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ABSTRACT

In this paper we study the link between the employment rate (the employed proportion of the working age population) and output growth. We find that this relationship differs significantly across a sample of 11 OECD countries over the last 30 years. Output elasticities of the employment rate are found to be highest in the US, Canada, and the UK, and lowest in Japan and Austria. We also find that this elasticity is affected by some structural and institutional features, like the share of agriculture in output, the level of firing costs, the degree of inter-union and inter-firm coordination, and the percentage of employees in large firms.

1. Introduction

Persistently high unemployment has become a fact of life in many European countries since the early 1980s. In 1994, the average unemployment rate in the European Union (EU) was nearly 12%, six times the average in the mid-1960s. Unemployment rates were much lower in Japan (3%) and even in the United States (6%), where they have shown few signs of trending upward (see Figure 1 for a sample of countries). Europe's jobless dilemma appears even more serious when one looks at employment to population ratios: the proportion of males aged 25 to 54 who are employed in the EU has fallen steadily during the last three decades, from over 95% in the 1960s to around 80% today (OECD, 1994). At the same time, the ratio for females has increased more slowly than elsewhere in the OECD. As a result, total employment to working age population ratios throughout Europe are presently 10 to 20 percentage points lower than in other OECD countries such as Japan or the United States (see Figure 2). This suggests that unemployment statistics -high as they may seem- actually understate the extent of Europe's employment problems.

These disparities in unemployment performance across the OECD are commonly attributed to differences in employment growth paths. North America has been creating jobs to the tune of 1.8% per year since 1960 and Japan at a comparable rate of 1.2%. In contrast, annual employment growth in the EU has been a dismal 0.3% (OECD, 1994). This poor employment performance has induced European governments to focus on the so-called *employment intensity of growth*, i.e. by how much does employment change when output changes. The European Commission's recent White Paper on *Growth, Competitiveness, Employment* (a.k.a. the *Delors Report*) is a clear example of this concern (European Commission, 1994).

Policymakers' concerns over the employment intensity of growth, however, are usually dismissed by academics, who point out -correctly- that the so-called employment intensity measure is simply the inverse of labour productivity. In this sense, the other side to Europe's weak employment

performance (vis-a-vis the United States) has been far superior productivity growth. Faster productivity growth has been reflected in faster-increasing real wages (and presumably rising standards of living) for Europe's workers. The natural corollary of this line of thought is that the output-employment link is irrelevant.

However, from a policymaker's perspective, neither an exclusive focus on the employment intensity of growth nor an exclusive focus on productivity growth appears warranted. Achieving a greater employment intensity of growth at the expense of reducing productivity growth does not seem desirable. But faster productivity growth -and hence real wage growth- for only a shrinking fraction of the population -that employed- does not appear desirable either. To see why, consider the following simple exercise: assume that the policymaker's objective is to try to maximise output per person. Leaving distributional issues aside for a moment, this is akin to maximising the slice of output that corresponds to each individual. Increases in output per person would in this context be welfare-improving. Expressing output per person as the product of output per employed person (i.e., productivity) and the employment to population ratio -"employment rate" for short- is straightforward:

$$\frac{\text{Output}}{\text{Population}} = \frac{\text{Output}}{\text{Employment}} \times \frac{\text{Employment}}{\text{Population}} \qquad (1)$$

This decomposition makes it obvious that augmenting output per employed worker is not necessarily welfare-enhancing if it comes at the expense of reducing the employment rate. Figures 3 and 4 present the evolution of output per employed person and output per working age person across six OECD countries.[1] They show that the United States' poor performance in terms of labour productivity growth is much less dismal when measured in terms of output per person of working age. On the contrary, the

[1] Hereafter we shall refer to working age population, which is a more meaningful concept, from an economic point of view. Its evolution over time is very similar to that of total population.

performance of high-productivity growth EU countries such as the United Kingdom or Spain appears significantly less rosy. The latter's impressive growth in labour productivity, for example, has been accompanied by a sharp drop in the employment rate, so that growth in output per person has been nearly a third smaller. A striking conclusion from these figures is that the evolution of output per person has varied much less across countries than has productivity growth. Only Japan appears to have consistently outperformed the rest of the OECD on both measures. It has managed to increase productivity growth without reducing its employment rate.

On the basis of the above discussion, we argue that it makes sense for policymakers to care about the link between growth and employment, but suggest that a more meaningful way to think of employment performance is in terms of what happens to employment rates rather than employment levels. From the policymaker's perspective, maximising the fraction of the potentially economically active population that is employed appears as a clear policy objective. Also, the employment rate is closely related to the unemployment rate, being equal to the product of one minus the unemployment rate times the participation rate:[2]

$$\text{Employment rate} = \frac{\text{Employment}}{\text{Population}} = \frac{\text{Labour force - Unemployed}}{\text{Labour force}} \times \frac{\text{Labour force}}{\text{Population}}$$

$$= (1 - \text{Unemployment rate}) \times \text{Participation rate} \qquad (2)$$

So, by examining the employment rate, we encompass two rates that are linked to economic activity and that usually concern policymakers.

The relevant policy question is how to raise the employment rate without sacrificing productivity growth. This paper makes a first attempt at exploring this issue by analyzing what affects the relationship between employment rates and output growth across the OECD.

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[2] Our notation differs from that of other authors, who define the employment rate simply as one minus the unemployment rate.

We begin by establishing some stylised facts regarding employment rates across the OECD. We then proceed to explore the relation between those rates and output growth in the OECD. First, we look at whether this relation differs across a sample of 11 countries (Section 2). We then examine whether the policy measures commonly advocated for reducing European unemployment rates would also affect the output-employment rate link (Section 3). We find that this link does actually differ significantly from country to country. We also find that it is affected by only a small subsample of institutional characteristics of the economy related to those unemployment policy measures. The implications of our analysis for economic policy are contained in Section 4.

