Capital accumulation, labour market institutions, and unemployment in the medium run

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Abstract

According to the mainstream view, labour market institutions are the key determinants of unemployment in the medium run. The actual empirical explanatory power of measures for labour market institutions, however, has been called into question recently (Baccaro and Rei 2007, Howell et al 2007), fuelling anew the discussion about the proximate causes for the particular evolution of European unemployment. This paper contributes to the debate by highlighting the role of autonomous changes in capital accumulation as demand shocks. In the empirical analysis, medium-term unemployment is explained by capital accumulation, labour market institutions and a number of macroeconomic variables in a panel analysis covering 20 OECD countries. The economic effects of institutional changes, macro shocks and capital accumulation are compared. Capital accumulation and the real interest rate are found to have statistically significant effects that are robust to the inclusion of control variables and show economically relevant orders of magnitude.

Keywords: unemployment, NAIRU, capital accumulation, labour market institutions, Keynesian economics

JEL codes: E12, E20, E24, E60

Introduction

Labour market institutions (LMI) are widely considered the key determinants of unemployment: "broad movements in unemployment across the OECD can be explained by shifts in labour market institutions" (Nickell et al 2005, 1). This view, which we will refer to as the *mainstream view*, has important policy conclusions. OECD (1994) and IMF (2003) have blamed high and long-lasting unemployment benefits, employment protection legislation, and similar regulations for persistently high unemployment in many European countries and advocated a liberalization and flexibilization of labour markets.

This explanation of European unemployment has recently been called into question. First, the OECD itself has presented a reassessment of its policy stance in the *OECD Employment Outlook 2006*, in which it concludes that "some European countries appear to achieve equally good employment outcomes with extremely different policy settings" (OECD 2006: 190). Yet while the *Employment Outlook* does indeed offer a much more nuanced analysis of labour market institutions compared to earlier publications, it still treats alternative explanations of the evolution of unemployment in a rather cavalier way. Second, the alleged empirical explanatory power of labour market institutions has come under considerable criticism in academic research. Howell et al (2007) find that "while significant impacts for employment protection, benefit generosity, and union strength have been reported, the clear conclusion from our review of these studies is that the effects for the PLMIs [protective labor market institutions] are distinctly unrobust, with widely divergent coefficients and levels of significance" (Howell et al 2007, 58). Similarly, Baccaro and Rei (2007), in their careful attempt to replicate the reported effects, conclude that "the claim that it would be possible to reduce unemployment simply by getting rid of labor market rigidities appears unwarranted based on our results." (Baccaro and Rei, 2007, 563)

The question is therefore opened anew as to what the proximate causes of unemployment are. The major competitor to labour market institutions in explaining unemployment are, of course, macroeconomic shocks, in particular demand shocks. While some of these shocks have recently been included in the analysis as control variables, they rarely receive much attention. Surprisingly few empirical studies on the medium term effects of demand shocks exist, and among these, monetary policy has attracted by far most interest (e.g. Ball 1994, 1999).

However, there is more to demand than monetary policy. As the *Manifesto on European unemployment* put it: "one reason for (…) the rise in unemployment has been a decline in investment relative to full-capacity output" (Modigliani et al. 1998, 169). While monetary policy can arguably exert an impact on investment decisions, there may be other reasons for private investment to fall below the level necessary for full employment. Indeed, Keynes himself had famously argued that it is mostly driven by animal spirits. To some extent these animal spirits will depend on specific institutional structures and the degree of uncertainty regarding the future evolution of important macroeconomic variables (Carruth et al 2000) or corporate governance structures (Stockhammer 2004b), but overall it is fair to say that investment expenditures cannot be easily reduced to underlying variables.

This paper complements the analysis of Baccaro and Rei (2007) and Howell et al (2007) by offering a more in-depth analysis of demand shocks. Its main contribution is including capital accumulation as a demand shock while at the same time allowing for effects of a rich set of labour market institutions and other macroeconomic shocks from two alternative data sets. Econometrically medium-term unemployment will be explained by capital accumulation,

labour market institutions and a number of macroeconomic variables in a panel analysis covering 20 OECD countries. 5-year averages are used as medium-term variables for two reasons. First, the focus of the paper is on medium-term unemployment or the NAIRU (non-accelerating inflation rate of unemployment), rather than on short-term movements of unemployment. 5-year averages are usually considered sufficient to smooth out business cycle fluctuations. Second, labour market institutions change slowly and the corresponding variables consequently show little variation. Their inclusion is thus more appropriate in regressions of medium-term data. The paper is related to the Post Keynesian literature on capital shortage, but it interprets changes in capital accumulation as a *demand* shock rather than a supply shock.

