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# Dynamism and Employment

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**Abstract**

Countries differ in terms of economic performance measured by the rate of unemployment and the employment-to-population ratio. Moreover, performance varies over time for a given country. Measures of performance, in particular economic dynamism, can explain the long swings of unemployment and the employment-to-population ratio for the OECD countries. These measures include an index of stock prices and the market capitalization of listed firms as ratio to GDP. In addition real house prices and employment move together. The root causes of differences in dynamism can be found in institutions and culture.

This paper is part of a research program on economic dynamism at the Center on Capitalism and Society, Columbia University.

## 1. Introduction

Economic performance can be measured in many ways. Productivity and unemployment are the most used indicators. High productivity implies that wage rates are high in a wide range of jobs and that people can afford a comfortable lifestyle. A low unemployment rate indicates that people can easily find jobs. High labor force participation rates indicate that the available jobs offer the stimulus and wages that make entering the labor market attractive.Labor market participation is also a measure of inclusion in the mainstream economy.

In this paper we will discuss the possible reasons why some economies appear to perform better than others and why economic performance of many Western countries has declined in recent years. Our main measure of economic performance is inclusion in the economy, such as the rate of unemployment and the employment-to-population ratio. One such measure is the employment rate among working-age males. Table 1 has the ratio of male employment to the total population of men in the age group 15-64 from the early 1980s to the present for five countries. There are three Continental European countries France, Germany and Italy, Sweden, which has a welfare state that promotes participation in the labor market, the United Kingdom and the U.S.

**Table 1.** Employment-to-population rates for men aged 25-64

| | France | Germany | Italy | Sweden | U.K. | U. S. |
|---|---|---|---|---|---|---|
| 1970-1974 | | | 87.05 | 90.14 | | 89.01 |
| 1975-1979 | | | 87.59 | 90.48 | | 86.86 |
| 1980-1984 | 82.11 | | 83.78 | 88.72 | 81.21 | 82.94 |
| 1985-1989 | 79.32 | | 81.26 | 89.25 | 82.21 | 85.26 |
| 1990-1994 | 77.36 | 79.26 | 78.76 | 81.53 | 78.83 | 83.36 |
| 1995-1999 | 76.56 | 76.99 | 75.20 | 80.00 | 80.94 | 85.19 |
| 2000-2004 | 78.43 | 76.24 | 77.22 | 82.05 | 82.43 | 82.62 |
| 2005-2009 | 77.39 | 81.20 | 77.68 | 84.67 | 82.64 | 81.24 |
| 2010-2012 | 76.54 | 83.60 | 74.82 | 85.12 | 81.91 | 78.59 |

Source: OECD statistics portal (www.oecd.org). See appendix.

The table shows that in the early 1980s employment was similar in the U.S. and the U.K. to that in France and Italy. In the late 1980s and 1990s employment fell in France and Italy, while it stayed about the same in the U.K. and the U.S. In the 2000s, in contrast, the downward movement in France and Italy stopped while employment in the U.S. fell significantly from about 85% to under 80%in 2010-2012. Yet in 2010-2012 France and Italy have the lowest employment rates while Germany and Sweden have the highestrates.

What accounts for the lower employment-to-population rates in France and Italy throughout this period? And what has made employment in the U.S. fall in the past decade and fall below the U.K. level. In particular, why did employment fall by more in the U.S. than in the U.K. during the recent financial crisis? These are some of the questions we will address in this paper.

## 2. From employment to unemployment

Unemployment varies between countries as well as within a country over time. The unemployment rates for 20 OECD countries[1] are shown in Appendix I. Unemployment was low in Europe until the early 1970s, lower than in the U.S., but in the 1970s and 1980s unemployment in many European countries moved to a new and higher plateau while U.S. unemployment fluctuated around a roughly constant mean. In order to account for this observation one has toexplain both why unemployment in Europe rose as well as why it remains high in many of the European countries. Within this explanation, one must also account for countries such as the U.K., the Netherlands and Denmark, which managed to escape the high plateau and move to lower rates in the past decade.

Our earlier work in this area focused on explaining the shift from a plateau of low unemployment to the high-unemployment plateau seen in so many of the European countries,

[1] Australia, Austria, Belgium, Canada, Denmark, Finland, France, Germany, Ireland, Italy, Japan, Netherlands, New Zealand, Norway, Portugal, Spain, Sweden, Switzerland, the U.K. and the U.S.

as well as in Canada, Australia and New Zealand in the seventies and eighties. We describe the regime shifts in Appendix II. In order to account for such a shift in unemployment one has to find a causal variable that also underwent a shifting mean around the same time.

A number of macroeconomic shocks affecting the natural rate of unemployment have been discussed in the literature. Asset prices and firms' investment decisions depend on expected productivity growth and real interest rates. In earlier work, culminating in the publication of *Structural Slumps* in 1994[2], our emphasis was on the role of changes in world real interest rates on unemployment. We discussed the way changes in savings and investment behavior at the global level affect firms' investment decisions. Each of the three models presented in the book incorporates an investment decision that affects the level of unemployment in an expectational equilibrium. In one model higher rates of interest reduce the level of hiring; in the second model they make firms prefer current profits over future profits and raise markups of price over marginal cost, which lowers the real demand wage; and in the third model the relative price of a labor-intensive capital good falls, which then lowers the real demand wage as in the Stolper-Samuelson effect in trade theory. To close, a wage-setting curve takes the place of the labor supply curve, the former describing the effect of information imperfections – adverse selection and moral hazard – in the labor market. The falling real demand wage can then give a new equilibrium with lower employment and lower wages.

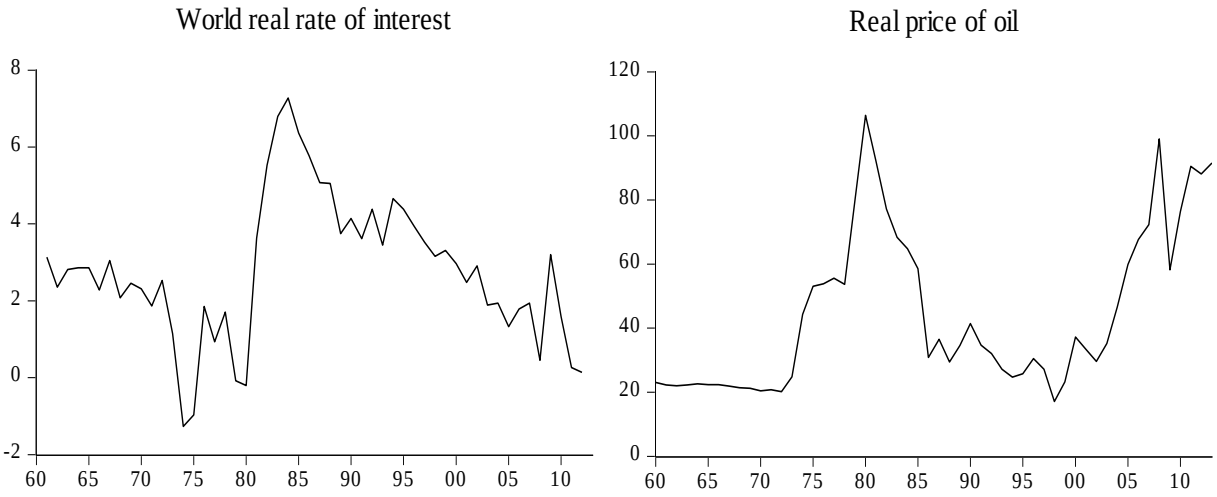
In addition to the effect of (world) real rates of interest on unemployment through its effect on hiring, price setting and investing,we have the effect of productivity growth on unemployment – as in Pissarides (2001), Ball and Moffit (2001), Hoon and Phelps (1997) and Manning (1991); higher stock prices implying expectations of increased future profits and a higher implicit shadow price of trained workers, which brings increased training and

[2] See also Fitoussi et al. (2000) and Phelps and Zoega (2002).

employment – as in Phelps and Zoega (2001); higher start-up costs reducing firm creation and employment – Pissarides (2002); and higher oil prices reducing labor demand and causing higher unemployment – see Carruth et al. (1998). Higher oil prices raise the fixed costs of running a business, which may have the effect of raising their markups of price over marginal costs and hence lowering labor demand.[3]

The figures below shows how the two variablesemphasized in Phelps (1994), the world real interest rates and the real price of oil, can account for the upward shift of unemployment from one plateau to another[4].

**Figure 1.** World real rate of interest and the real price of oil




Source: OECD. See table in appendix.

The real rate of interest jumped in the early 1980s but then started a downward slide that has continued to this day. The reasons for falling real rates can be found in the high saving rates of emerging economies, as well as in their rapid growth which has made their excess savings have a stronger effect on world capital markets and in declining investment in the developed

[3]One good example is the airline business where higher fuel prices quickly raise fares. When prices go up at unchanged money wages the effect is to lower the real wage that firms want to pay.
[4] The world real rate of interest is calculated as the weighted average of the real interest rates in the G7 countries using GDP in 2005 dollars as weights.

world. The movements of world oil prices are also quite relevant. After the spike in the early 1980s, prices came down quite rapidly, reached a bottom in the late 1990s but then started to increase again in the early 2000s, spiking in 2008 and remaining in a range not far from its previous peak in the early 1980s.

