

# Discussion of Hall on Output and Unemployment

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1. Good methodology: careful examination of data based on Okun (1962) and growth accounting.

### Okun's Law

2. I agree that Okun's Law should be a foundation for macroeconomic analysis.

But I prefer Okun's original version, with output on the right.

Also, lags are needed for quarterly data.

3. The behavior of unemployment has clearly deviated from Okun's Law since 2011.

But the behavior of employment given output does not appear anomalous. So, I think the behavior of labor force participation is the key puzzle.

## Labor Force Participation

4. There is important cyclical in labor force participation. This is clear from

(a) experiences during and after recessions.

(b) regressions of LFPR on employment and its lags.

5. The Great Recession probably goes a long way toward explaining the fall in LFPR:

(a) Forecasts for 2008-2014 based on past relationship between LFPR and employment.

(b) Erceg and Levin's cross-state evidence.

## Persistent Output Losses

6. Many countries, not just the U.S., have experienced persistent output losses and relatively good unemployment performance since 2008.

This fact casts doubt on explanations based on US-specific factors.

7. Do recessions do lasting harm to economies?

Evidence in Blanchard-Cerutti-Summers (2015)

# Okun's Law and a Version of Okun's Law for Employment

| VARIABLES           | (1)                   | (2)                    | (3)                    | (4)                  | (5)                       | (6)                  |
|---------------------|-----------------------|------------------------|------------------------|----------------------|---------------------------|----------------------|
|                     |                       | $\Delta U_r$           |                        |                      | $\Delta \text{Log(Empl)}$ |                      |
| $\Delta Y_t$        | -0.284***<br>(0.0188) | -0.216***<br>(0.0169)  | -0.214***<br>(0.0170)  | 0.311***<br>(0.0294) | 0.213***<br>(0.0277)      | 0.220***<br>(0.0276) |
| $\Delta Y_{t-1}$    |                       | -0.140***<br>(0.0176)  | -0.136***<br>(0.0177)  |                      | 0.230***<br>(0.0288)      | 0.225***<br>(0.0288) |
| $\Delta Y_{t-2}$    |                       | -0.0737***<br>(0.0168) | -0.0741***<br>(0.0178) |                      | 0.0506*<br>(0.0274)       | 0.0263<br>(0.0290)   |
| $\Delta Y_{t-3}$    |                       |                        | -0.0206<br>(0.0177)    |                      |                           | 0.0480*<br>(0.0288)  |
| $\Delta Y_{t-4}$    |                       |                        | 0.0292*<br>(0.0169)    |                      |                           | 0.0306<br>(0.0274)   |
| Sum of coefficients |                       | -0.429<br>(0.0210)     | -0.416<br>(0.0260)     |                      | 0.494<br>(0.0340)         | 0.550<br>(0.0420)    |
| Constant            | 0.229***<br>(0.0233)  | 0.342***<br>(0.0223)   | 0.332***<br>(0.0252)   | 0.107***<br>(0.0365) | -0.0362<br>(0.0365)       | -0.0800*<br>(0.0411) |
| Observations        | 263                   | 263                    | 263                    | 263                  | 263                       | 263                  |
| R-squared           | 0.468                 | 0.633                  | 0.638                  | 0.300                | 0.474                     | 0.485                |

Standard errors in parentheses

\*\*\* p<0.01, \*\* p<0.05, \* p<0.1

Note  $\Delta Y_t = \log(\text{rgdp}_t) - \log(\text{rgdp}_{t-1})$

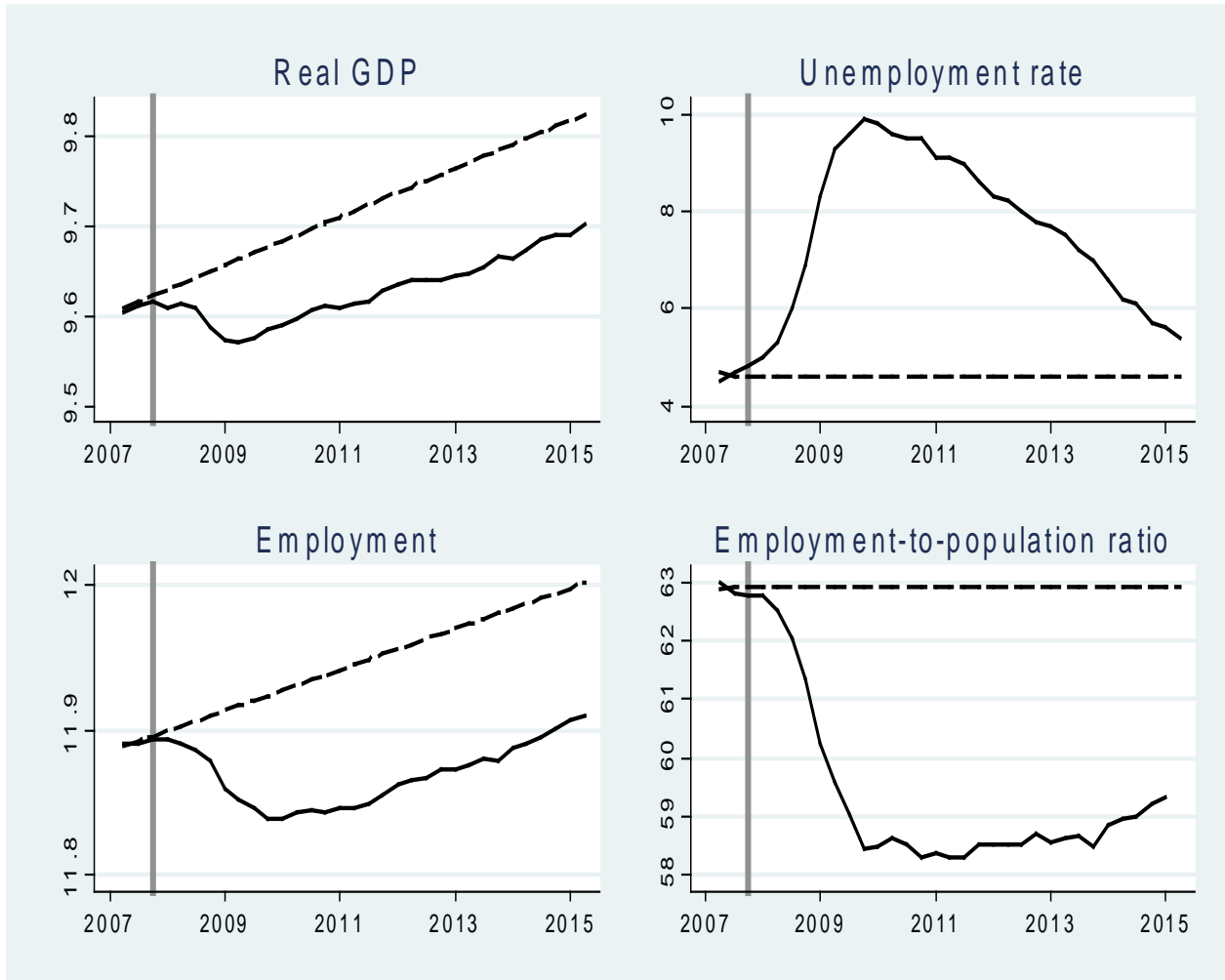
# Okun's Law and Reverse Okun's Law

| VARIABLES    | (1)<br>Quarterly     | (2)<br>Quarterly      | (3)<br>Annual        | (4)<br>Annual         |
|--------------|----------------------|-----------------------|----------------------|-----------------------|
| $\Delta U_r$ | -1.647***<br>(0.109) |                       | -1.747***<br>(0.144) |                       |
| $\Delta Y$   |                      | -0.284***<br>(0.0188) |                      | -0.398***<br>(0.0329) |
| Constant     | 0.800***<br>(0.0431) | 0.229***<br>(0.0233)  | 3.198***<br>(0.160)  | 1.285***<br>(0.128)   |
| Observations | 263                  | 263                   | 66                   | 66                    |
| R-squared    | 0.468                | 0.468                 | 0.696                | 0.696                 |