2. Are employment rates related to output growth?

2.1. Stylised facts

Our first objective is to document whether there is a relation between the employment rate and the rate of growth of output. We start with some basic stylised facts. Table 1 presents average growth rates and employment rates for our sample of OECD countries from 1970 to 1992. It shows that the behaviour of employment rates over the period has varied significantly more across countries than has output growth. There is, at first sight, no apparent cross-country correlation between the two variables. Countries with similar average growth performance, such as Australia and Spain, for example, nevertheless manifest diverging trends in employment rates. In particular, while the employment rate has remained more or less stable in the former country, it has declined dramatically in the latter, to yield the lowest employment rate in all of the OECD.

Going a step further and examining year-to-year changes in output versus changes in the employment rate yields a more consistent pattern. This pattern is shown in Figure 5 for all 11 countries and 22 years in our

sample. There is a clear positive relation between changes in output and changes in the employment rate: the raw correlation between the two variables is 0.57 (with a standard deviation of 0.025). Though suggestive, this fact is not all that useful for understanding the relationship between the employment rate and growth. It does not tell us, among other things, whether the relationship varies across countries or over time, nor does it provide any insights as to whether it is affected by technology, economic structure or institutions. To investigate these issues we first proceed to analyze the link between the employment rate and output growth separately for each country. This allows us to estimate country-specific output elasticities of the employment rate, i.e. what percentage of growth of the employment rate is associated with one percentage point of increase in output. We then return to the pooling of cross-country and time-series data to investigate what determines the variation in those elasticities.

2.2. Estimating country-specific output elasticities of the employment rate

While there has been little analysis of the relation between the employment rate and output growth, there is a long tradition of examining the relation between the unemployment rate and output growth. This is usually called "Okun's law" (from Okun, 1970), and it associates deviations of output from its trend growth path with fluctuations in the opposite direction of the unemployment rate around its equilibrium value. This is a relatively stable empirical relationship. Our focus on the employment rate in this paper generalises the usual Okun's law analysis: we implicitly include the labour participation rate and do not restrict the analysis to changes in output of a solely cyclical nature.[3]

The employment rate can be expected to depend on many institutional characteristics in a given country. We will not try to account for such determinants, but try only to examine how the employment rate is related to

[3] Note that taking deviations of output from a linear trend in the usual way would not yield a cyclical component if output is nonstationary, as seems likely.

economic activity. Therefore, we allow for the trend change in the employment rate to differ by country, and then estimate an empirical link between changes in the employment rate and changes in output, other things equal. The relationship we estimate is:

$$\text{Change in Employment rate} = a + b \times \text{Change in Output} \qquad (3)$$

where a and b are the coefficients to be estimated. a captures the trend change and b the output-employment link.

This relationship is estimated separately for each country using quarterly data over the 1960:1 to 1993:4 period. As a measure of the employment rate, we use total civilian employment divided by working age population (those aged 15 to 64). As the output variable, we use real gross domestic product (GDP) in domestic currency.[4] Given the quarterly frequency, we allow for several lags of the employment rate and output to enter our estimated equation and then measure the relationship via a summary, long-run coefficient.[5]

Table 2 presents the estimated long-run output elasticity for each country -again, the percentage change of the employment rate associated

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[4] Sample periods by country and data sources and definitions are presented in the Appendix.

[5] More precisely, we estimate the following equation:

$$\Delta ER_t = c\,\Delta ER_{t-1} + d\,\Delta^2 ER_{t-1} + e\,\Delta^2 ER_{t-2} + f\,\Delta^2 ER_{t-3} + g\,\Delta^2 GDP_t$$

$$+ h\,\Delta GDP_{t-1} + j\,\Delta^2 GDP_{t-1} + k\,\Delta^2 GDP_{t-2} + m\,\Delta^2 GDP_{t-3} + u_t$$

where ER denotes the employment rate, GDP the gross domestic product, t the period (quarter), u a random disturbance, and the remaining letters the coefficients to be estimated. Δ is the first difference operator (i.e. $\Delta x_t = x_t - x_{t-1}$). Note that this equation is simply a reparametrization of the equation in first differences, directly yielding the size of the long-run elasticity as the value of the ratio h/(1-c).

with one percentage point increase in output-. For simplicity, details on the estimation procedure and on diagnostic statistics are presented at the bottom of the table, rather than here.

The results show that the output-employment rate elasticity varies significantly across countries, from a low of 0.098 for Japan to a high of 0.574 for the United Kingdom. In general, the Anglo-Saxon countries -Australia, Canada, the United Kingdom and the United States- have the highest output elasticities, although Spain also shows a relatively high coefficient. On the contrary, employment rates in continental Europe -as represented by Austria, France, Germany, Italy and Norway- appear to be less responsive to changes in output.

The "employment threshold" rate -a parameter which is often the concern of policymakers- can be computed directly from the estimated link between output and the employment rate.[6] In our framework, this parameter is the minimum growth rate of output that is needed for the employment rate to remain constant (so that if output grows by less, the employment rate falls). Employment threshold estimates are displayed, in annual terms, in the second column of Table 2 and in Figure 6. The meaning of these threshold values is easy to understand by comparing them with the actual numbers in Table 1. For example, France's output growth was slightly above its threshold value, and so it managed to raise its employment rate slightly, while Spain's output growth was significantly below its threshold, so that its employment rate fell strongly.[7]

The estimated threshold rates convey two other interesting messages. The first one is that Anglo-Saxon countries tend to have lower employment

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6 It is calculated as the product of (minus) the constant in the regression times the inverse of the coefficient measuring the relationship between output and the employment rate (i.e., coefficient h in footnote 5), and then converted into annual frequency.

