and C. Waller (2012): “Demographics, Redistribution, and Inflation”*

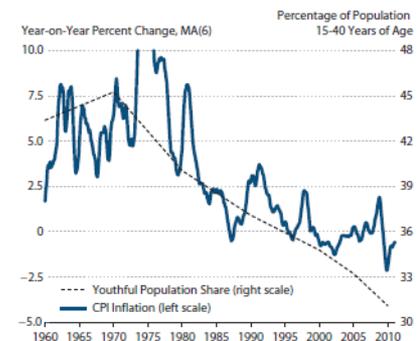
Bullard, Garriga, Waller

- **Older population wants:**
  - High real interest rate.
  - To produce this, monetary policy distorts investment demand.
  
- **The story:**
  - Old own money.
  - Prefer high real interest rates.
  - Created with deflation.
  - Money and capital are substitutes.
  - High real rate decreases investment and growth.
  
- **Key mechanism: “Tobin effect” connecting financial and real assets.**

**Figure 1**  
Inflation and Demographics: United States (1960-2010)



**Figure 2**  
Inflation and Demographics: Japan (1960-2010)





## *OECD Data: 30 Countries, 1960-2013*

- **Source: J. Yoon, J. Kim and J. Lee, “Impact of Demographic Changes on Inflation and the Macro-economy,” IMF working paper, Nov. 2014.**
- **Robust results:**
  - **Large elderly population reduces growth of GDP per capita.**
  - **Large elderly population reduces investment-to-GDP ratio.**
  - **Large elderly population reduces inflation.**

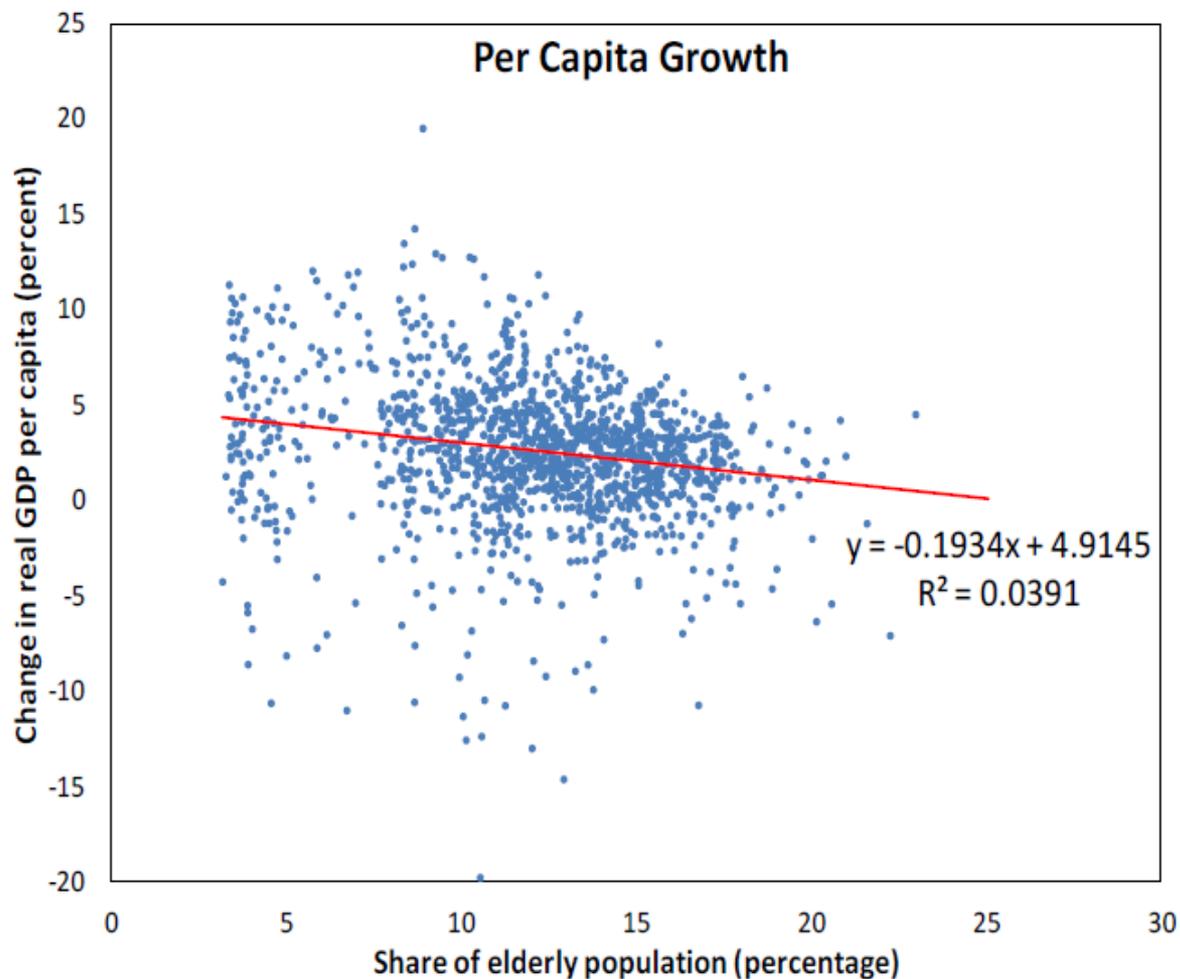
**List of Sample OECD countries**

United States	Norway	Spain
United Kingdom	Sweden	Turkey
Austria	Switzerland	Australia
Belgium	Canada	New Zealand
Denmark	Japan	Mexico
France	Finland	Korea
Germany	Greece	Czech Republic
Italy	Iceland	Slovak Republic
Luxembourg	Ireland	Hungary
Netherlands	Portugal	Poland



# *Older Population Reduces Growth: Bivariate Evidence*

Sample: 30 countries,  
1960-2013





# *Older Population Reduces Growth: Multivariate Evidence*

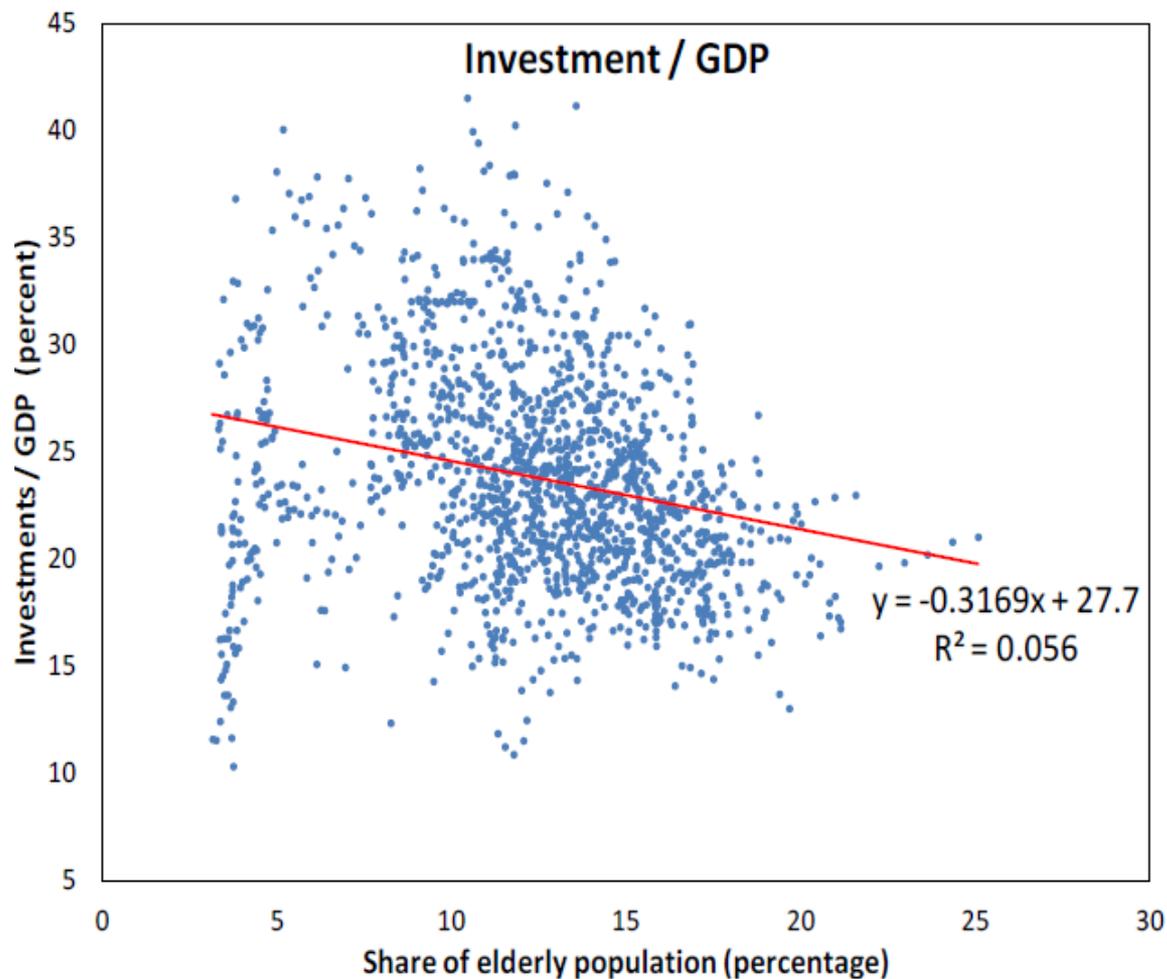
**Table 1. Demographic Impact on Growth of Real GDP per capita (PPP-based)**