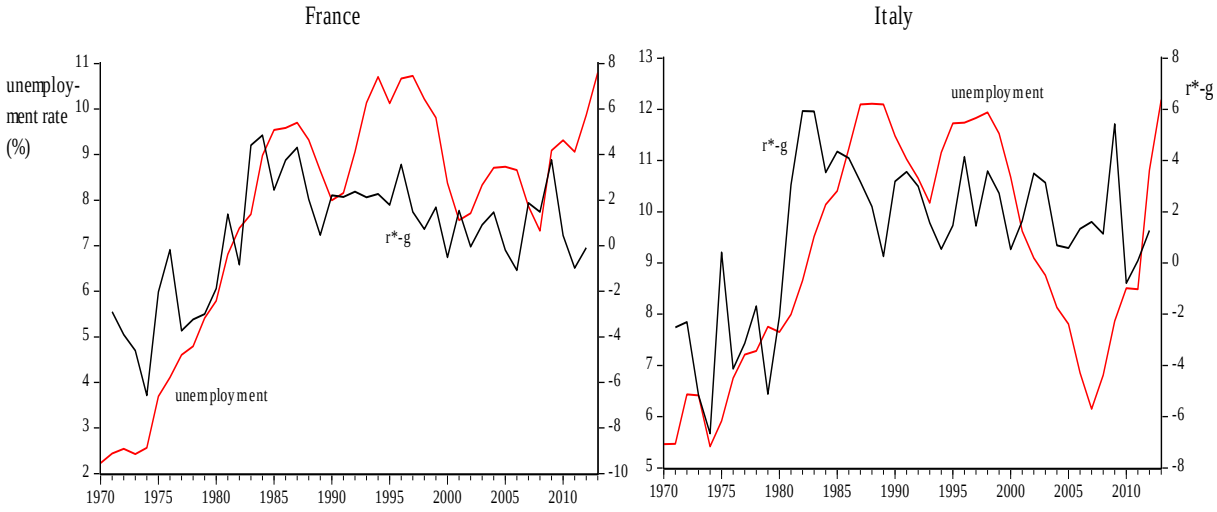
In our sample of 20 OECD countries there is a diversity of unemployment paths. While all the countries experienced an elevation in the mid1970s and early 1980s, some managed to recover so that the unemployment rate went back to its earlier level while others could not escape high unemployment. Thus while world real interest rates can help explain changes in mean unemployment over time, they cannot account for differences across countries in the mean level of unemployment.

Our emphasis on macroeconomic variables contrasts with that of Nickell et al. (2005). They find that differences in labor market institutions across countries and changes in these institutions over time can account for the variation of unemployment over time and across countries. Blanchard and Wolfers (2000) emphasize both macroeconomic shocks and labor market institutions by including interaction terms between macroeconomic shocks and institutions in their unemployment equations, following our work in Phelps (1994) and Layard Nickell and Jackman (1991). In this framework institutions are important not so much because of their direct impact on unemployment, but because they determine how sensitive unemployment is to macroeconomic shocks.

A framework that includes only world real interest rates and the price of oil as possible explanatory variables affecting unemployment can account for the elevation of unemployment in many countries in the late seventies and early eighties but it cannot account for the failure of unemployment to recede with a falling world real rate of interest and falling oil prices in the 1980s, 1990s and 2000s.

This brings us to the missing elements in the story of post-war unemployment that has to do with culture, institutions and innovation. In terms of explaining the diverse unemployment experience of the countries, the lack of dynamism may provide the missing element in accounting for the failure of unemployment to fall with the real interest rate in the 1980s and 1990s.The figure below has the French unemployment rate plotted against the difference between the world real rate of interest and the rate of growth of hourly productivity. We note that the fall in the rate of productivity growth offsets the fall in the real interest rate, leaving the difference between the two stuck at an elevated plateau. A similar pattern is found in the Italian data although unemployment fell in Italy after its adoption of the euro in 1999 only to return to its earlier level in recent years.

**Figure 2.** Unemployment, real interest rates and productivity growth




Sources: See table in appendix.

Other variables measuring dynamism would be stock prices and market capitalization of listed companies as a share of GDP. In Phelps and Zoega (2004) we found that the latter variable was positively correlated with labor force participation and productivity and negatively correlated with unemployment in a cross section of OECD countries. Moreover, periods of high unemployment are also periods of low investment. This is also an indication that persistently low unemployment reflects a low value of investment opportunities due to low

expected rate of productivity growth or high interest rates. The data on unemployment and investment described in Appendix III reveal a strong relationship between investment – defined as the ratio of gross capital formation to GDP – and the unemployment rate.[5]

## 3. Panel regressions

We now construct a panel of observations for the twenty OECD countries where each observation covers a five year interval. This gives eleven observations from 1960-64 to 2010-2014. We use the last three observations from each half-decade to calculate the average unemployment rate for each half-decade while the first three observations are used to calculate the average value for each causal variable. Our reduced form unemployment equation takes the following form;

$$u_{it} = \alpha_{i0} + \alpha_1 r_t^* + \alpha_2 \log(P_t^{oil}) + AX + \varepsilon_{it} \quad (1)$$

where $r^*$ denotes the world real rate of interest, $P^{oil}$ is the real prices of oil, $X$ is a vector of variables measuring an economy´s dynamism, such as the rate of productivity growth and level of share prices, and A is a vector of coefficients.

In column (1) of Table 2 below we initially redo our regression from the early 1990s, including only observations from 1960 -1990 and only the two variables, $r^*$ and $P^{oil}$. The two global variables shine through, each statistically different from zero and both having sizable effects on the unemployment rate. A 5% increase of world real interest rates – that is a five hundred basis point increase – can be expected to raise unemployment by 3.8% and a 10% increase of world oil prices in real terms can be expected to raise unemployment by 0.38%, a doubling of oil prices to raise unemployment by 3.77%.

We then extend our sample to include the last two decades so that the new sample starts in 1960 and ends in the half-decade starting in 2010. Both coefficients remain statistically significant from zero. The two variables, alongside the country fixed effects, explain slightly

[5] See Herbertsson and Zoega (2002) on this relationship.

less than before or 65% of the variation in the data. Both coefficients are smaller than before. The new estimates indicate that a 5% increase of real interest rates would raise unemployment by over 3%, still a sizable effect. The coefficient of the log of the real oil price now indicates that a 10% increase of the real oil price would raise unemployment by 0.3%, implying that a more than 30% increase of oil prices would be needed to raise unemployment by 1 per cent.

In column (3) we add the rate of growth of productivity growth, productivity measured by real GDP per hour worked. It has a negative coefficient, significant at the 10% level. The size of the coefficient implies that a 3% increase in the rate of productivity growth makes unemployment fall by slightly less than 1% (0.87% to be precise). Note that because the productivity data start in 1970 we lose more than 40 observations. Using a Wald test we can test our models' prediction that the coefficient of the growth rate of technology is equal in absolute value to the coefficient of the real interest rate. This hypothesis cannot be rejected[6] and in column (4) of the table the restriction is imposed by only including $r^*$-$g$ in the regression. The coefficient of the new variable is 0.37, indicating that an increase of 5% would make unemployment rise by 1.85%. The coefficient of the oil price variable is slightly smaller than before.

We then add, in column (5), a second variable that can measure an economy's dynamism. This is an index of share prices, normalized by hourly productivity. The normalization is done in the spirit of Tobin's q variable that has the cost of investing in the denominator of the term – productivity proxying for the cost of training new workers. It has a statistically significant coefficient showing that a doubling of normalized share prices causes unemployment to fall by 1.5%.In column (6) we only use observations from the period 1990 to 2010 and include the difference between the world real rate of interest and productivity growth, the log of the real price of oil and the log of the real share price.

[6]A Wald test gives: F=0.88 and p=0.35 which amounts to a failure to reject the null hypothesis.

