Are Labour Market Institutions Endogenous? An Investigation of Unemployment, Unions and Wages*

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Abstract

Single equation multi-country estimation of labour market variables may be seriously biased because of endogeneity issues. We present an empirical analysis of unemployment, union density and wages in 20 OECD countries where these variables are jointly determined. When explicitly modelling endogeneity our results suggest that unions play a more relevant role in explaining unemployment than what previously thought. In addition the impact of wages and unemployment in explaining union density is also much larger than what predicted by single equation estimates. Wages are also shown to react more to changes in unemployment.

JEL codes: E24, J51, J31.

Keywords: unemployment, unions, wages, labour market institutions, system estimation, endogeneity.

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1 Introduction

In recent years we have witnessed a growing literature on the impact of labour market institutions on labour market performance. In general, this has resulted in a number of multi-country empirical models aiming at estimating an empirical relationship between institutions, differently measured by a number of aggregate variables and indicators produced by the OECD and other researchers, and a labour market performance variable that has generally taken the form of the standardized unemployment rate[1]. The labour market institutions most widely studied in this respect are related to unemployment benefit provision, employment protection regulations, labour taxation and trade union bargaining power[2].

All multi-country models we are aware of that estimate unemployment as a function of labour market institutions implicitly assume labour market institutions as super-exogenous. This is to say that institutions do not depend on the state of the labour market and estimated parameters are independent of changes in policy. However this simplifying assumption is contradicted by a simple survey of how institutions are determined. If institutions are coordinating devices that are introduced and modified as optimal answers to market failures, they cannot be taken as fully exogenous to market outcomes. Indeed, under a political economy approach all institutions should be considered endogenous. In general, institutional changes respond to changing political equilibria, to macroeconomic shocks affecting the economy, or a combination of the two. The unemployment variable, being a key labour market variable affecting policy decision making in most OECD countries is therefore likely to be one of the determinants of institutions. Indeed a growing empirical literature that focus on the determinants of labour market institutions see unemployment as one of the determinants. For example Checchi and Lucifora (2002) and Checchi and Visser (2005) have argued that whenever unions are perceived as providing workers' insurance against unemployment risk, the union density is positively correlated with unemployment, which is taken as exogenous. This applies only in countries where unions provide effective insurance (as in the so called "Ghent countries" - Finland, Belgium, Sweden and Denmark - where unions are involved in managing the unemployment benefit schemes), whereas for all other institutional contexts, the correlation between

[1] See, for example, the justification of this choice given by Blanchard (2005). Alternative measures, like the employment to working age population ratio, suffer from being more sensible to the secular changes in participation patterns, and therefore are less likely to give a clear account of the problems in the labour market.

[2] See Nickell, Nunziata and Ochel (2005) for a description of each empirical indicator.

the two variables is negative, because greater unemployment weakens the bargaining power of unions, thus reducing the incentives to join them[3].

In this case the role played by the unemployment rate in determining institutional change is explicitly modelled, running however in a specular problem. Even admitting unemployment is one of the variables affecting institutional change, estimation of single institutional equations may be affected by potentially relevant biases in the same way as unemployment equations.

This is a problem of potential endogeneity that may result in biased and inconsistent estimates. A natural remedy would be to instrument institutions in the unemployment equation and apply 2SLS[4]. However this would still be an inefficient procedure because we would concentrate on a single equation when the true model is one where institutions and unemployment are simultaneously determined.

The approach of this paper is to investigate the problem of potential endogeneity of institutions through a multi-equation model of the labour market.

In principle, a system of equations modelling the labour market should incorporate an equation of each potentially endogenous variable, i.e. of each potentially endogenous institution. This would result in a system of unmanageable dimensions that would not be of much help in resolving the problem of biased and inconsistent estimates. We need therefore to reduce the system to a manageable dimension, and one way of doing this is to select a (possibly not so large) subset of institutions that we reckon being more likely to be endogenous in an unemployment model. In order to do that we have to think more carefully about how institutions are determined. Employment protection regulations, taxation and unemployment benefit policies are all determined inside national or regional parliaments and therefore are affected by the timing of political deliberations. They evolve at a slower pace than macroeconomic variables, being the product of political processes that do not necessarily (or directly) depend on the status of the economy. On the contrary, union membership rates in each country, are indeed the product of the decision-making of each single worker, a process happening in real time and therefore more likely to be empirically correlated with the status of the economy or with the perception that each worker has of the benefits of joining a union in alternative economic

[3]In the sociological literature Western (1997), Lange and Scrugg (1999) and Oskarsson (2005) find similar results, confirming a negative correlation between unemployment and union density.

[4]See Nunziata (2005) for a similar approach in analysing OECD wages. The instruments used in the paper are political variables such as government composition and percentage of left and right seats in parliament.

environments. Indeed, if we look at the data on union density in Figure 1 we notice a certain degree of variability across countries and time, as suggested by other studies such as Boeri et al. (2001). Concentrating on union density as the institutional variable most affected by endogeneity seems therefore a reasonable starting point.

Our approach does not consider true source of exogeneity rooted in the history of national legal systems (as in Nicoletti and Scarpetta 2001 or in Botero et al. 2003), but focuses on two sources of variation: the institutional framework of a country, as captured by a set of institutional variables and their interactions, and the macroeconomic environment, described by a series of macroeconomic shocks.

Whatever the correlation between unemployment and union density may be, a general consensus exist about the fact that both variables have impact onto wage bargaining activity, whereas less is known about potential feedbacks from bargaining outcomes on the incentive to join the unions[5]. In general this may depend on the structure of the extension laws. Following the need of capturing in a more detailed way the wage bargaining process, in addition to the unemployment and the union density equations our system contains therefore a wage equation where both union density and unemployment play a role.

2 The Approach of the Paper

We analyse 20 OECD countries (Australia, Austria, Belgium, Canada, Denmark, Finland, France, Germany, Ireland, Italy, Japan, Netherlands, New Zealand, Norway, Portugal, Spain, Sweden, Switzerland, United Kingdom, United States) observed over the period 1964 - 2000[6]. The graphs of the two main variables, union density (UD) and unemployment rate (UR) are reported in Figures 1 and 2. Descriptive statistics are reported in the appendix. Most countries have experienced a significant decline in union density in the sample period, often accompanied by an increase in unemployment rates. Notable exceptions are the Nordic countries, experiencing an upward trend in density rates, and Anglo-Saxon countries, with absence of trend in

[5] Under Marxian union theory, Bain and Elsheikh (1976) argue that the erosion of real income is a major motive for workers to turn to unions and to union action in an attempt to defend their living standards. In Checchi and Visser(2005), the inflation rate has a negative impact on unionisation, but this impact is attenuated by the existence of indexation clauses.

[6] Our sample is unbalanced, with an average of 34 observations per country and a maximum of 38. Data on Portugal is only available since 1992 for some key variables, like the proportion of males in manual manufacturing jobs over total employmentl.

the unemployment rates (at least starting from the 1980s). The scatterplots of these two variables presented in 2 clearly indicate a wide heterogeneity in country experiences. For Belgium, Canada, Denmark, Finland, Norway and Sweden the rise of density goes hand in hand with unemployment, whereas we observe a negative association for Austria, France, Germany, Japan and Switzerland. In the case of Australia, Ireland, Italy, New Zealand and United Kingdom we notice an almost complete clock-wise loop: a rise of union density in the 60's and 70's was closely followed by an upsurge of unemployment, which halted the further increase in density. The ensuing rise in unemployment brought in a decline in union density, which has not yet ended for few countries. The remaining countries (Netherlands, Portugal, Spain and United States) do not exhibit apparent association between these two variables.