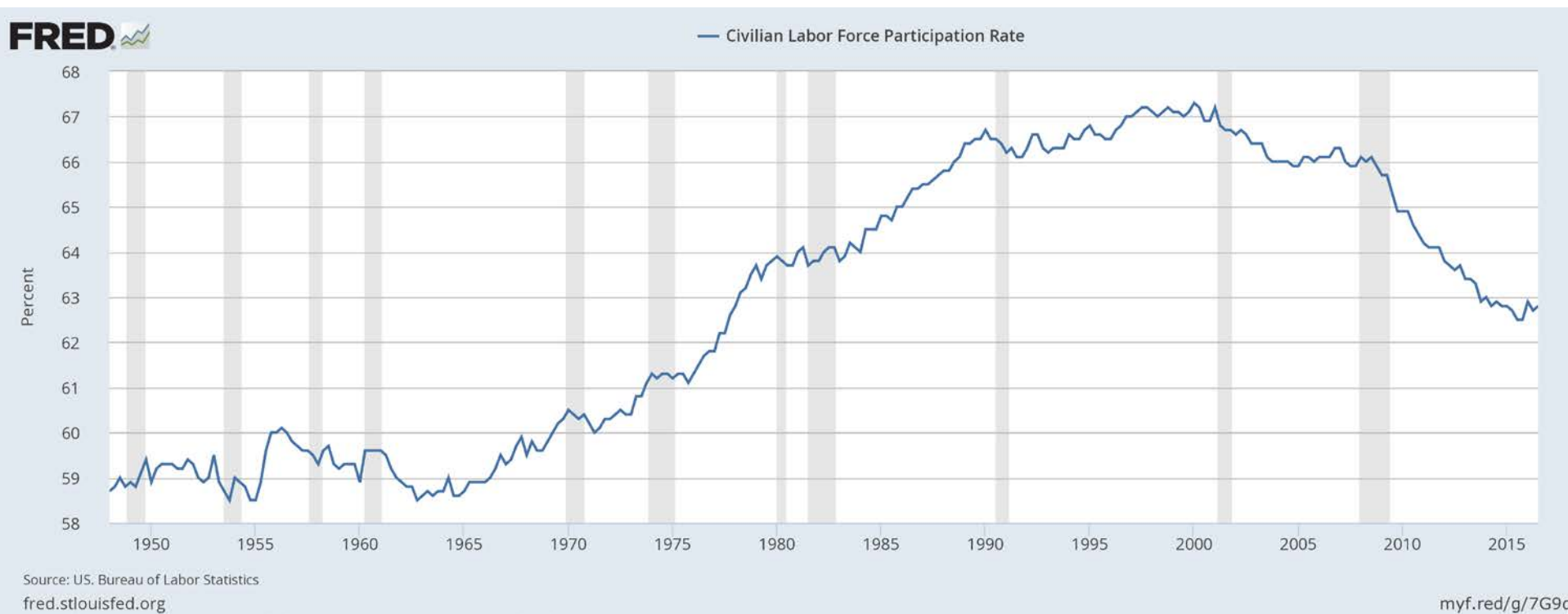
Standard errors in parentheses

\*\*\*  $p < 0.01$ , \*\*  $p < 0.05$ , \*  $p < 0.1$

# United States and the Great Recession



# Evolution of Labor Force Participation





# Explaining Changes in Labor Force Participation

|                     | (1)                                | (2)                   | (3)                   |
|---------------------|------------------------------------|-----------------------|-----------------------|
|                     | $\Delta$ Labor Force Participation |                       |                       |
| $\Delta Y_t$        | 0.00744<br>(0.0129)                | -0.00780<br>(0.0137)  | -0.00259<br>(0.0135)  |
| $\Delta Y_{t-1}$    |                                    | 0.0457***<br>(0.0142) | 0.0430***<br>(0.0141) |
| $\Delta Y_{t-2}$    |                                    | -0.00776<br>(0.0136)  | -0.0245*<br>(0.0142)  |
| $\Delta Y_{t-3}$    |                                    |                       | 0.0261*<br>(0.0141)   |
| $\Delta Y_{t-4}$    |                                    |                       | 0.0304**<br>(0.0134)  |
| Sum of Coefficients |                                    | 0.0300<br>(0.0170)    | 0.0720<br>(0.0210)    |
| Constant            | 0.00893<br>(0.0160)                | -0.00881<br>(0.0180)  | -0.0420**<br>(0.0201) |
| Observation         | 263                                | 263                   | 263                   |
| R-squared           | 0.001                              | 0.040                 | 0.085                 |

Standard errors in parentheses

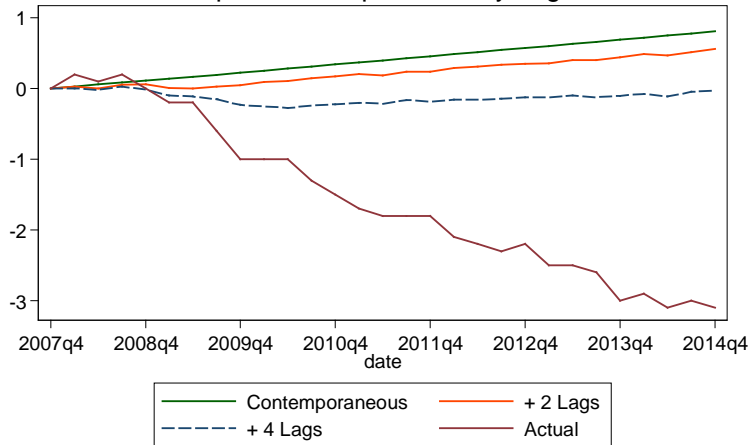
\*\*\*  $p < 0.01$ , \*\*  $p < 0.05$ , \*  $p < 0.1$

|                                    | (4)                | (5)                  | (6)                  |
|------------------------------------|--------------------|----------------------|----------------------|
| $\Delta$ Labor Force Participation |                    |                      |                      |
| $\Delta U_t$                       | 0.0149<br>(0.0309) | 0.0910**<br>(0.0404) | 0.0776*<br>(0.0406)  |
| $\Delta U_{t-1}$                   |                    | -0.0975*<br>(0.0495) | -0.104**<br>(0.0491) |
| $\Delta U_{t-2}$                   |                    | -0.0405<br>(0.0398)  | 0.0399<br>(0.0490)   |
| $\Delta U_{t-3}$                   |                    |                      | -0.119**<br>(0.0491) |
| $\Delta U_{t-4}$                   |                    |                      | 0.0135<br>(0.0402)   |
| Sum of Coefficients                |                    | -0.0470<br>(0.0370)  | -0.0920<br>(0.0470)  |
| Constant                           | 0.0148<br>(0.0123) | 0.0157<br>(0.0121)   | 0.0163<br>(0.0119)   |
| Observations                       | 263                | 263                  | 263                  |
| R-squared                          | 0.001              | 0.043                | 0.071                |

|                                    | (7)                    | (8)                    | (9)                    |
|------------------------------------|------------------------|------------------------|------------------------|
| $\Delta$ Labor Force Participation |                        |                        |                        |
| $\Delta \text{Emp}_t$              | 0.214***<br>(0.0184)   | 0.258***<br>(0.0211)   | 0.263***<br>(0.0202)   |
| $\Delta \text{Emp}_{t-1}$          |                        | -0.0959***<br>(0.0236) | -0.102***<br>(0.0226)  |
| $\Delta \text{Emp}_{t-2}$          |                        | 0.0238<br>(0.0209)     | -0.00711<br>(0.0225)   |
| $\Delta \text{Emp}_{t-3}$          |                        |                        | 0.0174<br>(0.0226)     |
| $\Delta \text{Emp}_{t-4}$          |                        |                        | 0.0842***<br>(0.0200)  |
| Sum of Coefficients                |                        | 0.186<br>(0.0230)      | 0.255<br>(0.0250)      |
| Constant                           | -0.0609***<br>(0.0119) | -0.0512***<br>(0.0125) | -0.0752***<br>(0.0128) |
| Observations                       | 263                    | 263                    | 263                    |
| R-squared                          | 0.341                  | 0.382                  | 0.442                  |