**Table 2.** Panel estimates for unemployment

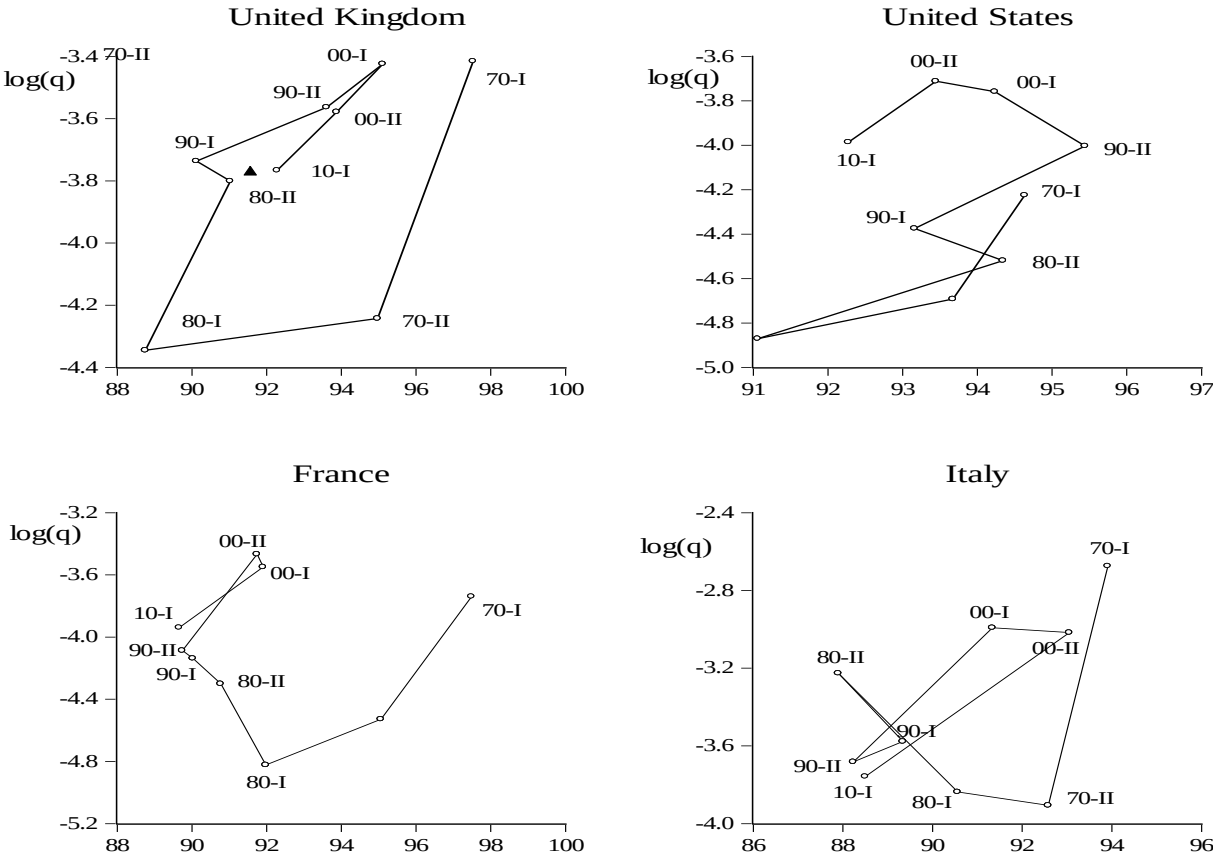
| Dependent variable: unemployment rate | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | (1) | (2) | (3) | (4) | (5) | (6) | (7) | (8) |
| constant | -10.53** (5.43) | -6.74** (2.15) | -1.44 (2.31) | 1.19 (1.35) | -3.13 (1.57) | 6.07** (0.51) | 15.83** (0.55) | 24.24* (1.97) |
| $r^*$ | 0.76** (3.35) | 0.63** (0.24) | 0.58** (0.23) | | | | | |
| $Log(P^{oil})$ | 3.77** (7.73) | 2.98** (0.49) | 1.93** (0.47) | 1.38** (0.33) | 1.00** (0.33) | 0.11 (0.16) | 0.04 (0.13) | 1.35** (0.25) |
| $g$ | | | -0.29* (0.15) | | | | | |
| $r^*-g$ | | | | 0.37** (0.10) | 0.41** (0.10) | -0.12 (0.07) | 0.26** (0.06) | 0.16 (0.10) |
| $Log(q)$ | | | | | -1.52** (0.43) | -3.22** (0.16) | | |
| $Log(mc)$ | | | | | | | -2.21** (0.08) | -2.41** (0.11) |
| $Log(p^h)$ | | | | | | | | -2.72** (0.65) |
| Period | 1960-1990 | 1960-2010 | 1970-2010 | 1970-2010 | 1970-2010 | 1990-2010 | 1990-2010 | 1990-2010 |
| R-squared | 0.73 | 0.65 | 0.68 | 0.68 | 0.71 | 0.87 | 0.92 | 0.92 |
| D-W | 1.31 | 1.22 | 1.53 | 1.50 | 1.50 | 1.68 | 1.92 | 2.14 |
| Observations | 140 | 220 | 169 | 163 | 153 | 99 | 78 | 71 |

Estimation method: Weighted least squares. White cross-section standard errors & covariance. Significance at 5% level denoted by ** and significance at 10% level is denoted by .*

By taking out the years before 1990 the real rate becomes statistically insignificant as does the real price of oil. However, the coefficient of real share prices becomes larger and more significant.In column (7) we replace the real share price by a measure of market capitalization as a ratio to GDP. This variable has a negative coefficient which is statistically different from zero. The size of the coefficient implies that a doubling of market capitalization would make the unemployment rate fall by 2.21%. In the next column we add the log of real house prices and the results show that a doubling of house prices would make unemployment fall by 2.72%. Taken together these macroeconomic variables can account for the long swings of the unemployment rate, the elevation in the mid-1970s and late 1970s, and the recovery taking place in some of the countries, such as the United States, in the 1990s.

In Figure 3 below we show the relationship between normalized share prices and the employment rate, that is the share of the labor force that is employed *1-u*, for four countries; two continental European countries France and Italy and the U.K. and the U.S. In the U.K. and the U.S. there was a slump of both normalized share prices and employment in the 1970s followed by a recovery and then another slump in the late 2000s. Based on the historical relationship between the variables, employment should be high when share prices are high. In the U.S. the level of employment in the second half of the 2000s and the first half of the 2010s are "too low" given the level of share prices. The same does not apply to the U.K. although the late 1980s, 1990s and early 2000s recovery takes place at lower levels of employment than observed during the fall in employment and share prices in the 1970s. In France and the U.K. there was also a slump in the 1970s. In Italy both variables recovered briefly in the first half of the 2000s but have since fallen back to their earlier lows. In France the partial recovery of share prices seen in the 1980s and 1990s did not make a dent in the unemployment pool, but as in Italy in the early 2000s saw a recovery of both employment and share prices, which was then reversed in the recent crisis.

**Figure 3.** Employment (*100-u*) and normalized share prices in four countries




We can also test whether real interest rates, oil prices and measures of dynamism affect the employment-to-population ratio. Due to rising rates of labor force participation among women in recent years we use the participation rates for men aged 15-64, defined as the ratio of employment to population in this age group. By studying differences in the employment-to-population rate for men we can better answer the question posed at the beginning of this paper: What accounts for differences in employment-to-population rates across countries and over time for a given country? Table 3 reports the results of a panel regression, similar to that reported in Table 2 above.In column (1) of the table we use only the world real rate of interest and the real price of oil as explanatory variables. The coefficients are both negative and statistically different from zero. The coefficient of the world real rate of interest has a higher numerical value than in the unemployment equation in Table 2. It is about twice as high as in

the unemployment equation. An increase of real rates of 1% – that is by 100 basis points – reduced the employment-to-population rate by 1.67%. The coefficient of the oil price variable is also higher than before – a doubling of real oil prices makes the employment-to-population ratio fall by 5.37%. In column (2) we add the rate of productivity growth to the equation. The coefficient of this variable is positive and statistically significant – a 1% increase in the rate of productivity growth, as from 3% to 4%, makes the employment-to-population rate increase by 0.37%. In column (3) we make the growth rate appear as a subtractor from the world real rate of interest and add the logarithm of normalized share prices. The latter is statistically significant from zero, although with a somewhat smaller numerical value that in the unemployment equation in Table 2 – a doubling of the normalized stock market variable will raise the employment-to-population variable by 0.85%. In column (4) we re-estimate the equation for the period 1990-2010. By omitting the years 1970-1989 the coefficient of both real interest rates and real oil prices lose their significance. However, the coefficient of real share prices becomes larger and more significant. The numerical value implies that the doubling of real house prices makes the employment rate increase by 3.39%. We then replace real share prices by market capitalization as a share of GDP and find that the doubling of market capitalization increases employment by 1.96%. Finally, in column (6) we add the log of real house prices and this variable turns out to be very significant. The value of the coefficient implies that the doubling of real house prices raises the employment rate by 4.26%. In this last regression the difference between the world real interest rate and the rate of growth of productivity becomes significant (at the 10% level) with a negative coefficient.

**Table 3.** Panel estimation for employment-to-population rates

| Dependent variable: unemployment rate | | | | | | |
|---|---|---|---|---|---|---|
| | (1) | (2) | (3) | (4) | (5) | (6) |
| constant | 101.10** (2.34) | 94.38** (2.54) | 88.05** (1.81) | 41.434** (0.82) | 31.39** (1.50) | 22.05** (0.26) |
| $r^*$ | -1.67** (0.14) | -1.49** (0.16) | | | | |
| $log(P^{oil})$ | -5.37** (0.59) | -4.05** (0.60) | -2.25** (0.37) | 1.16** (0.12) | 1.40** (0.31) | -0.35 (0.52) |
| $G$ | | 0.37** (0.14) | | | | |
| $r^*$-$g$ | | | -0.98** (0.11) | 0.01 (0.06) | 0.21** (0.10) | -0.31* (0.17) |
| $log(q)$ | | | 0.85** (0.48) | 3.39** (0.44) | | |
| $Log(mc)$ | | | | | 1.96** (0.09) | 1.55** (0.20) |
| $Log(p^h)$ | | | | | | 4.26** (0.65) |
| Period | 1960-2010 | 1960-2010 | 1970-2010 | 1990-2010 | 1990-2010 | 1990-2010 |
| R-squared | 0.89 | 0.92 | 0.92 | 0.97 | 0.97 | 0.99 |
| D-W | 1.60 | 1.64 | 1.60 | 1.56 | 1.72 | 1.89 |
| Observations | 154 | 141 | 134 | 97 | 79 | 59 |

Estimation method: Weighted least squares. White cross-section standard errors & covariance. Significance at 5% level denoted by * and significance at 10% level is denoted by *.

