Public Enterprises and Labor Market Performance*

Johannes Hörner
Kellogg School of Management, Northwestern University
L.Rachel Ngai Claudia Olivetti
London School of Economics and CEP Boston University
March, 2003

Abstract

This paper suggests that state involvement in the production sector in European countries may contribute to the explanation of the differences in the evolution of unemployment in Europe and the United States. We report evidence on the scope and size of state-owned enterprises and relate it to labor market performances. We develop a simple model in which state enterprises offer less risky wage profiles and show that in the presence of economic turbulence this may lead to higher unemployment in more interventionist countries.

*We have benefited from comments of Francesco Caselli, Kevin Lang, Christopher Pissarides, Richard Rogerson, Robert Shimer, Chung Yi Tse and participants at Boston University, Hong Kong University of Science & Technology, London School of Economics and the Second Biennial Conference of Hong Kong Economic Association.
1 Introduction

Over the past few decades the labor market performance of most European countries has been substantially different from the experience of the United States. Most European countries experienced a dramatic and persistent increase in unemployment rates. As shown in Figure 1, in the 1960s, European unemployment rates were lower than the US unemployment rate. Starting in the late 1970s/early 1980s, unemployment rates started to rise in most European countries. By the year 2000, unemployment rates in many European countries were more than double the US unemployment rate.1

The literature has mainly focused on the role of labor market institutions in explaining Europe/U.S. differences in labor market outcomes.2 The standard view is that the interaction between common adverse shocks and diverse labor market institutions, such as minimum wage, hiring/firing policies, and unionization, generates both the increase in unemployment and the heterogeneity in its evolution.3 This paper suggests that another hitherto overlooked channel may contribute to the explanation of these differences. We argue that the difference in ownership structure with several industries directly or indirectly controlled by the state in Europe can affect the operation of labor markets.

Previous literature emphasizes how different labor market institutions affect firms’ hiring/firing decisions and workers’ incentives.4 Our argument is not based on incentives. Rather, it is based on the different implication of profit and welfare maximization. Surprisingly, welfare maximization does not necessarily imply a lower unemployment rate.5

We restrict our attention to the role of public or state-owned enterprises and exclude typical public sector activities, such as the provision of education, health services, public security, and administrative services.6 We define public enterprises as government-owned or -controlled economic

---

1 A similar picture emerges when we look at the dynamics of employment to working-age population ratios, with many European countries (the more “protective” ones) being characterized by lower (and declining) employment rates and the US employment rate steadily growing over the same time period.

2 See Nickell (1997) for a comprehensive study of differences in labor market institutions in Europe and in the U.S.

3 See among others, Layard, Nickell and Jackman (1991), and Blanchard and Wolfers (2000).

4 See Bentolila and Bertola (1990), Bertola and Ichino (1996), Bertola and Rogerson (1997), and Mortensen and Pissarides (1999a and 1999b) for examples of mechanisms emphasizing demand side factors, and Marimon and Zilibotti (1999), and Ljungqvist and Sargent (1999, 2001) for supply side mechanisms.

5 There is also a related literature that studies the effect of state ownership of enterprises on productivity and efficiency. For example see Ehrlich, Gallais-Hamorno, Liu, and Lutter (1994).

6 Although the government is also a “big” employer in the U.S. (about 15% of total employment in 1994 compared to about 18% for France, and Italy) huge differences characterize “Europe” and the U.S. in terms of the extent of public sector involvement in basic services such as health care provision, and schooling. The share of health services
entities that generate most of their revenue by selling goods and services. This definition includes commercial, industrial, and financial enterprises directly operated by a government department and those in which the government holds a majority of shares directly or indirectly through other state enterprises. It also includes enterprises in which the state holds a minority of shares if the distribution of the remaining shares leaves the government with effective control (and/or “golden share”). The definition excludes public sector activities such as education, and health services, that are financed in other ways, usually from the government’s general revenue. By government or state, we mean all the different levels of public governance (state level, and municipalities). Indeed, whereas the only public enterprise in the United States is the postal service, in many European countries the government is present in sectors typically run by private companies in the United States, such as banking, car manufacturing, airlines, telecommunications, oil extraction, refinement and distribution. Although a wave of privatizations has been underway since the early 1980s in many European countries, this process was significant in only a few countries, such as Germany and the United Kingdom. In other European countries, such as France, Italy, and Spain, although a limited privatization of state-owned concerns started early 1980s, the bulk of privatizations only occurred in the early 1990s.

We take these differences in ownership structure as given. In fact, most of these institutions trace back their origins to the post WWII period. There are different historical motivations for the emergence and evolution of public enterprises in many European countries in the 1950s and 1960s. Social motives, such as the desire to guarantee full employment, and to provide those infrastructures and services needed to enhance the country’s productivity; strictly economic motives such as the belief that some services, such as electricity, water, telecommunication (beside education and health), should be controlled and provided by the public sector in order to insure that every citizen could have basic services at a fair price. Finally, national motives, such as the need for country specific investment in the country’s armed force and in its defense system.

We compare two, two-sector economies that only differ in their ownership structure. In the

provided by the public sector is twice as large in European countries and in Canada as in the U.S. The U.S. public health expenditure share has been equal to about 40% of total expenditure in health care since 1975. Over the same time period the public health expenditure share ranged between 70% and 90% for many European countries and Canada (source, OECD).

See Toninelli (2000) for an extensive analysis of the emergence and evolution of state-owned enterprises for a selected number of countries (Italy, France, Germany, Spain, UK and the U.S.).

As discussed in Toninelli (2000), this is the market failure argument that can be illustrated by the case of a natural monopoly in the public utilities sector. In this case, if it is cheaper to produce goods under a monopoly than under competition or oligopoly, and potential market entrants can be held off without predatory measures, then it would be beneficial for the government to run this sector in order to avoid unregulated private enterprises to exploit the market.
European economy, the first sector is public, while the second is private. In the US economy, both sectors are private. There are two differences between public and private sector. First, in a private sector, a worker’s wage is exogenous. In the public sector instead, his wage is set by the government. Second, in the private sector, the number of firms is determined by free entry. In the public sector, the number of firms is set by the government. To produce, a firm needs to open a vacancy whose cost is sunk, and to hire a worker. Workers and firms meet randomly. The search is directed. In both economies, the government seeks to maximize welfare that is, the expected utility level of a representative worker, subject to budget balance. In the European economy, the government controls the unemployment benefits, the (income) tax rate, the measure of public firms, and the wage paid to its employees. In the U.S. economy, the government only controls the unemployment benefits and the tax rate.

Our main finding is that unemployment may be higher in the European than in the U.S. economy. In addition, this difference may become more pronounced when the economy becomes more turbulent. Specific conditions under which those results obtain are discussed below.

The rest of the paper is organized as follows. Section 2 provides cross-country evidence on the scope and size of public ownership, and discusses how public ownership relates to cross-country variation in employment rates. Section 3 describes the model. Finally, we discuss the main implications of our model in Section 4.