	OECD FE				OECD FE IV 2/			
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Population Growth	-0.686 [0.270]		-1.194 [0.018]**	-1.130 [0.031]**	0.075 [0.807]		-0.621 [0.053]*	-0.504 [0.118]
Share of 65 and over		-0.211 [0.002]***	-0.261 [0.000]***	-0.122 [0.349]		-0.590 [0.000]***	-0.614 [0.000]***	-0.365 [0.000]***
Share of 15-64		-0.132 [0.159]	-0.201 [0.037]**	-0.090 [0.372]		-0.159 [0.009]***	-0.192 [0.002]***	0.010 [0.901]
Life expectancy				-0.198 [0.189]				-0.363 [0.000]***
Openness	0.008 [0.276]	0.013 [0.188]	0.019 [0.041]**	0.025 [0.006]***	0.007 [0.331]	0.018 [0.011]**	0.022 [0.004]***	0.033 [0.000]***
Secondary school enrollment	-0.018 [0.116]	0.005 [0.571]	0.006 [0.485]	0.014 [0.132]	-0.040 [0.000]***	-0.002 [0.862]	-0.002 [0.882]	0.015 [0.185]
Budget Balance/GDP	0.091 [0.100]	0.083 [0.135]	0.100 [0.081]*	0.100 [0.070]*	-0.003 [0.956]	0.028 [0.549]	0.044 [0.347]	0.053 [0.258]
Inflation	-0.090 [0.000]***	-0.101 [0.000]***	-0.103 [0.000]***	-0.100 [0.000]***	-0.087 [0.000]***	-0.112 [0.000]***	-0.113 [0.000]***	-0.105 [0.000]***
Investment / GDP	0.272 [0.000]***	0.244 [0.000]***	0.248 [0.000]***	0.244 [0.000]***	-0.105 [0.014]**	-0.179 [0.000]***	-0.178 [0.000]***	-0.188 [0.000]***
Constant	-1.670 [0.309]	7.407 [0.208]	12.862 [0.035]**	17.557 [0.041]**	8.548 [0.000]***	24.193 [0.000]***	26.897 [0.000]***	35.604 [0.000]***
Observations	1104	1104	1104	1104	1072	1072	1072	1072
Number of ifscodes	30	30	30	30	30	30	30	30
R-squared	0.177	0.185	0.199	0.203				



# *Older Population Reduces Investment: Bivariate Evidence*

Sample: 30 countries,  
1960-2013





# *Older Population Reduces Investment: Multivariate Evidence*

**Table 2. Demographic Impact on Current Account, Savings, and Investment**

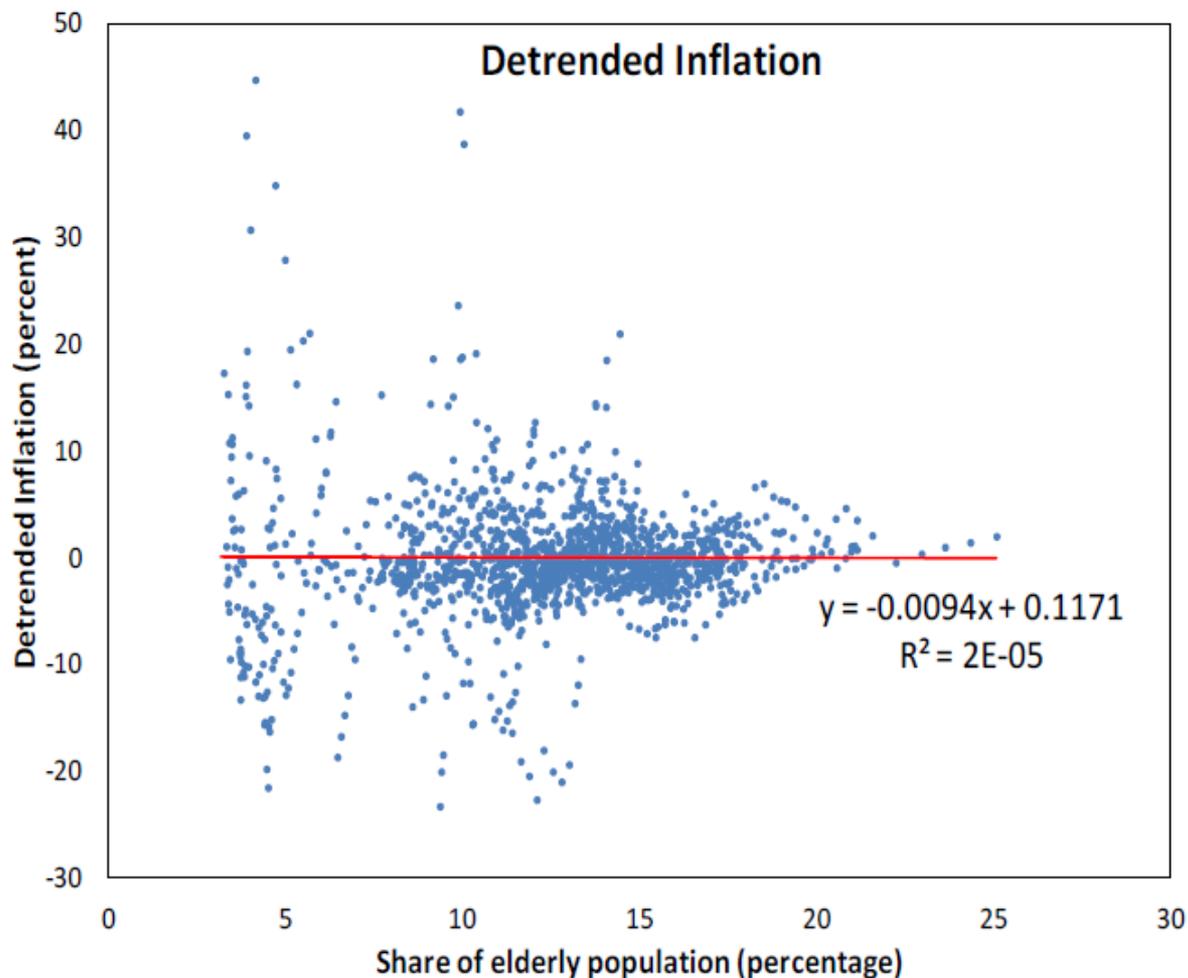
	OECD				OECD		
	CA/GDP (1)	S/GDP (2)	I/GDP (3)		CA/GDP (7)	S/GDP (8)	I/GDP (9)
Population Growth	-0.397 [0.603]	-0.776 [0.277]	-0.185 [0.836]	Population Growth	-0.654 [0.380]	-0.876 [0.258]	-0.021 [0.981]
Share of 65 and over	-0.372 [0.141]	-0.942 [0.001]***	-0.486 [0.043]**	Old Dependency	-0.162 [0.215]	-0.560 [0.000]***	-0.332 [0.006]***
Share of 15-64	0.246 [0.163]	0.012 [0.951]	0.249 [0.219]	Young Dependency	0.143 [0.080]*	0.019 [0.829]	-0.121 [0.173]
Life expectancy	0.379 [0.180]	0.428 [0.019]**	-0.210 [0.327]	Life expectancy	0.448 [0.133]	0.368 [0.038]**	-0.339 [0.148]
Budget Balance/GDP	0.109 [0.215]	0.399 [0.000]***	0.313 [0.000]***	Budget Balance/GDP	0.115 [0.184]	0.398 [0.000]***	0.306 [0.000]***
NFA / GDP	0.026 [0.009]***	0.028 [0.000]***	0.002 [0.652]	NFA / GDP	0.026 [0.009]***	0.029 [0.000]***	0.002 [0.566]
TOT change	0.110 [0.001]***	0.063 [0.001]***	-0.049 [0.043]**	TOT change	0.108 [0.001]***	0.063 [0.001]***	-0.048 [0.044]**
GDP growth	-0.106 [0.195]	0.180 [0.027]**	0.255 [0.000]***	GDP growth	-0.109 [0.185]	0.180 [0.025]**	0.259 [0.000]***
Openness	0.033 [0.105]	0.005 [0.754]	-0.024 [0.209]	Openness	0.033 [0.109]	0.004 [0.811]	-0.025 [0.208]
Constant	-9.447 [0.484]	2.229 [0.824]	31.270 [0.006]***	Constant	-36.980 [0.097]*	5.890 [0.672]	61.560 [0.002]***
Observations	1163	1121	1163	Observations	1163	1121	1163
Number of ifscodes	30	29	30	Number of ifscodes	30	29	30
R-squared	0.184	0.439	0.383	R-squared	0.188	0.431	0.379
RMSE	3.157	2.889	2.834	RMSE	3.149	2.909	2.844

Source: J. Yoon, J. Kim and J. Lee, "Impact of Demographic Changes on Inflation and the Macroeconomy," IMF working paper, Nov. 2014.