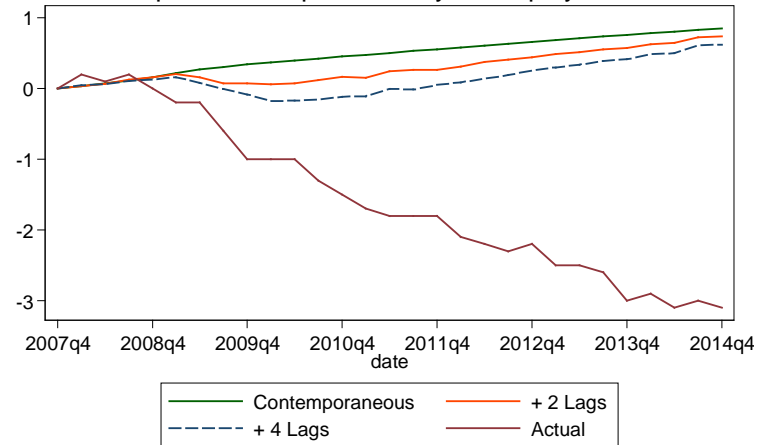
# Labor force Participation: Forecast exercise

Participation Rate predicted by Log GDP



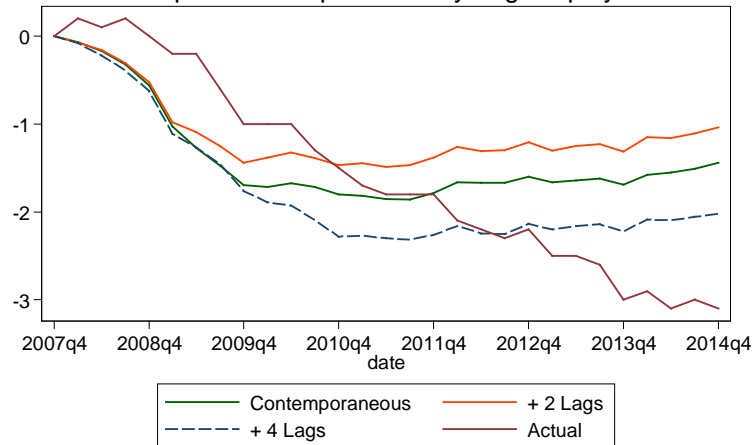
Note: The 2007q4 value is normalized to zero. The forecasts were made with coefficients estimated using data up to 2007.

Participation Rate predicted by Unemployment Rate



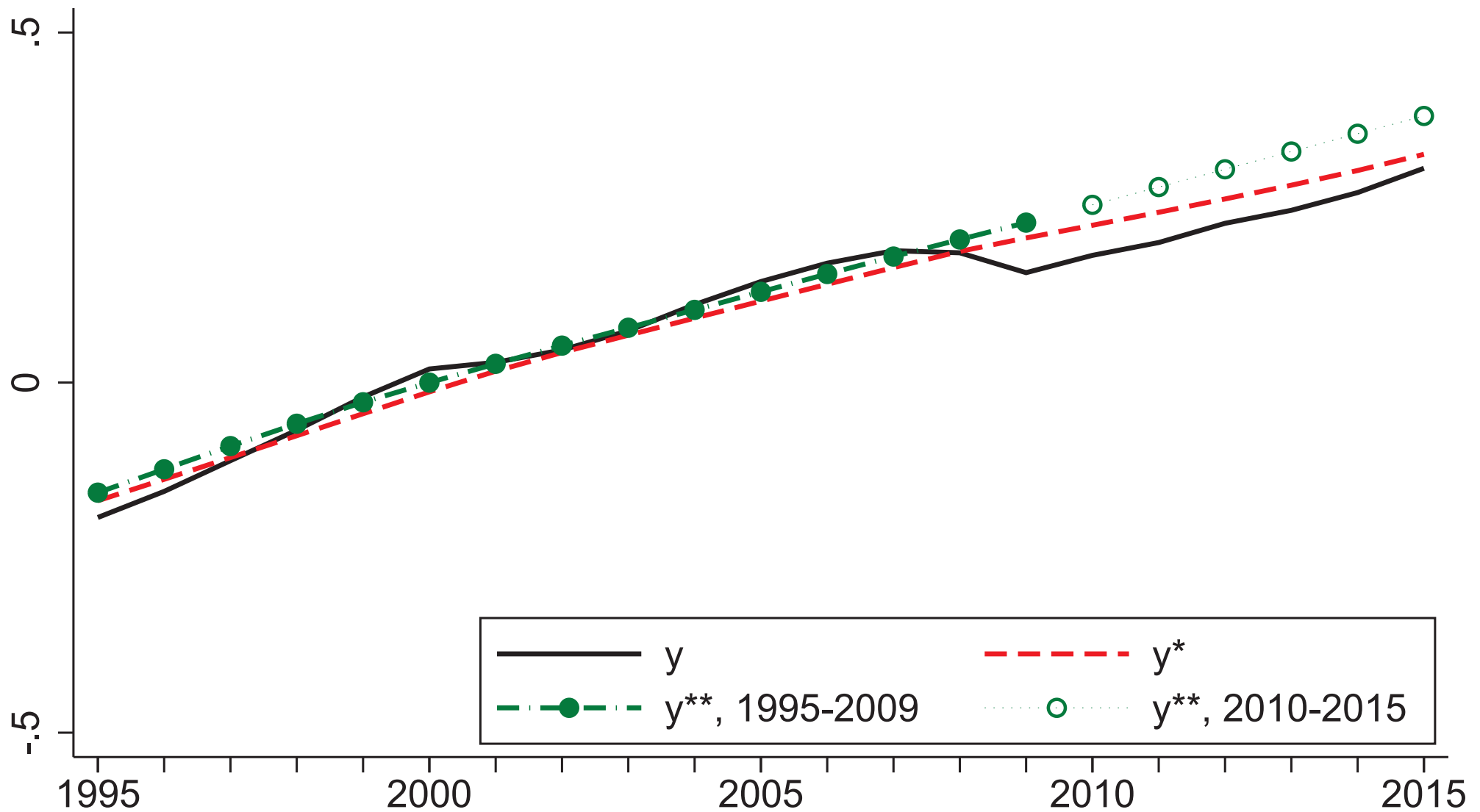
Note: The 2007q4 value is normalized to zero. The forecasts were made with coefficients estimated using data up to 2007.

Participation Rate predicted by Log Employment



Note: The 2007q4 value is normalized to zero. The forecasts were made with coefficients estimated using data up to 2007.

# Figure 1 - United States



$y^{**}$  is normalized to zero in 2000

Sources:

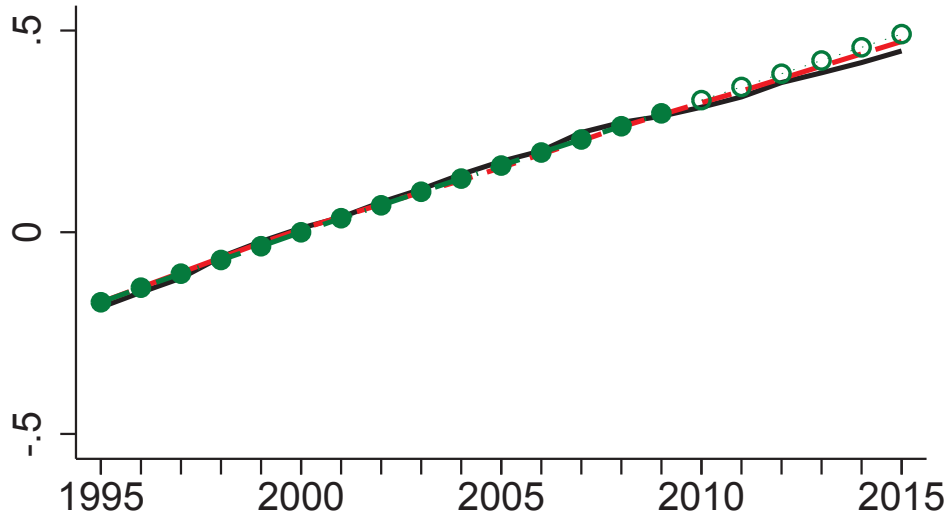
$y$  and  $y^*$ : OECD Economic Outlook May 2014