2 Public Ownership and Employment

In this section we provide some evidence of the relationship between the degree of government involvement in the production sector of the economy and the labor market outcomes. It is very difficult to find comparable cross-country data on the public sector and on public enterprises. Countries differ in the structure of their government and degree of centralization, in their accounting procedures and so forth. Moreover, the organizational and ownership structure of state-owned enterprises may be very different both across sectors and across countries, and the boundaries between the public and the private sector may be somewhat blurry. Hence, to document these facts, in this section we use a variety of data sources.9

We first present data on the scope and size of public enterprises in the economy. For some select countries, we also analyze the evolution of their economic weight over time. Finally, we use cross country indexes that have been constructed to measure the extent of state control in the economy, both through direct or indirect ownership and through legislation, to show, at least to a first

---

9Our main data sources are the OECD (reports and web page), the World Bank (including data from their Cross National Data on Government Employment and Wages web page), and the Economist Intelligence Unit.
approximation, the role of public ownership in explaining cross-country variation in employment rates.

2.1 The Scope and Size of Public Enterprises

The market power of state-owned enterprises (SOEs) and its evolution vary dramatically across countries. In many European countries the presence of the state in the economy stems from historical factors. After WWII, governments wished to intervene in the national economy, and to support the employment level. These concerns resulted in a substantial presence of the state in a number of industrial, financial, and commercial sectors of the economy. Although a wave of privatizations has been underway in Europe since the 1980s, in many countries the presence of the state in these sectors was still quite pervasive in the early 1990s. For instance, in Italy the state still owned four of Italy’s top-ten corporate groups, and five of the top-ten individual businesses at the beginning of the 1990s. In 1996, more than fifty percent of Italy’s banks were state-owned. Moreover, at that time, the state still had a statutory or de facto monopoly over basic phone services, gas import and distribution, and cigarettes and tobacco. Over the same period, in Spain, the total product of one of the three state holding companies accounted for more than 7% of Spain’s GDP, and for about 10% of Spain’s industrial production (including 100% in aluminum). In contrast, at the same time, only a few services, including electricity and railways, were run as public enterprises in the U.S. where, starting in the late 1990s, there seemed to be public support for the privatization of basic services such as prisons, schools (charter schools), water supply and distribution. In Germany, federal, state and local government have equity participation in many firms although no majority stake. In the UK once privatizations of state-owned enterprises, including among other, the car manufacturer Jaguar, began, all public utilities were privatized.\textsuperscript{10}

In order to document these facts, we use the \textit{Country Commerce Reports} from the Economist Intelligence Unit to build a list of (industrial, commercial, and financial) sectors where SOEs operate for some select European countries and the U.S.. We restrict our attention to the following subset of countries: France, Germany, Italy, Portugal, Spain, UK and U.S.A. This is by no means a complete list but it provides enough variation in the degree of government control of the economy - from the most interventionist European countries to the least interventionists Anglo-Saxon countries. We do not distinguish between SOEs run at the federal, state, or local level. Moreover, we also do not distinguish between enterprises that are 100%-owned by the government, and enterprises in which the government has some majority share, and from enterprises in which the state holds a minority of shares while keeping effective control through a golden share. Table 1 summarizes our

\textsuperscript{10}Only British Waterways, an agency that manages canals and other inland waterways, was still state-owned in 2000.
findings for the early 1980s. The results for the early 1990s are reported in Table 2. As it is clear from the tables the extent of government involvement did not change substantially between the two decades. The only exception are Canada and the UK, which seriously engaged in privatizations in the early 1980s. In the table, the yes entries represent the presence of the government as an entrepreneur in each particular sector. As shown in the table, the presence of the government is massive in countries such as Italy, France, and Spain. Its activities range from air transportation to oil extraction, refinement, and distribution, and computer and electronics. On the other hand, public enterprises only operate in a few subsectors of the economy in the U.S. (railways, postal services, and water distribution). Coincidentally, the UK is one of the few European countries to experience a non-negligible growth and a decline in unemployment over the 1990s. As shown in the table, countries with high (and persistent) unemployment rates in the 1980s and the 1990s, such as France, Italy and Spain, are also characterized by a higher degree of government involvement in the production sector of the economy.

The question is whether the economic weight of public enterprises in the economy is also quantitatively relevant. First, we use data from the OECD to quantify the importance of employment in public enterprises over total employment. Data for different countries are available for different years between 1993 and 1996. Once again, cross-country comparison must be taken with caution since different countries have a different way of classifying public enterprises. For instance, Austria is the only country where social security offices and agencies have public enterprise status.

Table 3 summarizes data on the employment in the limited public sector and in public enterprises as a fraction of total employment. We define public enterprises as government-owned or -controlled economic entities that generate most of their revenue by selling goods and services. The limited public sector includes ministries and other services of (central and local) government, education, health, and the army, as well as other activities that are mainly financed through the government’s general revenue. The first column shows how the size of the limited public sector is very similar for high unemployment Southern European countries (18.2% for Italy, 15% for Spain, and 20% for France) and the U.S. (around 14%), and it is actually higher for Scandinavian countries (more than 30% of total employment both in Sweden and in Denmark) where unemployment rates are relatively lower. Hence, public sector employment seems to bear no strong relationship with a country’s

---

11 However, the decline in public ownership is only one of the factors that may have contributed to the decline in unemployment in the UK. Over the same time period, labor market institutions were also reformed. It is not the aim of this paper to disentangle the two effects.

12 The data are taken from the 1997s report “Measuring Public Employment in OECD countries: Sources, Methods, and Results”. To our knowledge this report provides the best available data on employment in the public sector. In particular, it presents figures that are comparable across countries, and include measures of employment in public enterprises. The different national data sources are also discussed in details in the report.
The role of the government in the production sector of the economy seems to be more important. Entries in the second column of Table 3 represent the share of employment in *public enterprises* relative to total employment. This share is almost negligible in countries such as the U.S. (0.7%) and Japan (0.5%) where unemployment rates are relatively low, whereas it is a quantitatively relevant part of total employment (above 4%) for many European countries that have been characterized by high and persistent unemployment during the 1980s and 1990s. As previously mentioned, for many countries it is hard to distinguish between private and public firms, since the statute of public enterprises is such that although they are public in nature, they operate in typical private sector activities. However, we consider these data indicative of the fact that the presence of a big public enterprises may have an effect on a country’s labor market performance.

We also use World Development Indicators from the World Bank to provide information on the weight of the economic activity of SOEs as a share of GDP, and of investments of commercial SOEs as a share of gross domestic investments for the period 1985-1990. Data are summarized in Table 4. The table shows that the fraction of economic activity due to SOEs is three times as large in France and Greece than in UK, and four times larger in Portugal relative to the UK. Similarly, the investment shares of SOEs in Greece, Portugal, and Italy are about twice as large as in the UK. Unfortunately data are available only for these countries. Finally, to corroborate our point, we also look at the evolution of the economic weight of SOEs over time. Table 5 reproduces Table 9.1 in Toninelli (2000). The entries in the table are computed by averaging SOEs weight in employment, GDP, and gross capital investment. The weight of public enterprises is twice as large in Italy and France than in Germany and the UK. Moreover, in 1990 the UK dramatically reduced the size of its public enterprises. In the same year the economic weight of SOEs is almost five times larger in Italy and France than in the UK, and about twice as large in Spain and Germany than in the UK.  