## 4. Historical data, United States

The short time spans of the data used in the previous section prevent us from studying the relationship between asset prices and unemployment in the 1950s, 1960s and 1970s. In Figure 4 below we plot the cyclically-adjusted price-earnings ratio for the S&P composite index and the employment rate, defined as *100-u*.[7]

The p/e ratio is rising in the 1950s and in the 1960s until 1965 and falls continuously for almost twenty years and reaches a minimum in 1982. It then rises quite rapidly in the 1980s and 1990s and reaches a maximum in 2000. There was the "internet boom" of the second half of the 1990s. The p/e ratio then falls, stabilizes in the mid2000s and then falls again in 2008. The employment rate follows the p/e index quite closely after 1960. In the 1950s, however, the p/e is falling while employment is rising. Employment then rises with the stock market in the early 1960s, then falls with the stock market from 1965 to 1982, then recovers with the stock market until 2000 – although the employment boom in the late 1980s is larger than the corresponding movement of the p/e ratio would lead us to predict. Both employment and the stock market then slide downwards after 2000 and then drop abruptly in 2008-2009. A recovery of both is seen after 2010.The following equation can be estimated for the period 1948-2013.

$$u_t = \beta_0 + \beta_1 u_{t-1} + \beta_2 (p/e) + \varepsilon_{it} \qquad (2)$$

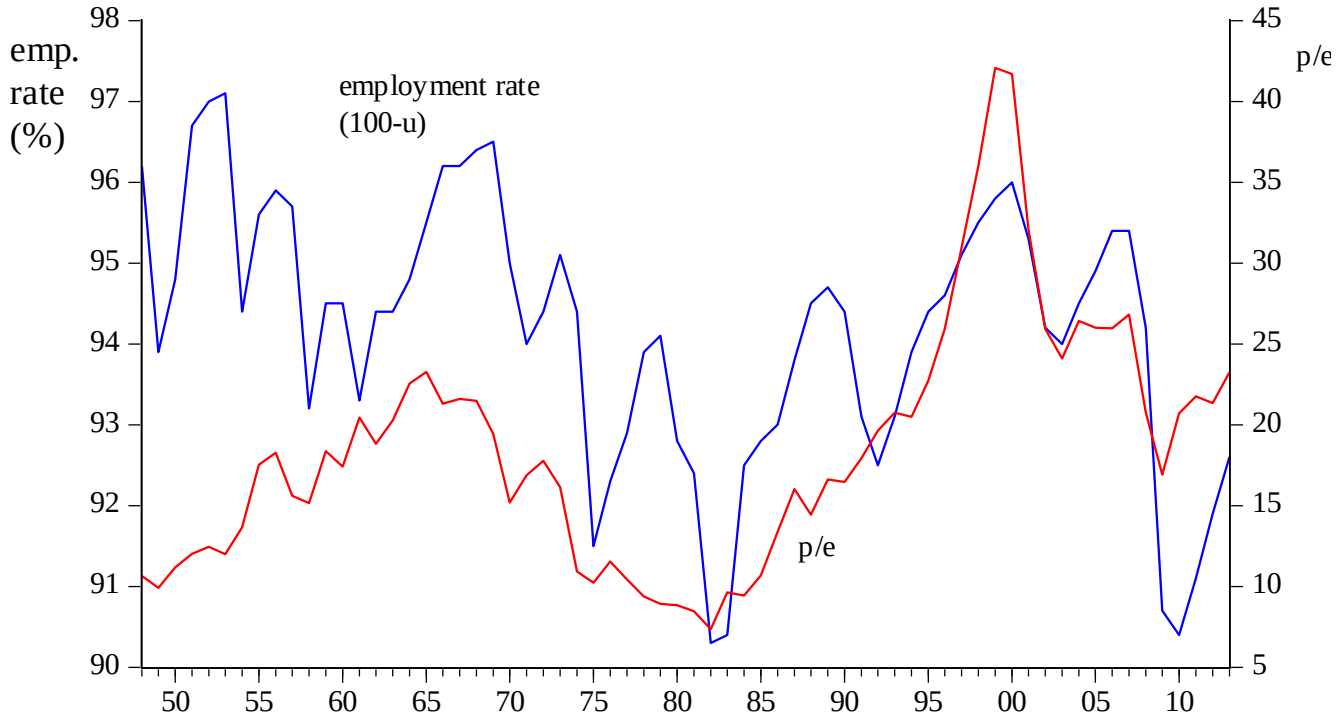
The results are shown in the table below.

**Table 4.** Employment (100-u) and the p/e ratio for the U.S.

| | Coefficient | t-statistic |
|---|---|---|
| Constant | 24.32 | 3.32 |
| Lagged u | 0.72 | 8.82 |
| p/e | 0.77 | 2.37 |
| R-squared | 0.63 | |
| D-W | 1.51 | |

[7] The p/e ratio is taken from the On-line data set of Robert Schiller (http://www.econ.yale.edu/~shiller/data.htm)and used in his book Irrational Exuberance. The unemployment rates are taken from the BLS website.

**Figure 4.** The rate of employment (100 – *u*) and the price-earnings ratio for the United States



The estimation results in Table 4 imply that the doubling of the p/e ratio will make the employment rate, defined as 100-u, increase by 2.37%.

## 5. Institutions and cross sections

While the variables macroeconomic variables can account for changes in unemployment over time, we are still let with the country specific fixed effects from equations estimated in Tables 2 and 3. In this section we take the fixed effects – that is the country-specific constant terms – from Table 4 and relate them to measures of institutions and values. In particular, we are interested in the institutional and cultural reasons for differences in dynamism and economic performance across the OECD countries.

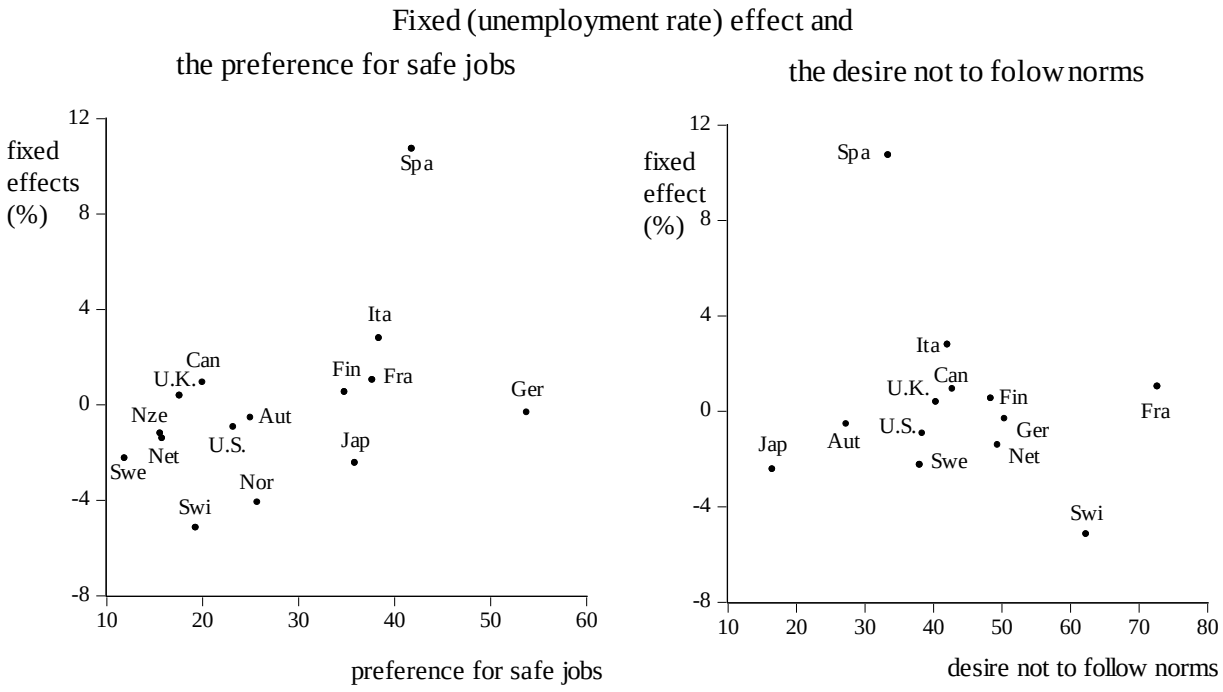
There are two values questions taken from the World Values Survey[8] and three measures of institutions. The two values questions measure the desirability for job security when assessing the desirable attributes of a job, on the one hand, and the desire not to follow norms, on the other hand. The two questions, taken from the 2005-2008 survey, are phrased in the following manner:

> Question 1:
>
> Now I would like to ask you something about the things which would seem to you, personally, most important if you were looking for a job. Here are some of the things many people take into account in relation to their work. Regardless of whether you're actually looking for a job, which one would you, personally, place first if you were looking for a job?
>
> First choice: 1 A good income, 2 A safe job with no risk, 3 Working with people you like, 4 Doing an important job, 5 Do something for community.
>
> Percentage choosing option 2 used in regression.
>
> Question 2:
>
> People pursue different goals in life. For each of the following goals, can you tell me if you strongly agree, agree, disagree or strongly disagree with it? I seek to be myself rather than to follow others.
>
> Percentage "agreeing strongly" used in regression.

[8]See www.worldvaluessurvey.org..

The figure below shows the relationship between the estimated fixed effects taken from Table 4 and the responses to these two questions. Note that the more people desire safety the higher is the rate of unemployment – that is the fixed effect – and the less they desire to follow their own path and not satisfy norms, the higher is the unemployment rate.

**Figure 5.** Unemployment and values




Note that France is an outlier in the right-hand panel, their desire not to follow norms is not matches by correspondingly lower unemployment rates.

We also include three institutional variables. One measures the unemployment benefit replacement ratio; the second the proportion of the labor force that is covered with union contracts; and the third the extent to which the unions coordinate their wage negotiations. We first regress average unemployment between 1990 and 2010 on the five explanatory variables – two measuring values and three institutions – and then the employment-to-population ratio for the same period for males, the male labor force participation rate and finally the fixed effects, or constant terms, from Table 2 above.

**Table 5.** Institutions and values in a cross section of countries

| | Unemployment rate, 1990-2010 | Employment to pop. ratio, 90-10 | Labor force part. rate, 90-10 | Fixed effect from panel regression |
|---|---|---|---|---|
| Constant | 6.33<br>(3.60) | 81.98**<br>(5.95) | 89.15<br>(3.71) | 0.27<br>(4.43) |
| Union coverage | 0.07**<br>(0.03) | -0.12*<br>(0.07) | -0.07<br>(0.04) | 0.06<br>(0.04) |
| Coordination | -3.82**<br>(1.32) | 3.06*<br>(1.40) | 0.41<br>(1.23) | -3.75<br>(2.25) |
| Replacement ratio | 8.29<br>(6.81) | -2,.00<br>(9.98) | 0.63<br>(7.82) | 9.19<br>(10.12) |
| BE_MYSELF | -0.14*<br>(0.07) | 0.07<br>(0.10) | -0.01<br>(0.07) | -0.16<br>(0.10) |
| SAFEJOB_NORISK | 0.18**<br>(0.09) | -0.21**<br>(0.05) | -0.13**<br>(0.05) | 0.20<br>(0.15) |
| R-squared | 0.67 | 0.57 | 0.50 | 0.49 |
| Observations | 13 | 13 | 13 | 13 |

Significance at 5% level denoted by ** and significance at 10% level is denoted by *.HAC standard errors & covariance (Bartlett kernel, Newey-West fixed bandwidth).