# *Older Population Reduces Inflation: Bivariate Evidence*

Sample: 30 countries,  
1960-2013





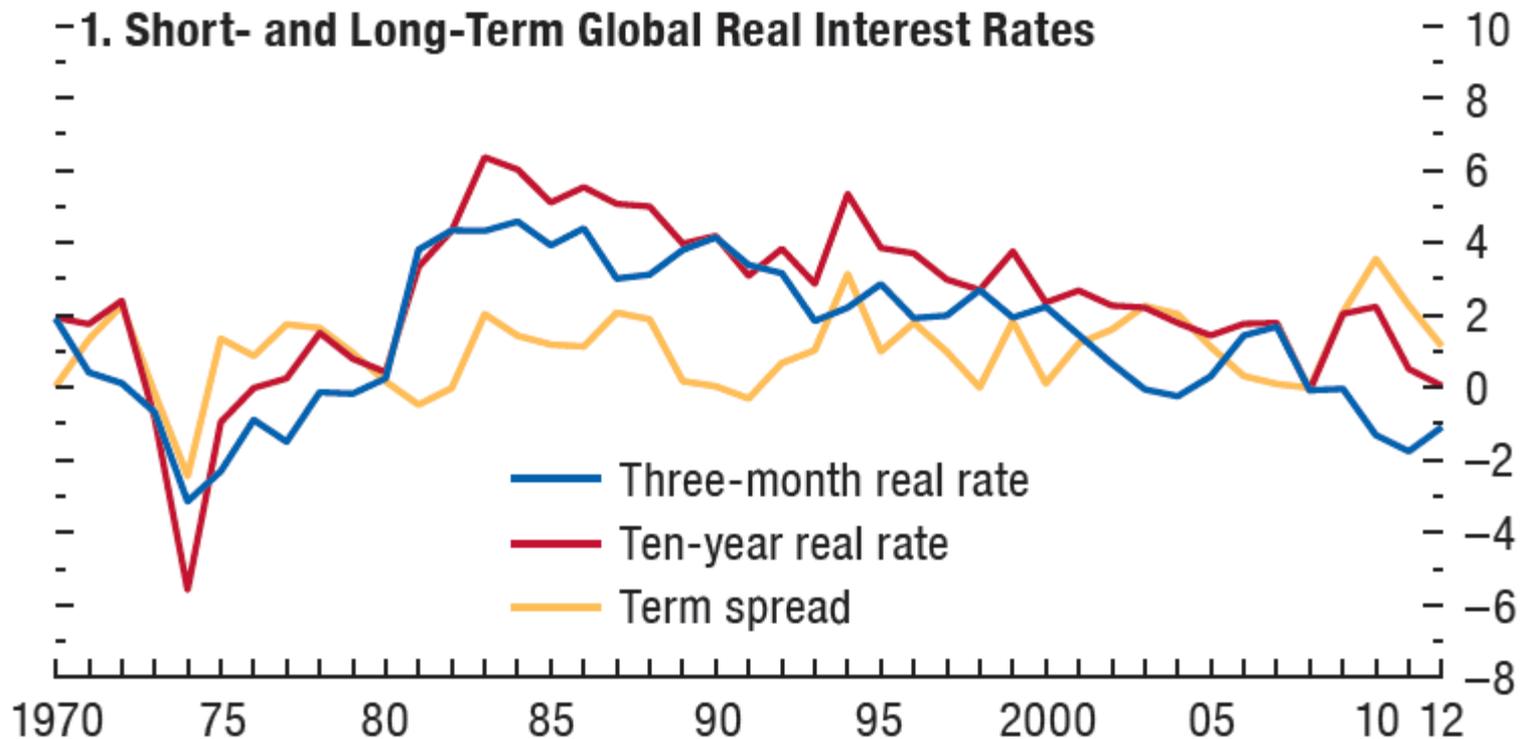
# *Older Population Reduces Inflation: Multivariate Evidence*

**Table 4. Demographic Impact on Inflation**

	OECD				
	(1)	(2)	(3)	(4)	(5)
Population Growth	0.339 [0.715]	0.524 [0.577]		0.549 [0.570]	0.317 [0.764]
Share of 65 and over		-0.176 [0.009]***	-0.125 [0.013]**	-0.137 [0.006]***	-0.416 [0.008]***
Share of 15-64			-0.101 [0.226]	-0.103 [0.233]	-0.330 [0.037]**
Life Expectancy					0.304 [0.043]**
TOT change	-0.145 [0.005]***	-0.144 [0.005]***	-0.145 [0.005]***	-0.144 [0.005]***	-0.143 [0.005]***
GDP growth	-0.750 [0.000]***	-0.795 [0.000]***	-0.799 [0.000]***	-0.802 [0.000]***	-0.784 [0.000]***
M2 growth	0.192 [0.000]***	0.183 [0.000]***	0.180 [0.001]***	0.180 [0.001]***	0.176 [0.000]***
Budget Balance Chg.	0.129 [0.051]*	0.153 [0.022]**	0.153 [0.033]**	0.158 [0.018]**	0.150 [0.022]**
Constant	-0.053 [0.910]	2.418 [0.060]*	8.443 [0.149]	8.739 [0.151]	4.132 [0.255]
Observations	1167	1167	1167	1167	1167
Number of ifscode	30	30	30	30	30
R-squared	0.212	0.216	0.217	0.217	0.222
RMSE	5.235	5.227	5.223	5.223	5.209



# *Older Population Does Not Appear to Increase Real Interest Rates*



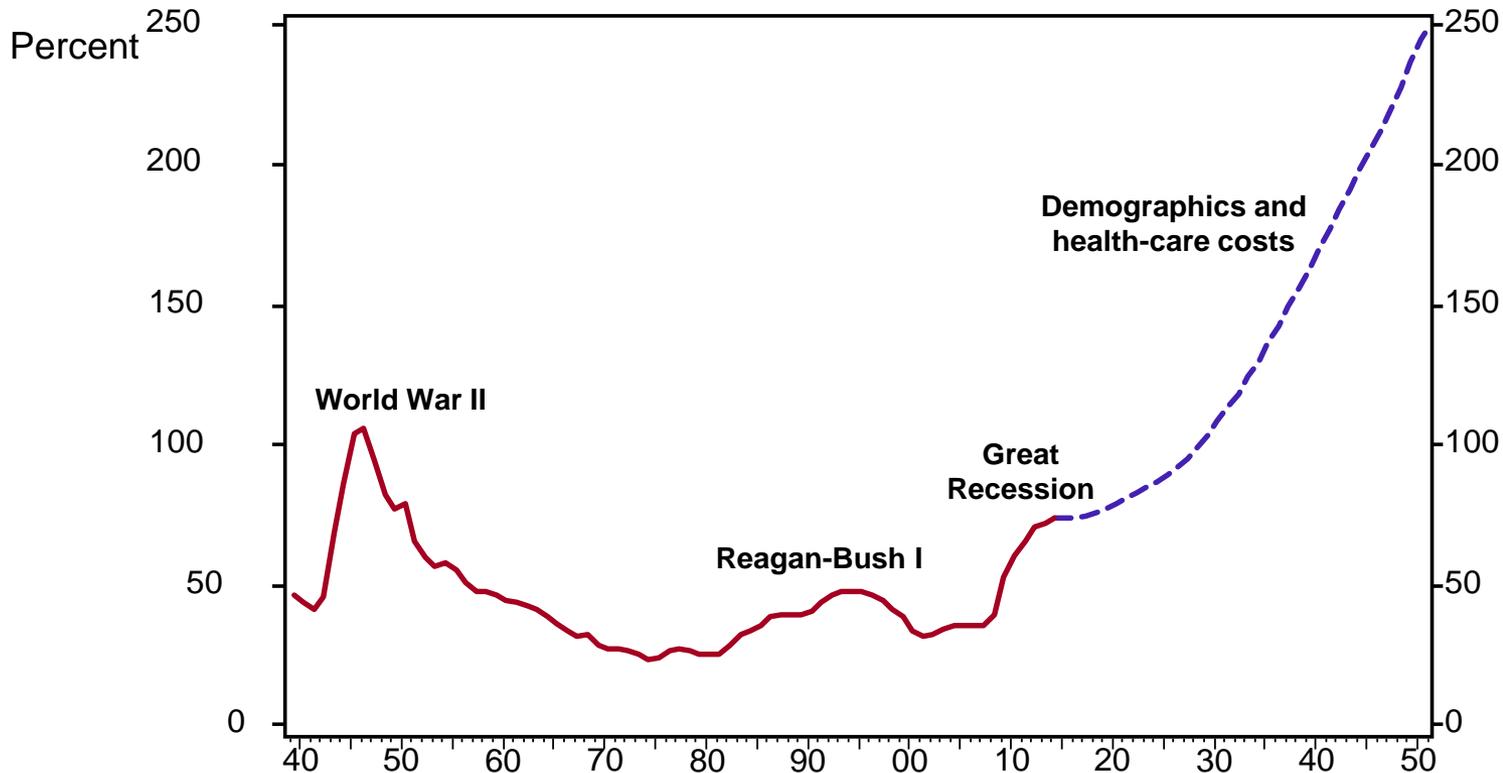
Sample: GDP-weighted average for all countries in IMF International Financial Statistics database.