13This is consistent with the empirical analysis in the work by Algan, Cahuc, and Zylberberg (2002). Their work shows that public employment may have a crowding out effect on total employment only in those countries where the public goods produced are substitute for private sector goods.

14Note how both in Italy and in the UK the weight of public enterprises doubled between 1963 and 1979. Italy was characterized by a wave of nationalisations especially in the oil extraction, refinement and distribution with the creation of ENI a huge state-owned conglomerate. This brings us to the debate on the endogeneity of a country’s institutions. The increase in the economic weight of SOEs could be a response to some aggregate shock to the economy- in this case, the first 1973/1974 oil shock. In this paper, we just compare two economies with a different (and exogenous) ownership structure at one point in time.
2.2 State Control and Employment: Cross-country Evidence

We now turn to the analysis of whether state ownership or state control in the economy has a role in explaining cross-country differences in employment rates. Figure 2 and Figure 3 plot the index of employment protection legislation (EPL) for the late 1990s, and the corresponding indexes of state control and state ownership in the economy. The latter are taken from the work by Nicoletti, Scarpetta and Boylaud (1999 and 2001). These indexes are available for the late 1990s, and are based on families of indicators constructed according to a “taxonomy of regulatory intervention in the product market”. The indicators have a pyramidal structure and the summary indicators are obtained by assigning weights to the lower level indicators using factor analysis. The state control index is used to build this summary index, which represents the state control of business-sector activities. It summarizes information about the modalities of state intervention (i.e. public ownership and interference in private firms). The indicators of these two modalities of government intervention are obtained by adding up (with appropriate weights) more specific features of the regulatory regimes. The EPL index is computed in a similar fashion in order to summarize the extent of regulation in the labor market. In particular, the index is ranked into 20 levels according to five criteria: working time, fixed term contract, firing costs, minimum wages, and employee’s representation rights.

While the index of state control (and the index of state ownership) lack a time dimension, the index of EPL does (it is also available for the late 1980s). Therefore, in this paper we restrict our attention to the late 1990s. In Figure 2 we plot the index of EPL for the late 1990s against the index of public ownership (which is a subset of the index of state control). In Figure 3 we plot the index of EPL against the index of state control. The sample is the subset of the twenty countries for which we have data on the size of employment both in public enterprises and in the general public sector for the mid 1990s. Both Figure 2 and Figure 3 show a very strong correlation between the EPL index and the indexes of state control and of public ownership across countries. The correlation between the index of EPL and the sub-index that solely focuses on public ownership is equal to 0.72 and is statistically significant at the 1% level. When we use index of state control, the correlation rises to 0.8 and, again, it is statistically significant at the 1% level. This is not surprising since, as pointed out in the literature, cross-country indicators

\[15\] For example, the index of public ownership is based on summary indexes of the scope and size of public enterprises, whereas the index of interference in private firms summarizes information about the government special voting rights, and use of command and control regulation. See Nicoletti, Scarpetta and Boylaud (1999), pg. 10-25 and Tables A2.1.1 to A2.1.5 in the Appendix.

of institutions tend to be positively correlated. However, the higher correlation between these two indexes implies that it may be very difficult to empirically identify their effect on labor market performance. Moreover, it seems to indicate that the scope and size of public sector control in the business sector is as important as the presence of EPL.

In the literature there is some agreement on the fact that there exists a negative (cross-country) relationship between the index of EPL and the employment rate, and employment growth. In Figure 4, we show how a similar pattern also characterizes the index of state control and the index of private ownership. As in Figure 2 and Figure 3, we restrict our attention to the sample of twenty countries. Figure 4 plots the employment-to-working-age population rate in 1996 against the index of state control, the index of public ownership, and the index of EPL for the late 1990s (Figure 4.1, Figure 4.2, and Figure 4.3, respectively). In the figure, we also report the simple correlation coefficients and their level of significance. We find that there is a strong negative relationship between employment (and employment growth) and the different indexes. In particular, the index of state control seems to be slightly more important then the indicator of EPL. The negative relationship is even stronger when we exclude employment in the agricultural sector (Figure 5.1 to 5.3). One of the reasons for excluding the agricultural sector from our analysis is that the regulatory indicators do not include provisions (contained in national and supranational agricultural policies) that are very important for employment in this sector. Moreover, individuals are mostly classified as self-employed in the agriculture sector.

These are simple correlations, and they could be completely driven by other institutional or economic factors that are not taken into account in the bivariate analysis. Thus, they provide only suggestive evidence of the existence of a negative relationship between state ownership and unemployment. However, Nicoletti et al. (2001) also find that the negative correlations is robust to the inclusion of other factors in the regression analysis, although they also use more general measures of product-market regulation. In particular, they find that the (simple) cross-country correlation between employment rate in 1995 (in the non-agricultural business sector) and the

---

17For the index of EPL there is also a concern that countries with higher employment protection may be associated with higher values of the index ‘by construction’. This may also be the case for the index of State Control and the index of Public Ownership.

18See OECD Employment Outlook, 1999. In the literature there is disagreement on the effect of EPL on unemployment rates. From a theoretical standpoint, some form of employment protection legislation (such as firing costs) affect the steady state inflow rate into unemployment and the unemployment duration in opposite direction. Hence, the effect on the steady state unemployment is uncertain. From an empirical point of view, part of the problem with using (standardized) unemployment rates to compare labor market outcomes across countries derives from the definition of unemployed. Even though all countries in the OECD use the same criterion, it is plausible that in practice this categorization varies systematically across countries.
index of state control is equal to -0.73 and significant at the 10% level, and that the correlation between employment rate and the index of public ownership is equal to -0.71 and again significant at the 10% level. Moreover, they also show that these two indexes have a negative relationship with employment growth between 1982 and 1995 (-.39 and -.44 respectively for the two indexes). Just to give an idea of the order of magnitude, the index of employment protection policies has a correlation of -0.61 with employment rate in 1995 and of -0.45 with the growth in employment rate between 1982 and 1995. To conclude, we believe this analysis provides evidence that the distortions of economic mechanisms introduced by the presence of the state in the business sector (both in terms of ownership, and in terms of state involvement through regulatory action) could help explain the pattern of employment rates across OECD countries to the same extent that the institutional factors specific to the labor market (unemployment benefit, minimum wage, firing/hiring costs) can. These results must be seen in light of the strong positive correlation between the summary measures of EPL and the indexes of state intervention in the economy. In practice, it is very hard to identify the separate contribution of these two types of institutions to the explanation of cross-country differences in employment rates and in their dynamics. In this paper we focus on the study of the mechanism through which public ownership may affect labor market outcomes across countries. The quantitative analysis of this issue is certainly interesting and it is left for future research.