We should note that due to lack of observations for the values variables we are left with only 13 observations, which affects the significance of the estimates.

The results suggest that labor unions tend to increase unemployment while the coordination of unions – that is the centralization in wage bargaining – decreases unemployment. A higher unemployment benefits replacement ratio has a positive coefficient so tends to increase unemployment. The variable measuring the desire not to conform has a negative correlation with unemployment and the variable measuring the desire for job security has a positive correlation. These coefficients are sometimes significantly different from zero at the 5% level, sometimes significant at the 10% level and sometimes with less significance although with the expected sign. Similarly, unions and benefits tend to lower the employment-to-population ratio, the desire for job security also tends to lower it and the

desire not to conform to norms tends to increase it. The sign of the coefficient in the labor force participation equation and the fixed effect equation are also as expected, although less significant.

## 6. Conclusions

While changes in the world real rate of interest and the price of oil can help explain the elevation of unemployment in the late 1970s and early 1980s, it is differences in economic performance that explain the differences between unemployment rates and employment-to-population rates between the countries. We trace these differences to measures of dynamism, the level of entrepreneurship and innovation, as captured by stock prices and market capitalization. In addition, higher real house prices appear to raise employment.

Differences in dynamism can then be traced to institutions and culture. In an earlier paper we traced differences in dynamism to variables such as red tape, employment protection unions and unemployment benefits and the level of education of the population. Here we have found that the desire for job security, the tendency to conform, unemployment benefits and labor unions all have the effect of raising unemployment.

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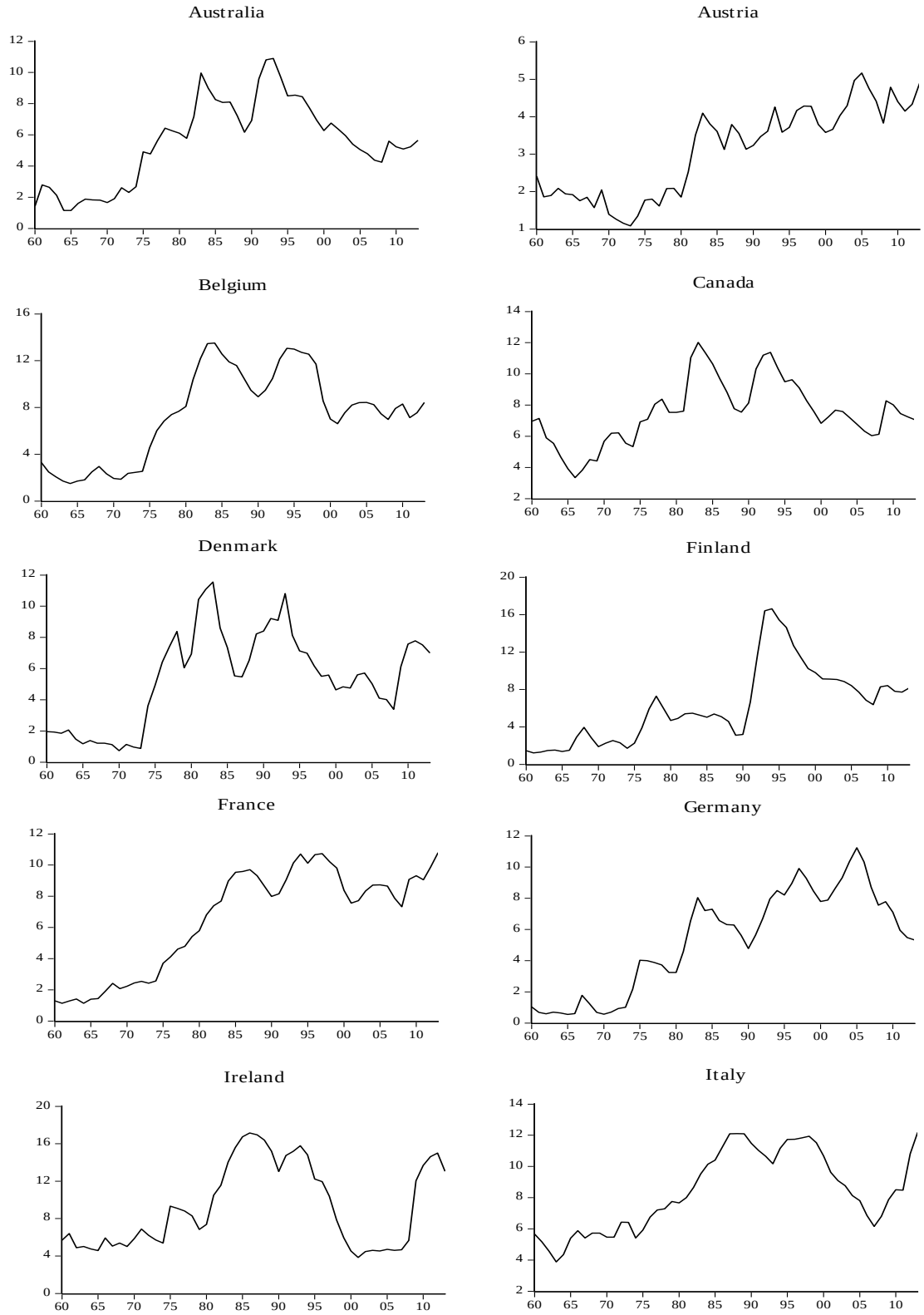
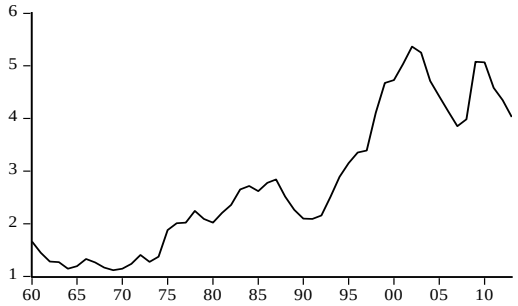
# Appendix I. Unemployment data