# Changing Demographics Drive CBO Forecast of

Federal Debt Held by the Public Relative to GDP  
Percent

CBO 'Alternative Fiscal Scenario': Fed'l Debt Held by Public Relative to GDP  
Percent



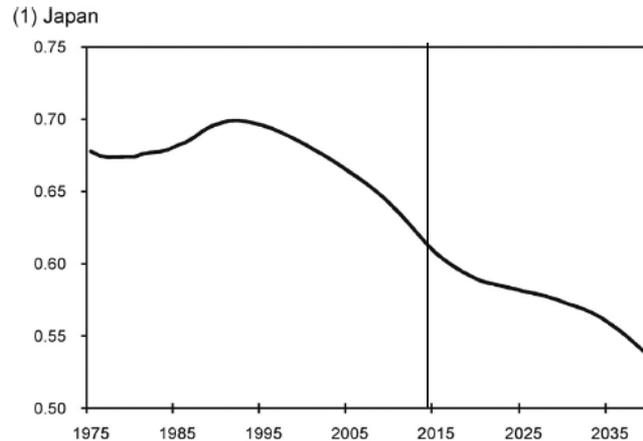


# *D. Ikeda & M. Saito (2014), “Effects of Demographic Changes on Real Interest Rate in Japan”*

## Ratio of Working-Age Population to Total Population

*D. Ikeda, M. Saito / Japan and the World Economy 32 (2014) 37-48*

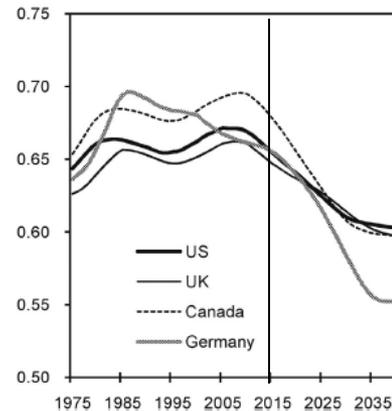
**Japan’s working-age population has declined from 70% to 60% since 1995.**



**Japan’s working-age population will decline another 5 percentage points during the next 20 years.**

**The U.S. working-age population has only begun to decline, from 67% in 2010 to 65% now.**

(2) US, UK, Canada and Germany



**U.S. share will decline another 3 percentage points by 2025.**

(3) France, Italy, Spain and Korea

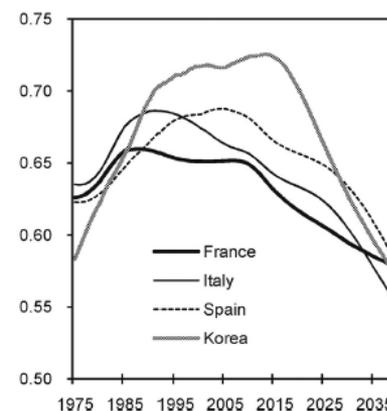


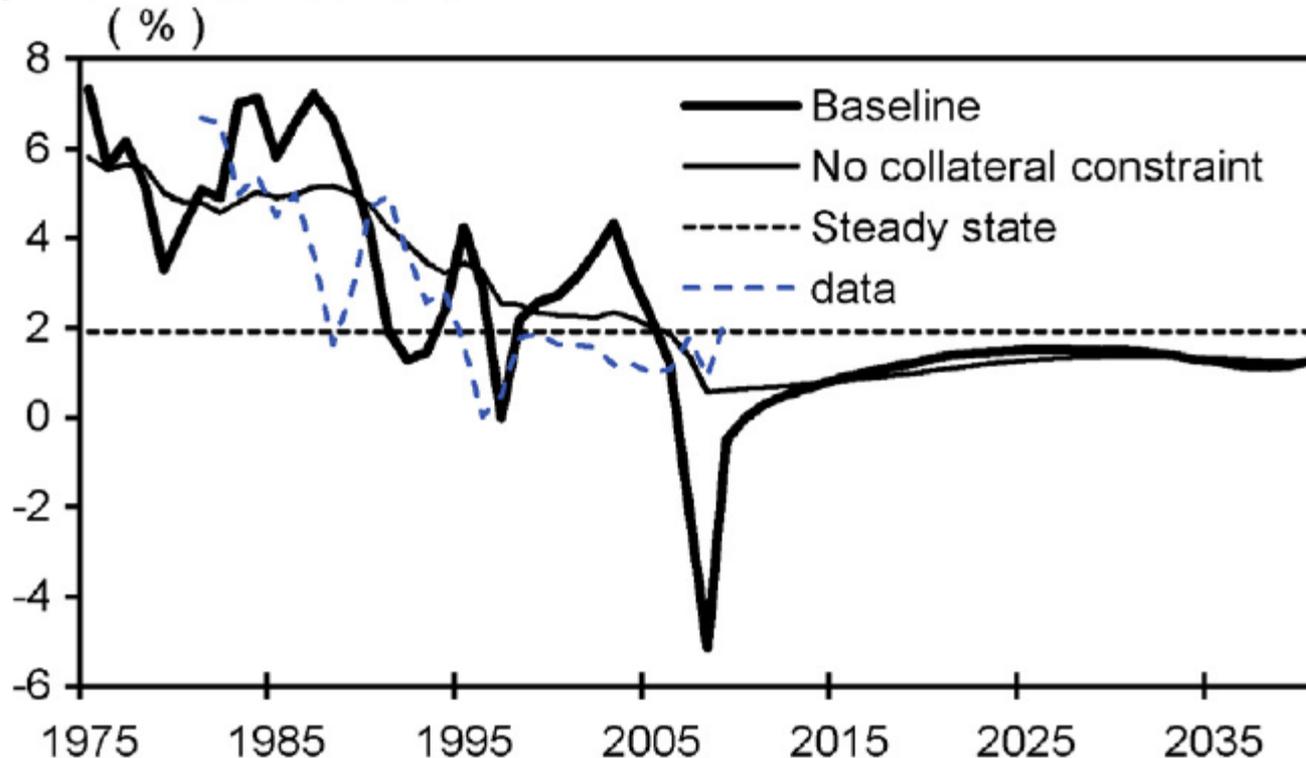
Fig. 1. Ratio of working-age population to total population. Notes: The data source is the United Nations. The data after 2010 is the forecast of the United Nations.