3 Model

We compare two economies that only differ in their ownership structure. In each economy, there are consumers, workers, capitalists and a government. Each firm operates in one of two sectors, sector 1 and 2, producing respectively the only two consumption goods, good 1 and 2. Firms have identical production technologies, requiring exactly one unit of capital and one worker. The output of a firm is independently and identically distributed. In all sectors, capital is rent from capitalists at a fixed exogenous price. In the European economy, the first sector is public, while the second is private. In the U.S. economy, both sectors are private.19 There are two differences between public and private sector. First, in a private sector, a worker is paid an exogenous fraction of the output’s value. In the public sector, his wage is set by the government. Second, in the private sector, the number, or mass, of firms is such that expected profit is zero. In the public sector, the mass of firms is set by the government.

19In this description, the public sector correspond to state-owned enterprises exclusively. Other components of the public sector, such as administrative services, defense, health and education, that are present in both economies and typically produce nonmarket goods, are omitted from the analysis.
In each economy, there is a unit mass of workers. Workers and firms having rent capital meet simultaneously according to a matching technology which we assume is homogenous of degree one. The search is directed. Workers are risk-averse and choose whether and where to search to maximize their expected utility as consumers. In both economies, unemployed workers, that is, workers that remain unmatched, are entitled to benefits set by the government. Moreover, both labor and capital incomes -including unemployment benefits- are taxed at an identical rate fixed by the government. Net labor and capital income are spent by consumers (workers and capitalists) on the two goods. Prices clear the goods markets.

In both economies, the government seeks to maximize welfare that is, the expected utility level of a representative worker, subject to budget balance. In the European economy, the government controls the unemployment benefits, the tax rate, the measure of public firms, and the wage paid to its employees. Its revenues consists of the tax revenues, the sales revenues of good 1, and its expenditures consist of capital expenditures as well as unemployment benefits and wages paid in the public sector. However, in the U.S. economy, the government only controls the unemployment benefits and the tax rate. Its revenues consist of tax revenues, and its expenditures consist of unemployment benefits.

An equilibrium for a given economy is a vector of prices and an allocation such that: 1. Workers search decisions are optimal; 2. Government maximizes welfare subject to budget balance; 3. goods markets clear. In addition, we restrict attention to equilibria in which both sectors are active. This would necessarily be the case if, for instance, Inada conditions were imposed on the consumers’ utility functions, rendering both goods essential.

Before solving the model, let us emphasize the three key assumptions. First, the matching technology is homogeneous of degree one. Second, the production technologies across sectors are the same. Third, the government maximizes the representative worker’s expected utility, not the capitalist’s. Because of the first two assumptions, comparing unemployment rates across economies reduces to comparing the market tightness between a publicly-run sector and a privately-run one. The third implies that the government bears a real cost when it opens a vacancy, because the rental fee is paid to the capitalist, not the worker.\textsuperscript{20}

However, creating a vacancy in the public sector generates a revenue to the government, namely, the output’s value it generates. Therefore, the government faces a familiar trade-off while deciding how many public vacancies to post. [Along with the unemployment benefits it sets, which, not surprisingly, provide full insurance to the worker, this variable pins down all other unknowns in the model: there exists anyway a unique public wage such that workers are indifferent between searching in either sector, a unique price that clears the market, and a unique tax rate that balances the

\textsuperscript{20}Otherwise, the government would choose an infinite measure of public firms.
Accordingly, the measure of public vacancies equalizes the corresponding marginal revenue with the marginal cost. If this sector is run privately instead, as expected profits are zero, the firms’ total revenues are necessarily equal to their total cost (beware however, that these costs and revenues are not the same than for the government). Therefore, the comparison of unemployment rates may go either way, depending on the parameters.

4 Analysis

Assume that the utility function \( u : \mathbb{R}^2_{++} \to \mathbb{R} \) is smooth, jointly strictly concave and strictly increasing in both parameters. Following the empirical literature we assume that job-searchers and vacancies in both sectors are matched through an homogenous of degree one matching function. Moreover, for convenience we will further assume a Cobb-Douglas specification (hereafter CD). In particular, in each sector \( i = 1, 2 \) the number of matches \( M_i \) can be written as \( A_i u_i^\gamma_i v_i^{1-\gamma_i} \), \( \gamma_i \in (0,1) \) where \( u_i \) is the measure of searchers in sector \( i \) while \( v_i \) is the measure of vacancies posted in sector \( i \). Let \( \gamma_i = \gamma, i = 1, 2 \), just as \( A_i = A, i = 1, 2 \), \( Y_i = Y \) a.s., \( i = 1, 2 \), and \( \alpha_i = \alpha, i = 1, 2 \), \( \theta_i = v_i/u_i \). We denote the proportional tax rate by \( \tau \), the relative price of good 1 by \( p \), the wage in sector \( i = 1, 2 \) by \( w_i \) and the unemployment benefit by \( w_0 \). Superscripts \( S \) and \( E \) refer to the U.S. and the European economy, respectively.

The proof goes as follows. Lemma 1 establishes that the relative price of good 1 in the U.S. is 1. This implies that comparing employment rates \( E^S \) and \( E^E \) between countries boils down to comparing the market tightness of the first sector across countries (Lemma 2). Lemma 3 shows that workers are completely “insured” in Europe, that is, workers are indifferent between being unemployed and working in either sector. Using this result, Lemma 4 determines the values of the relevant market tightnesses.

The next lemma shows that CD and IT imply that the relative price in the U.S. economy is 1.

**Lemma 1** \( p^S = 1 \).

21 There are a few empirical studies that show how a Cobb-Douglas approximation of the matching function fits the data well. Petrongolo and Pissarides (2001) offer an extensive survey of this literature.
Proof. Let \( p \) stand for \( p^S \) in what follows in this proof. From the zero profit condition (hereafter ZP) and CD, we get that:

\[
\frac{\theta_1}{\theta_2} = p^{1/\gamma}
\]

Therefore, because searchers are indifferent across sectors (hereafter LI):  

\[
\frac{p^1}{e^{\theta_1}} = \frac{p^2}{e^{\theta_2}} \quad [Ev((1 - \tau) \alpha p Y; p) - v((1 - \tau) w_0; p)] = [Ev((1 - \tau) \alpha Y; p) - v((1 - \tau) w_0; p)],
\]

where \( v(\cdot) \) is the consumer’s indirect utility function. If the R.H.S. is zero, then so must be the L.H.S., so that

\[
Ev((1 - \tau) \alpha p Y; p) = Ev((1 - \tau) \alpha Y; p),
\]

and therefore \( p = 1 \). If the L.H.S. is nonzero, then the right hand side is not either. In particular, both must be strictly positive for workers to actively search. Notice then that for \( p > 1 \), \( p^1 > 1 \) and \( Ev((1 - \tau) \alpha p Y; p) > Ev((1 - \tau) \alpha Y; p) \) imply that the equality cannot hold, and a similar reasoning applies for \( p < 1 \). The equality trivially holding for \( p = 1 \) therefore implies that this is the unique solution. ■

The second lemma shows that CD and IT imply that comparing (un)employment rates boils down to comparing market tightnesses of the first sector across economies.