$y^{**}$ , 1995-2009: OECD Economic Outlook December 2007

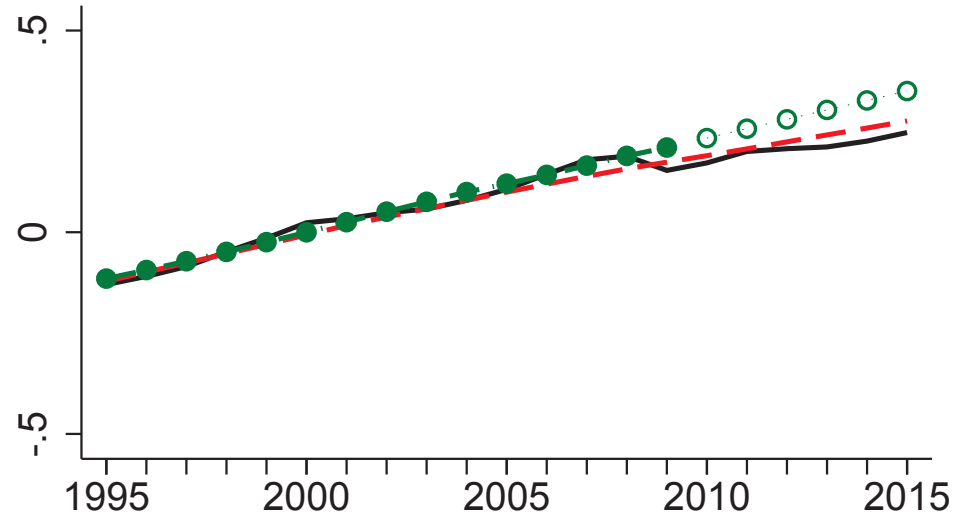
$y^{**}$ , 2010-2015: extrapolated from  $y^{**}$ , 2000-2009