## *Very Large Decline in Real Interest Rate in Japan Since Early 1990s = -600 BPs*

**Baseline is Full Model, Including Effects of TFP, Demographics, Govt. Spending**

### (1) Real Interest Rate

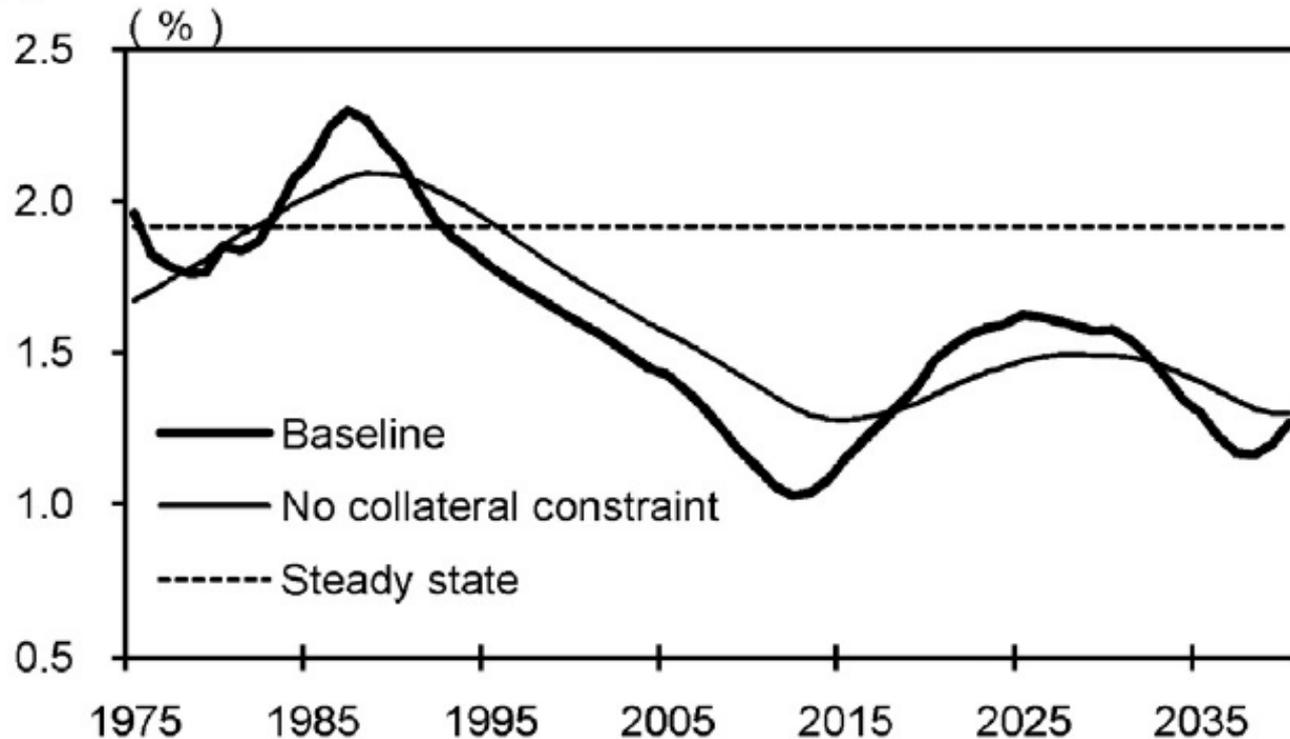




## *Adverse Demographics in Japan Account For Perhaps -100 BPs; TFP Dominates*

**Baseline is Demographics-Only Model Excluding Effects of TFP and Govt. Spending**

### (1) Real Interest Rate





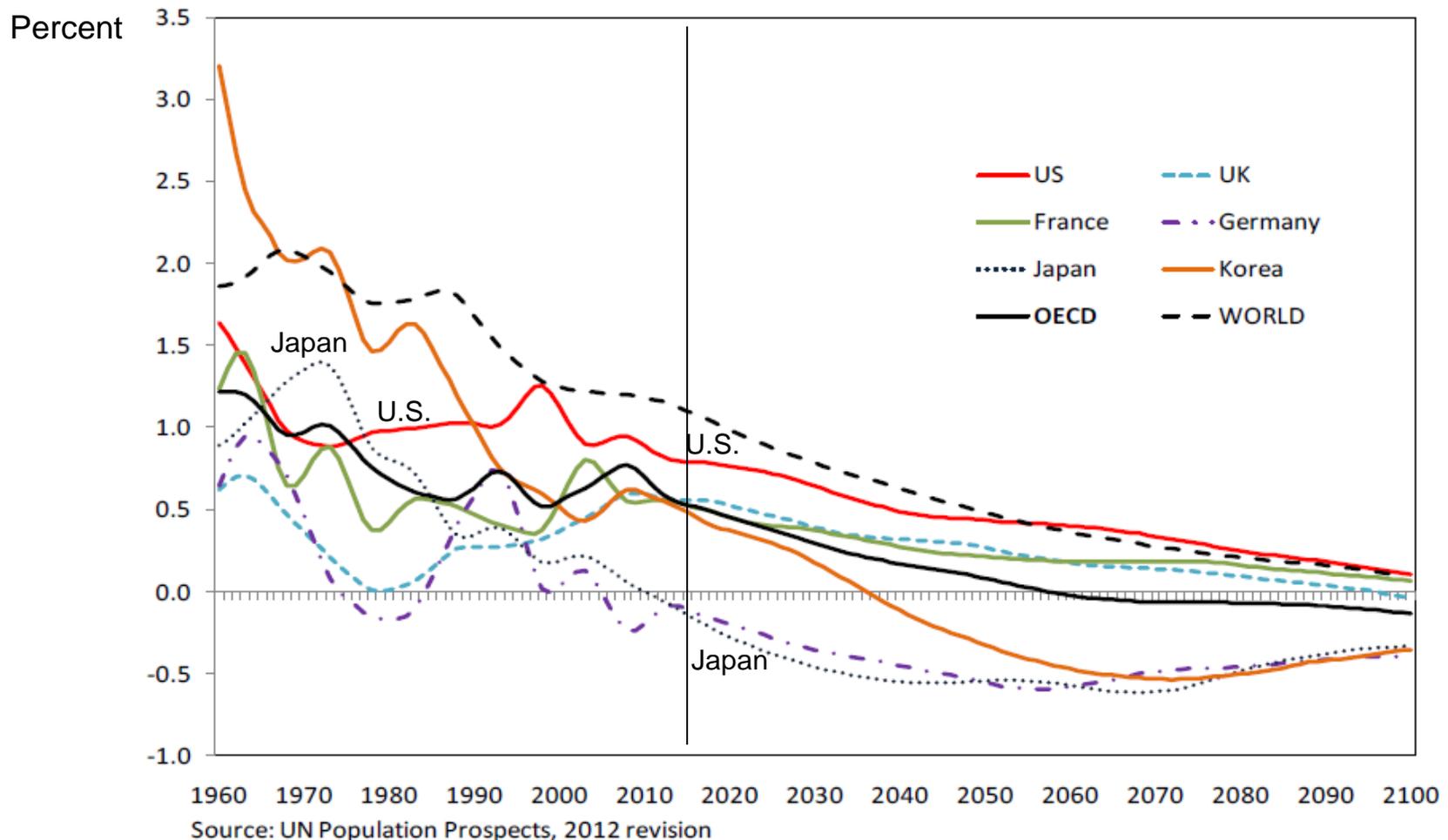
# *Outlook for U.S. Growth and Real Interest Rates*

- **Although much better than Japan and France, key U.S. demographic measures will move similarly to those in UK and Germany during next 10 years.**
  - **Population growth rate will decline but remain faster than OECD average.**
  - **Working-age share equals OECD average now but will decline faster.**
  - **Dependency ratio equals OECD average now and will increase faster.**
- **Congressional Budget Office forecasts for 2015-25 include:**
  - **TFP growth of 1%.**
  - **Hours-worked growth of 0.6%.**
  - **Capital-services growth of 0.6%.**
  - **Real-GDP growth of 2.2%**
  - **Real-GDP-per-capita growth of 1.5%.**
  - **PCE inflation of 2%.**
  - **Real interest rates in 2020 and beyond:**
    - **3-month T-Bill: 1.4%**
    - **10-year Treasury Note: 2.6%**