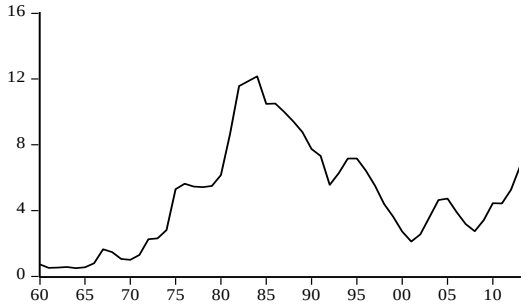
**Figure A1.** Unemployment rates



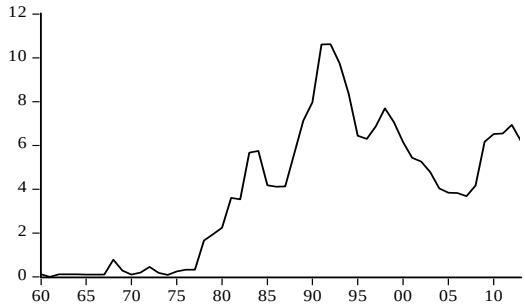
Japan



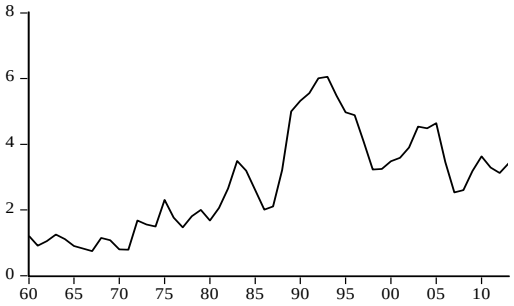

Netherlands



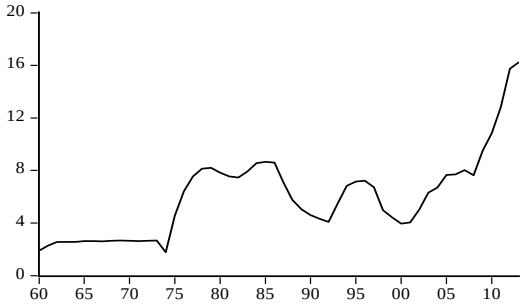

New Zealand



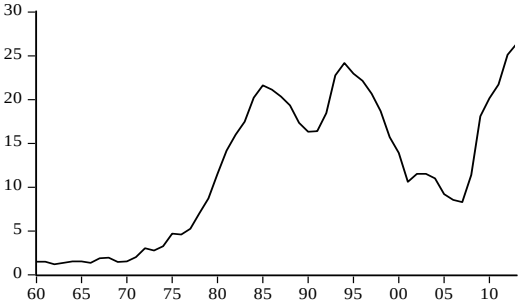

Norway



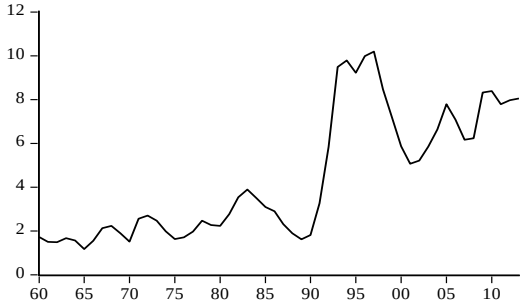

Portugal



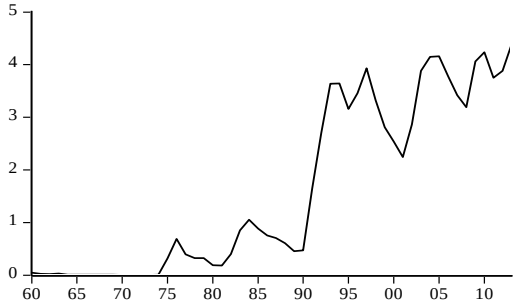

Spain



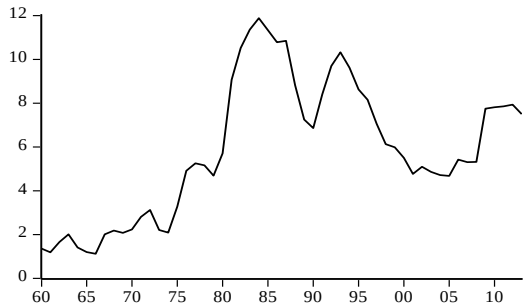

Sweden



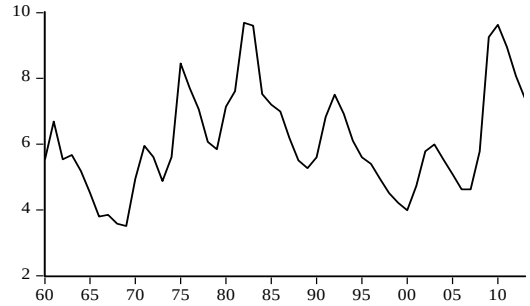

Switzerland




United Kingdom




United States



## Appendix II. Regime shifts

Kernel density estimation can be used to detect changes in mean unemployment. Following Bianchi (1997) we can estimate the density distribution for unemployment $f(u_i)$. There may be different levels of mean unemployment – or plateaus – such as years of low unemployment in the 1960s and years of high unemployment in the 1970s and 1980s. The density distribution of the data is a mixture of distributions described by

$$f(u) = \sum_{j=0}^{m-1} p_j g_j\left(u; \mu_j, \sigma_j\right) p_j \geq 0 \quad \text{(A1)}$$

where $p_j$'s are mixing proportions with

$$\sum_{j=0}^{m-1} p_j = 1 \quad \text{(A2)}$$

and $g_j$ are densities with first and second moments $\mu_j$ and $\sigma_j$. If the gap in the $\mu_j$'s is large relative to the $\sigma_j$'s the modes in the distribution are said to be well separated and $f(u)$ is multimodal with $m$ modes. If the gap is small relative to the variances the mixture components in the density are not well separated.

The density can be estimated non-parametrically by the method of kernels. Given a sample of $n$ independent and identically distributed observations, a kernel density estimator of $f(u)$ is constructed as (see Silverman, 1986)

$$\widehat{f_h}(xu) = (nh)^{-1} \sum_{i=1}^{n} K\left(\frac{u-u_i}{h}\right) = (nh)^{-1} \sum_{i=1}^{n} K(x) \quad (4)$$

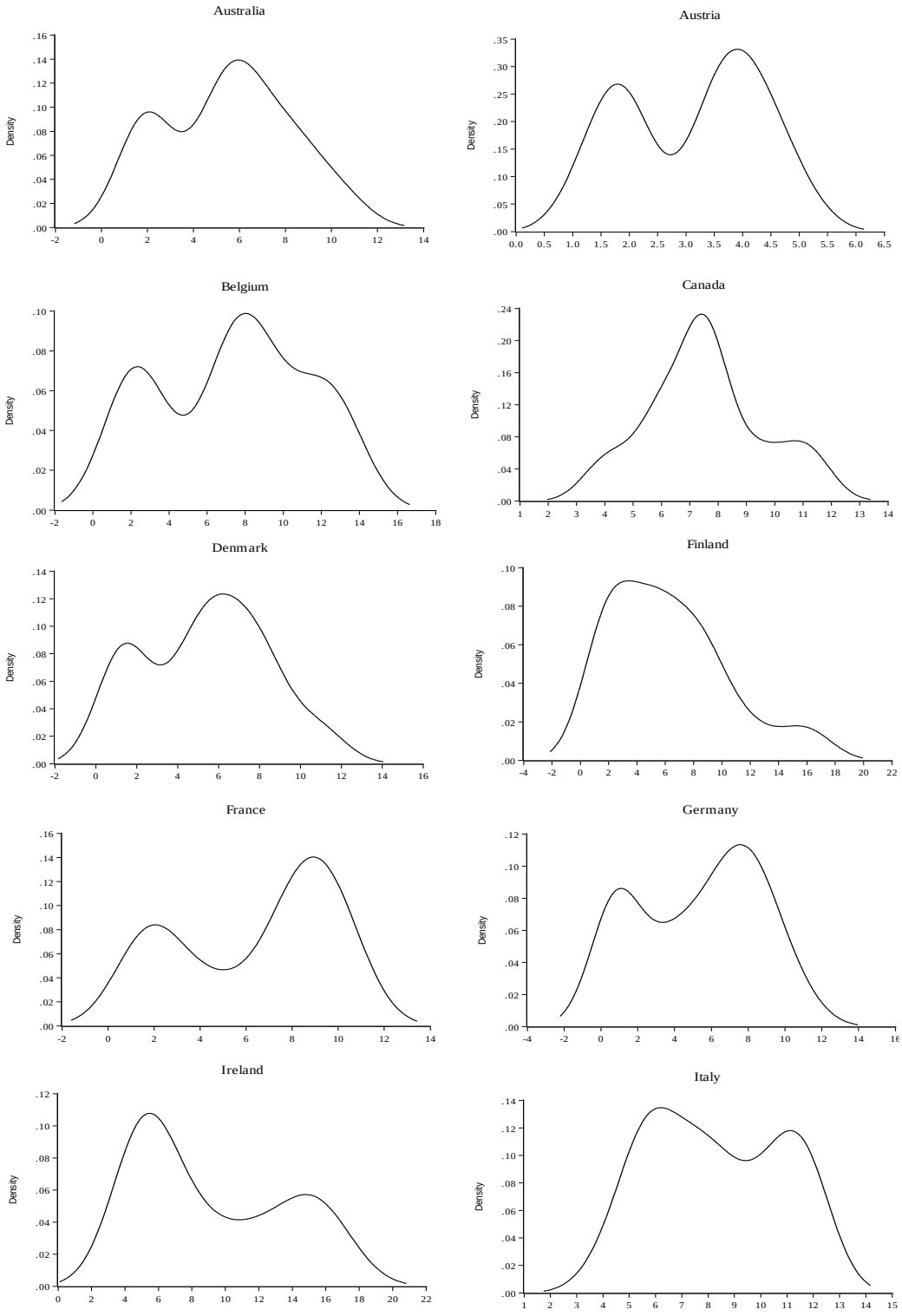
where $h > 0$ is the bandwidth and $K(x) = 1/\sqrt{2\pi}\, exp(-1/2x^2)$ is the Gaussian kernel. The bandwidth $h$ determines the degree of smoothness of the density estimate, with larger values of $h$ producing a smoother density estimate.

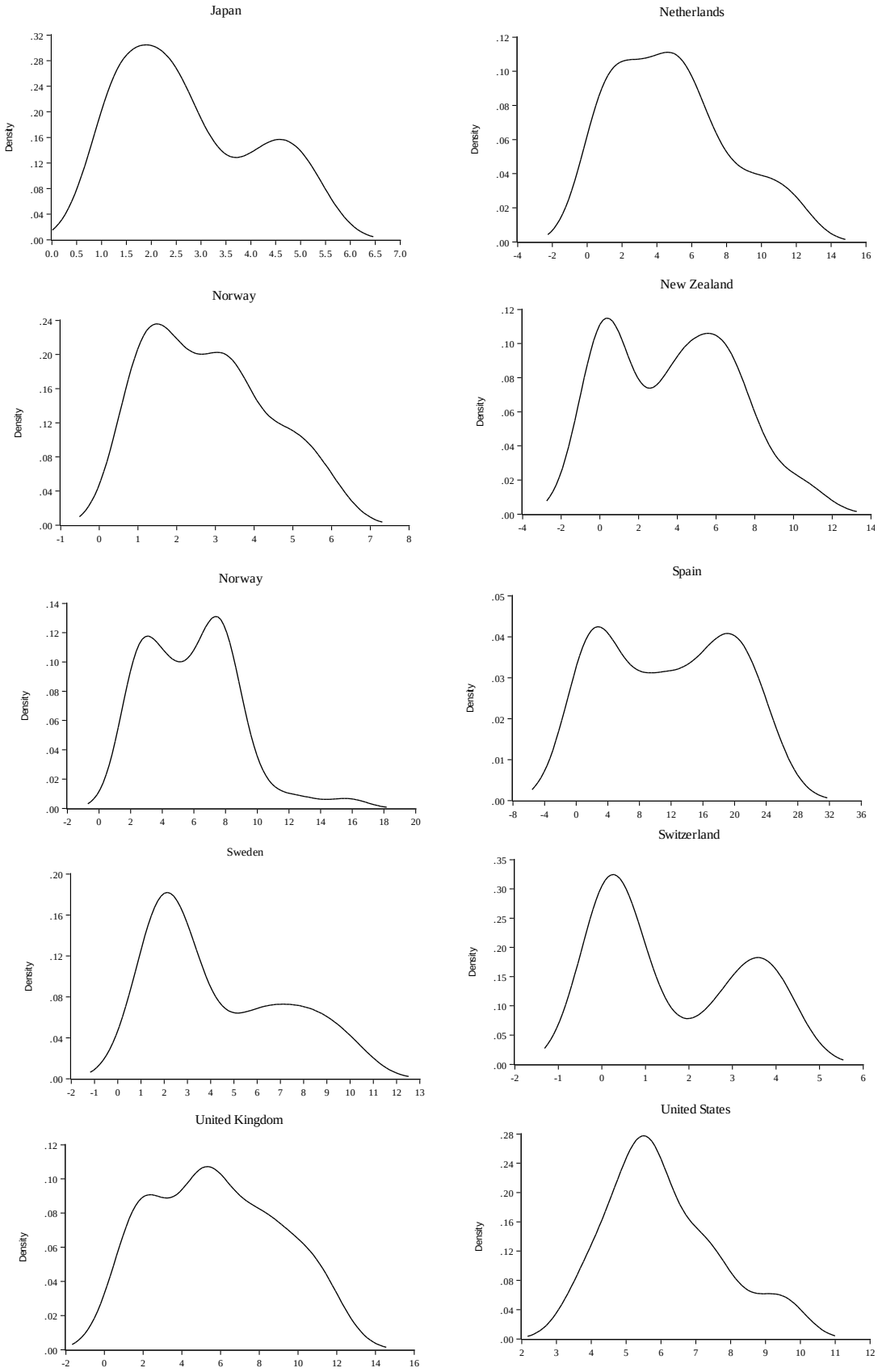
A critical bandwidth $h_m$, is defined as the smallest possible $h$ producing a density with, at most, $m$ modes.[9] If the true underlying density has two modes, a large value of $h_1$ is expected because a considerable amount of smoothing is required to obtain a unimodal density estimate from a bimodal density. A large value of $h_m$ would then indicate the presence of more than $m$ modes.