# Figure 2 - OECD Countries

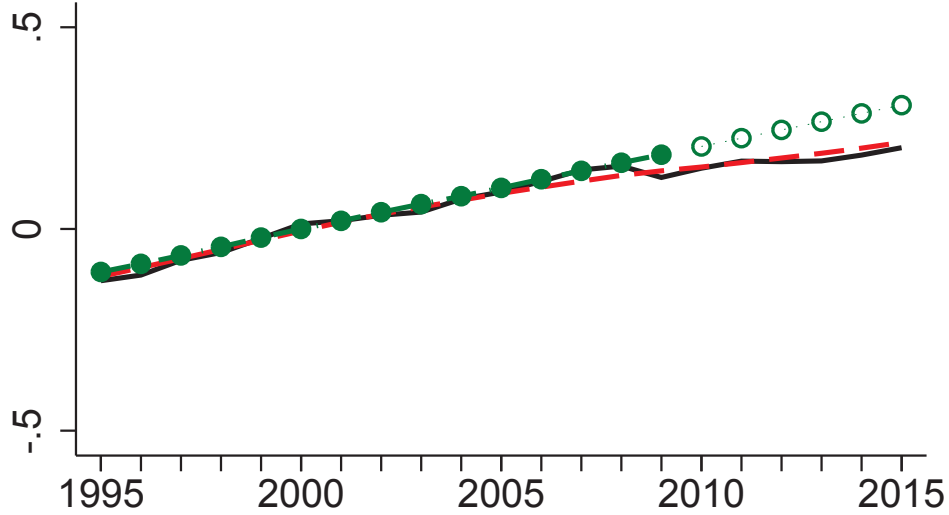
## Australia



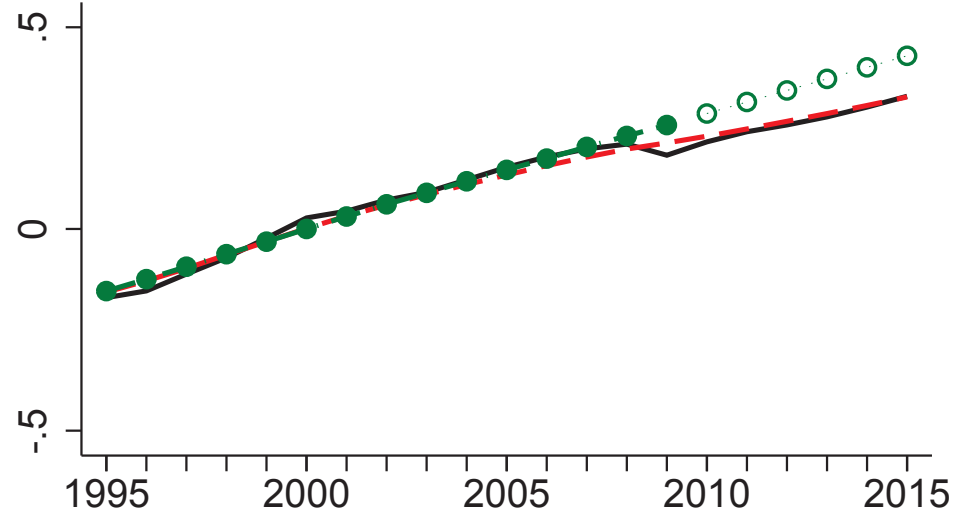
## Austria



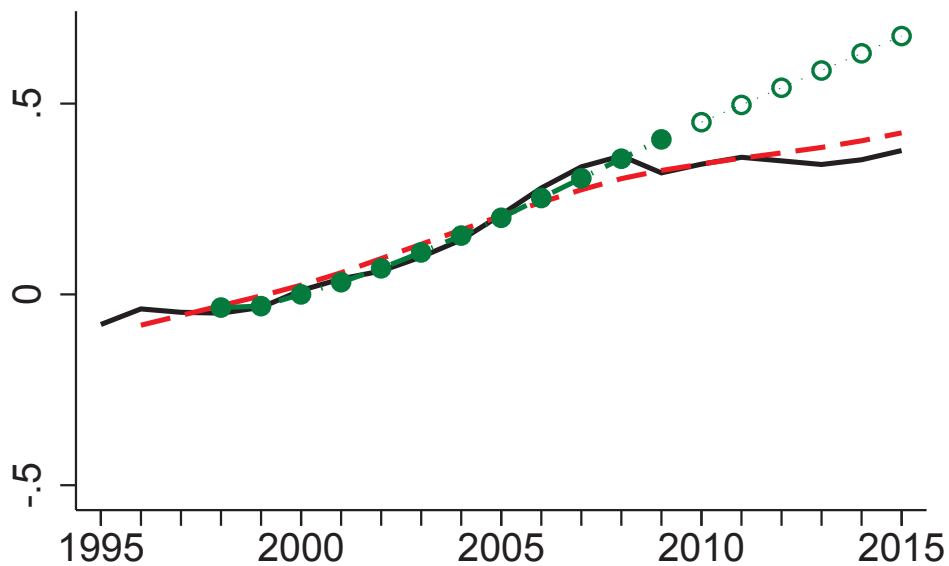
## Belgium



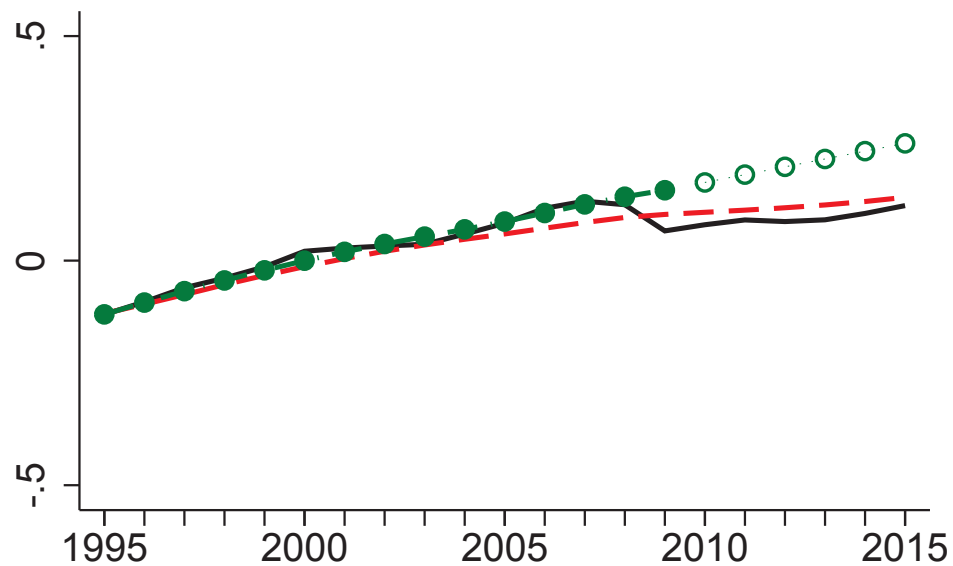
## Canada



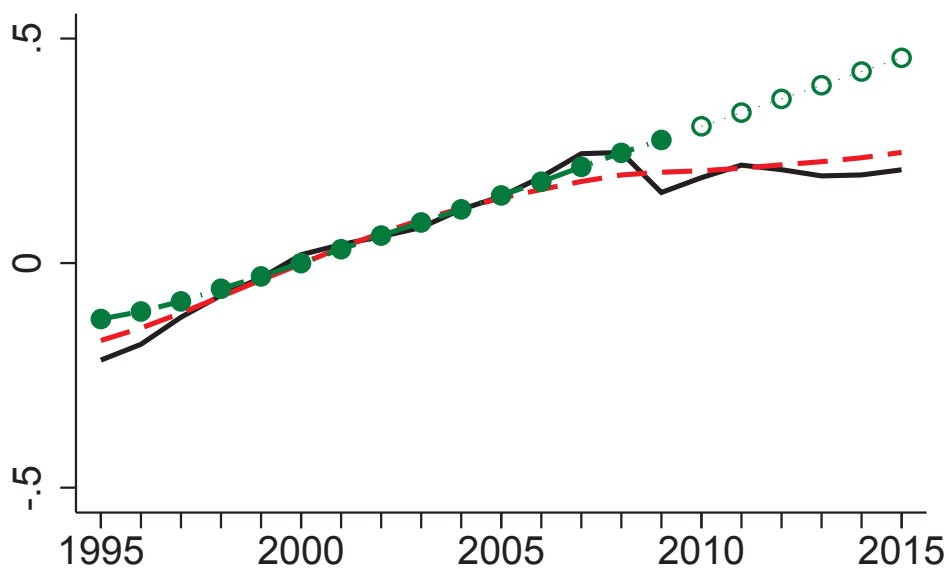
### Czech Republic



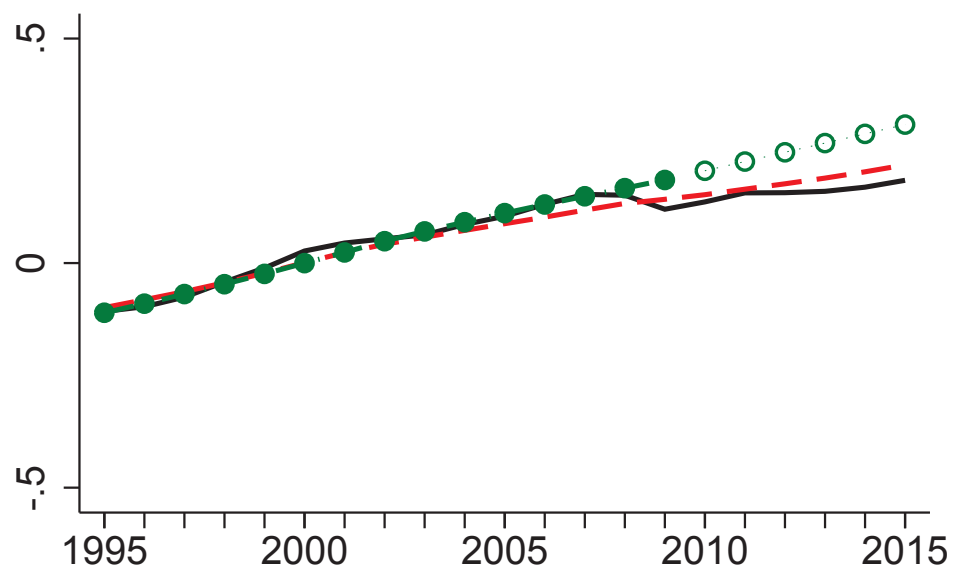
### Denmark



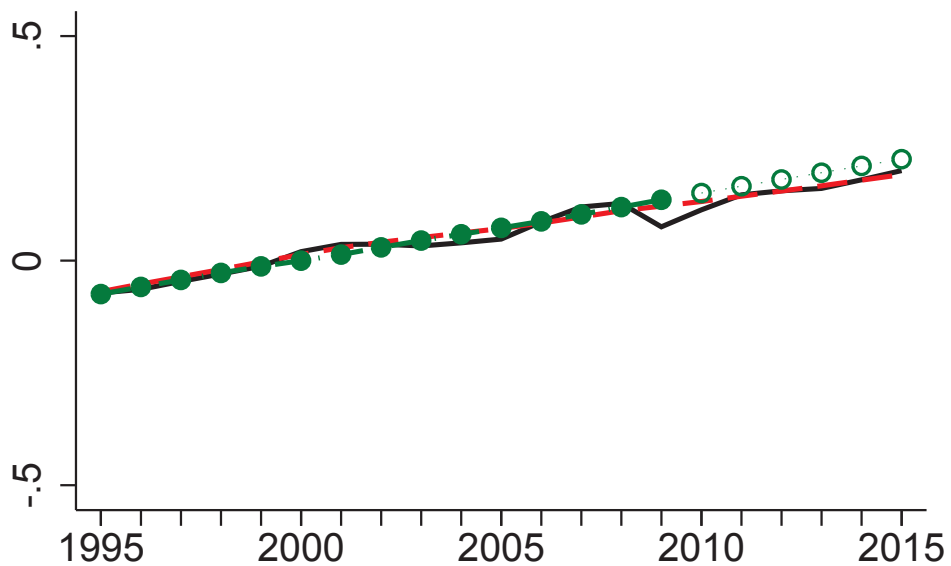
### Finland



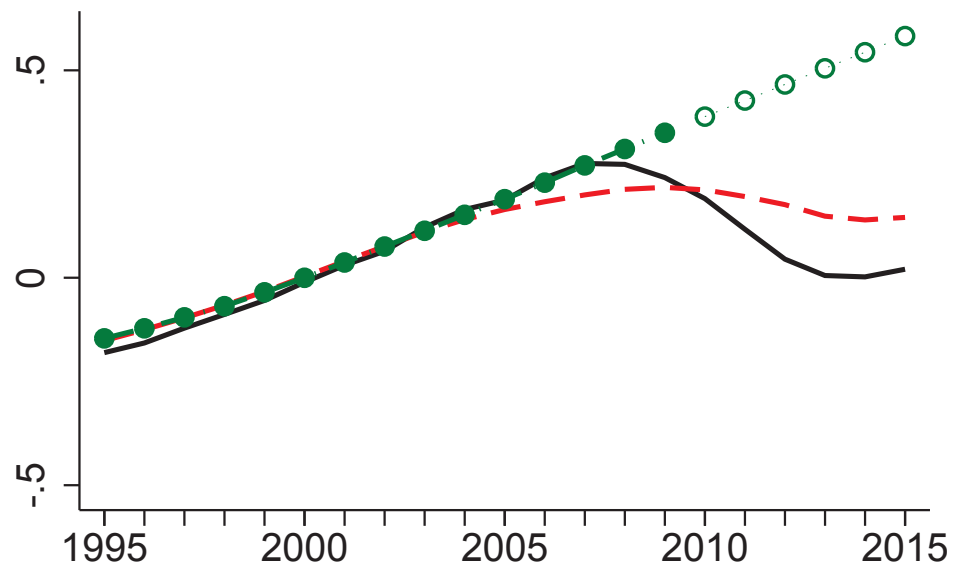