7 The numbers do not exactly coincide because the sample periods used in the estimation differ from the period in Table 1.

rate threshold values. However, several EU countries -especially Germany- also show low values. The worst performers are Spain, Japan and Italy. The second message is that these threshold values are larger than those usually found to be needed in order to achieve a constant unemployment rate. This is because of the observed downward trend in the participation rate in most countries (recall expression (2) above). This is another way to convey the idea that it may be harder to achieve a higher employment rate than to lower the unemployment rate.

3. Explaining cross-country variation in the output-employment rate link

3.1. Does the output-employment rate link differ significantly across countries?

The results presented in Table 2 confirm that the employment rate intensity of growth varies significantly across countries, even within the OECD. In this section we formally test for this hypothesis and analyze whether these differences can be explained as a function of differences in product market structure, wage bargaining structure, and other variables which are often associated with labour market performance. This exercise allows us to examine whether the policy measures commonly advocated for reducing unemployment rates would also have an effect on the output-employment rate link.

We begin by estimating a common regression for our panel of 11 OECD countries. Estimating a single equation for the whole group of countries allows us to exploit the existence of both cross-country and time-series variation in the data, and lays the foundation for our subsequent analysis of the effects of economic structure and institutions. There is, of course, a tradeoff in that the fit of the equation for a particular country is likely to be worse than in the individual equations.

Table 3 presents our estimates of the long-run output elasticities of

the employment rate. Our estimates allow for the coefficients of interest (namely, those capturing the long-run relationship) to be country-specific.[8] Because we impose a common dynamic structure on all countries, this set of estimates reveals significantly less cross-country variance than those obtained from the individual regressions. The single most important result from this table is that we can formally reject the hypothesis that the elasticity is the same across countries. Our estimates range from a low of 0.21 for Japan to a high of 0.49 for Germany.

3.2. What affects the employment rate intensity of growth?

In themselves, these results are not all that interesting, but they do serve two useful purposes. First, they confirm that, as suggested by the individual regressions, the sensitivity of employment rates to output varies across countries. Second, they provide the starting point for our analysis of how cross-country differences in structural and institutional variables affect the link between output and employment rates. Our next step is to introduce a set of variables that can help us explain cross-country differences in the output coefficients.

Our approach is straightforward: we simply estimate a new version of our panel equation in which we interact the output and employment terms with country-specific parameters that may proxy for the relevant structural variables.[9] The choice of these variables is difficult and necessarily

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[8] This is done by interacting the employment and output coefficients with country dummies. We also allow for country-specific constant terms and for seasonal dummies.

[9] We now estimate the following equation:

$$\Delta ER_{it} = c(1+K\,PE_i)\Delta ER_{it-1} + d\Delta^2 ER_{it-1} + e\Delta^2 ER_{it-2} + f\Delta^2 ER_{it-3} + g\Delta^2 GDP_{it}$$

$$+ h(1+M\,PY_i)\Delta GDP_{it-1} + j\Delta^2 GDP_{it-1} + k\Delta^2 GDP_{it-2} + m\Delta^2 GDP_{it-3} + u_{it}$$

where subindex i denotes countries, PE and PY are, respectively, employment-related and output related variables, and K and M are their

arbitrary. Here, we opt for following the patterns set by previous studies, most notably by Layard *et al.* (1991) in their empirical study of the determinants of unemployment across the OECD. Our reason for this is simple: the variables they choose are the ones commonly considered to affect both price and wage setting in the economy, and hence unemployment.[10] By using these variables we test whether they are also useful in explaining the relationship between the employment rate and output.

Note that the long-run elasticity depends on both the employment rate inertia (i.e., the relationship between the employment rate at different points in time), and the direct output-employment rate relationship. The structural variables may affect both, one of them, or none. To be sure, we always entered them as potentially affecting both, and allowed the empirical results to tell us whether each structural variable had a significant effect or not.

After some trials, we limited the variables affecting employment inertia to two. One is a composite index of firing costs measuring both the size of mandated severance payments and requirements of advance notice. Higher firing costs should imply greater inertia of employment, and hence of the employment rate. The other is a measure of coordination between labour unions. Presumably, greater inter-union coordination should induce wage negotiators to internalise the aggregate effects of their actions better, and should reduce employment inertia.

The interactions with the output term are meant to capture the effects of economic structure and the wage bargaining system. The simplest specification (column 1 of Table 4) includes only two variables: the average yearly change in the participation of agriculture in total output

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respective vectors of coefficients. We again allow for country-specific constant terms and for seasonal dummies.

[10] See the Appendix for sources and definitions of these variables.

and the degree of inter-union coordination. A second specification substitutes the inter-union coordination measure for a more general measure capturing the degree of coordination between both unions and employers (column 2). Finally, a third specification includes the inter-union coordination variable and the percentage of employees in manufacturing working in large firms. The second variable acts as an additional proxy for coordination in bargaining (column 3). Both variables are also included as determinants of employment rate inertia in columns (2) and (3).

Table 4 presents the estimates obtained from this set of regressions. Consider first the results from the simplest specification (column 1). The coefficient on the interaction of the employment rate with firing costs is positive and significant. This suggests that, as anticipated, higher firing costs increase the degree of employment rate inertia and thus reduce the output elasticity. The interaction of union coordination with the employment rate is negative and significant, indicating that higher union coordination reduces employment inertia.