# U.S. Population Growth Is Declining

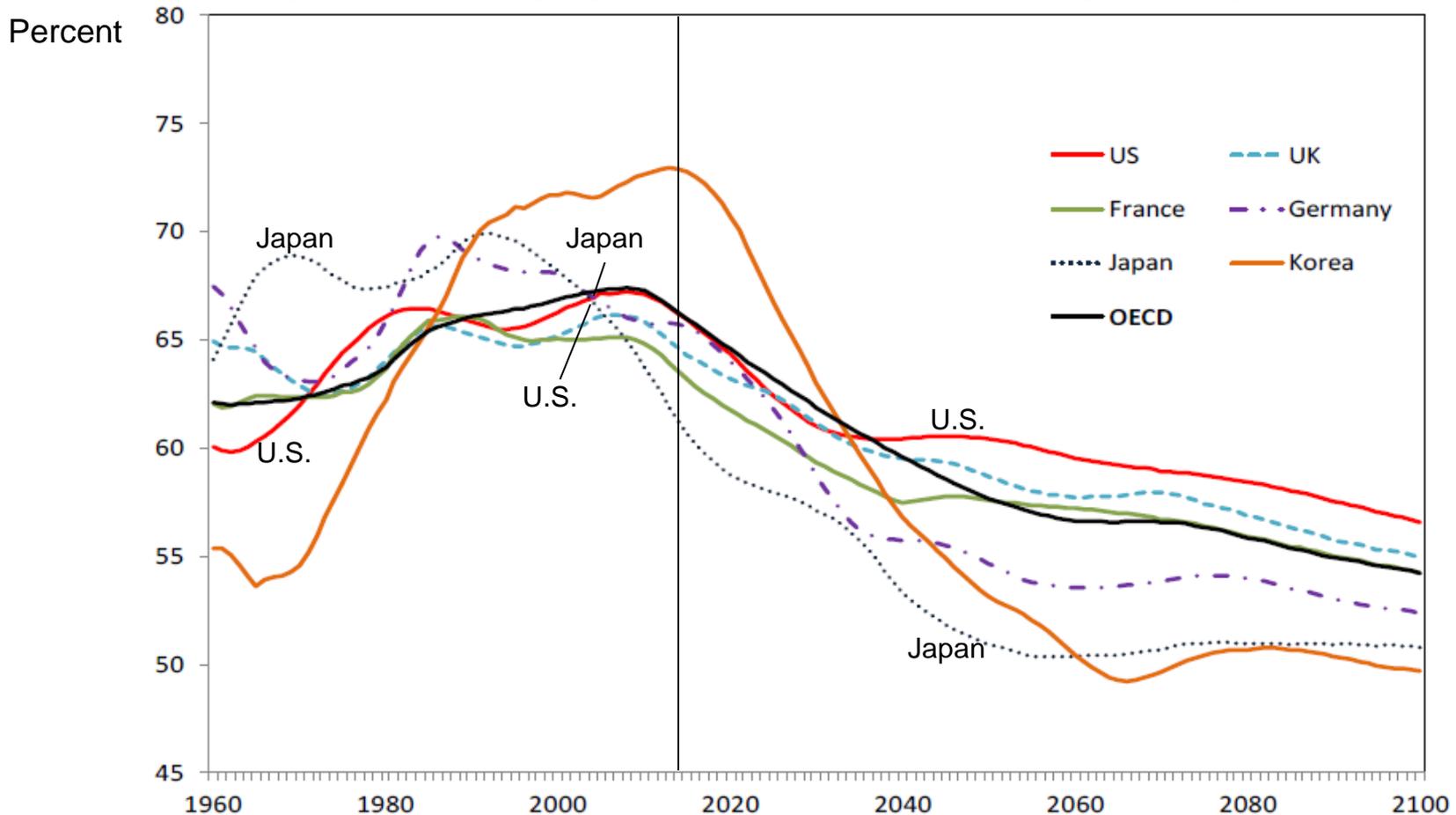
Figure 4. Total Population Growth (percent)





# *Decline in U.S. Share of Working-Age Population Similar to UK and Germany*

**Figure 5. Working-Age Population Share of Total Population (percent)**

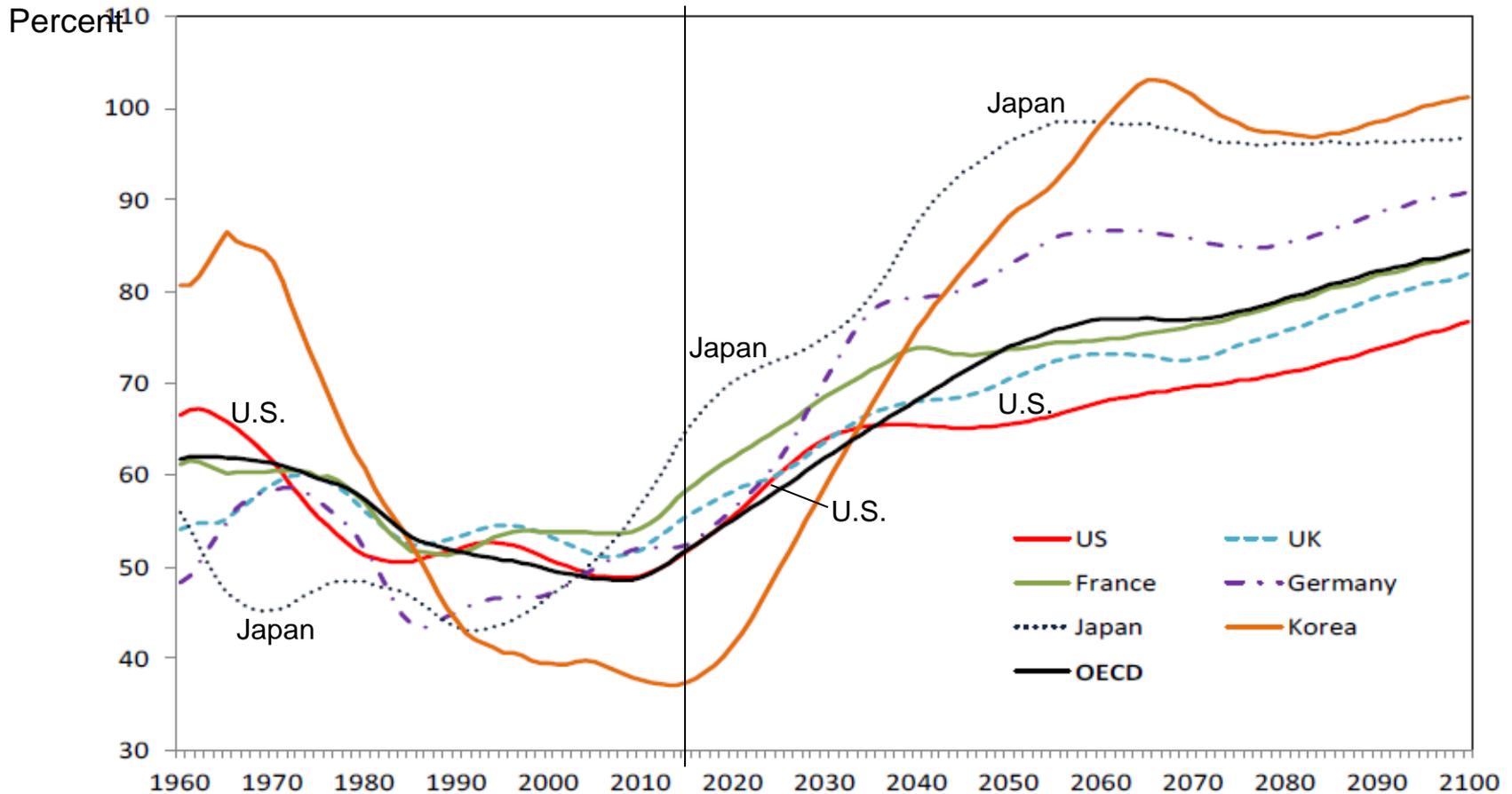


Source: UN Population Prospects, 2012 revision



# *U.S. Dependency Ratio Rising Slightly Faster Than OECD Average*

**Figure 6. Dependency Ratios for Major Economies**



Source: UN Population Prospects, 2012 revision



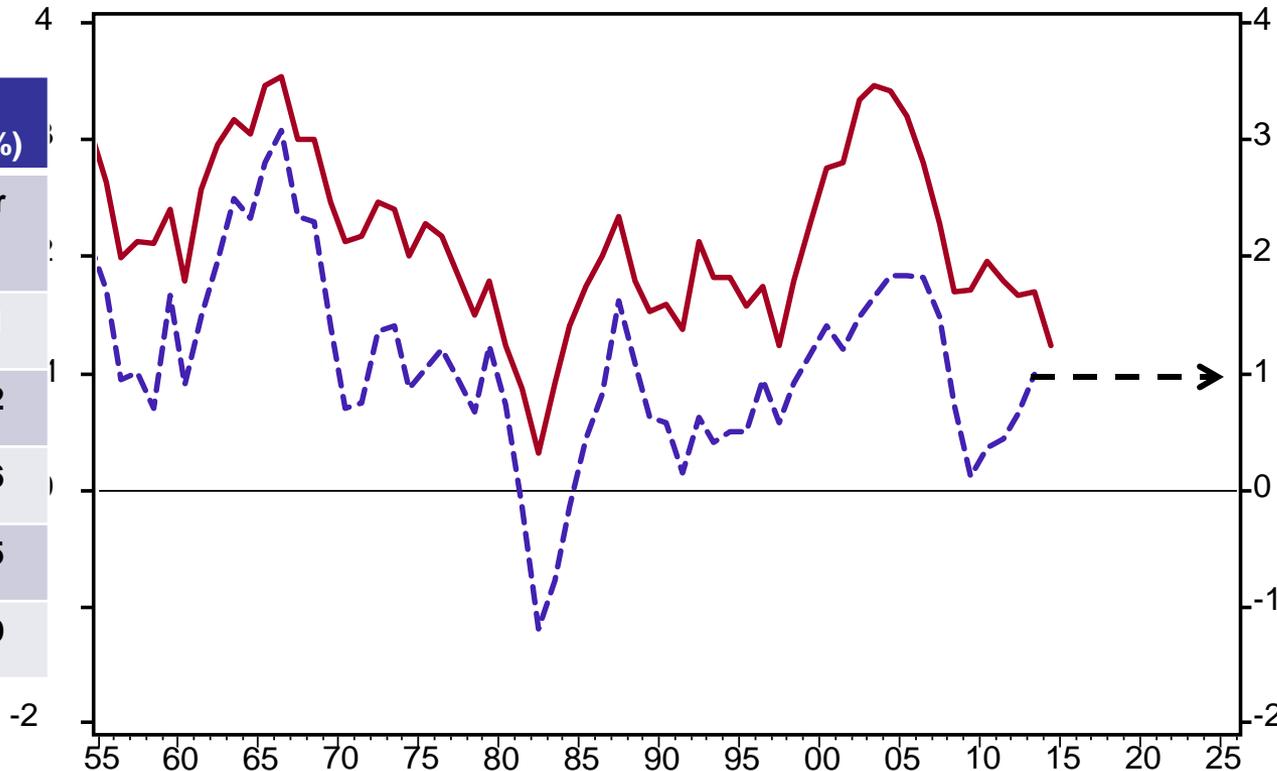
# *Productivity Surge of 1996-2005 Appears to Have Ended; Expect 1%*