### France



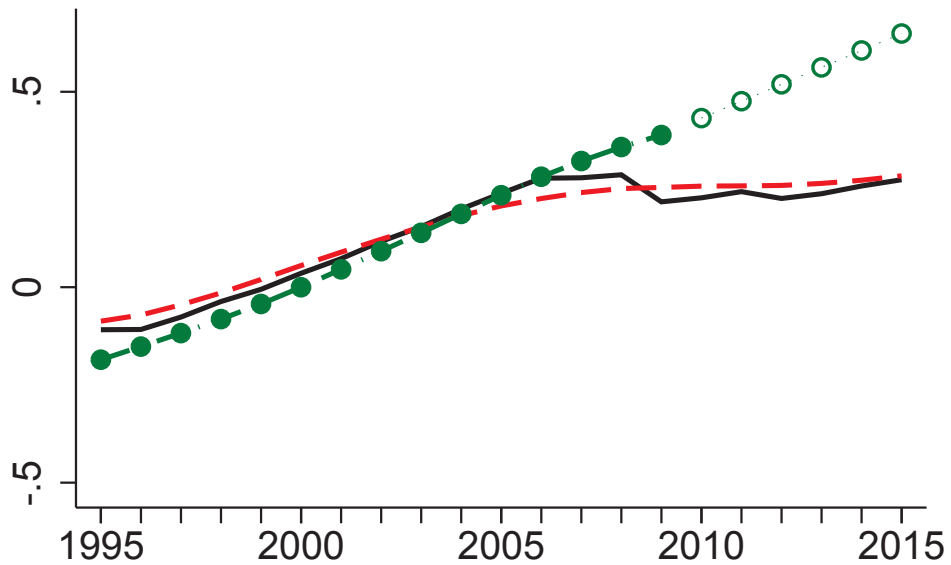
### Germany



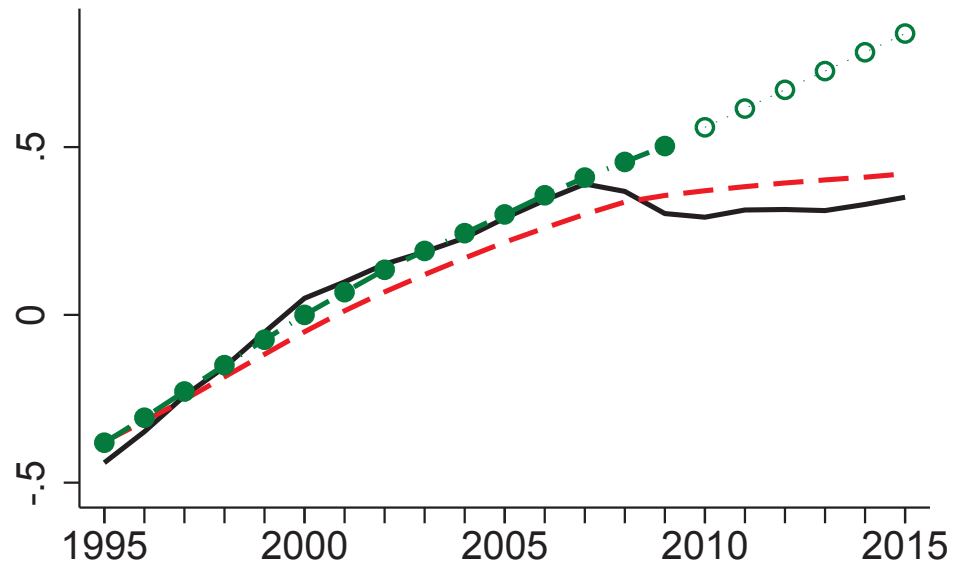
### Greece



### Hungary

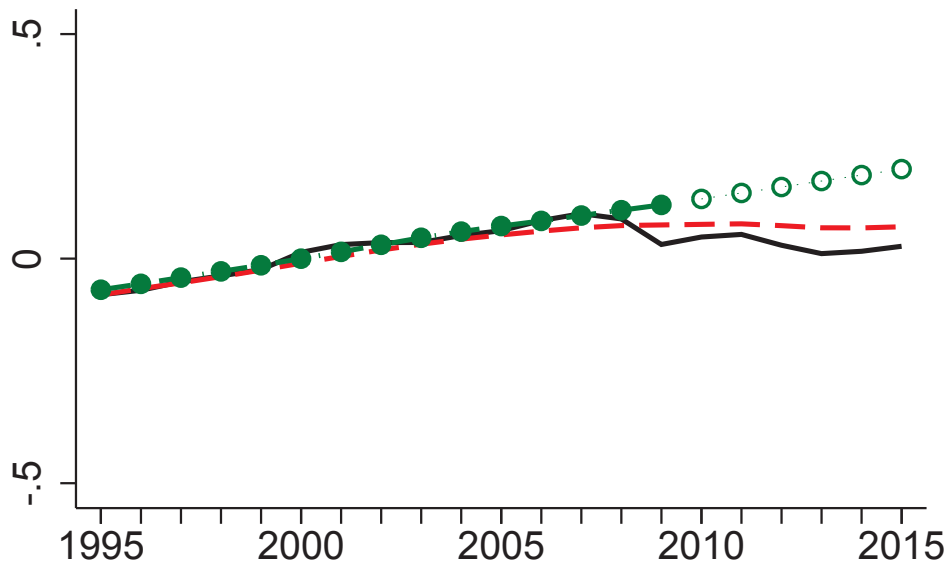


### Ireland

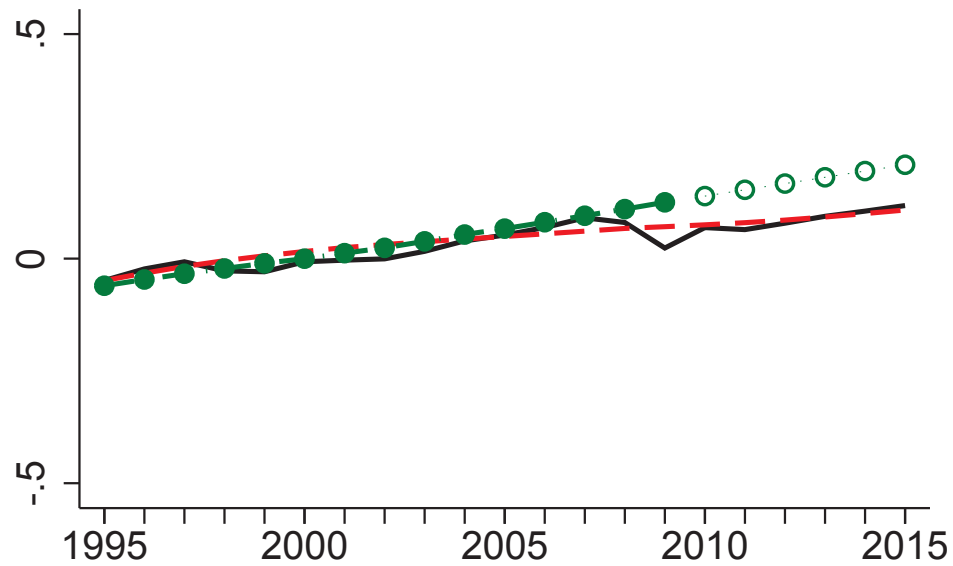




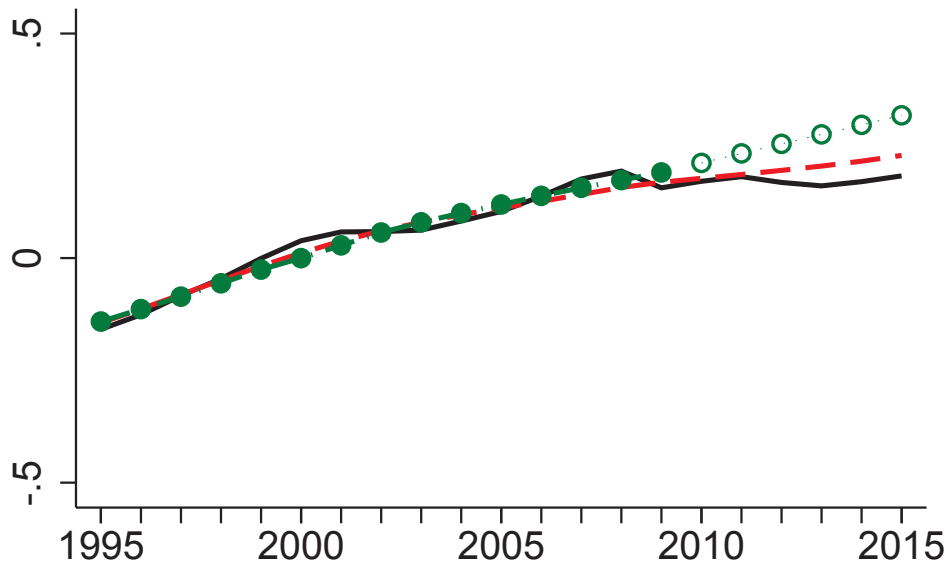
Italy



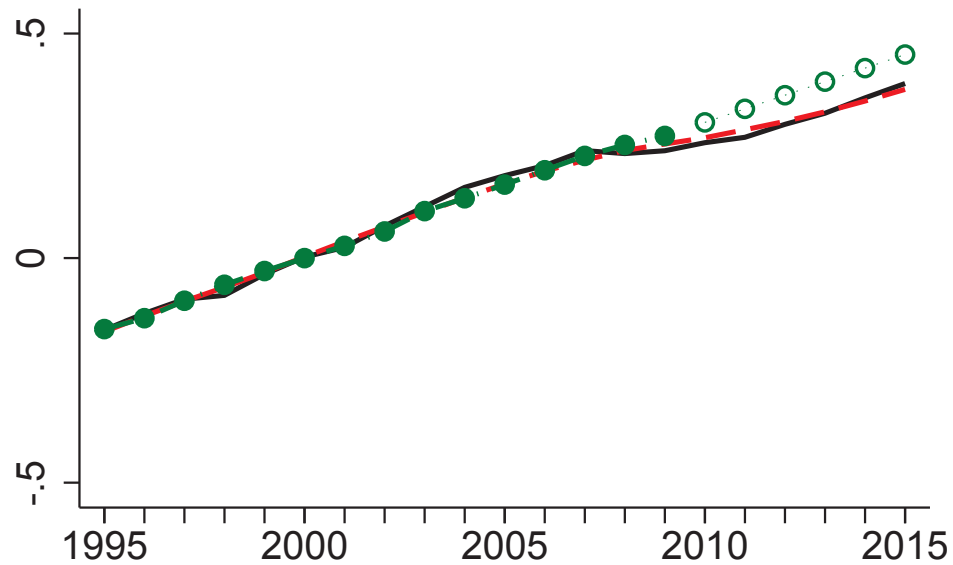
Japan



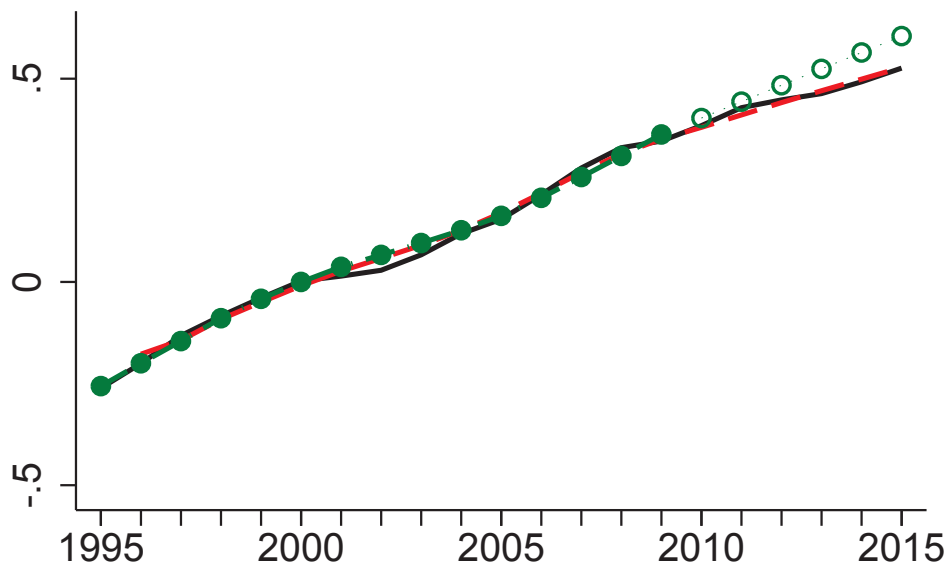
Netherlands



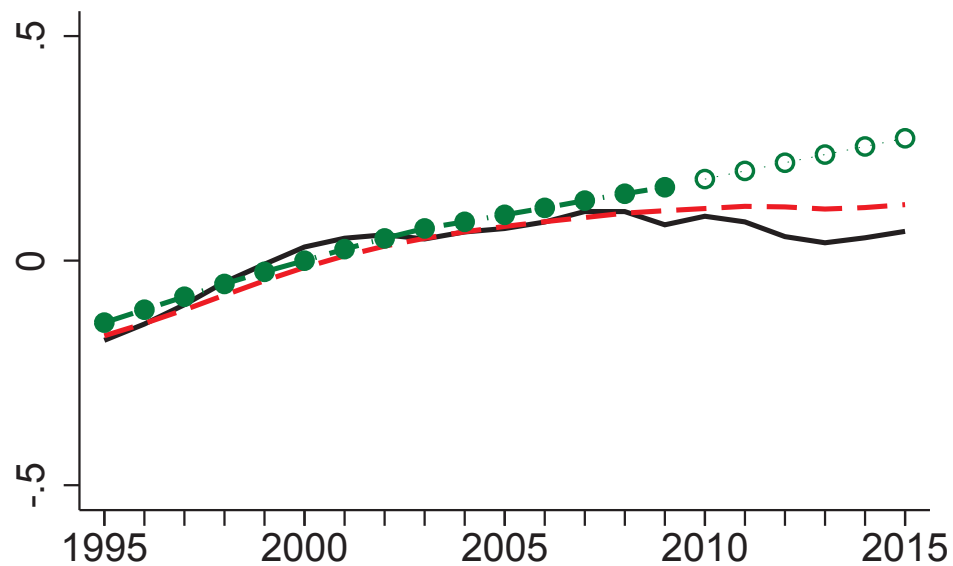
New Zealand