Turning to the interactions with output, we find that the variation in the proportion of agricultural output always has a positive and significant coefficient. This suggests that those countries with the largest decreases in the proportion of output coming from agriculture tend to have lower output elasticities.[11] This result makes sense if, as seems likely, these countries had high proportions of their labour force under-employed in agriculture at the beginning of the period.[12] Finally, inter-union coordination appears to have a negative impact on the output coefficient, which is sensible if such coordination is allowing workers to extract higher wages when output increases, at the expense of expanding employment. The opposite signs on the union coordination variable in the interactions

[11] This variable is negative in all cases except for the United Kingdom.

[12] It should be noted that the change in agricultural output was not significant at all when entered as a determinant of employment rate inertia. Also, firing costs were never significant when entered as a determinant of the contemporaneous output-employment link.

with employment and output can be easily reconciled if one supposes that union coordination allows for asymmetric responses to increases and decreases in output: more coordinated unions are better placed to take into account the negative effects of wage increases on employment during downturns, but also more able to translate higher output into higher wages during upturns. This is consistent with most so-called *insider-outsider* models of union behaviour (see, e.g., Lindbeck and Snower, 1988).

The results for the other two specifications are quite similar. The general coordination measure behaves much like the union coordination variable, although with somewhat muted effects. The percentage of employees in large firms variable has an extremely small, albeit significant, effect on both the employment and output coefficients.

The estimated interaction terms allow us to calculate country-specific output-employment rate elasticities that are directly comparable to those obtained in Tables 2 and 3. This is done in Table 5. Since all sets of estimates are similar, we present only the results corresponding to our simplest specification (column 1 of Table 4). These results suggest several conclusions. First, the estimates fall easily within the ranges calculated using the country dummies in Table 3. In this sense, the structural variables used in that specification appear to capture the relevant cross-country differences well. Second, output elasticities are higher -i.e. employment rates are more closely linked to changes in output- in the United States, Canada and the United Kingdom, countries with relatively flexible labour markets. Output elasticities are lowest in Japan and Austria, where clearly the evolution of employment rates are influenced by other factors.[13]

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13 In addition to these interaction terms, we also tried other potentially relevant variables. These were the following (see definitions in the Appendix): measures of openness of the economy and real profits per employee (to capture the degree of competition in the product market); the percentage of employees in firms with less than 100 people; measures of corporatism, union density, and strike activity; the unemployment benefits duration and replacement ratio; and a measure of expenditures on active labour market policies. None of them showed a significant effect.

In order to analyze what factors seem to be influencing the output-employment rate link the most in different countries, we have simply decomposed the country-specific elasticities into the components due to each of the structural parameters. We find that the biggest differences between the high elasticity countries and those with lower elasticities lie in their different degrees of employment rate inertia. This contrasts with the fact that the coefficients on output alone are significantly more similar across countries. In turn, in explaining differences in employment rate inertia, firing costs appear to be the main factor. Among the low elasticity countries -including most of continental Europe and Japan- greater union coordination than in the rest of the OECD tends to work in favor of lower employment rate inertia, but this is more than offset by higher firing costs. The extreme cases in this regard appear to be Italy, Spain and Norway, which have the highest levels of firing costs and, in consequence, the highest employment rate inertia attributable to that factor.

4. Conclusions and policy implications

The current situation of persistently high unemployment rates in Europe appears more acute if measured by the employment rate, i.e. the employed proportion of the working age population. This rate is significantly lower in European countries than in the United States or Japan.

The employment rate is of interest to policy for several reasons. First, the employment rate is a more general measure of labour market performance than the unemployment rate, since it encompasses the behaviour of labour force participation. Second, a higher employment rate is conducive to a more egalitarian distribution of productivity increases across the population. This paper has argued that, for these two reasons, it is of interest to study the behaviour of the employment rate.

The paper first examined the link between the employment rate and output growth in a sample of 11 OECD countries and found it to differ significantly across countries. The paper then analyzed whether country-specific characteristics helped explain the differences. The results suggest that some structural and institutional features do indeed affect the link between output growth and the employment rate.

Let us now focus on the policy implications of the latter analysis. Assigning a normative interpretation to our ranking of output elasticities is risky. Even if raising the employment rate is accepted as a policy goal worth pursuing, raising the employment rate intensity of growth would imply a more pronounced cyclical response of the employment rate. The latter is likely to entail a welfare cost that would have to be traded off for a higher medium-term employment rate.

What do our results imply with regard to the usual policy prescriptions to reduce unemployment? The main conclusion is that measures to reduce firing costs -an often-heard recommendation against unemployment- are also likely to have a significant positive impact on the employment rate. A reduction in firing costs increases the response of employment growth to output growth, and hence what we have called the employment rate intensity of growth.

The influence of the wage bargaining structure is harder to interpret in terms of policy recommendations. The results suggest that higher inter-union coordination reduces the employment rate response to output growth. However, the results also indicate that, controlling for the influence of firing restrictions, greater union coordination lowers employment rate inertia. The joint evidence on bargaining structure and firing costs suggests that to achieve a stronger link between the employment rate and output, some degree of union coordination combined with reduced *insider* bargaining power may be desirable.

Lastly, we have not been able to find any evidence that other policy measures often advocated to reduce unemployment -such as increasing the degree of competition in product markets, reducing the generosity of unemployment benefits, or augmenting expenditures on active labour market policies- influence the link between output growth and the employment rate in a significant way.

Appendix. Database description and some statistical results

A.1. Time series variables

* Nominal GDP, Public consumption, Exports, Imports, Value added in manufacturing and in agriculture, and their respective deflators: OECD, *Quarterly National Accounts*, and, for Spain, Instituto Nacional de Estadística, *Contabilidad Nacional de España*.
* Employment and Consumer price index: OECD, *Main Economic Indicators*, and, for Spain, Banco de España, *Boletín Estadístico*.
* Money (M1 or M2), and Nominal exchange rate: IMF, *International Financial Statistics*.