5-Year Avg Annualized Growth Rate of Nonfarm-Business Labor Productivity  
Percent annualized

5-Year Avg Annualized Growth Rate of Nonfarm-Business Multifactor Productivity  
Percent annualized

Percent

Avg. Annualized Productivity Growth (%)		
Period	TFP (thru 2013)	Labor (thru 2014)
1 year	0.35	0.81
5 yrs	0.99	1.22
10 yrs	0.86	1.46
20 yrs	1.07	2.15
30 yrs	0.96	1.99



Source: Bureau of Economic Analysis

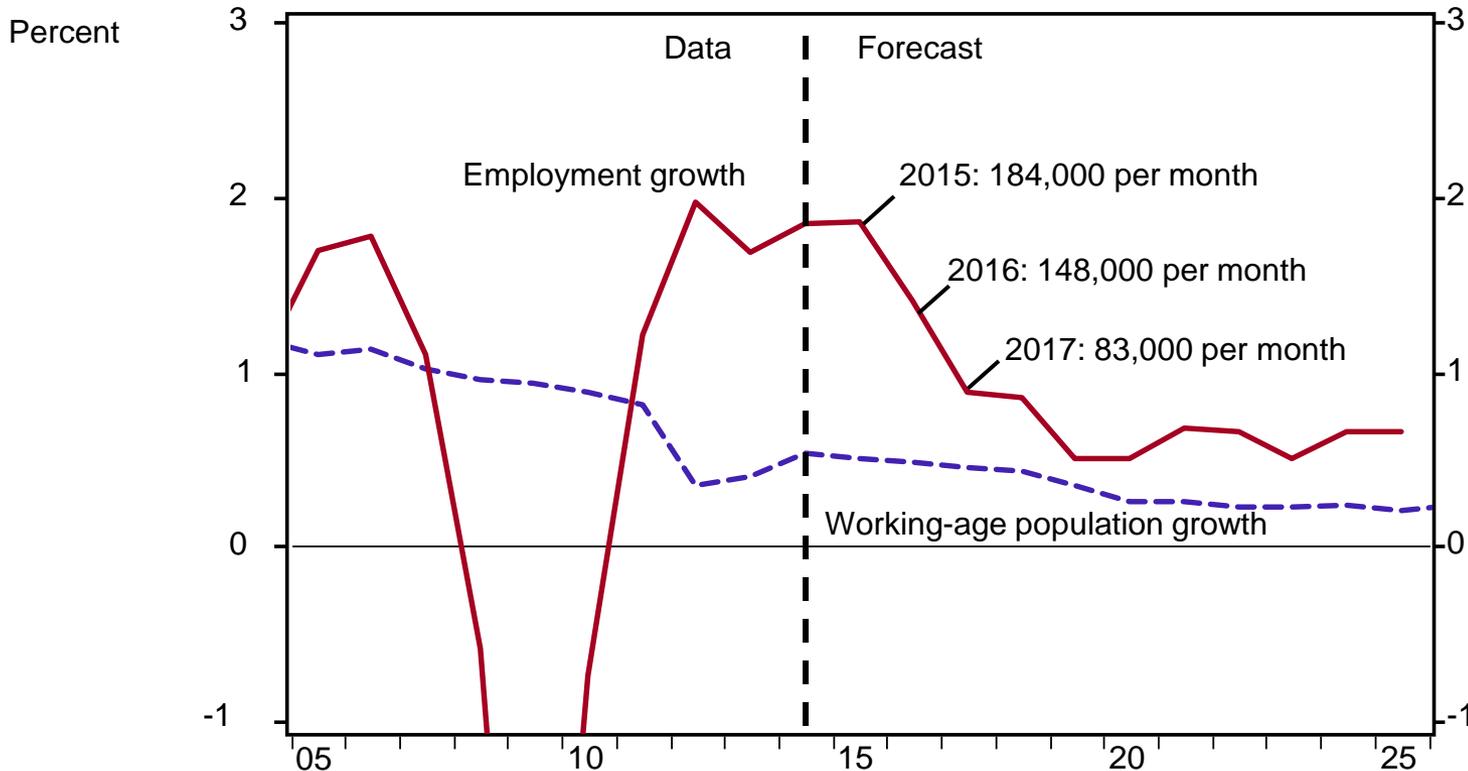
Labor: Annual thru 2014; Multifactor: Annual thru 2013



# CBO Projects Much Slower Employment Growth Ahead

CBO Projections of Annual Change in Nonfarm Employment  
Percent

Projected Annual Change in Population Aged 18-64  
Percent



How can employment grow faster than the working-age population?

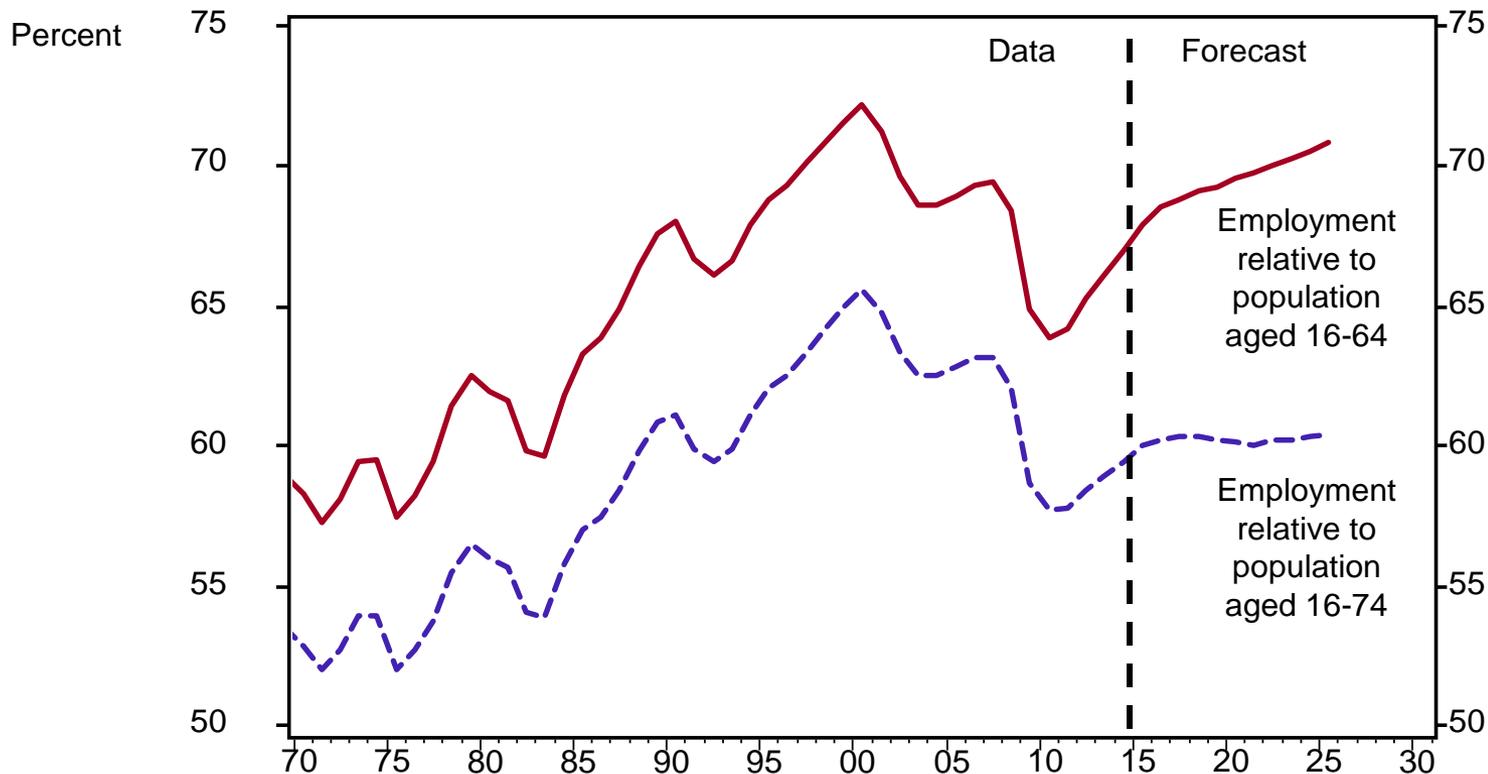
- Increasing participation rates
- Increasing employment of older workers (65+).