The paper is structured as follows. Section 2 reviews the NAIRU model and recent empirical research on the determinants of unemployment. Section 3 presents the regression equation. Section 4 discusses the data sources and variable definitions. Section 5 summarizes the econometric results. This includes baseline results for both data sets, some findings on interactions of labour market variables, an illustration of the economic impacts of the variables, and a discussion of different measures for capital accumulation. Finally, section 6 summarizes the results and indicates policy conclusions.

2. A review of the literature

As the NAIRU model is well charted terrain in the literature and the contribution of this paper is of empirical nature (the inclusion of capital accumulation in a rather conventional reduced-form unemployment equation), there is no need to rehearse the model in detail. Rather, this survey will focus on the empirical literature to highlight how our approach relates to, builds

on, and differs from previous research. Carlin and Soskice (2005) as well as Layard, Nickell and Jackman (2005) offer good introductions to the NAIRU model. Stockhammer (2008) shows that the NAIRU theory can be given New Keynesian, Post Keynesian, and Marxian interpretations depending on the respective demand closure and the NAIRU-endogeneity closure chosen.

The NAIRU model is a general model of output, employment and inflation that allows for inflation resulting from conflicting income claims. Such models imply that at any point in time there exists a (short-run) inflation barrier, the NAIRU, such that if demand takes unemployment below that barrier, inflation will tend to rise. This is summarized in the expectations-augmented Phillips curve:

(1) $u = -\Delta p/w_1 + u_N$

where u, p, and u_N are the rate of unemployment, the rate of inflation, and the NAIRU, respectively. Note that equation (1) says nothing about the determination of the NAIRU.

In contemporary policy debates, the NAIRU theory is often associated with a particular explanation for high levels of unemployment in Europe. Accordingly, Stockhammer (2008) distinguishes between the NAIRU *theory* and the NAIRU *story* of European unemployment: While the NAIRU *theory* is a flexible framework that a priori entails no empirical claims, the NAIRU *story* is a specific interpretation of the model. It involves two propositions. First, that the NAIRU is determined exogenously by labour market institutions, which are, in turn, mostly subject to policy. Second, that changes in the NAIRU *cause* (in the strong sense of the

word) changes in actual unemployment (rather than vice versa or with a third variable affecting both). Consequently, the NAIRU serves as a strong attractor for actual unemployment. The NAIRU story thus claims that the rise of unemployment in Europe is essentially due to labour market inflexibility: changes in the NAIRU over the past decades have been due to wage-push factors typically summarized conveniently as overly generous welfare states. The NAIRU story is equivalent to what we call the mainstream view.

Actual unemployment depends on the change of the rate of inflation and on the NAIRU. As the change in inflation is interpreted as surprise inflation, it has to vanish over longer time periods. The starting point of much of the recent empirical literature has thus been a reduced-form unemployment equation:

(2) $u_N = u(L; P; S)$

Here, the NAIRU depends on factors influencing the wage aspirations of workers exogenously (summarized by the vector L), on factors influencing the mark-up of firms (summarized by the vector P) and on various macroeconomic shocks (summarized by the vector S). Available empirical studies differ with regard to the variables used to proxy the vectors L, P, and S. Labour market institutions, which are expected to shift workers' bargaining position, have received the most and often exclusive attention in empirical work.

The literature on the respective role of labour market institutions and capital accumulation on unemployment have proceeded along independent lines, with the former effectively ignoring the latter. Blanchard (2005) recapitulates the debate centred on the evolution of the NAIRU

over the past three decades, while Baker et al (2005) and Baccaro and Rei (2007) offer detailed summaries and comparisons of the more recent empirical literature on the role of LMI. Table 1 presents an overview of a selection of recent studies. Most include variables measuring unemployment benefits, employment protection legislation, union density, the degree of coordination of collective bargaining, and the tax wedge. They differ along several dimensions. One aspect is the extent to which they include macroeconomic control variables. Nickell (1997) and Elmeskov et al (1998), for instance, include none at all. Blanchard and Wolfers (2000) control for real interest rates, TFPS, technological labour demand shocks, and terms of trade. It has since become standard to include these variables.

insert table 1 about here

Second, while some studies are based on annual data (e.g. IMF 2003, OECD 2006, Arestis et al. 2007) others use medium-term data (Nickell 1997, Blanchard and Wolfers 2000, Baker et al 2005). While the former may suggest greater precision, this is not necessarily the case. As LMI typically change only slowly, data are often available only in intervals greater than annual basis. In this case, estimations based on annual data either have to limit the set of LMI taken into account (Stockhammer 2004a, Arestis et al 2007) or the data have to be interpolated (IMF 2003, OECD 2006). Baccaro and Rei (2007) conclude from their extensive tests of different estimation strategies that 5-year averages are preferable to yearly data on econometric grounds.