Figures 1 and 2 around here

There are several theoretical reasons accounting for positive or negative association between union density and unemployment. If we consider union density as predetermined, in an imperfect competition framework an increase in union membership increase union bargaining power and, as a consequence, their wage claims. A rise in the bargained wage yields an overall increase in unemployment, thus creating a positive correlation among the two variables (Nickell and Layard 1999). On the contrary, if we take unemployment as predetermined, and the demand for union services is driven by a demand for employment insurance from risk adverse workers, then an increase of unemployment calls for an increase in density (Checchi and Visser 2005). However, the demand for union may also reflect workers' gratitude for union bargaining activity (a sort of 'gift exchange' - see Booth 1995): in such a case, an increase in unemployment would be associated to a less successfull bargaining activity, thus leading to a decline in the support to unions. In the latter case, we do not have a clear apriori for the sign of the correlation between union density and unemployment. For these reasons, we believe worth investigating the overall association between these two variables, taking into accont that wage dynamics is involved in the interplay.

Let us denote unemployment, union density and labour cost in country i and year t, respectively, with u_{it}, m_{it} and w_{it}. Our strategy consists in estimating the following system:

$$\begin{cases} u_{it} = \beta_0^u + \beta_2^u m_{it} + \boldsymbol{\beta}_4^{u\prime}\mathbf{z}_{it} + \boldsymbol{\beta}_5^{u\prime}\mathbf{h}_{it} + \boldsymbol{\beta}_6^{u\prime}\mathbf{s}_{it} + \phi^u t + \mu_i^u + \eta_t^u + \varepsilon_{it}^u \\ m_{it} = \beta_0^m + \beta_1^m u_{it} + \beta_3^m w_{it} + \boldsymbol{\beta}_4^{m\prime}\mathbf{z}_{it} + \boldsymbol{\beta}_5^{m\prime}\mathbf{h}_{it} + \boldsymbol{\beta}_6^{m\prime}\mathbf{n}_{it} + \phi^m t + \mu_i^m + \eta_t^m + \varepsilon_{it}^m \\ w_{it} = \beta_0^w + \beta_1^w u_{it} + \beta_2^w m_{it} + \boldsymbol{\beta}_4^{w\prime}\mathbf{z}_{it} + \boldsymbol{\beta}_5^{w\prime}\mathbf{h}_{it} + \delta\pi_{it} + \mu_i^w + \eta_t^w + \varepsilon_{it}^w \end{cases} \quad (1)$$

where $\mathbf{z}$ is a vector of exogenous labour market institutions, $\mathbf{h}$ is a set of interactions between institutions, $\mathbf{s}$ is a set of macroeconomic shocks affecting unemployment (oil price, labour demand shocks, terms of trade shocks, monetary shocks), $\mathbf{n}$ is a vector of variables affecting density (male employment manufacturing share, educational attainment and strikes), π is a productivity term, and t, μ_i, η_t and ε_{it} are respectively a time trend, a country fixed effect, a time fixed effect and the stochastic error term.

In constructing the specification of each equation in the system we follow the approach adopted respectively in Nickell et al (2005), Checchi and Lucifora (2002) and Nunziata (2005). Nickell et al (2005) frame their analysis of OECD unemployment dynamics in an aggregate demand context, where labour market institutions are capable to explain a relevant portion of long run dynamics. They separately considere the contribution of institutions and macroeconomic shocks, in a single equation model with an AR(1) component. Checchi and Lucifora (2002) explain the demand for union activity as due to macroeconomic cycle (proxied by inflation and unemployment rates), compositional effects (gender, age and sector composition of the labour force) and other competing labour market institutions, discussing their potential complementarity/substituability impact. They also model union density in a single equation model without AR component. Finally, Nunziata (2005) consider an imperfect competiton model of wage bargaining, finding support to the existence of a wage curve in the Layard-Nickell-Jackman tradition. In his single equation model, the real unit labour cost is considered as an AR(1) process and regressed onto the levels of unemployment, (trend of) labour productivity and institutional variables (both alone and interacted with unemployment).

In all cases, these papers use a single-equation multi-country approach, taking other macroeconomic variables (for example unemployment in the density and wage equation, or density in the unemployment and wage equation) and institutional variables as predetermined. All papers consistently find significant impacts of institutional variables onto unemployment, union density

and the real wage, but all their conclusions hold only under the coeteris- aribus assumption. By so doing these papers share two weaknesses:

i) they neglect positive/negative feedbacks through potentially endogenous variables, thus leading to biased estimates of the impact of labour market institutions,

ii) by estimating a unique model across countries, they do not consider country heterogeneity in their institutional framework, thus misleading the perception of a unique *modus operandi* of market economies, which is heavily disputed by some political economists (among them Hall and Soskice 2001 and Amable 2003).

In this paper we believe to have overcome these two limits. On one hand, by moving to system equation methods we are able to fully incorporate the feedbacks effects introduced by the endogeneity of some variables. On the other hand, when we generalize our model allowing for some heterogeneity in the feedbacks between variables, we actually let the impact of institutions to vary across countries, therefore allowing for alternative social systems in the model.

This is particularly important when we intend to analyse the overall impact of other (presumed) exogenous variables. Suppose for example that our objective is to measure the impact of a reduction in unemployment benefits. According to our current knowledge, we would look at the coefficient in an unemployment equation, and we would measure the predicted reduction in unemployment. However, this may also induce a reduction in the incentive to join the unions, thus reinforcing the initial impact of the policy measure. On the other hand, it is rather possible that in some countries unemployment and density are negatively correlated, as we have seen in previous descriptive evidence. In such a case we would expect for the same group of countries a reduction in the initial impact of the measure. By allowing for country-specific feedback effects, we are able to identify peculiarities in institutional effects.

3 The Empirical Analysis

3.1 Single Equation Estimations

We start our analysis with a set of single equation estimations where institutions are assumed exogenous. Table 6 reports when institutions are assumed exogenous. It reports separate estimates for unemployment, union density and wages. These equations can be considered as analogous to the ones estimated respectively in Nickell et al (2005), Checchi and Lucifora

(2002) and Nunziata (2005). The first two columns display the fixed effects estimations for unemployment excluding and including shocks. The third and the fourth columns display the union density estimations including and excluding wage feedbacks. The fifth column displays a baseline labour cost regression. All specifications include a set of institutional interactions in order to capture complementarity effects. We consider an interaction term between the benefit ratio and duration, and between employment protection and benefits[7] The first aims at controlling for the potential existence of a trade-off between generosity and duration in unemployment subsidisation. The second one controls for the trade-off between insuring workers against the risk of unemployment either in the workplace (by making dismissals more costly) or in the labour market (using unemployment benefits - see Blanchard and Tirole 2004). We also control for a set of macroeconomic shocks that have been shown relevant in Nickell et al (2005), adding a real oil price variable as suggested by Phelps (1994) and Fitoussi et al. (2000)[8].

Our regressions are very much in line with previous studies. The benefit and taxation variables seem to play a relevant role in the unemployment equation. Higher labour taxes and generous benefits provided for a long duration are correlated with higher unemployment. Union density has a positive coefficient that is offset by a negative coordination effect. This is to say that stronger unions with a cooperative attitude in wage bargaining do not tend to raise unemployment. Employment protection is not significant unless in presence of generous and long benefits.

The union density equations in columns 3 and 4 show that density is increasing in unemployment, wages, generosity of benefits, the proportion of workers involved in strikes and males in manual manufacturing jobs over total employment. Notice that we also control for the educational attainment of the population, finding a positive impact onto density. We find confirmation of a substitution effect of measures of employment protection: the more protected is a worker, the less perceived is the risk of unemployment, the lower is the demand for union insurance. As regards the effect of the wage, our estimates suggest that employees are more

[7] In what follows all interactions between institutional variables are calculated as interaction between deviations from the world average. In this way the coefficient of each institution in levels can be read as the coefficient of the "average country", i.e. the country characterized by the average level of that specific institutional indicator. This because for this average country the interaction terms are zero.

[8] Muellbauer and Nunziata (2004) show that the oil price is a key variable in forecasting the US business cycle over the last 50 years, with an asymmetric effect over recession and expansion periods. Considering the US as the leader OECD country, the real oil price can be considered as a good proxy of global macroeconomic conditions.

prone to join a union when monetary compensation is more generous[9].

Finally, the labour cost equation suggests that productivity is the key determinant of wages, with a significant impact of the tax wedge and employment protection interacted with unemployment benefits, in accordance with a bargaining theory of wage determination. The unemployment rate has the expected negative sign in this equation suggesting a lower reservation wage when unemployment is higher.