The timing of the shifts is found by estimating the distribution function for the unemployment rates 1960-2012 using kernel density estimation. The estimated distribution functions are shown in Figure A2.

[9] See Silverman (1981, 1983, and 1986).

**Figure A2.** Kernel density estimation




Japan
Density
.32
.28
.24
.20
.16
.12
.08
.04
.00
0.0 0.5 1.0 1.5 2.0 2.5 3.0 3.5 4.0 4.5 5.0 5.5 6.0 6.5 7.0
Netherlands
Density
.12
.10
.08
.06
.04
.02
.00
-4 -2 0 2 4 6 8 10 12 14 16
Norway
Density
.24
.20
.16
.12
.08
.04
.00
-1 0 1 2 3 4 5 6 7 8
New Zealand
Density
.12
.10
.08
.06
.04
.02
.00
-4 -2 0 2 4 6 8 10 12 14
Norway
Density
.14
.12
.10
.08
.06
.04
.02
.00
-2 0 2 4 6 8 10 12 14 16 18 20
Spain
Density
.05
.04
.03
.02
.01
.00
-8 -4 0 4 8 12 16 20 24 28 32 36
Sweden
Density
.20
.16
.12
.08
.04
.00
-2 -1 0 1 2 3 4 5 6 7 8 9 10 11 12 13
Switzerland
Density
.35
.30
.25
.20
.15
.10
.05
.00
-2 -1 0 1 2 3 4 5 6
United Kingdom
Density
.12
.10
.08
.06
.04
.02
.00
-2 0 2 4 6 8 10 12 14 16
United States
Density
.28
.24
.20
.16
.12
.08
.04
.00
2 3 4 5 6 7 8 9 10 11 12

The timing of the shifts in mean unemployment is then found when the unemployment rate crosses the intersection between any two modes in the estimated density – one for the low equilibrium rate of unemployment and another for the high rate. If there is only one mode in the estimated density there is not a shift in mean unemployment, which is the case for the United States, to take one example. The table below shows the timing of shift between unemployment plateaus found using the method of kernel density estimation, as in Bianchi and Zoega (1998) and Silverman (1986).

**Table A1.** Elevation of mean unemployment in OECD countries

| Countries | Shifts | Dates | Countries | Breaks | Shifts |
|---|---|---|---|---|---|
| Australia | 1 | 1975↑ | Japan | 1 | 1998↑ |
| Austria | 1 | 1981↑ | Netherlands | 0 | |
| Belgium | 1 | 1976↑ | New Zealand | 1 | 1981↑ |
| Canada | 0 | | Norway | 0 | |
| Denmark | 1 | 1974↑ | Portugal | 1 | 1989↑ |
| Finland | 0 | | Spain | 1 | 1980↑ |
| France | 1 | 1979↑ | Sweden | 1 | 1992↑ |
| Germany | 1 | 1975↑ | Switzerland | 1 | 1992↑ |
| Ireland | 2 | 1982↑, 1997↓ | U.K. | 0 | |
| Italy | 3 | 1983↑, 2002↓, 2012↑ | U.S. | 0 | |

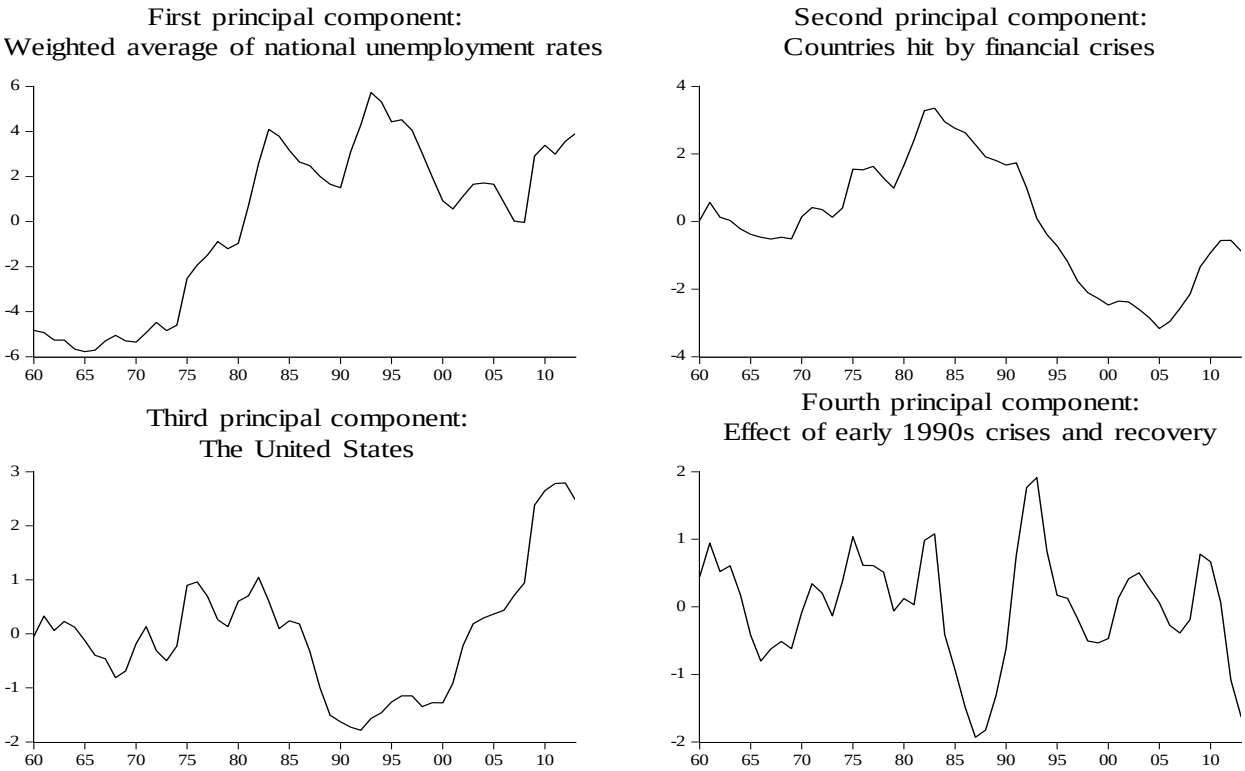
Timing found from estimated densities for the unemployment rates using kernel density estimation.

## Appendix III. Investment and unemployment

The twenty unemployment series can be summarized by a set of principal components (PC), each calculated as a weighted sum of the underlying unemployment series. The figure below shows the four most important principal components, which together explain 91% of the variation in the matrix of unemployment plots that has twenty countries and 53 observations for each starting in 1960 and ending in 2012.

Of the four principal components the first one is by far the most important, explaining 66% of the variation in the unemployment matrix (see Table A2 below). As shown in Table A3 this variable is a weighted average of the country unemployment rates. This average gives a positive weight to all countries, but a higher weight to the European countries with highest unemployment. Note the elevation in the mid1970s, then much greater rise in the early 1980s, then a weak and partial recover, another elevation in the first half of the 1990s, then again a partial recovery followed by the onset of the latest recession starting in 2008. There was a jump in the late seventies and early eighties to a new plateau of higher unemployment.