Third, there is a difference in the degree to which studies try to control for price push variables. Bassanini and Duval (2006) are alone in including a variable for product market

regulation. The lack of research on the determinants of price (mark-up) setting in the context of explaining unemployment is one of the blind spots of the literature.

Overall, there is disagreement regarding the performance of labour market institutions in explaining medium-run unemployment. Some authors, most notably the IMF (2003) and Nickell et al (2005), find strong effects of labor market institutions. The empirical explanatory power of labour market institutions has, however, been under substantial criticism lately. Fitoussi et al. (2000) note "that the institutional reforms in the OECD proposal can only be a small part of the story. In several countries, such as Ireland, equilibrium unemployment has fallen in the absence of net reform, in our estimation, whereas in others the net reform has apparently not affected equilibrium unemployment significantly" (Fitoussi et al 2000, 257). Baker et al (2005) find "no meaningful relationship between [the] OECD measure of labor market deregulation and shifts in the NAIRU" (Baker et al 2005, 107). Similar conclusions are drawn by Blanchard and Katz (1997, 67-68), Madsen (1998, 862), Stockhammer (2004a), and Freeman (2005). Remarkably, the *OECD Employment Outlook 2006* acknowledges that different combinations of institutional settings can result in low unemployment (OECD 2006).

The inclusion of variables measuring demand shocks, import price shocks, technology shocks and other shocks presupposes the presence of a degree of persistence in unemployment. The most common factors considered to lead to unemployment persistence are insider bargaining, skill-loss in unemployment and queuing (Røed 1997). Wage demands, in these models, depend on a weighted average of current and past unemployment (or long-term unemployment) rather than on current unemployment alone. As a consequence, one-time increases in the unemployment rate may have permanent effects.

The case for an endogeneity of the NAIRU, however, is broader than a dampening of the unemployment elasticity of wages. First, the level of employment may depend on the capital stock (in combination with imperfect substitution between capital and labour; Sawyer 2002, Arestis and Sawyer 2005). Thus, the NAIRU will depend, among others, on the capital stock. Second, a (lasting) rise in the real interest rate may affect the mark-up as capital costs increase (Hein 2006). An interest rate hike would consequently affect not only actual unemployment, but also the NAIRU. Third, wage claims themselves may depend on past experience (Skott 2005, Stockhammer 2008). Workers will adapt to certain wage levels if they persist for an extended period due to anchoring effects well established by experimental economics. More technically, autonomous wage claims will thus depend on past wage levels, independent of (or additionally to) changes in the wage elasticity. For all these reasons the NAIRU may follow the path of actual unemployment. Consequently, macroeconomic shocks may influence the NAIRU over medium time periods important for economic policy making.

Against this background, Post Keynesians have long highlighted the role of insufficient capital formation as a cause of unemployment, and a sizeable empirical literature on the subject exists (Rowthorn 1995, 1999, Alexiou and Pitelis 2003, Arestis and Biefang-Frisancho Mariscal 1997, 1998, Stockhammer 2004, Arestis et al 2007). Within the Keynesian literature, three channels through which capital accumulation may affect unemployment and the NAIRU have been distinguished. First, there is limited substitutability: Rowthorn (1999) has shown that unless an elasticity of substitution of one is assumed (as it is in Layard, Nickell and Jackman (1991) and the mainstream labour market theory building on their work) equilibrium unemployment will depend, among other factors, on the capital stock even in a Layard-Nickell type NAIRU model. Second, there is a bargaining effect. Rowthorn (1995) argues that "unemployment reduces the ability of workers to push up wages, while

excess capacity limits the ability of firms to raise prices" (Rowthorn 1995, 28). Thus, an insufficient capital stock will require a higher unemployment rate to equilibrate income claims of workers and employers. These two effects (which are complementary) are both supply-side arguments. The third way in which capital accumulation may play a role is as a demand factor: investment is the most volatile of the macroeconomic aggregates and is considered the driving variable in business cycle theory as well as in growth theory. For all these reasons the NAIRU itself may therefore depend on capital accumulation.