Lemma 2 \( E^E > E^S \) iff \( \theta_1^S > \theta_2^E \)

Proof. Observe that total employment \( E \) satisfies:

\[
E = M_1 + M_2 = \phi(\theta_2) + u_1(\phi(\theta_1) - \phi(\theta_2)),
\]

where \( \phi(\theta) \) is the probability that a job searcher is matched with a vacancy given market tightness \( \theta \). So

\[
E^E - E^S = u_1^E(\phi(\theta_1^E) - \phi(\theta_2^E)),
\]

since \( \theta_1^S = \theta_2^S = \theta_2^E \) by ZP. ■

The remainder of the appendix focuses on Europe and superscripts are accordingly dropped. The next lemma shows that the wage in the public sector is the certainty equivalent of the (risky) wage in the private sector, and that the unemployment benefit completely insure searchers.\(^{22}\) Because the government is risk-neutral and workers are risk-averse, the optimal unemployment benefits and public wage are fixed numbers rather than lotteries. Similarly, the government can

\(^{22}\)Note that introducing a disutility of working merely amounts to introducing a wedge between the unemployment benefit and the certainty equivalent of the wage in either sector, without changing the full insurance result.
always decrease the spread between this public wage and the unemployment benefit in a way that both increases welfare and decreases the government’s expenditures. (However, the proof is a little more involved than this intuition suggests, because it is typically not possible to only change those two variables while keeping searchers indifferent across sectors).

**Lemma 3** For given $p$ and $\tau$, $w_0 = w_1 = w$, where $E v((1 - \tau) w_2, p) = v((1 - \tau) w, p)$

**Proof.** Fix $p > 0$ throughout and let $\omega_i = (1 - \tau) w_i$ $i = 0, 1, 2$. For sake of contradiction suppose not, that is $w_0 < w_1$ and therefore $w_0 < w$ (by LI). Without loss of generality (we reverse the role of indices in what follows otherwise) we assume that:

$$\frac{M_1 v_p(\omega_1, p)}{u_1} + \frac{(u_1 - M_1)}{u_1} v_w(\omega_0, p) \geq \frac{M_2 E[v_p(\omega_2, p)]}{u_2} + \frac{(u_2 - M_2)}{u_2} v_w(\omega_0, p),$$

where $v_w$ and $v_p$ are the derivatives of $v$ with respect to $w$ and $p$. Define then $\frac{\Delta w_i}{\Delta}$ such that :

$$\frac{M_1}{u_1} v_w(\omega_1, p) \frac{\Delta w_1}{\Delta} + \frac{(u_1 - M_1)}{u_1} v_w(\omega_0, p) = 0. \tag{*}$$

Then given that $v$ is strictly concave we have that:

$$\frac{M_1}{u_1} \frac{\Delta w_1}{\Delta} + \frac{(u_1 - M_1)}{u_1} < 0.$$

Next, for $\frac{\Delta p}{\Delta} < 0$, define $\frac{\Delta w_2}{\Delta}$ such that :

$$\frac{M_1}{u_1} v_w(\omega_1, p) \frac{\Delta w_1}{\Delta} + \frac{(u_1 - M_1)}{u_1} v_w(\omega_0, p) + \left( \frac{M_1 v_p(\omega_1, p)}{u_1} + \frac{(u_1 - M_1)}{u_1} v_p(\omega_0, p) \right) \frac{\Delta p}{\Delta} \tag{**}$$

$$= \frac{M_2}{u_2} E[v_w(\omega_2, p)] \frac{\Delta w_2}{\Delta} + \frac{(u_2 - M_2)}{u_2} v_w(\omega_0, p) + \left( \frac{M_2 E[v_p(\omega_2, p)]}{u_2} + \frac{(u_2 - M_2)}{u_2} v_p(\omega_0, p) \right) \frac{\Delta p}{\Delta}.$$

Notice that Government controls the random variable $\omega_2$ downwards through the tax rate $\tau$. Since by assumption the last term on the L.H.S. is smaller than the last term on the R.H.S., and the first terms on the L.H.S. sum to zero it must be that:

$$\frac{M_2}{u_2} E[v_w(\omega_2, p)] \frac{\Delta w_2}{\Delta} + \frac{(u_2 - M_2)}{u_2} v_w(\omega_0, p) < 0.$$

Then given that $v$ is strictly concave we have that:

$$\frac{M_2}{u_2} \frac{\Delta w_2}{\Delta} + \frac{(u_2 - M_2)}{u_2} < 0.$$
Define finally $\frac{\Delta p}{\Delta}$ by:

$$\frac{M_1 \Delta \omega_1}{u_1} + \frac{(u_1 - M_1)}{u_1} + \frac{M_2 \Delta \omega_2}{u_2} + \frac{(v_2 - M_2)}{u_2} = M_1 Y \frac{\Delta p}{\Delta},$$  

and observe that by construction it is indeed negative. To conclude the proof it remains to observe that by Taylor's theorem there exists a sufficiently small $\Delta > 0$ in the net unemployment benefits $\omega_0$ and corresponding changes $\Delta p$, $\Delta \omega_1$, and $\Delta \omega_2$ such that LI and Budget Balance (hereafter, BB) are maintained while welfare increases. (*), (**), and (***) imply that worker searching in sector 1 are better off from the change, and (**) implies that LI is maintained (which in turn implies that workers searching in sector 2 are also better off). Finally, (***) implies that the budget remains balanced. 

The final lemma provides closed-form solutions for the two relevant market tightnesses. The market tightness for the public sector is slightly more complicated to determine than for the private sector. The idea is as follows. Given the relative price of good 1, the gross income of a worker in the private sector is determined, and cannot be influenced by the government. This gross income pins also down the gross income of unemployed workers and of workers in the public sector, given the previous lemma. Given a relative price and the consumer’s gross income, the indirect utility function of a consumer decreases in the tax rate. Therefore, to maximize welfare, for a given relative price, the government should minimize the tax rate. In particular, this implies that, at the optimum, the government cannot, by changing $u_1$ or $v_1$, increase its surplus, for otherwise it could have chosen a lower tax rate. Therefore, holding the price fixed, the derivatives with respect to $u_1$ and $v_1$ of the budget surplus should be zero, which, along with budget balance, pins down the market tightness. However, the price may change as $u_1$ and $v_1$ change, and this price change has two effects on welfare: one positive, because it is likely to decrease the relative price of good 1, one negative, because to offset this loss in budget revenue, the government needs to increase the tax rate to balance the budget. If consumer’s utility function displays constant elasticity of substitution between the two goods, these two effects cancel each other.

**Lemma 4** $\theta_1 = \frac{1-\gamma}{\gamma} \frac{w}{R} \pm \sigma$, and $\theta_2 = \left( \frac{A(1-\alpha)Y}{R} \right)^{1/\gamma}$, where $\sigma = 0$ with constant elasticity of substitution.