# Critical CBO Assumption: Employment-to-Population Rebounds Strongly

CBO Employment-to-16-64-Population Forecast  
Percent

CBO Employment-to-16-74-Population Forecast  
Percent

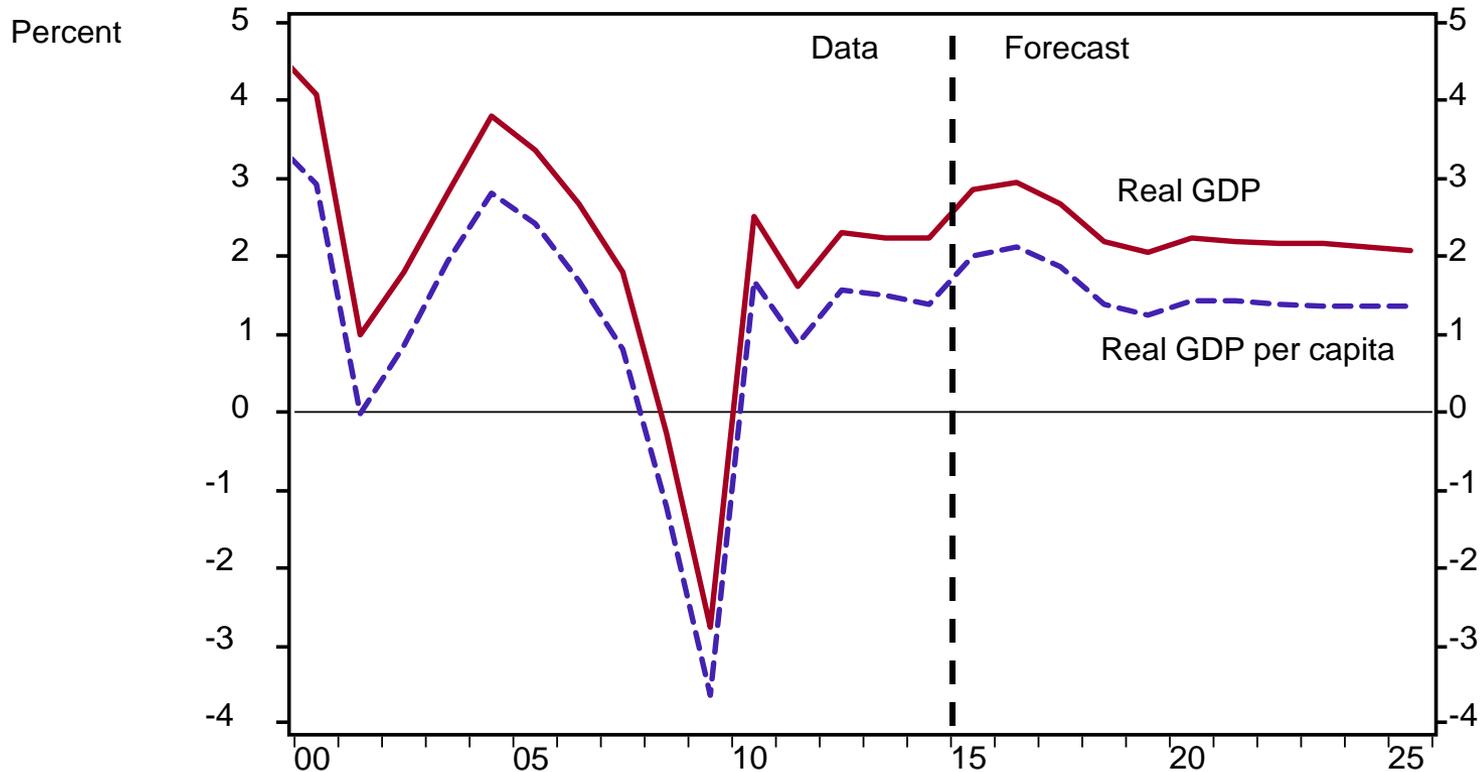




# Real-GDP Growth Headed Toward 2.2%; Per-Capita GDP to 1.4%

CBO Forecast of Real-GDP Growth Rates  
Percent

CBO Forecast of Real-GDP Per-Capita Growth Rates  
Percent



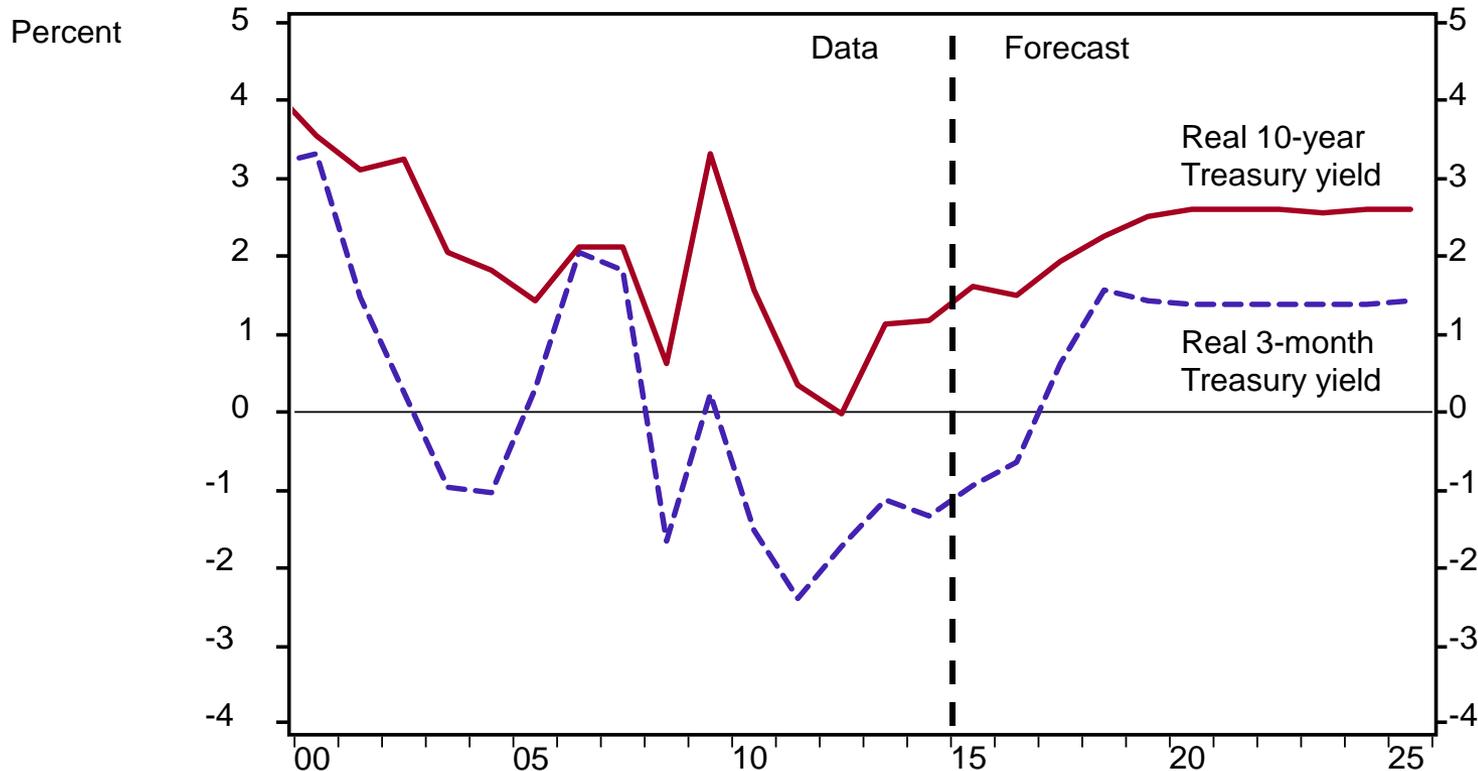
Real-GDP growth will be lower if employment grows less than CBO expects.



# *Real 10-Year Yield Levels Off At 2.6%; Real 3-Month Yield At 1.4%*

CBO Forecast of Real 10-Year Treasury Yield (deflated by current PCE inflation)  
Percent

CBO Forecast of Real 3-Month Treasury Yield (deflated by current PCE inflation)  
Percent





## *In Sum: Demographics and Growth*

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- **An older population reduces inflation, investment and growth.**
- **Real interest rates could rise if the Tobin effect dominates.**
- **Japan's experience suggests adverse demographics reduce the real interest somewhat, although productivity trends are the dominant influence.**
- **Given somewhat adverse demographic trends in the U.S. and weak productivity growth, real interest rates are likely to remain lower than historic levels.**