Several studies have found that interest rates have empirically important effects on unemployment. Based on a regression explaining changes in unemployment between the 1980s and 1990s in 19 OECD countries Fitoussi et al (2000, 259) find that "[c]hanges in the domestic (short-term) real rate of interest go hand in hand with changes in average unemployment." Blanchard and Wolfers (2000) present a panel investigation for 20 OECD countries and highlight the interaction of macroeconomic shocks and institutions. They also find strong effects of the evolution of real interest rates. The IMF (2003) includes some macroeconomic variables next to various labour market institutions in panel regressions explaining unemployment (for 20 OECD countries from 1960 to 1998) and finds that the real interest rate as well as the measure of Central Bank independence show a positive and highly significant impact on unemployment. Bassanini and Duval (2006) perform a panel analysis for 21 OECD countries over the 1982-2003 period and find that the long-term real interest rate has a statistically significant impact on unemployment.

3. Regression specification

The contribution of this paper is to include capital accumulation as a demand shock into a rather conventional reduced-form unemployment equation while controlling for the standard

labour market institutions and several macroeconomic shocks. Demand shocks are usually only represented in the form of interest shocks, which is arguably a rather simplified measure of demand. This focus results from a certain supply-side bias in macroeconomics over the past decade that has been criticized among others by Solow (2000) and Modigliani et al (1998). Investment expenditures are the most volatile component of demand and the empirical literature on investment clearly finds that variations in interest rates explain only a minor part of the variation in investment. Over longer periods, neoclassical as well as the New Growth Theory usually treat capital accumulation as an endogenous variable, while Post Keynesian growth theory (at least partially) features autonomous investment expenditures at its very core (Robinson 1956, Marglin 1984, Taylor 2004). Only the latter would thus predict a significant effect of capital accumulation on unemployment *in the medium run*. While this literature makes the case for a strong role of capital accumulation, much of it does not (or only in rudimentary way) allow for a potential role of labour market institutions. This paper is related to the Post Keynesian capital shortage literature, but it interprets changes in capital accumulation as *demand* shocks.

The baseline regression equation to be estimated takes the following form:

$$u_{t,i} = b_1 LMI_{t,j} + b_2 ACCU_{t,j} + b_3 MS_{t,j} + b_4 C + b_5 FE_t + b_6 FE_j + \varepsilon_{t,j}$$

Where LMI, ACCU and MS stand for labour market institutions, capital accumulation and macroeconomic shocks, respectively. C stands for other control variables to be specified later that will be included in variations of the basic specification. FE_t and FE_j are cross section and period fixed effects, respectively. The precise set of labour market variables varies with the data set, but typically they will include indicators for employment protection legislation, unemployment benefit generosity, union density, the coverage and coordination of collective

bargaining, and the tax wedge. All these are wage push variables and, with the exception of coordination, are expected to have a positive sign.[1]

Only in one variant will we consider a price-push variable: product market regulation (PMR). This is a shortcoming our paper shares with the rest of the literature that has studied wage push variables much more carefully than price-push variables. PMR is expected to have a positive effect on unemployment.

All LMI variables are standard in the literature. One innovation of this paper is to include the rate of capital accumulation as a demand shock. As will be shown later (section 6), econometrically it makes little difference whether capital accumulation – that is the rate of growth of capital stock – is included in the regression or the log of (real) business investment. Capital accumulation is preferred because it has a more straightforward interpretation. Including it, however, may raise concerns of endogeneity: If the estimation were focusing on short-term effects, one could argue that an increase in output will increase accumulation as well as employment. However, in the long run, employment (and unemployment) is independent of output growth in the orthodox view. Capital accumulation in the long run depends on technology (for neoclassical economists) or on expected profitability (for Post Keynesians). Either way, in the context of five year averages it seems that capital accumulation is no more endogenous than the interest rate or labour market institutions themselves.

4. Data

[1] The tax wedge is in fact often regarded as a price push variable (Layard et al 2005, Carlin and Soskice 2005).

In our empirical investigation, we include data from 20 OECD countries.[2] Annual data on unemployment rates (u), the real net capital stock of the total economy (K), and the consumer price index (the logarithmic change of which will be denoted as INFL) are taken from the European Commission's AMECO database.