A.2. Sources for structural parameters

* Real profits per employee in common currency: Average over 1960-1990, from OECD, *National Accounts*.
* From Layard *et al.* (1991, pp. 51-52 and 420) (see this reference for original sources) (Those authors' abbreviation between parentheses):
- Firing costs: Number of months' salary given to workers as severance pay after 10 years of service (SEV) plus Number of months' notice required after 10 years of service (NOT).
- Extent of inter-union and inter-firm co-ordination, both formal and informal, in the process of wage-bargaining, going from 1 to 3 (UNCD and EMCD, respectively).
- Percentage of employees in manufacturing who work in firms that employ more than 500 people (PLF) and less than 100 people (PSF).
- Corporatism: Calmfors and Drifill's ranking of the degree of centralization of wage bargains, original and adjusted on the basis that low degrees of centralization are better for economic performance than middle-range levels (CORP and CORP').
- Union density (1965-77) (UN).
- Normalised strike indicators for the 1950s (SH1) and 1960s (SH2).
- Unemployment benefit duration: duration for which benefits continue at a

reasonable level, in months; indefinite duration = 48 months (BD).

- Replacement ratio: Percentage unemployment benefit replacement rates (RR).
- Expenditures on active labour market programs per unemployed person as a percentage of output per person (LMP).

A.3. Description of sample period covered by country

The sample periods were determined by availability of relevant data series: United States (1964:1-1992:4), Germany (1968:1-1992:4), Canada (1960:1-1992:4), France (1970:1-1992:4), Italy (1972:1-1992:4), Japan (1965:1-1992:4), United Kingdom (1963:1-1992:4), Spain (1970:1-1992:4), Australia (1969:2-1992:4), Norway (1970:1-1993:2), Austria (1969:1-1993:1).

A.4. Diagnostic tests for Table 2

Country	Sargan test	LM4 Test
United States	3.07	0.71 (0.59)
Germany	6.78	2.43 (0.05)
Canada	2.51	0.33 (0.85)
France	1.93	0.83 (0.51)
Italy	3.92	1.69 (0.16)
Japan	1.98	4.31 (0.01)
United Kingdom	1.23	0.70 (0.58)
Spain	5.35	1.22 (0.31)
Australia	4.68	0.70 (0.59)
Norway	4.83	2.74 (0.04)
Austria	2.99	0.79 (0.53)

Note: (a) Sargan test: test for the validity of the instrument set (distributed as a chi-square with p-k degrees of freedom, where p is the number of instruments and k the number of estimated parameters. The relevant critical value is: chi-square(4)=9.49. (b) LM4: Lagrange multiplier test for up to fourth-order autocorrelation of the residuals (p-value in parentheses). The Sargan test is not rejected in any of our regressions, indicating that the set of instruments is not invalid. Similarly, the LM test indicates that there is no sign of serial correlation in any of the regressions except those for Japan and Norway.

Table 1

Employment rates and output, 1970-1992 (%)

Country	Employment rate 1970	Employment rate 1992	Change in employment rate 1970-1992	Average annual output growth rate 1970-1992
United States	62.2	70.9	8.7	2.6
Germany	57.9	61.7	3.8	2.4
Canada	59.9	67.3	7.4	3.3
France	50.6	51.6	1.0	2.5
Italy	55.9	54.6	-1.3	2.7
Japan	70.7	73.2	2.5	3.8
United Kingdom	69.9	69.0	-0.9	1.9
Spain	58.5	47.5	-11.1	3.0
Australia	67.6	67.5	-0.1	3.0
Norway	59.2	64.4	5.2	3.5
Austria	64.9	68.8	3.7	2.6

Source: see the Appendix.

Notes: Germany refers to the former West Germany. The employment rate is defined as civilian employment divided by the population of 15 to 64 years old.

Table 2

Individual country estimates of long-run output elasticities of the employment rate

Country	Output elasticity	Output growth threshold (%)
United States	0.413	2.08
Germany	0.344	1.84
Canada	0.446	3.12
France	0.318	2.57
Italy	0.105	4.24
Japan	0.098	4.55
United Kingdom	0.574	2.49
Spain	0.442	4.67
Australia	0.513	3.42
Norway	0.249	2.50
Austria	0.181	1.63

Note: The coefficients are derived from individual country equations. The equation includes a constant term and seasonal dummies. The estimation is carried out using instrumental variables. The instruments for the current change in output include the contemporaneous values of the deviation of world trade from trend, the change in the terms of trade, the change in the real money stock, the change in real value added in manufacturing and the deviation of government expenditure from trend.

Table 3

Long-run output elasticities of the employment rate from regressions with country-dummy interactions

Country	Output elasticity
United States	0.418
Germany	0.492
Canada	0.446
France	0.300
Italy	0.320
Japan	0.213
United Kingdom	0.428
Spain	0.458
Australia	0.347
Norway	0.223
Austria	0.231

Note: Computed from panel version of regressions in Table 2, in which coefficients on lagged changes in output and employment rate are allowed to differ by country. 10 country dummies are interacted with each of the two variables (the United States dummy is left out). Estimated using instrumental variables (see Table 2 for details).

Diagnostic tests: Sargan test of validity of the instruments=0.88 (critical value=9.49), F-test for joint significance of the 10 country dummies on lagged employment=5.51; F-test for joint significance of 10 country dummies on lagged output=6.07 (p-value=0.00 in the last two cases).