**Proof.** $\theta_2$ is easily found from ZP. Using the previous lemma, we write $w_0$, $w_1$ and $w$ interchangeably. Observe that the government can dissipate any surplus without changing the price by increasing sufficiently the net unemployment benefits $\omega_0$ and reducing the tax rate in the amount necessary to maintain labor indifference. Such a change would unambiguously improve welfare. As a consequence, at the optimum, the government cannot change $u_1$ nor $v_1$ in such a way as to create a surplus (Notice that $u_1$ and $v_1$ do not affect welfare directly). Therefore, if we write BB
as \( f(u_1, v_1) = 0 \) for some \( f \), it must be that \( \frac{df(u_1, v_1)}{du_1} = 0 \) and \( \frac{df(u_1, v_1)}{dv_1} = 0 \) at the optimal values \( (u_1, v_1) \). Holding the price fixed, we have therefore:

\[
(1 - M_2)(1 - \tau) w + (1 - \tau) Rv_1 = pM_1 Y + \frac{\tau}{1 - \alpha} Rv_2,
\]

where \( M_2 = (1 - u_1) A^{\theta_2^{1-\gamma}}, \) \( M_1 = u_1 A^{\theta_1^{1-\gamma}}, \) \( u_2 = (1 - u_1) \theta_2 \) (We used ZP to rewrite budget balance). In addition:

\[
pM_1 Y = \frac{(1 - \tau) Rv_1}{1 - \gamma}
\]

\[
(1 - \tau) M_2 w = \gamma pM_1 Y \frac{1 - u_1}{u_1} - \frac{\tau Rv_2}{1 - \alpha}.
\]

Substituting back into the budget constraint yields that \( \theta_1 = \frac{1 - \gamma}{\gamma} \frac{w}{R} \). Changing \( u_1 \) and \( v_1 \) may affect the price however, which affects both the welfare (the consumer’s indirect utility function is decreasing the price) directly, and indirectly through the tax rate that adjusts to balance the budget. We summarize this effect by \( \sigma \), which may be either positive or negative. When the utility function exhibits constant elasticity of substitution, it is straightforward to compute the optimal choices and verify that \( \sigma = 0 \). □

Observe that \( \theta_1 = \frac{1 - \gamma}{\gamma} \frac{w}{R} \) is the optimal ratio \( v_1/u_1 \) that a firm maximizing \( pM_1 Y - (1 - \tau) wu_1 - (1 - \tau) Rv_1 \) would choose. One way to explain this “coincidence” is as follows. The budget surplus can be split into two parts, as follows

\[
[pM_1 Y - (1 - \tau) wu_1 - (1 - \tau) Rv_1] + [\tau M_2 Y - (1 - \tau) w (u_2 - M_2)],
\]

or

\[
[ApY \theta_1^{1-\gamma} u_1 - (1 - \tau) R\theta_1 u_1 - (1 - \tau) wu_1] + [\tau Y \theta_2^{1-\gamma} u_2 - (1 - \tau) w (u_2 - u_2 A^{\theta_2^{1-\gamma}})].
\]

which clearly distinguishes between revenues and expenditures by sector. For a fixed price, the marginal budget surplus of a worker in each sector must be zero, for otherwise, by holding fixed \( \theta_i, \) \( i = 1,2, \) but increasing \( u_i \) in the sector \( i \) for which this marginal surplus is positive, the government could increase its surplus while preserving the consumers’ utility, a contradiction. As the second formulation emphasizes, however, each sector’s surplus is linear in \( u_i \), so that marginal surplus equals average surplus, each term is zero, and the optimal \( \theta_1 \) can then be determined by examining only \( pM_1 Y - (1 - \tau) wu_1 - (1 - \tau) Rv_1 \). Using this perspective, we can represent the determination of market tightnesses in Figure 6, where \( TR \) and \( TC \) (resp. \( MR \) and \( MC \)) denote total (resp. marginal) revenue and cost, and subscripts \( F \) and \( G \) refer to the private firms and the government-managed firms, respectively.

It is worth mentioning that the relative price of good 1 and size of sector 1 is larger in the European economy than in the U.S. economy if and only if the unemployment in the European
economy is higher than in the U.S. economy. Also, let us emphasize that, by construction, the welfare in Europe is always larger than in the U.S.. Obviously, we do not view this as a compelling description of reality, as our model ignores several other aspects of public management (incentives, information processing, etc).

5 Concluding Remarks

The main finding of the analysis is that the difference in the ownership structure between the European economy and the U.S. economy does not necessarily have a negative impact on the relative employment in Europe and in the U.S.. The comparison of (un)employment rates across economies reduces to comparing the equilibrium market tightness of the first sector of production across economies. In particular, unemployment in the European economy exceeds unemployment in the U.S. economy if the market tightness of the first sector in the European economy exceeds the corresponding value in the U.S. economy, that is, in the constant elasticity of substitution case, if and only if:

\[
\frac{1 - \gamma w}{\gamma R} < \left( \frac{(1 - \alpha) AY}{R} \right)^{1/\gamma}.
\]

This condition is more likely to hold for high values of \(\gamma\) and low values of the worker’s “bargaining” power \(\alpha\), and of the cost of opening a vacancy, \(R\) (observe that \(w\), the certainty equivalent of the wage in the private sector, is increasing in the worker’s share). Notice that we are comparing two economies that only differ in their ownership structure, but whose other fundamentals are identical. This assumption is clearly not realistic, but is made to emphasize that, everything else being equal, a difference in ownership structure suffices to generate differential unemployment rates. The lower the worker’s share in both economies, the smaller the employment rate in the “publicly-run” economy is, relative to the employment rate of the “privately-run” economy. This is due to the fact that the government faces a trade-off between the (sunk) real cost and the (social) benefit of opening vacancies in the state-controlled sector. In our model, the social benefit corresponds to consumers’ welfare. Hence, the lower the output share of the worker, the lower the benefit to the government for a given measure of public firms. This results in a lower market tightness in sector 1 in Europe than in the U.S. and therefore, in lower total employment in the European economy relative to the U.S. economy. It may appear a little paradoxical that, in face of high unionization, an economy partially run by the government has lower unemployment than an economy with private ownership, but remember that common intuition relies on the fact that economies with large public sectors also have larger degree of unionization.

\(^{23}\)Empirical literature supports \(\gamma\) in the range of 0.5 – 0.7, see Petrongolo and Pissarides (2001).
A similar logic is at work for the vacancy cost $R$. We interpret this cost as the price of capital equipment. Krusell, Ohanian, Rios-Rull and Violante (2000) construct the (quality-adjusted) time series for the price of capital equipment for the post WWII period in the U.S. They conclude that the price of capital equipment has been declining at a faster rate over the 1980s and 1990s. Over the same two decades the unemployment rate increased substantially and persistently in Europe whereas it fluctuated around 6% in the U.S. Hence this prediction of our model is consistent with the empirical evidence. In the theoretical literature the effect of a change in the vacancy cost on the steady state unemployment rate is ambiguous.24

An important prediction delivered by our model relates to the effect of turbulence on unemployment. Consider the effect of a mean-preserving spread of the distribution of output on the relative (un)employment rates in the two economies. Unemployment is also more likely to be higher in Europe than in the U.S. after such a change. Such a spread decreases the certainty equivalent $w$ of the private wage while leaving the expected output $Y$ unchanged. As a consequence, employment in the U.S. remains the same, whereas employment in the European economy declines. Thus, our model predicts an increase in the (un)employment differential between the two economies following a common aggregate shock that increases the “turbulence” in the economy. Note that the mean-preserving spread may be large enough to reverse the sign of the inequality. That is, if initially the unemployment rate in the partially “public” economy is lower than in the “private” economy, a large increase in turbulence may reverse the ranking of unemployment rates. This prediction is consistent with the observed cross-country employment dynamics. As shown in Figure 1, unemployment rates were lower in Europe than in the U.S. until approximately the late 1970s (early 1980s). Over the 1980s and 1990s, European economies experienced a large and persistent increase in the unemployment rate, well above the corresponding statistics for the U.S.