Table 6 around here

The last three columns of Table 6 display the same models estimated instrumenting the potential endogenous variables. In the unemployment equation union density is instrumented using the male manual in manufactoring variable, the strike variable, educational attainment in the population, and wages. As we can see the union coefficient is doubled while the differences in the other coefficients is negligible apart from the tax wedge coefficient that is substantially lower.

In the union density equation we instrument the unemployment rate and the wage using the macroeconomic shocks, the proportion of minimum to median wage, and productivity as instruments. Again the estimated model is pretty much similar apart from a substantial increase in the unemployment rate coefficient.

Finally we instrument union density and unemployment in the wage equation using the male manual in manufactoring variable, the strike variable, educational attainment in the population and the macroeconomic shocks as instruments. Here we experience the major differences, with union density and employment protection in levels becoming significant with expected signs, at the expenses of the tax wedge. The story suggested by the IV estimation is then quite different, suggesting that once we control for productivity wages are higher in countries where unions are stronger and employment protection stricter, rather than countries with higher taxation on labour. As regards the effect of unemployment, the estimated coefficient is very close to the OLS one.

[9]Many theoretical models of union density provide joint determination of union density and equilibrium wage, either through a "public good" approach (Booth 1995) or a social custom approach. See the discussion in Checchi and Lucifora 2002.

Despite observing substantial differences in the coefficients by simply instrumenting the endogenous variables, the methodology we are employing at this stage is still focusing on single equation estimation. This way we leave aside an important part of the information available to the researcher, i.e. that unemployment, wages and possibly union density are jointly determined. If this is the case, the single equation procedure is inefficient because we are concentrating on single equations when the true model is one where the variables of interest are simultaneously determined. A step further is therefore the joint estimation of a system composed of our three equations.

3.2 Tackling Endogeneity: System Estimation

Tables 7 and 8 display the joint estimates of the unemployment, union density and wages equations under alternative methods. The techniques we use are SURE and 3SLS, with fixed effects. While in the case of 3SLS we explicitly model endogeneity, in the case of SURE all regressors are assumed exogenous and the equations are only related through the variance-covariance matrix, i.e. only contemporaneous correlations are modelled. All models in Table 7 exclude institutional interactions, while models in Table 8 allow for complemetarity effects between institutions.

Most of the single equations results still hold when the equations are jointly estimated. However we notice that the 3SLS estimates suggest a much more relevant role of unions in explaining unemployment. The estimated coefficient is much larger than the one estimated by fixed effects OLS (0.238 versus 0.060, when interactions are included) and it is highly significant. On the other side, the unemployment coefficient in the union density equation is doubled (1.378 versus 0.630). This suggests that single equations estimations, assuming exogeneity of the key variables, are seriously biased downward. In other words unions play a more relevant role in explaining unemployment and unemployment is a more relevant factor explaining unions membership rates.

As regards the wage equation, while the union density coefficient is in line with the single equation estimates (in the 2SLS version), the unemployment coefficient is more than three times larger (-0.018 versus -0.005). This is to say that the labour market adjustment mechanism is much stronger than what predicted by single equation multi-country models. This is a particularly relevant finding given that the whole story of unemployment as being determined

by the institutional framework of the labour market at the equilibrium depends on wages adjusting to changes in the labour market. If unemployment were insignificant in the wage equation, wages would not adjust to changes in the labour market and unemployment would be fully persistent[10]. A larger negative coefficient of unemployment in the wage equation means that wages adjust more than what predicted by the single equation estimate.

The coefficient of wages in the union density equation is also much larger (15.727 versus 6.273). Our system estimates provide therefore stronger evidence in favour of the view that the "European model" is characterised by stronger unions and high unemployment, through a self-sustained mechanism: stronger unions creates stronger wage pressure, which induces higher unemployment, which in turn reinforce the demand for union protection. However the system is mitigated by the downward pressure on wages exterted by the unemployment rate, which feeds back negatively onto the demand for unions.

Tables 7 and 8 around here

Overall our estimations show that once we model endogeneity the relationship between our key variables becomes stronger. This is true both if we simply instrument the endogenous regressors as well as if we model a simultaneous system. In the latter case we showed that the estimated coefficients effects are in the range of two to four time larger than the ones obtained assuming exogeneity.

3.3 Relaxing the Assumption of Homogeneous Coefficients

These results have been obtained imposing an homogeneous structure in the coefficients. In other words we are assuming that the correlations between variables are the same in all countries in the sample. However this may not be necessarily the case. Many authors in the literature have stressed the importance of considering institutions as part of a comprehensive social model rather than single dimensions separated from the context.

Our next step is to relax this assumption and see if and how the coefficients vary across countries. Our objective is to check if we can identify some regularities in the way our endoge-

[10] See Nickell (1998) for a theoretical discussion on this point.

nous variables relate to each other. This is another exercize that measures the resctrictions imposed by a single equation - homogeneous coefficients model.

For example we want to check whether the data suggest some degree of heterogeneity in the correlations between unemployment and union density. Our first step in this direction is to estimated a system using SURE, i.e. mantaining the assumption of exogeneous regressors, and just including interactions of union density and unemployment with country dummies, respectively in the unemployment and union density equation. Figure 3 display the scatter plot of the impact of unemployment onto density on the impact of density onto unemployment, excluding Portugal, a country for which we cannot say much given the limited number of observations. What we infer from the picture is that heterogeneity is a relevant issue. Despite the majority of countries are located in the North-East quadrant, some are characterized by a negative impact of density on unemployment and some by a negative impact of unemployment on density. No country is in the South-West quadrant except for France, whose effects are practically close to zero.

How much we can trust the results contained in the picture depends on how much we are ready to believe that not modelling endogeneity is not having an impact on the qualitative distribution of the countries in the space defined in the figure. Our trust should then be limited given the results of the previous section. Modelling endogeneity has a big impact on the estimates and there are no reasons to believe that the estimated heterogeneity should not be affected too.

Our next step is therefore to draw a similar picture as the one in Figure 3, but estimating our system using 3SLS, i.e. modelling endogeneity. However, in this case our task is complicated by the fact that we would need to estimate 20 coefficients for union density in the unemployment equation plus 20 coefficients for unemployment in the union density equation, all of which should be considered endogenous. This would result in the impossibility to identify such a large system. In order to solve this problem, our strategy is to estimate the system recursively, assuming both union density and unemployment as endogenous but imposing a set of perturbations in the coefficients that allow some degree of heterogeneity across countries. More specifically, we estimate the model in its simplest form adding in the unemployment equation a set of 19 interactions between UD and the country dummies, excluding one country chosen from our sample, say, Australia. We do the same for the union density equation, i.e. we add 19

interactions between UR and the country dummies excluding Australia. In this case we retain the assumption of endogeneity, but the coefficient is perturbed by the set of interactions that are assumed exogenous. We follow this procedure recursively for all countries, excluding one country at a time from the interactions and we end up having 20 coefficients for UD and 20 coefficients for UR, estimated under the assumption of endogeneity. Finally we plot the estimated coefficients in order to check if we can find a pattern in the mutual influence of union density and unemployment. Figure 4 display the estimated coefficients, again excluding Portugal.

The comparison of Figures 3 and 4 shows that modelling endogeneity enables us to pick up something that is missing otherwise. The overall picture of unemployment and density sustaining each other is just an average behaviour. We notice two groups of countries. In the south-east quadrant we have the "union decline" scenario: unions producing high unemployment, and by doing so eroding their base of support. This is what Burda (1990) cleverly termed the "Cheshire cat" union. United States is a typical example of this occurrence. On the contrary, in the north-west region of the graph, we find the "union rise" scenario: here an increase in unemployment has a positive impact on union density, either through appropriate institutional arrangements (like the unemployment benefit system managed by unions, as in Sweden and Finland) or through a different attitude of the union. In the same group of countries, unions are sufficiently coordinated and/or centralised to exert a negative impact onto unemployment (other things remaining constant). In both scenrios, the social systems are self-regulating, since a negative feed-back ensures their stability: in the "union rise" world, which is typical of nordic countries (and more general of *coordinated market economies* - see Hall and Soskice 2001) the expansion of unions contains the unemployment, thus reducing the incentive to become union members. In the "union decline" scenario the weakness of the union keeps the unemployment rate low, thus reducing the union support.