Table 4

Employment rate equations with interactions with country-specific variables

Variable	(1)	(2)	(3)
Employment	0.411	0.378	0.597
	(4.37)	(4.19)	(4.40)
x Firing costs	0.014	0.009	0.013
	(3.06)	(2.254)	(2.83)
x Union coordination	-0.240	-	-0.254
	(6.20)		(6.45)
x Union + Employer coordination	-	-0.112	-
		(6.24)	
x Percentage of employees in large firms	-	-	-0.004
			(1.91)
Output	0.411	0.408	0.301
	(10.36)	(10.73)	(3.77)
x Change in proportion of GDP in agriculture	0.551	0.538	0.359
	(6.37)	(6.53)	(2.28)
x Union coordination	-0.027	-	-0.031
	(2.12)		(2.35)
x Union + Employer coordination	-	-0.013	-
		(2.19)	
x Percentage of employees in large	-	-	0.003
			(1.58)
Sargan test	2.16	1.87	1.54

Note: Panel regressions in which coefficients on lagged changes in output and the employment rate are interacted with the variables appearing below them. Estimated with instrumental variables (see Table 2). Absolute values of t-ratios in parentheses. Sargan test: test of the validity of the instrument set (critical value=9.49).

Table 5

Long-run output elasticities of the employment rate

Country	Output elasticity
United States	0.472
Germany	0.338
Canada	0.388
France	0.345
Italy	0.379
Japan	0.233
United Kingdom	0.475
Spain	0.377
Australia	0.318
Norway	0.252
Austria	0.245

Note: Computed from estimates in column (1) of Table 4.