As previously discussed, the common view, based on incentives, is that the interaction of common adverse aggregate shocks with the labor market institutions already in place in most European countries in the 1960s generated the observed pattern. In particular, the main argument is that, in the U.S., flexible labor market institutions allowed unemployment to put pressure on wages and therefore the U.S. economy could absorb the mass of unemployed. In European countries, labor market institutions prevented the economy to adjust to the new situation and unemployment rose therefore in a persistent way.

24 See, for instance, Mortensen and Pissarides (1999b).
References


Table 1: Cross-country evidence on public enterprises: early 1980s

<table>
<thead>
<tr>
<th>Sector</th>
<th>Canada</th>
<th>France</th>
<th>Germany</th>
<th>Italy</th>
<th>Portugal</th>
<th>Spain</th>
<th>UK</th>
<th>USA</th>
</tr>
</thead>
<tbody>
<tr>
<td>electricity/power utilities</td>
<td>yes</td>
<td>yes</td>
<td>yes</td>
<td>yes</td>
<td>yes</td>
<td>yes</td>
<td>yes</td>
<td>yes</td>
</tr>
<tr>
<td>postal services</td>
<td>yes</td>
<td>yes</td>
<td>yes</td>
<td>yes</td>
<td>yes</td>
<td>yes</td>
<td>yes</td>
<td>yes</td>
</tr>
<tr>
<td>railway transportation</td>
<td>yes</td>
<td>yes</td>
<td>yes</td>
<td>yes</td>
<td>yes</td>
<td>yes</td>
<td>yes</td>
<td>yes</td>
</tr>
<tr>
<td>banking/insurance</td>
<td>yes</td>
<td>yes</td>
<td>yes</td>
<td>yes</td>
<td>yes</td>
<td>yes</td>
<td>yes</td>
<td>yes</td>
</tr>
<tr>
<td>car manufacturer</td>
<td>yes</td>
<td>yes</td>
<td></td>
<td>yes</td>
<td>yes</td>
<td>yes</td>
<td></td>
<td></td>
</tr>
<tr>
<td>airlines/air transportation</td>
<td>yes</td>
<td>yes</td>
<td>yes</td>
<td>yes</td>
<td>yes</td>
<td>yes</td>
<td>yes</td>
<td>yes</td>
</tr>
<tr>
<td>aluminium</td>
<td>yes</td>
<td></td>
<td>yes</td>
<td></td>
<td></td>
<td>yes</td>
<td></td>
<td></td>
</tr>
<tr>
<td>iron/steel/mining</td>
<td>yes</td>
<td>yes</td>
<td>yes</td>
<td>yes</td>
<td>yes</td>
<td>yes</td>
<td>yes</td>
<td>yes</td>
</tr>
<tr>
<td>coal/chemicals</td>
<td>yes</td>
<td>yes</td>
<td>yes</td>
<td>yes</td>
<td>yes</td>
<td>yes</td>
<td></td>
<td></td>
</tr>
<tr>
<td>shipbuilding</td>
<td>yes</td>
<td>yes</td>
<td></td>
<td></td>
<td></td>
<td>yes</td>
<td></td>
<td></td>
</tr>
<tr>
<td>pulp and paper</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>yes</td>
<td></td>
<td></td>
</tr>
<tr>
<td>airplanes/engines/aircraft missiles &amp; aerospace</td>
<td>yes</td>
<td>yes</td>
<td>yes</td>
<td>yes</td>
<td>yes</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>water supply and distribution</td>
<td>yes</td>
<td>yes</td>
<td>yes</td>
<td>yes</td>
<td>yes</td>
<td>yes</td>
<td>yes</td>
<td>yes</td>
</tr>
<tr>
<td>Telecommunications/basic phone/wireless</td>
<td>yes</td>
<td>yes</td>
<td>yes</td>
<td>yes</td>
<td>yes</td>
<td>yes</td>
<td>yes</td>
<td>yes</td>
</tr>
<tr>
<td>TV/Radio broadcasting</td>
<td>yes</td>
<td></td>
<td></td>
<td>yes</td>
<td>yes</td>
<td>yes</td>
<td></td>
<td></td>
</tr>
<tr>
<td>oil (refinement, distribution, extraction, import)</td>
<td>yes</td>
<td>yes</td>
<td>yes</td>
<td>yes</td>
<td>yes</td>
<td>yes</td>
<td></td>
<td></td>
</tr>
<tr>
<td>tobacco/cigarettes/liquor</td>
<td>yes</td>
<td>yes</td>
<td>yes</td>
<td>yes</td>
<td>yes</td>
<td>yes</td>
<td></td>
<td></td>
</tr>
<tr>
<td>nuclear energy/uranium</td>
<td>yes</td>
<td>yes</td>
<td></td>
<td>yes</td>
<td></td>
<td>yes</td>
<td></td>
<td></td>
</tr>
<tr>
<td>computer &amp; electronics</td>
<td>yes</td>
<td>yes</td>
<td></td>
<td>yes</td>
<td></td>
<td>yes</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Table 2: Cross-country evidence on public enterprises: early 1990s