Figure 4 also shows a third group of countries in the north-east quadrant. These countries represent a multiple-equilibria scenario in presence of positive feed-backs: since unemployment and density self-sustain each other, we may obtain high unemployment-high density outcomes as well as low unemployment-low density ones.

If we go back to Figure 2 we notice that the "union rise" countries are characterized by a positive density and unemployment growth. Our findings suggest that without the rise in

union density the increase in unemployment would have been much higher. On the contrary, the "union decline" countries experienced a decline in density with different trends in unemployment. This may be the result of weaker unions preventing unemployment from rising.

Our results therefore confirm and reinforce previous findings by Nickell (1997) and Layard and Nickell (1999): union support per se does not necessarily have a positive impact onto unemployment, especially when accounting for the wage impact. On the contrary, they show a positive side of unions in some (but not all) countries. As such, these results could also be taken as guidelines for union managers: whenever unions are viable to contain unemployment, their prospects are not necessarily gloom as it may be expected, and better prospects can be envisaged.

Figures 3 and 4 around here

4 Conclusions

We presented an empirical analysis of unemployment, union density and wages in 20 OECD countries. We showed that when each of these key labour market variables is estimated by means of a single equation multi-country model the estimated coefficients may be seriously biased. Our analysis therefore confirms that endogeneity may be an issue. Instrumenting the endogenous variables partially solve the problem but it is still an inefficient procedure. We present a set of system estimations where unemployment, union density and wages are jointly determined. When explicitly modelling endogeneity our results suggest that unions play a more relevant role in explaining unemployment than what previously thought. In addition the impact of wages and unemployment in explaining union density is also much larger than what predicted by single equation estimates. Wages are also shown to react more to changes in unemployment.

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Appendix: Variable Definitions and Sources

Permanent Employment Protection (EP): the OECD provides a time-varying employment protection indicator for the time period 1989-99[11] containing information on legislation changes occurred in European countries in the same period. This piece of information is chained with the cross sectional indicators on permanent employment protection provided by the OECD[12]. The legislation changes occurred before 1989 are taken into account using the information provided by Nickell et al. (2005). Their series is built using an interpolation of the data provided by Blanchard and Wolfers (2000), readjusted in the mean with range {0,2} increasing with strictness of employment protection. The latter is constructed chaining OECD data with data from Lazear (1990). Notice that the OECD data, used from 1985 onwards, is constructed on the basis of a more extensive collection of employment protection dimensions compared with data used by Lazear.

Net Union Density (UD): for non-European countries this variable is constructed as the ratio of total reported union members (gross minus retired and unemployed members), as reported in Visser (1996) and Ebbinghaus and Visser (2000).

Bargaining Coordination (COW): this is an index with range $\{1, 3\}$ constructed as an interpolation of OECD data on bargaining coordination. It is increasing in the degree of coordination in the bargaining process on the employers' as well as on the unions' side. The resulting series were matched with the data reported in Belot and van Ours (2004).

Benefit Replacement Ratio (BRR): the data is provided by the OECD with one observation every two years for each country in the sample. The data refer to the first year of unemployment benefits, averaged over family types of recipients, since in many countries benefits depend on family composition. The benefits are measured as a proportion of average earnings before tax.

Benefit Duration (BD): we constructed this index as a weighted average $BD = \alpha BRR_2/BRR_1 + (1-\alpha)BRR_4/BRR_1$, where BRR_1 is the unemployment benefit replacement rate received during the first year of unemployment, BRR_2 is the replacement rate received during the second and third year of unemployment and BRR_4 is the replacement rate received during the fourth and fifth year of unemployment. Note that we give more weight to the first ratio than to the second $(\alpha = 0.6)$.

Tax Wedge (TW): the tax wedge is equal to the sum of the employment tax rate, the direct tax rate and the indirect tax rate: $TW = t1 + t2 + t3$. The employment tax rate $t1$ is calculated as $t1 = EC/(IE - EC)$,

[11] See Nicoletti et al. (2001).

[12] See the OECD Employment Outlook (1999) and (2004).

where EC denotes the employers' total contributions and IE denotes wages, salaries and social security contributions. The direct tax rate is defined as $t2 = DT/HCR$ where DT is the amount of direct taxes and HCR is the amount of households' current receipts. The indirect tax rate is defined as $t3 = (TX - SB)/CC$ where TX are total indirect taxes, SB subsidies, and CC private final expenditures. All data come from London School of Economics CEP - OECD data base, updated using the same criteria.

LDS: Labour Demand Shock

This series consists of the residuals $\hat{\varepsilon}_t$ of the following 20 by country regressions:

$$\log(ET_t) = \beta_0 + \beta_1 \log(ET_{t-1}) + \beta_2 \log(ET_{t-2}) + \beta_3 \log(ET_{t-3}) + \beta_4 \log(YQ_t) + \beta_5 \log(WTP_t) + \varepsilon_t$$

where ET is total employment and YQ and WTP are respectively real GDP and real labour cost at 1990 prices.

Real Interest Rate

Long term real interest rate, constructed using long term nominal interest rate and inflation from OECD Economic Outlook Database.

Terms of Trade Shock

This series is equal to $IMP = \frac{MC}{YC}\Delta\left\{\log\left(\frac{P_m}{P_G}\right)\right\}$, where MC are imports at current prices, YC is GDP at current prices, P_m is import price deflator and P_G is GDP deflator at market prices, both with 1990 as base year.

variable	description
UR	unemployment rate (percentage)
UD	union density (percentage)
WAGE	log(labour cost)
TW	tax wedge (proportion)
BRR	benefit replacement ratio (percentage)
BD	benefit duration (index: 0 - 1)
BRRBD	(BRR-BRRaverage)*(BD-BDaverage)
EP	employment protection (index: 0 - 4)
EPBEN	(EP-Epaverage)*(BRR-BRRaverage)*(BD-BDaverage)
COORD	wage bargaining coordination (index: 1 - 3)
KAITZ	minimum to median wage (proportion)
LROIL	log real oil price
LD SHOCK	labour demand shock
TRADE SHOCK	term of trade shock
RIRL	real interest rate
MMM	male manual manufacturing
STRIKES	strikes, workers involved (proportion of employees)
TY25	average years of education
PROD	productivity
TREND	linear trend