The LMI data comes from two different sources. The first source is the most recent OECD database on institutional variables that is used in the comprehensive study by Bassanini and Duval (2006), which, in turn, formed the basis of the respective section in the OECD *Employment Report* 2006. Bassanini and Duval have compiled two annual time series databases, covering the 1970-2003 (henceforth: BD70-03) and 1982-2003 (henceforth BD82-03) periods, respectively. The latter database has been hailed as a major improvement over previous institutional datasets plagued by various data problems (Howell et al 2007, section 2), notably for its carefully constructed new series on employment protection legislation (EPL), and is preferred here with a view to data quality. In addition to EPL, the variables employed are the unemployment benefit replacement ratio (UB), benefit duration (BD), union density (UD), and the tax wedge (TW). Furthermore, we include the BD82-03 dummy variable that is 1 if the union coverage is high and 0 otherwise (CBC).[3]

In order to check the robustness of our findings by extending the period covered, we additionally employ the labour market institutions database compiled by Baker et al. (2005; henceforth BGHS). This dataset extends and revises the Nickell and Nunziata LMI database, which has been used widely in econometric studies during the 1990s. Besides the

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Nothing of substance hinges on the classification in our context.

[2] These are Australia, Austria, Belgium, Canada, Denmark, France, Finland, Germany, Ireland, Italy, Japan, the Netherlands, New Zealand, Norway, Portugal, Spain, Sweden, Switzerland, the United Kingdom, and the United States.

disadvantages of no variable measuring PMR in the BGHS database, there are three main advantages of using it rather than the alternative BD70-03. First, BGHS has substantially more variation in its variables than BD70-03.[4] Second, BGHS also covers the 1960s, thus a longer time period. Third, BGHS includes a series measuring bargaining coordination (COORD), a variable also treated somewhat unsatisfactorily in the Bassanini and Duval datasets.[5] As an additional check for robustness, all regressions were also performed on the BD70-03 dataset.[6] The respective results have been relegated to the appendix.[7]

The macro shocks considered likewise vary with the data set employed. The real interest rate (INT) and a terms of trade shock (TOTS; measured as the relative prices of imports[8]) are included in all data sets. Both are expected to have a positive effect on unemployment. Furthermore, in the Bassanini and Duval datasets, a labour demand shock (LDS) (supposed to control for biased technological change) and the deviation of total factor productivity from its trend (TFPS) are included. While the former should have a positive effect on unemployment, the TFPS effect should be negative, as higher-than-expected productivity growth allows for (temporarily) lower real wages (Ball and Moffitt 2002).

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[3] The BD82-03 dataset also includes a variable for active labour market expenditures, which is available only from 1985. This variable was included in our original regressions (available upon request) but dropped because it was consistently statistically insignificant and reduced the sample.

[4] BD70-03 is not just an extended version of BD82-03, but in parts substantially simplified. While some variables (UB, UD, COORD, TW) as well as all macro shock variables are identical in the sets, EPL and CBC merely give constant country means with little (EPL: post-1991 period for Finland, Germany, and Sweden) to no variation at all (CBC). Benefit duration is implicitly included in the unemployment benefit measure (see also table A1 in the appendix).

[5] Bassanini and Duval have a variable measuring the degree of corporatism (low, medium, or high), which again exhibits very little variation across countries over time.

[6] The BD datasets have been left unaltered with one notable exception: In the longer sample, a number of missing values for TW as well as three values for UD have been filled in by applying growth rates derived from the equivalent time series in the Baker et al dataset to the original Bassanini and Duval series. This solution seemed warranted given the high positive correlation between the series for the respective periods. Moreover, the sensitivity of these alterations was checked by running the entire set of regressions using the non-filled series as well. The differences are minor and can be attributed to the concomitant prolongation of the panel sample.

[7] We have also estimated our set of regressions using the original LMI database by Nickell and Nunziata (1960-95). The results yielded no new insights and are therefore not reported in this paper, but are available from the authors upon request.

Both the institutional and the macro data were transformed into 5-year-averages, yielding eight data points each for the BGHS series, and five for BD82-03. The first and final period of BD82-03 were counted as full periods, and the macro data also cover these reduced periods.[9]

For reasons of simplicity, identical notations are used throughout the paper for the same *type* of labour market institution in the different datasets employed. As highlighted above, the definitions as well as the values of specific variables vary with the dataset. Table A1 in the appendix lists the variable notations used in this paper and the corresponding notations employed by the respective researchers for their original series.