Figure 1. Unemployment rates

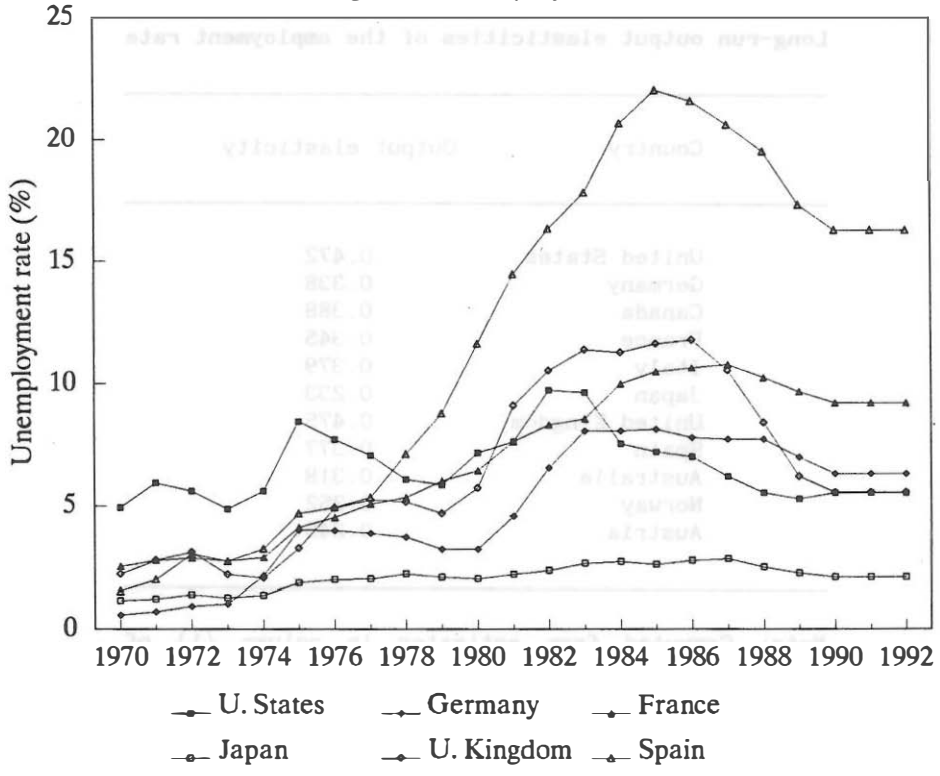


Figure 2. Employment rates

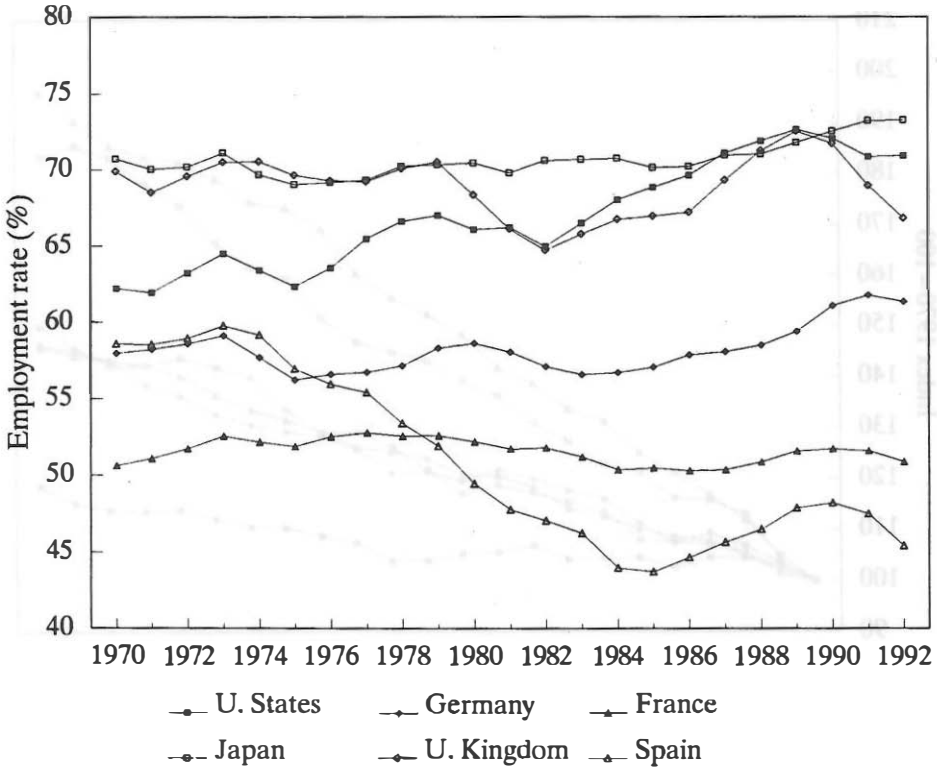


Figure 3. Output per employed person

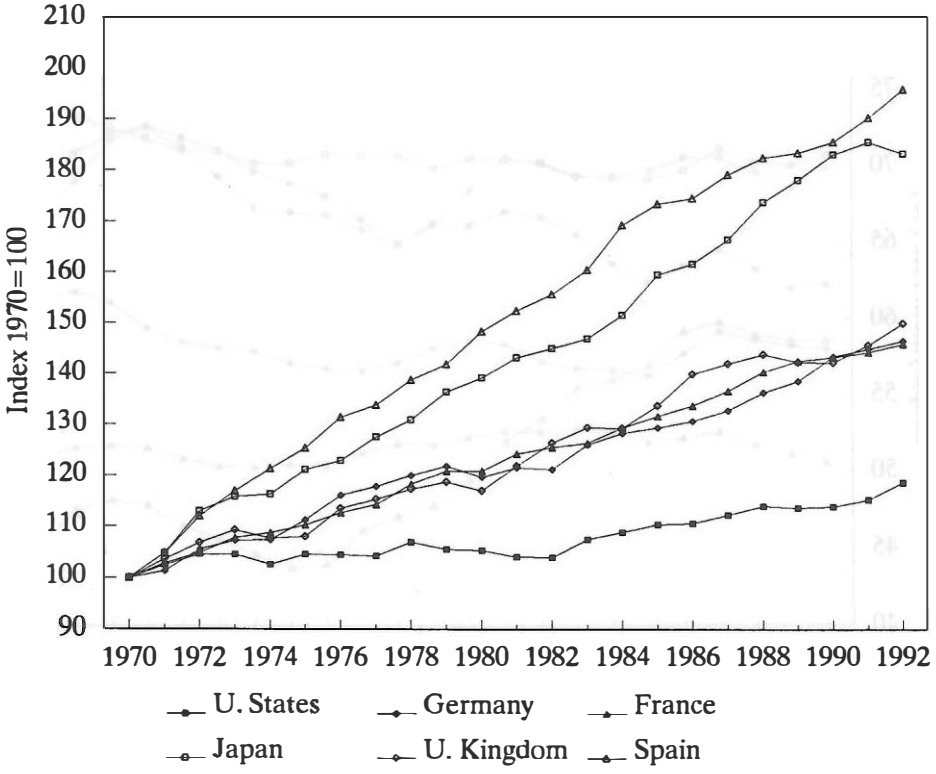


Figure 4. Output per person of working age

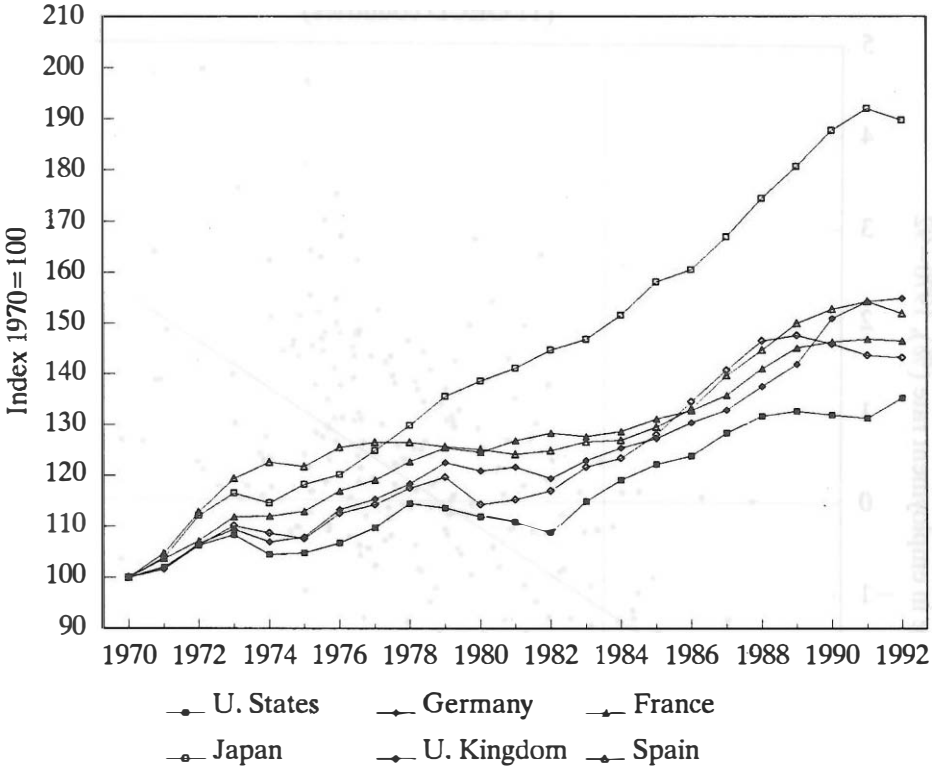


Figure 5. Employment rate vs. Output growth
(11 OECD countries)