Table 1: List of variables

Country	Year	UR	UD	WAGE	BRR	BD	TW	COW	EP
aus	1960s	1.5	43.3	2.90	13.4	1.02	0.31	2.00	0.90
aus	1970s	3.7	47.3	3.10	19.4	1.02	0.35	2.25	0.90
aus	1980s	7.3	48.2	3.22	23.1	1.02	0.39	2.22	0.90
aus	1990s	8.4	37.5	3.34	26.0	1.01	0.39	1.53	1.04
aut	1960s	2.0	57.5	5.00	18.8	0.00	0.53	2.50	1.10
aut	1970s	1.6	53.2	5.33	25.4	0.41	0.55	2.50	1.33
aut	1980s	3.3	50.9	5.55	34.1	0.75	0.58	2.50	2.16
aut	1990s	3.8	41.1	5.66	38.2	0.72	0.62	2.31	2.20
bel	1970s	4.4	49.6	6.52	51.0	0.83	0.43	2.06	3.24
bel	1980s	11.4	50.9	6.76	50.6	0.79	0.46	2.44	3.22
bel	1990s	11.5	52.4	6.89	47.0	0.78	0.50	2.00	2.90
can	1960s	4.0	28.9	2.98	37.5	0.00	0.38	1.00	0.80
can	1970s	6.7	33.6	3.17	55.1	0.00	0.42	1.44	0.80
can	1980s	9.4	37.0	3.25	56.8	0.00	0.43	1.06	0.80
can	1990s	9.3	35.9	3.42	52.7	0.00	0.52	1.00	0.80
dnk	1960s	1.3	59.7	4.58	40.5	0.46	0.39	3.00	2.00
dnk	1970s	4.1	68.4	4.90	76.8	0.59	0.53	2.97	2.37
dnk	1980s	8.3	77.9	5.06	77.1	0.62	0.60	2.53	2.32
dnk	1990s	7.4	76.0	5.20	70.3	0.83	0.60	2.31	1.81
fin	1960s	2.2	40.2	3.83	21.4	0.00	0.42	1.54	2.33
fin	1970s	3.6	62.7	4.26	35.4	0.49	0.54	1.97	2.33
fin	1980s	4.9	69.9	4.54	45.4	0.57	0.60	2.03	2.31
fin	1990s	11.7	78.0	4.77	56.1	0.54	0.63	2.47	2.15
fra	1960s	1.9	20.0	4.17	50.8	0.25	0.56	2.00	1.03
fra	1970s	3.9	21.4	4.64	47.7	0.21	0.59	2.00	2.27
fra	1980s	9.3	14.7	4.94	58.8	0.38	0.65	2.00	2.72
deu	1960s	0.9	32.7	3.14	42.3	0.57	0.43	2.50	1.41
deu	1970s	2.4	33.8	3.57	39.8	0.60	0.47	2.50	3.15
deu	1980s	6.2	34.2	3.77	38.4	0.61	0.50	2.50	3.21
deu	1990s	7.8	29.5	3.84	37.0	0.60	0.51	2.50	2.92
irl	1960s	5.1	54.5	1.49	22.7	0.75	0.27	2.09	0.19
irl	1970s	7.2	61.2	2.00	34.8	0.55	0.31	2.88	0.70
irl	1980s	14.1	61.1	2.33	49.4	0.39	0.38	2.12	0.90
irl	1990s	11.5	51.9	2.53	37.8	0.67	0.37	2.95	0.90
ita	1960s	5.2	27.6	2.49	7.8	0.00	0.57	1.69	3.59
ita	1970s	6.4	45.6	2.96	4.6	0.00	0.55	1.97	3.64
ita	1980s	10.2	43.8	3.17	2.5	0.00	0.57	1.78	3.61
ita	1990s	11.3	38.7	3.37	23.7	0.11	0.66	2.16	3.31

Table 2: Summary of the data by country and decade

Country	Year	UR	UD	WAGE	BRR	BD	TW	COW	EP
jpn	1960s	1.2	34.7	0.20	35.9	0.00	0.24	2.50	2.10
jpn	1970s	1.7	30.5	0.78	34.9	0.00	0.26	2.50	2.10
jpn	1980s	2.5	26.3	1.14	28.6	0.00	0.33	2.50	2.29
jpn	1990s	3.2	23.0	1.27	31.5	0.00	0.29	2.50	2.03
nld	1960s	1.3	36.5	3.51	65.0	0.35	0.56	2.60	2.73
nld	1970s	4.0	36.1	3.79	65.0	0.44	0.56	2.06	2.73
nld	1980s	10.0	28.2	3.80	67.8	0.68	0.55	2.50	2.71
nld	1990s	5.9	23.9	3.86	70.1	0.67	0.44	3.00	2.59
nzl	1970s	0.8	37.8	3.22	27.2	1.02	0.29	2.50	0.90
nzl	1980s	4.5	38.3	3.20	30.2	1.04	0.30	2.19	0.90
nzl	1990s	7.7	26.6	3.13	28.4	1.03	0.26	1.05	0.95
nor	1960s	0.9	51.0	4.65	10.7	0.00	0.49	3.00	2.94
nor	1970s	1.6	51.6	4.91	21.0	0.32	0.60	2.97	2.94
nor	1980s	2.8	55.4	5.09	54.7	0.49	0.65	2.78	2.91
nor	1990s	4.8	55.3	5.24	61.7	0.52	0.60	2.62	2.78
prt	1990s	5.7	26.2	6.98	65.3	0.42	0.39	2.00	3.77
spn	1960s	1.7	9.0	-0.24	55.5	0.00	0.23	3.00	4.08
spn	1970s	4.3	9.0	0.20	52.9	0.00	0.28	2.75	4.06
spn	1980s	17.9	9.9	0.49	73.7	0.20	0.41	2.25	3.83
spn	1990s	19.3	17.0	0.70	66.5	0.37	0.46	2.00	3.28
swe	1960s	1.9	65.6	4.76	29.5	0.00	0.50	3.00	0.10
swe	1970s	2.2	72.5	5.05	58.4	0.03	0.65	3.00	2.34
swe	1980s	2.8	81.3	5.12	85.8	0.05	0.78	2.39	3.52
swe	1990s	7.4	86.3	5.33	82.0	0.05	0.77	1.99	2.66
swz	1960s	0.0	31.6	3.48	14.0	0.00	0.30	2.00	1.10
swz	1970s	0.2	31.0	3.78	22.1	0.00	0.34	2.00	1.10
swz	1980s	0.6	28.2	3.93	53.4	0.00	0.36	1.97	1.10
swz	1990s	3.0	23.3	3.97	69.6	0.18	0.35	1.53	1.10
uk	1960s	1.7	44.9	1.93	33.0	0.73	0.40	1.81	0.30
uk	1970s	3.6	53.4	2.18	34.7	0.55	0.45	1.72	0.53
uk	1980s	9.8	50.9	2.36	26.3	0.70	0.51	1.06	0.60
uk	1990s	7.9	37.1	2.56	21.6	0.74	0.45	1.00	0.61
usa	1960s	4.3	26.1	3.04	22.2	0.15	0.36	1.00	0.20
usa	1970s	6.2	25.6	3.19	26.5	0.19	0.41	1.00	0.20
usa	1980s	7.3	19.1	3.26	29.6	0.17	0.44	1.00	0.20
usa	1990s	5.6	14.9	3.41	26.9	0.19	0.45	1.00	0.20

Table 3: Summary of the data by country and decade

Country	Year	KAITZ	LROIL	MMM	STRIKES	TY25	LD SHOCK	TRADE SHOCK	RIRL
aus	1960s	0.00	0.75	0.28	0.24	10.06	0.000	-0.006	0.009
aus	1970s	0.00	1.99	0.25	0.23	10.70	0.003	0.002	-0.013
aus	1980s	0.32	3.18	0.19	0.11	11.74	0.002	-0.003	0.056
aus	1990s	0.61	2.93	0.15	0.11	12.49	-0.002	-0.001	0.064
aut	1960s	0.00	0.75	0.28	0.01	8.23	-0.009	0.003	0.041
aut	1970s	0.00	1.99	0.29	0.00	8.75	-0.006	-0.002	0.023
aut	1980s	0.00	3.18	0.28	0.00	9.68	0.002	-0.001	0.045
aut	1990s	0.00	2.93	0.24	0.01	10.53	0.001	-0.003	0.047
bel	1970s	0.28	1.99	0.29	0.02	7.91	0.004	-0.001	0.014
bel	1980s	0.56	3.18	0.23	0.01	8.82	-0.002	0.004	0.064
bel	1990s	0.52	2.89	0.19	0.01	9.67	-0.002	-0.013	0.050
can	1960s	0.48	0.75	0.26	0.04	9.22	-0.001	-0.004	0.022
can	1970s	0.50	1.99	0.22	0.06	10.06	0.000	0.001	0.008
can	1980s	0.41	3.18	0.18	0.03	11.17	0.006	-0.009	0.058
can	1990s	0.42	2.93	0.16	0.02	12.15	-0.005	0.002	0.056
dnk	1960s	0.00	0.75	0.26	0.01	8.68	-0.005	-0.011	0.026
dnk	1970s	0.00	1.99	0.23	0.04	9.52	0.004	0.000	0.050
dnk	1980s	0.00	3.18	0.19	0.04	10.40	0.004	-0.005	0.078
dnk	1990s	0.00	2.93	0.19	0.02	11.29	-0.005	-0.005	0.052
fin	1960s	0.00	0.75	0.23	0.02	7.04	-0.008	-0.003	0.019
fin	1970s	0.00	1.99	0.24	0.17	8.06	0.006	0.004	-0.012
fin	1980s	0.00	3.18	0.21	0.13	9.43	0.009	-0.006	0.032
fin	1990s	0.00	2.93	0.19	0.07	10.55	-0.008	-0.001	0.059
fra	1960s	0.47	0.75	0.27	0.14	6.64	-0.002	-0.004	0.023
fra	1970s	0.56	1.99	0.27	0.09	7.51	0.004	0.003	0.010
fra	1980s	0.62	3.18	0.22	0.01	8.68	-0.001	-0.003	0.054
deu	1960s	0.00	0.75	0.34	0.00	9.30	-0.005	-0.003	0.038
deu	1970s	0.00	1.99	0.32	0.01	10.48	0.009	-0.002	0.029
deu	1980s	0.00	3.18	0.29	0.01	11.69	-0.003	-0.001	0.048
deu	1990s	0.00	2.93	0.26	0.01	12.59	-0.003	-0.002	0.046
irl	1960s	0.00	0.75	0.19	0.03	7.36	0.000	-0.011	0.015
irl	1970s	0.00	1.99	0.21	0.03	7.76	0.003	0.006	-0.002
irl	1980s	0.00	3.18	0.20	0.04	8.50	-0.003	-0.011	0.050
irl	1990s	0.05	2.93	0.19	0.02	7.48	0.000	-0.008	0.043
ita	1960s	0.00	0.75	0.24	0.18	5.57	-0.003	-0.004	0.014
ita	1970s	0.00	1.99	0.26	0.45	6.33	0.002	0.007	-0.025
ita	1980s	0.00	3.18	0.22	0.32	7.39	0.002	-0.007	0.036
ita	1990s	0.00	2.93	0.20	0.19	8.57	-0.002	0.000	0.054