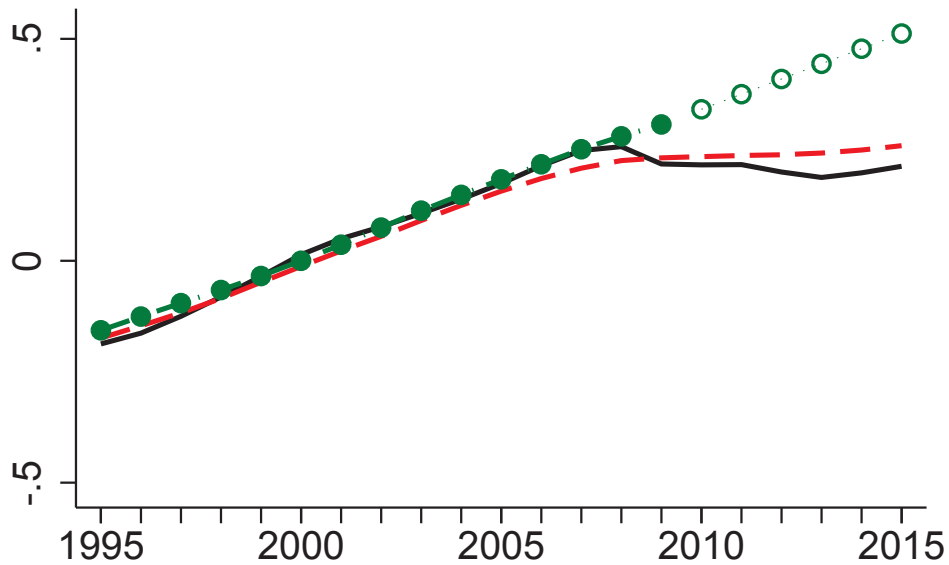
### Poland



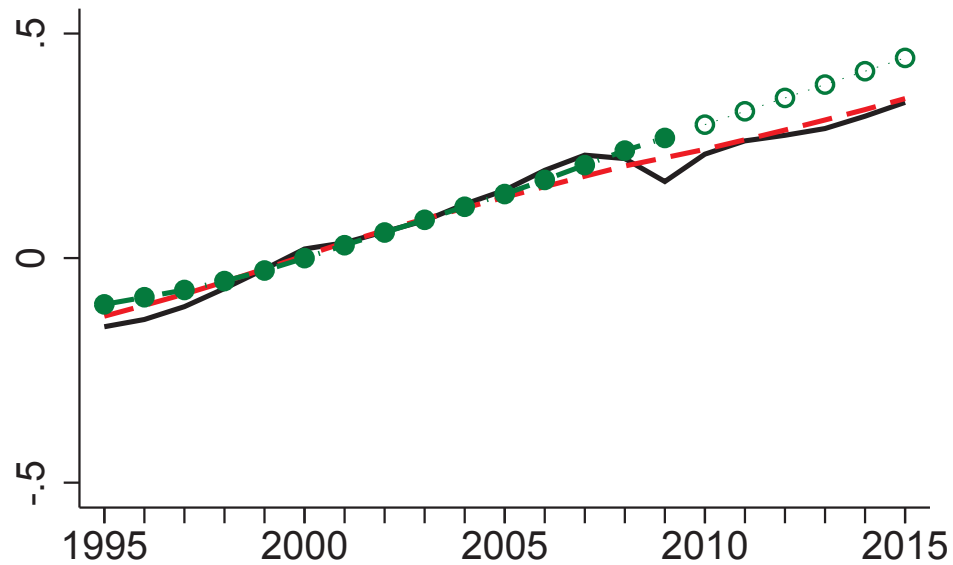
### Portugal



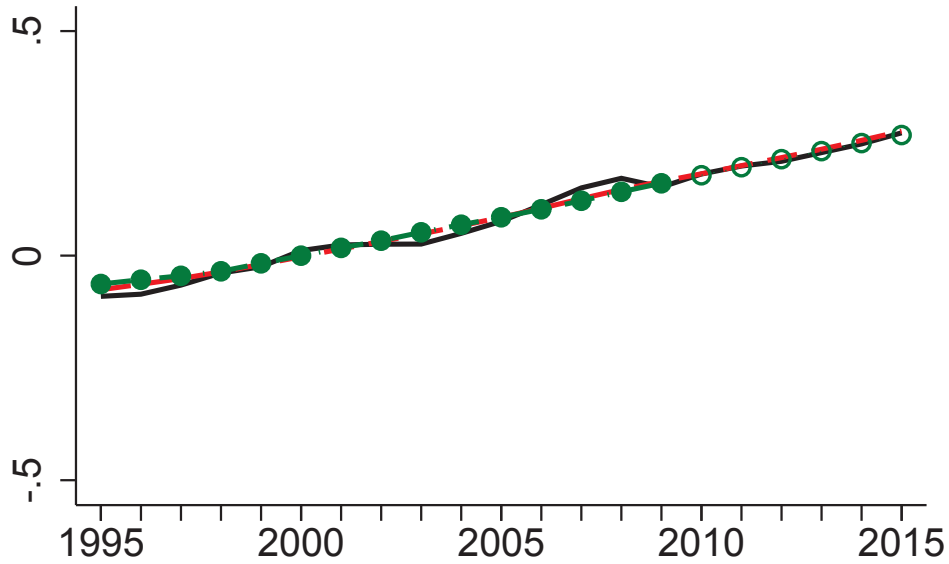
### Spain



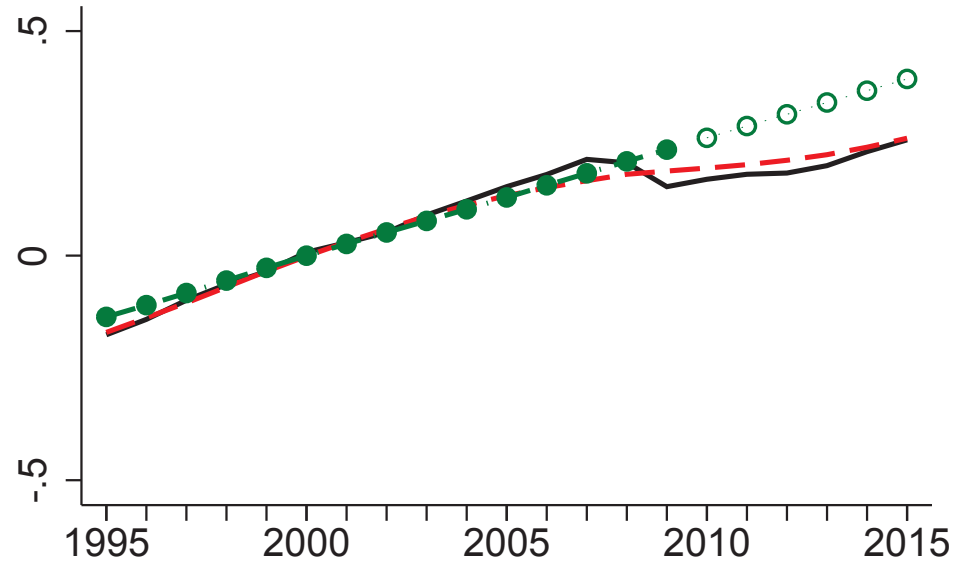
### Sweden



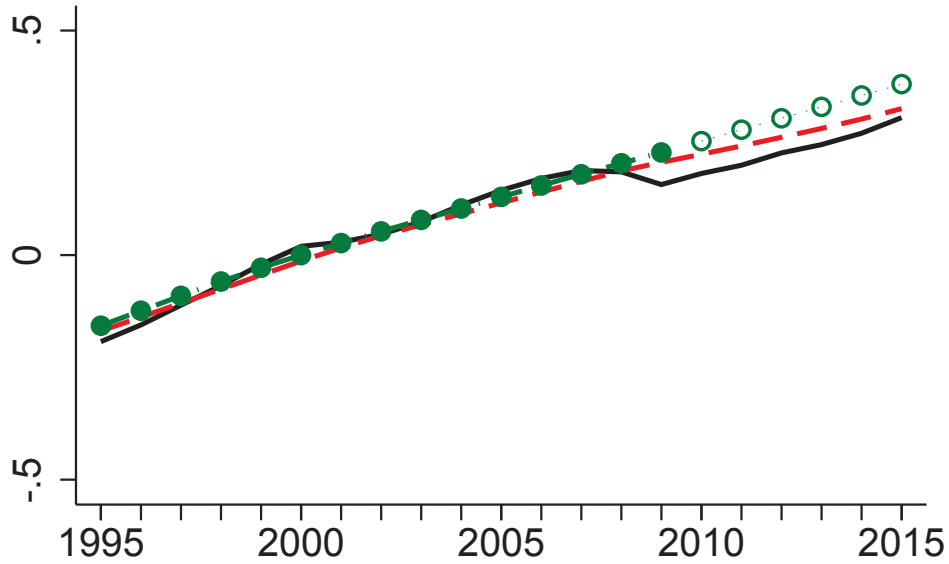
### Switzerland



### United Kingdom



### United States



|         | Loss of Potential Y<br>2007-2015 | U, 2007 | U, 2015 |
|---------|----------------------------------|---------|---------|
| Canada  | 9.7%                             | 6.0     | 6.9     |
| France  | 8.6                              | 8.0     | 10.4    |
| Germany | 3.4                              | 8.6     | 4.6     |
| Italy   | 12.1                             | 6.1     | 11.9    |
| Japan   | 9.6                              | 3.8     | 3.4     |
| UK      | 12.4                             | 5.4     | 5.4     |
| US      | 5.3                              | 4.6     | 5.3     |