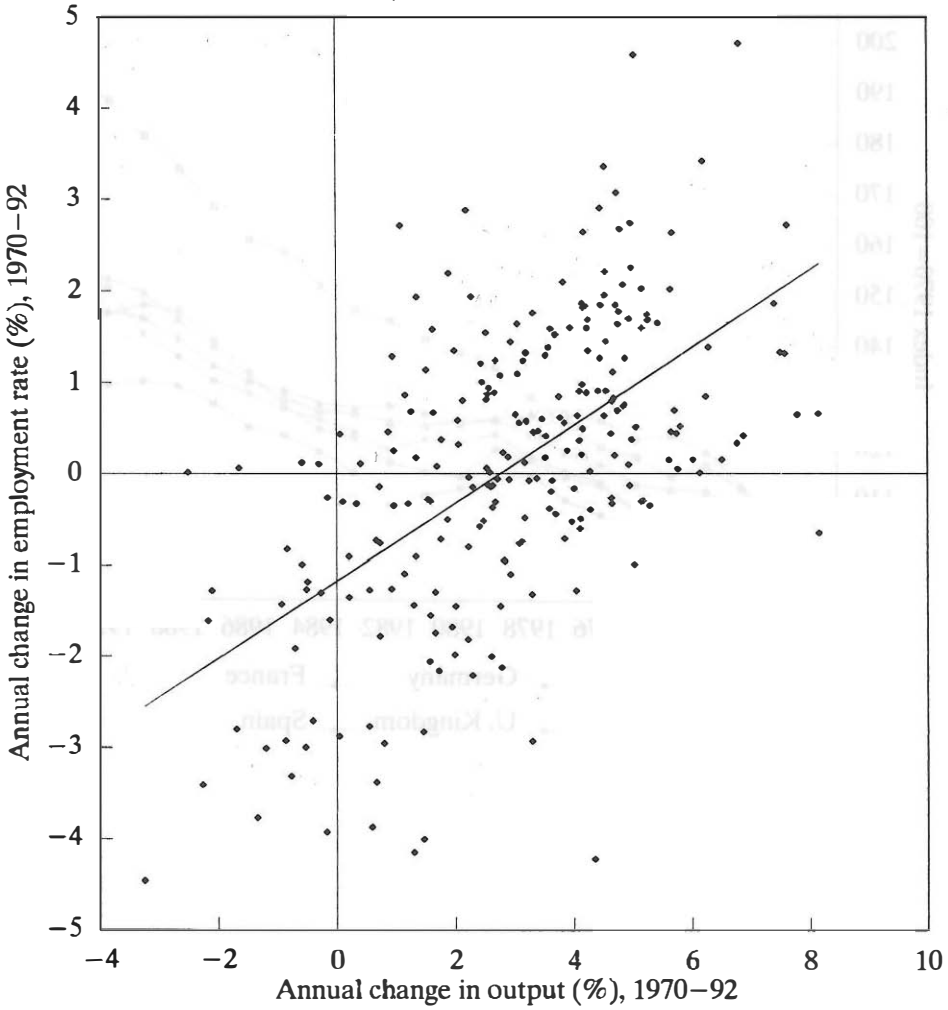
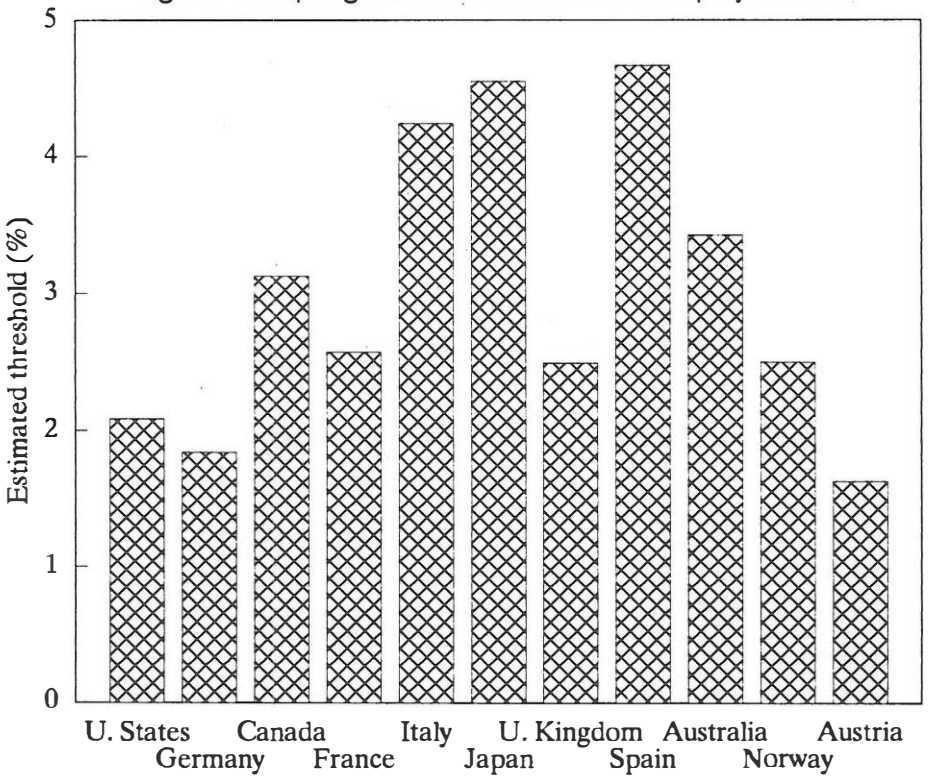


Figure 6. Output growth thresholds for the employment rate



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