Table 4: Summary of the data by country and decade

Country	Year	KAITZ	LROIL	MMM	STRIKES	TY25	LD SHOCK	TRADE SHOCK	RIRL
jpn	1960s	0.00	0.75	0.20	0.02	9.08	-0.003	-0.004	0.017
jpn	1970s	0.14	1.99	0.21	0.03	9.78	-0.003	0.002	-0.001
jpn	1980s	0.31	3.18	0.20	0.00	10.73	0.001	-0.003	0.043
jpn	1990s	0.30	2.93	0.21	0.01	11.56	0.000	-0.001	0.035
nld	1960s	0.62	0.75	0.29	0.00	8.45	0.005	-0.012	0.013
nld	1970s	0.61	1.99	0.27	0.01	9.00	0.003	-0.001	0.009
nld	1980s	0.57	3.18	0.22	0.00	9.91	-0.005	-0.002	0.059
nld	1990s	0.49	2.93	0.18	0.01	10.67	0.001	-0.008	0.044
nzl	1970s	0.55	2.66	0.28	0.11	9.80	0.007	0.012	-0.038
nzl	1980s	0.40	3.18	0.23	0.09	10.42	0.003	-0.006	0.035
nzl	1990s	0.45	2.93	0.18	0.04	11.24	-0.003	0.001	0.063
nor	1960s	0.00	0.75	0.28	0.00	8.88	-0.008	-0.009	0.011
nor	1970s	0.00	1.99	0.26	0.00	9.71	0.005	0.003	-0.007
nor	1980s	0.00	3.18	0.20	0.01	10.81	0.004	-0.002	0.055
nor	1990s	0.00	2.93	0.17	0.01	11.63	-0.004	-0.008	0.040
prt	1990s	0.40	2.91	0.18	0.04	5.87	-0.001	-0.010	0.046
spn	1960s	0.56	0.75	0.26	0.01	5.68	0.000	-0.004	0.011
spn	1970s	0.49	1.99	0.26	0.14	6.14	0.006	-0.003	-0.027
spn	1980s	0.38	3.18	0.24	0.18	6.96	0.000	-0.002	0.049
spn	1990s	0.33	2.93	0.22	0.17	7.96	-0.004	-0.003	0.048
swe	1960s	0.00	0.75	0.31	0.00	8.48	-0.003	-0.005	0.021
swe	1970s	0.00	1.99	0.27	0.01	9.40	0.005	0.008	0.002
swe	1980s	0.00	3.18	0.22	0.03	10.45	0.005	-0.004	0.044
swe	1990s	0.00	2.93	0.18	0.01	11.09	-0.007	-0.001	0.055
swz	1960s	0.00	0.75	0.36	0.00	10.83	0.003	-0.006	0.001
swz	1970s	0.00	1.99	0.33	0.00	11.48	-0.008	-0.006	0.000
swz	1980s	0.00	3.18	0.28	0.00	12.12	0.002	-0.005	0.010
swz	1990s	0.00	2.93	0.21	0.00	12.58	0.004	-0.005	0.030
uk	1960s	0.00	0.75	0.33	0.04	8.59	0.000	-0.001	0.030
uk	1970s	0.00	1.99	0.29	0.06	9.54	0.006	0.003	-0.007
uk	1980s	0.00	3.18	0.23	0.04	10.68	-0.005	-0.007	0.042
uk	1990s	0.08	2.93	0.18	0.03	11.95	-0.001	-0.007	0.044
usa	1960s	0.51	0.75	0.24	0.02	9.99	-0.004	-0.001	0.022
usa	1970s	0.45	1.99	0.22	0.02	10.89	0.004	0.004	0.011
usa	1980s	0.40	3.18	0.19	0.00	11.82	0.003	-0.002	0.060
usa	1990s	0.37	2.93	0.17	0.01	12.35	-0.004	-0.003	0.044

Table 5: Summary of the data by country and decade

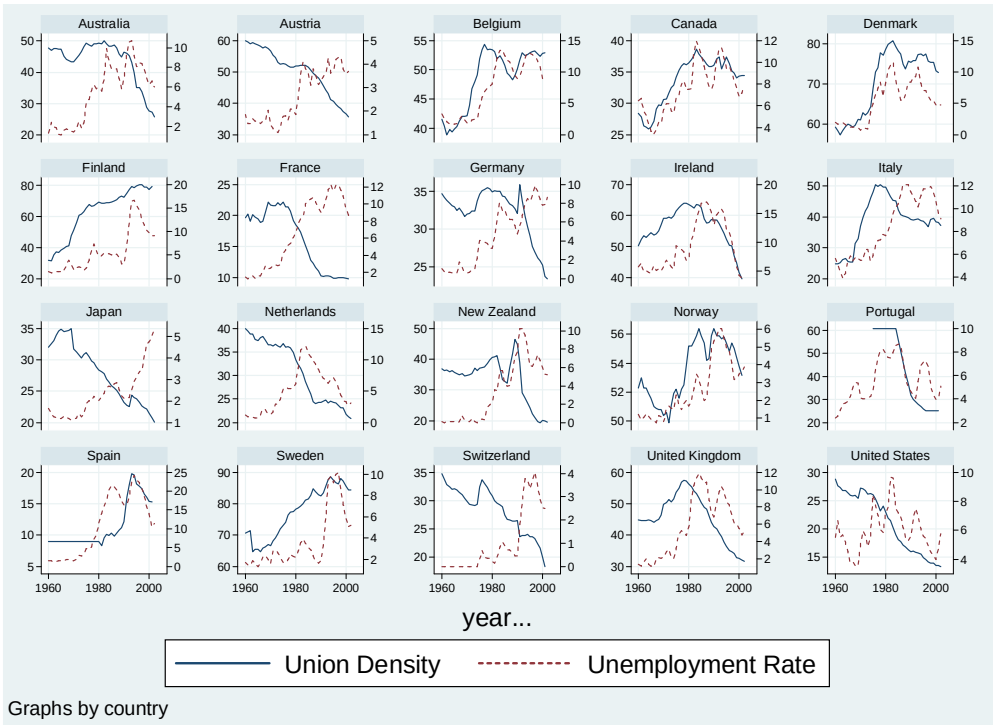

Figure 1: Union density and unemployment rate in 20 OECD countries from 1960 to 2000 (percentage)