**Figure A3.** Principal components of unemployment matrix



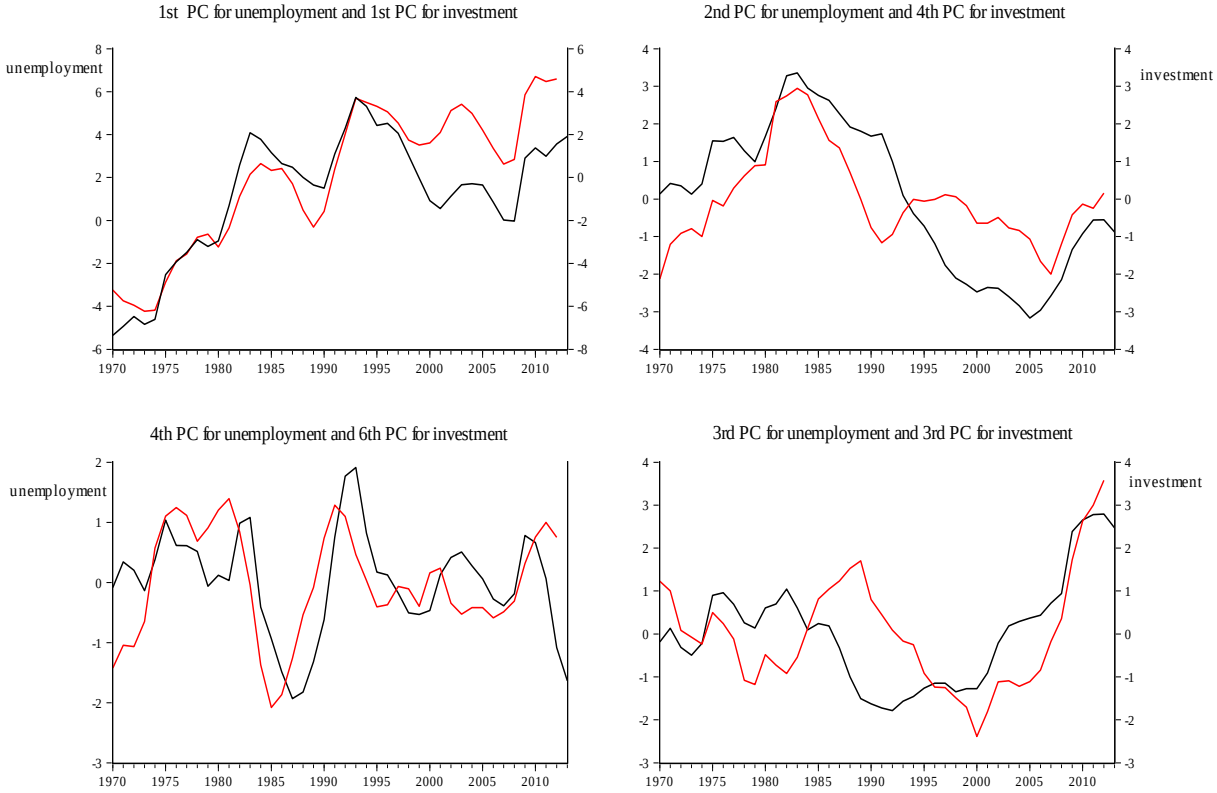

The other three principal components explain respectively 15%, 6% and 3% of the variation in the matrix. The second principal component – in the top right-hand panel -- has a large weight on countries that were hit severely by the recent financial crisis and saw unemployment rise significantly in recent years. The third principal component – in the bottom left-hand corner – captures the U.S. experience of having a strong recovery in the late 1980s and 1990s and then a very big increase in unemployment in recent years. The fourth principal component – in the bottom right-hand corner – captures the experience of some countries that were hit in the early 1990s, in particular Finland and Sweden who had a financial crisis at the time.

**Table A2.** Eigenvalues for unemployment and investment matrix

| | Unemployment rate | | | | Investment (% of GDP) | | | |
|---|---|---|---|---|---|---|---|---|
| Number | Value | Proportion Explained | Cumulative value | Cumulative proportion | Value | Proportion explained | Cumulative value | Cumulative proportion |
| 1 | 13.22 | 0.66 | 13.22 | 0.66 | 10.52 | 0.53 | 10.52 | 0.53 |
| 2 | 3.07 | 0.15 | 16.29 | 0.81 | 2.76 | 0.14 | 13.28 | 0.66 |
| 3 | 1.30 | 0.06 | 17.58 | 0.88 | 1.67 | 0.08 | 14.96 | 0.75 |
| 4 | 0.65 | 0.03 | 18.23 | 0.91 | 1.52 | 0.08 | 16.49 | 0.82 |
| 5 | 0.56 | 0.03 | 18.80 | 0.94 | 0.86 | 0.04 | 17.35 | 0.87 |
| 6 | 0.40 | 0.02 | 19.19 | 0.96 | 0.79 | 0.04 | 18.14 | 0.91 |
| 7 | 0.23 | 0.01 | 19.42 | 0.97 | 0.60 | 0.03 | 18.74 | 0.94 |

The figure below plots the principal components for the unemployment matrix, taken from Figure A3, and the corresponding principal components taken from a matrix of investment, measured as gross capital formation as a ratio to GDP, for the same sample of OECD countries. The investment PC has been inverted so as to have a positive correlation with unemployment. The eigenvalues for the investment matrix are reported in Table A2 above; the first PC explains 53% of the variation in the matrix, the second 14% and the third and the fourth each explain 8% of the variation.

**Figure A4**. Principal components for unemployment and investment




Note that the first principal components of unemployment and investment (inverted) – shown in the top left-hand panel of Figure A4 above – are very similar to the $r^*$-$g$ series in Figure  in the main text. As in Figure A3, the right-hand upper panel shows the path for the two series, unemployment and investment, in countries hit by the recent financial crises; the bottom left-hand path has the pattern for the United States; and the bottom right-hand panel has the path taken by countries hit by a crisis in the early 1990s.  The eigenvectors giving the weights used to construct the principal components are shown in Table A3 below.

**Table A3.** Eigenvectors for the unemployment rate and investment matrices

| | Unemployment | | | | Investment | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | PC1 | PC2 | PC3 | PC4 | PC1 | PC2 | PC3 | PC4 | PC5 | PC6 |
| Australia | 0.249 | 0.128 | -0.230 | 0.155 | 0.126 | 0.335 | -0.362 | -0.012 | 0.316 | 0.356 |
| Austria | 0.231 | -0.225 | 0.128 | -0.108 | 0.246 | -0.223 | 0.152 | 0.131 | 0.119 | -0.155 |
| Belgium | 0.257 | 0.109 | -0.112 | -0.058 | 0.216 | 0.042 | -0.017 | 0.433 | 0.164 | -0.383 |
| Canada | 0.226 | 0.230 | -0.107 | 0.352 | 0.185 | 0.366 | -0.278 | -0.042 | 0.071 | -0.341 |
| Denmark | 0.229 | 0.217 | 0.052 | 0.251 | 0.240 | 0.084 | 0.037 | 0.289 | 0.056 | 0.382 |
| Finland | 0.219 | -0.222 | -0.183 | 0.258 | 0.278 | 0.027 | -0.188 | -0.185 | -0.211 | -0.063 |
| France | 0.267 | -0.077 | -0.011 | -0.209 | 0.279 | 0.097 | -0.138 | 0.145 | -0.002 | -0.212 |
| Germany | 0.236 | -0.203 | -0.034 | 0.007 | 0.236 | -0.336 | 0.053 | -0.023 | 0.249 | 0.058 |
| Ireland | 0.193 | 0.329 | 0.039 | -0.167 | 0.149 | 0.265 | 0.545 | 0.006 | 0.097 | -0.046 |
| Italy | 0.239 | 0.045 | -0.237 | -0.387 | 0.286 | 0.088 | 0.035 | -0.128 | -0.090 | -0.136 |
| Japan | 0.183 | -0.334 | 0.241 | -0.084 | 0.264 | -0.279 | 0.044 | -0.057 | -0.029 | -0.043 |
| Netherland | 0.200 | 0.344 | -0.005 | -0.207 | 0.233 | -0.266 | 0.070 | 0.177 | 0.231 | 0.316 |
| New Zeal. | 0.248 | -0.057 | -0.191 | 0.033 | 0.167 | 0.215 | 0.154 | -0.230 | -0.503 | 0.325 |
| Norway | 0.231 | -0.106 | -0.259 | 0.235 | 0.252 | 0.053 | -0.081 | -0.265 | -0.031 | -0.112 |
| Portugal | 0.184 | 0.007 | 0.572 | -0.268 | 0.199 | -0.045 | 0.386 | -0.331 | 0.030 | -0.207 |
| Spain | 0.261 | 0.051 | 0.038 | -0.221 | 0.078 | 0.286 | 0.219 | 0.556 | -0.318 | 0.071 |
| Sweden | 0.201 | -0.326 | 0.067 | 0.162 | 0.258 | 0.042 | -0.334 | -0.017 | -0.067 | 0.016 |
| Switzerl. | 0.197 | -0.369 | 0.167 | 0.093 | 0.255 | -0.234 | -0.104 | -0.065 | -0.029 | 0.259 |
| U.K. | 0.247 | 0.216 | 0.020 | -0.085 | 0.268 | -0.052 | 0.033 | 0.027 | -0.262 | 0.076 |
| U.S. | 0.124 | 0.280 | 0.537 | 0.467 | 0.080 | 0.392 | 0.234 | -0.237 | 0.493 | 0.161 |

## Appendix IV. The Data

**Table A4.**The data and their sources

| Variables | Notation | Definition | Source |
|---|---|---|---|
| World real rate of interest. | $r^*$ | Weighted average of the real interest rates in the G7 countries, using GDP in 2005 dollars from the Penn World table as weights. | OECD statistics portal and the Penn-World table. |
| Real rate of interest. | $r$ | Calculated using the yield on ten-year government bonds and the CPI index. | OECD statistics portal. |
| Nominal interest rate. | $i$ | Yield on ten-year government bonds. | OECD statistics portal. |
| Inflation. | $\pi$ | Log difference between current and last year´s value of the CPI. | OECD statistics portal. |
| Real price of oil. | $p^{oil}$ | Price of Illinois basin posted crude in dollars deflated by the U.S. CPI. 2013 prices. | Illinois Oil & Gas Association (IOGA.com), taken from inflationdata.com. |
| Productivity growth. | $g$ | Log difference of the level of real productivity per hour, U.S. dollars, constant prices, 2005. | OECD statistics portal. |
| Real share prices. | $q$ | Share price index deflated with the CPI and normalized by hourly productivity. | OECD statistics portal. |
| Market capitalization. | $mc$ | Market capitalization of listed companies as a share of GDP. | World Bank. |
| Real house prices. | $P^h$ | Index of real house prices. | Federal Reserve Bank of Dallas. |
| Price-earnings data for U.S. | $p/e$ | Ratio of stock prices to earnings in the U.S. | Online data, Robert Shiller. |
| Unemployment rates | $u$ | Rate of unemployment in OECD countries. | OECD. |
| Historical unemployment rate in U.S. | $u$ | Unemployment rate going back to 1948 in the U.S. | BLS. |
| Proportion of young workers. | youth | Ratio of workers between ages of 20 and 24 to the total population. | OECD statistics portal. |