<table>
<thead>
<tr>
<th>Industry</th>
<th>Canada</th>
<th>France</th>
<th>Germany</th>
<th>Italy</th>
<th>Portugal</th>
<th>Spain</th>
<th>UK</th>
<th>USA</th>
</tr>
</thead>
<tbody>
<tr>
<td>electricity/power utilities</td>
<td>yes</td>
<td>yes</td>
<td>yes</td>
<td>yes</td>
<td>yes</td>
<td>yes</td>
<td>yes</td>
<td>yes</td>
</tr>
<tr>
<td>postal services</td>
<td>yes</td>
<td>yes</td>
<td>yes</td>
<td>yes</td>
<td>yes</td>
<td>yes</td>
<td>yes</td>
<td>yes</td>
</tr>
<tr>
<td>railway transportation</td>
<td>yes</td>
<td>yes</td>
<td>yes</td>
<td>yes</td>
<td>yes</td>
<td>yes</td>
<td>yes</td>
<td>yes</td>
</tr>
<tr>
<td>banking/insurance</td>
<td>yes</td>
<td>yes</td>
<td>yes</td>
<td>yes</td>
<td>yes</td>
<td>yes</td>
<td>yes</td>
<td>yes</td>
</tr>
<tr>
<td>car manufacturer</td>
<td>yes</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>airlines/air transportation</td>
<td>yes</td>
<td>yes</td>
<td>yes</td>
<td>yes</td>
<td>yes</td>
<td>yes</td>
<td></td>
<td></td>
</tr>
<tr>
<td>aluminium</td>
<td>yes</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>iron/steel/mining</td>
<td>yes</td>
<td>yes</td>
<td>yes</td>
<td>yes</td>
<td>yes</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>coal/chemicals</td>
<td>yes</td>
<td>yes</td>
<td>yes</td>
<td>yes</td>
<td>yes</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>shipbuilding</td>
<td>yes</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>pulp and paper</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>yes</td>
<td>yes</td>
</tr>
<tr>
<td>airplanes/engines/aircraft missiles &amp; aerospace</td>
<td>yes</td>
<td>yes</td>
<td>yes</td>
<td></td>
<td>yes</td>
<td>yes</td>
<td></td>
<td></td>
</tr>
<tr>
<td>water supply and distribution</td>
<td>yes</td>
<td>yes</td>
<td>yes</td>
<td>yes</td>
<td>yes</td>
<td>yes</td>
<td>yes</td>
<td>yes</td>
</tr>
<tr>
<td>Telecommunications/basic phone/wireless</td>
<td>yes</td>
<td>yes</td>
<td>yes</td>
<td>yes</td>
<td>yes</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>TV/Radio broadcasting</td>
<td>yes</td>
<td>yes</td>
<td></td>
<td></td>
<td>yes</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>oil (refinement, distribution, extraction, import)</td>
<td>yes</td>
<td>yes</td>
<td>yes</td>
<td></td>
<td>yes</td>
<td>yes</td>
<td></td>
<td></td>
</tr>
<tr>
<td>tobacco/cigarettes/liquor</td>
<td>yes</td>
<td>yes</td>
<td>yes</td>
<td>yes</td>
<td>yes</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>nuclear energy/uranium</td>
<td>yes</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>yes</td>
<td>yes</td>
</tr>
<tr>
<td>computer &amp; electronics</td>
<td>yes</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>yes</td>
<td>yes</td>
</tr>
<tr>
<td></td>
<td>Employment in Public Sector</td>
<td>Employment in Public Enterprises</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>--------------</td>
<td>-----------------------------</td>
<td>----------------------------------</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Australia</td>
<td>14.6</td>
<td>4.1</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Austria</td>
<td>15.8</td>
<td>6.7</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Belgium</td>
<td>20</td>
<td>3.9</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Canada</td>
<td>17.4</td>
<td>2.5</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Denmark</td>
<td>35.4</td>
<td>3.9</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Finland</td>
<td>25.1</td>
<td>2.1</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>France</td>
<td>20.2</td>
<td>6.8</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Germany</td>
<td>14.1</td>
<td>1.3</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Greece</td>
<td>9.6</td>
<td>3.3</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Ireland</td>
<td>16.8</td>
<td>4.3</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Italy</td>
<td>18.2</td>
<td>5</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Japan</td>
<td>6.5</td>
<td>0.5</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Netherlands</td>
<td>11.8</td>
<td>2.1</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>New Zealand</td>
<td>12.1</td>
<td>2.1</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Portugal</td>
<td>14.8</td>
<td>2.7</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Spain</td>
<td>15.1</td>
<td>2.9</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Sweden</td>
<td>31.7</td>
<td>6.4</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Turkey</td>
<td>9.4</td>
<td>2.7</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>United Kingdom</td>
<td>11.9</td>
<td>5</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>United States</td>
<td>14.2</td>
<td>0.7</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Data Source: “Measuring Public Employment in OECD Countries: Sources, Methods, and Results”, OECD Report 1997
### Table 4: Economic Weight of State-Owned Firms

<table>
<thead>
<tr>
<th>Country</th>
<th>Economic Activity (% of GDP)</th>
<th>Investment (% gross domestic investment)</th>
</tr>
</thead>
<tbody>
<tr>
<td>France</td>
<td>11.2%</td>
<td></td>
</tr>
<tr>
<td>Greece</td>
<td>11.5%</td>
<td>20.2%</td>
</tr>
<tr>
<td>Italy</td>
<td>12.9%</td>
<td></td>
</tr>
<tr>
<td>Portugal</td>
<td>15.1%</td>
<td>16.6%</td>
</tr>
<tr>
<td>UK</td>
<td>3.6%</td>
<td>6.4%</td>
</tr>
</tbody>
</table>

Note: Data are averages for the period 1985-1990.

### Table 5: Evolution of Economic Weight of State-Owned Firms

<table>
<thead>
<tr>
<th>Year</th>
<th>France</th>
<th>Germany</th>
<th>Italy</th>
<th>Spain</th>
<th>UK</th>
</tr>
</thead>
<tbody>
<tr>
<td>1963</td>
<td>19</td>
<td>11</td>
<td>12</td>
<td>12</td>
<td>10</td>
</tr>
<tr>
<td>1979</td>
<td>18</td>
<td>13</td>
<td>20</td>
<td>10</td>
<td>19</td>
</tr>
<tr>
<td>1985</td>
<td>24</td>
<td>12</td>
<td>20</td>
<td>12</td>
<td>13</td>
</tr>
<tr>
<td>1990</td>
<td>18</td>
<td>10</td>
<td>19</td>
<td>10</td>
<td>4</td>
</tr>
</tbody>
</table>

Note: Arithmetic mean of the weight in employment, in gross capital formation, and in GDP (in percentages)

Source: Toninelli (2000), Table 9.1, page 209
Figure 1: Unemployment Rates in the European Union and the United States, 1960-2000

Figure 2: Relationship between EPL and Public Ownership

Correlation = 0.7265**

Index of EPL, late 1990s

Index of Public Ownership

UK
Japan
Germany
Spain
Portugal
Turkey
Italy

Figure 3: Relationship between EPL and State Control

Correlation = 0.8232**

Index of State Control

Index of EPL, late 1990s

UK
US
Ireland
Australia
Canada
New Zealand
Denmark

Data Sources:
EPL 1990s: OECD Labor Force Statistics (online)
Public Ownership and State Control: OECD Economics Department, WP 226, 1999 [indicators refer to 1996-1998 depending on the country]

**Significance at the 1% level
Data Sources:
EPL 1990s Emp Rate (% Working Age Population): OECD Labor Force Statistics (online)
Public Ownership/State Control: OECD EconWP 226, 1999
**Significance at 1%, *Significance at 5%
Figure 5.1: Relationship between (non agricultural) Employment and State Control

Correlation = -0.7165**

Figure 5.2: Relationship between (non agricultural) Employment and Public Ownership

Correlation = -0.6015**

Figure 5.3: Relationship between (non agricultural) Employment and EPL1990s

Correlation = -0.6768**

Data Sources:
EPL 1990s Emp Rate (% Working Age Population): OECD Labor Force Statistics (online)
Public Ownership/State Control: OECD EconWP 226, 1999
**Significance at 1%, *Significance at 5%
Figure 6: Cost and Revenue Curves (per worker)