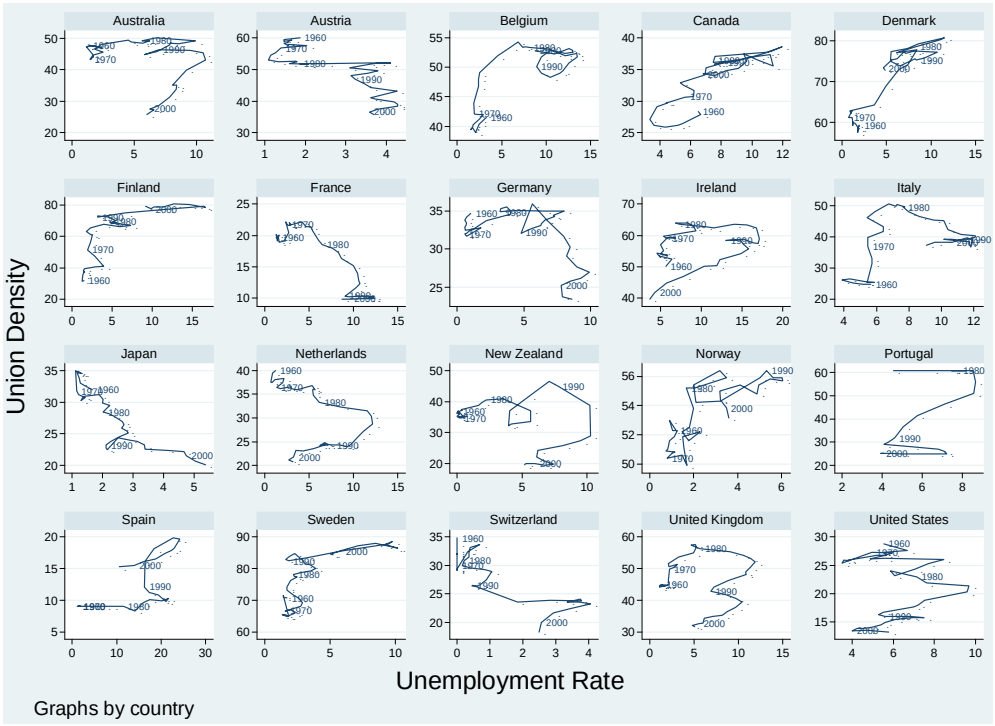

Figure 2: Connected scatterplot of union density and unemployment rate in 20 OECD countries from 1960 to 2000

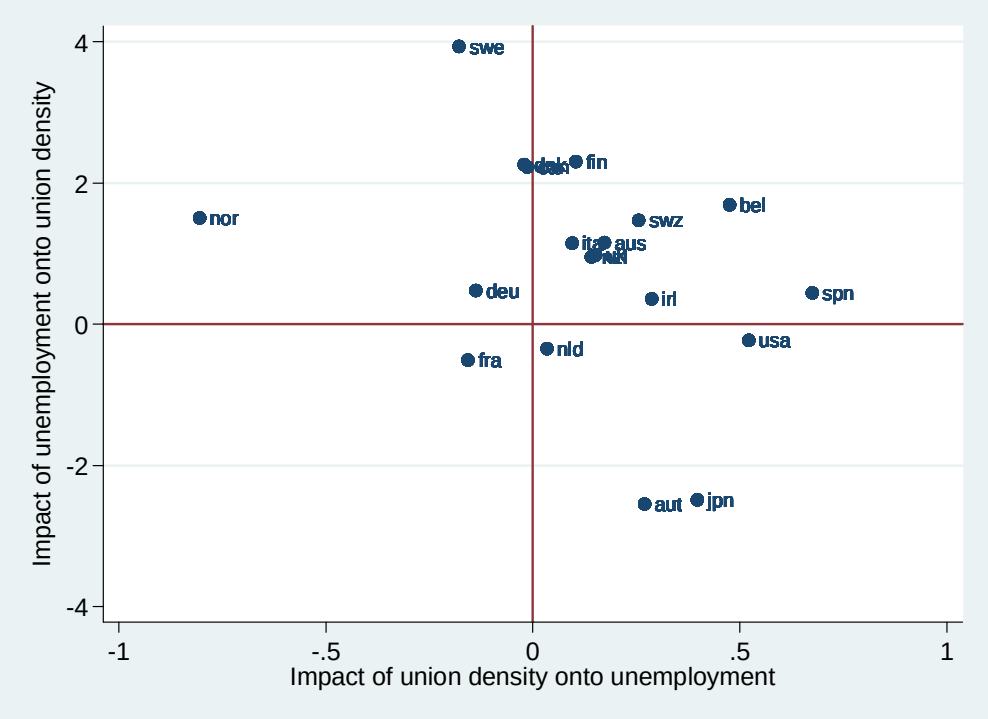

Figure 3: SURE heterogeneous system: union density and unemployment coefficients

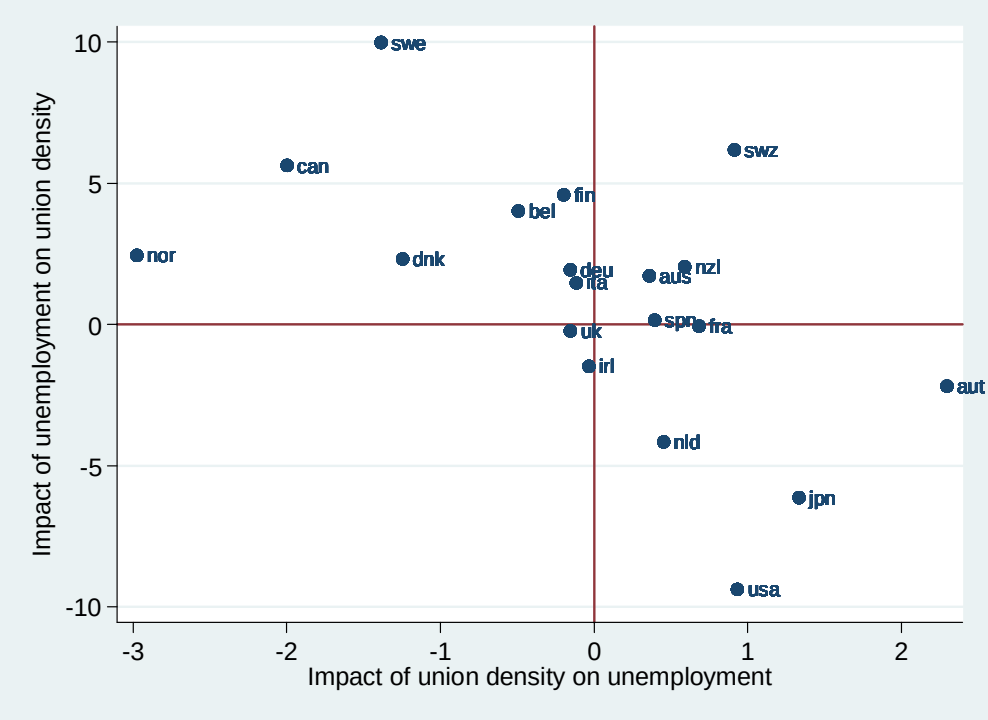

Figure 4: 3SLS heterogeneous system with perturbations: union density and unemployment coefficients

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
	UR	UR	UD	UD	WAGE	UR	UD	WAGE
	OLS	OLS	OLS	OLS	OLS	2SLS	2SLS	2SLS
UR			0.630	0.554	-0.005		1.028	-0.007
			(0.087)**	(0.092)**	(0.001)**		(0.286)**	(0.001)**
UD	0.063	0.060			-0.000	0.130		0.007
	(0.016)**	(0.016)**			(0.000)	(0.048)**		(0.002)**
WAGE				6.273			3.591	
				(2.498)*			(5.574)	
TW	13.275	11.820			0.332	7.616		0.019
	(2.327)**	(2.236)**			(0.059)**	(3.536)*		(0.100)
BRR	0.017	0.007	0.195	0.195	0.000	-0.003	0.175	-0.001
	(0.010)	(0.010)	(0.023)**	(0.023)**	(0.000)	(0.011)	(0.025)**	(0.000)*
BD	-0.177	0.135	-0.155	-0.227	-0.014	0.143	-0.324	-0.008
	(0.701)	(0.673)	(1.685)	(1.679)	(0.018)	(0.683)	(1.714)	(0.021)
BRRBD	0.156	0.124	0.037	0.048	0.001	0.114	-0.041	-0.000
	(0.025)**	(0.024)**	(0.062)	(0.062)	(0.001)	(0.025)**	(0.080)	(0.001)
EP	-0.443	-0.493	-1.280	-1.481	0.001	-0.294	-1.328	0.018
	(0.226)	(0.216)*	(0.522)*	(0.526)**	(0.006)	(0.254)	(0.569)*	(0.008)*
EPBEN	0.211	0.187	-0.086	-0.102	0.003	0.182	-0.179	0.003
	(0.034)**	(0.033)**	(0.083)	(0.083)	(0.001)**	(0.033)**	(0.090)*	(0.001)**
COORD	-1.248	-1.045				-1.171		
	(0.271)**	(0.261)**				(0.277)**		
KAITZ	-0.625	-0.967			0.018	-0.769		0.050
	(0.847)	(0.814)			(0.022)	(0.836)		(0.027)
LROIL	0.954	0.992			0.031	0.844		0.024
	(0.176)**	(0.176)**			(0.004)**	(0.202)**		(0.005)**
LD SHOCK		-23.120				-22.273		
		(6.046)**				(6.162)**		
TRADE SHOCK		-12.364				-11.449		
		(4.425)**				(4.531)*		
RIRL		21.463				21.429		
		(3.220)**				(3.269)**		
MMM			70.973	48.168			65.626	
			(11.811)**	(14.860)**			(26.283)*	
STRIKES			14.880	15.169			13.834	
			(3.145)**	(3.134)**			(3.298)**	
TY25			4.266	4.157			3.809	
			(0.578)**	(0.577)**			(0.601)**	
PROD					0.936			0.921
					(0.022)**			(0.026)**
TREND	-0.065	-0.050	-0.414	-0.590		-0.022	-0.465	
	(0.032)*	(0.031)	(0.088)**	(0.113)**		(0.036)	(0.198)*	
Country effects	yes	yes	yes	yes	yes	yes	yes	yes
Time effects	yes	yes	yes	yes	yes	yes	yes	yes
Observations	680	680	680	680	680	680	680	680
Countries	20	20	20	20	20	20	20	20
R-squared	0.79	0.81	0.94	0.94	.99	0.6686	0.3755	0.9398
RMSE	2.0437	1.9565	4.9285	4.9084	0.0513	1.9880	5.0132	0.0619

Standard errors in parentheses
significant at 5%; ** significant at 1

Table 6: Single equation estimations

	(1)	(2)	(3)	(4)	(5)	(6)
	UR	UD	WAGE	UR	UD	WAGE
	SURE	SURE	SURE	3SLS	3SLS	3SLS
UR		0.923	-0.004		1.240	-0.015
		(0.083)**	(0.001)**		(0.212)**	(0.002)**
UD	0.151		0.001	0.238		0.006
	(0.015)**		(0.000)**	(0.046)**		(0.001)**
WAGE		10.000			16.545	
		(2.342)**			(4.274)**	
TW	9.031		0.291	10.076		0.287
	(2.198)**		(0.056)**	(2.927)**		(0.072)**
BRR	-0.036	0.186	-0.000	-0.049	0.168	-0.001
	(0.008)**	(0.019)**	(0.000)	(0.010)**	(0.019)**	(0.000)**
BD	-0.481	-0.294	-0.015	-0.824	0.302	-0.025
	(0.673)	(1.612)	(0.017)	(0.757)	(1.686)	(0.019)
EP	-0.770	-1.219	-0.001	-0.536	-1.249	0.001
	(0.209)**	(0.488)*	(0.005)	(0.265)*	(0.557)*	(0.007)
COORD	-0.879			-0.474		
	(0.256)**			(0.220)*		
KAITZ	-0.927		0.019	-1.892		0.011
	(0.803)		(0.021)	(0.728)**		(0.022)
LROIL	0.784		0.029	0.474		0.030
	(0.173)**		(0.004)**	(0.147)**		(0.004)**
LD SHOCK	-21.350			-12.816		
	(5.937)**			(4.555)**		
TRADE SHOCK	-11.290			-8.418		
	(4.355)**			(3.323)*		
RIRL	25.050			16.328		
	(3.108)**			(2.854)**		
MMM		39.475			-16.995	
		(13.536)**			(16.927)	
STRIKES		13.803			9.078	
		(2.936)**			(2.349)**	
TY25		4.030			2.710	
		(0.540)**			(0.446)**	
TREND	-0.013	-0.675		0.006	-0.781	
	(0.031)	(0.105)**		(0.036)	(0.152)**	
PROD			0.933			0.928
			(0.021)**			(0.023)**
Country effects	yes	yes	yes	yes	yes	yes
Time effects	yes	yes	yes	yes	yes	yes
Observations	680	680	680	680	680	680
Countries	20	20	20	20	20	20
R-squared	0.78	0.93	0.99	0.74	0.92	0.99
RMSE	2.0286	4.8974	0.0509	2.2011	5.2619	0.0629

Standard errors in parentheses
significant at 5%; ** significant at 1

Table 7: SURE and 3SLS System Estimations

	(1)	(2)	(3)	(4)	(5)	(6)
	UR	UD	WAGE	UR	UD	WAGE
	SURE	SURE	SURE	3SLS	3SLS	3SLS
UR		0.924	-0.005		1.378	-0.018
		(0.088)**	(0.001)**		(0.229)**	(0.002)**
UD	0.135		0.001	0.238		0.006
	(0.015)**		(0.000)**	(0.045)**		(0.001)**
WAGE		10.452			15.727	
		(2.357)**			(4.434)**	
TW	10.023		0.322	9.747		0.321
	(2.122)**		(0.056)**	(2.825)**		(0.073)**
BRR	-0.006	0.176	-0.000	-0.022	0.143	-0.001
	(0.009)	(0.022)**	(0.000)	(0.012)	(0.025)**	(0.000)*
BD	0.009	-0.383	-0.014	-0.373	0.172	-0.019
	(0.654)	(1.635)	(0.017)	(0.744)	(1.719)	(0.019)
BRRBD	0.112	-0.018	0.000	0.103	-0.062	0.002
	(0.023)**	(0.061)	(0.001)	(0.027)**	(0.073)	(0.001)*
EP	-0.314	-1.569	0.003	-0.016	-1.779	0.011
	(0.210)	(0.512)**	(0.006)	(0.261)	(0.556)**	(0.007)
EPBEN	0.186	-0.192	0.003	0.195	-0.326	0.006
	(0.032)**	(0.080)*	(0.001)**	(0.036)**	(0.087)**	(0.001)**
COORD	-1.012			-0.505		
	(0.247)**			(0.209)*		
KAITZ	-0.969		0.020	-1.852		0.011
	(0.772)		(0.021)	(0.715)**		(0.022)
LROIL	0.843		0.030	0.457		0.032
	(0.167)**		(0.004)**	(0.138)**		(0.004)**
LD SHOCK	-20.932			-10.971		
	(5.719)**			(4.226)**		
TRADE SHOCK	-11.506			-7.593		
	(4.185)**			(3.083)*		
RIRL	20.474			11.847		
	(3.053)**			(2.556)**		
MMM		35.583			-23.094	
		(13.993)*			(18.912)	
STRIKES		13.892			8.720	
		(2.948)**			(2.374)**	
TY25		4.056			2.599	
		(0.543)**			(0.449)**	
PROD			0.930			0.927
			(0.021)**			(0.023)**
TREND	-0.024	-0.702		0.004	-0.775	
	(0.030)	(0.107)**		(0.035)	(0.164)**	
Country effects	yes	yes	yes	yes	yes	yes
Time effects	yes	yes	yes	yes	yes	yes
Observations	680	680	680	680	680	680
Countries	20	20	20	20	20	20
R-squared	0.80	0.93	0.99	0.76	0.92	0.99
RMSE	1.9399	4.8823	0.0505	2.1417	5.3322	0.0641

Standard errors in parentheses
significant at 5%; ** significant at 1

Table 8: SURE and 3SLS System Estimations with institutional interactions