5. Econometric results

This section presents the econometric results. First, the baseline results for the BD82-03 dataset and the BGHS dataset are summarized. Second, possible interactions among LMI and between LMI and MS are investigated, as these have recently received a lot of attention in the literature. Third, the economic impact of the variables is illustrated by means of simulations. Fourth, different measures of capital accumulation are compared.

5.1 Baseline results

Tables 2 and 3 list the main empirical findings employing the BD82-03 and the BGHS datasets, respectively. We present results for six different specifications. In specification (1),

[8] It would be preferable to call this shock an import price shock rather than a terms of trade shock because import prices are in the numerator of the variable and export prices do not enter. However, as the term 'terms of trade shock' has become established in the literature, we follow convention and also use the term.
[9] Having the macro data cover the full 5-year periods instead (in order to preserve the business-cycle smoothing effect) does not alter the results in any substantial way.

medium-run unemployment is explained by the available LMI variables and the variable measuring product market regulation. Specification (2) adds four macro shocks for which BD provide data (the INT, TOTS, LDS, and TFPS). These two can be considered conventional specifications found in the relevant empirical literature. Specification (3) introduces the growth of the capital stock as an explanatory variable. Consider this the (Post-)Keynesian specification. The final three specifications are checks of robustness. Whereas the first three contain fixed country and time effects, the fourth variant contains cross section fixed effects only. Specification (5) is a variation of (3), in which the acceleration (or deceleration) of consumer price inflation is included as a control variable. This variable should have an effect only if the 5-year averages do not sufficiently smooth out business cycle fluctuations. Specification (6) is estimated in difference form as commended by Baccaro and Rei (2007).

insert table 2 about here

Looking first at the institutional variables in table 2, two of them – UD and CBC – are highly significant throughout the different specifications. However, while UD carries the expected (positive) sign, the CBC dummy variable has a negative coefficient, suggesting that a bargaining regime with a higher degree of employees covered by wage bargains negotiated collectively should feature lower unemployment. This is not in line with standard theory that portrays both UD and CBC as measures for the influence of trade unions on the collective bargaining process, which is considered unemployment-augmenting because unions are assumed to give a higher weight to the interests of their (employed) members than to those of the unemployed, leading to bargained real wages exceeding market clearing levels. In this line of argument, CBC is regarded as a variable measuring the “true” power of trade unions that may not be reflected accurately in union density. In a country, the degree of union

membership may be small while the reach of wage bargains negotiated by the same unions is actually large (France being a prime example). A higher degree of collective bargaining coverage should thus raise unemployment as well.

One explanation for the opposite empirical finding here could be that CBC, rather than measuring the potentially harmful influence of unions, could actually be viewed as a proxy for the degree of collective bargaining *coordination*. A number of authors have suggested that the potentially negative role of trade unions can be offset by a high degree of centralisation and/or coordination in the wage bargaining process, which is expected to promote a higher sensibility among the negotiating parties for the overall macroeconomic effects of negotiated wages (Scarpetta 1996, Nickell 1997, Elmeskov et al 1998). The COORD variable itself, however, remains statistically insignificant with one exception (specification 4 without time effects) in the BD82-03 dataset, and without exception in the longer sample (cf. table A2 in the appendix).

As for the effects of employment protection on unemployment, the usual expectation is that stricter employment protection leads to higher unemployment as enterprises are more reluctant to hire the more difficult it is to make workers redundant again later on. Various authors, however, have suggested that the effect might be negligible, as employment protection not only reduces the outflow from (longer-term) unemployment but also the inflow into (short-term) unemployment precisely because it makes firing more costly (e.g. Nickell, 1997). Indeed, we obtain a positive coefficient for the new OECD measure of EPL, which, however, is statistically insignificant. This finding is in line with the majority of recent empirical studies (including Bassanini and Duval, 2006) that typically fail to detect a significant impact of this variable on unemployment at the macro level.

The tax wedge (TW) – the single most influential institutional variable in the regressions of Bassanini and Duval (2006) – is only occasionally significant with the expected sign, and apparently sensitive to the specification. Similarly, the degree of unemployment benefit generosity (UB) turns out highly significant only when LMI alone are included in the regressions, but becomes insignificant as once macroeconomic shocks are included. The PMR variable is insignificant throughout all specifications.

Among the macro shocks, only the real long-term interest rate shock exerts a statistically significant, unemployment-raising effect throughout all different regressions. In specification (3), a 1 percentage point increase in INT increases unemployment by over 0.5 percentage points. The other shocks also mostly carry the expected sign, with the exception of TFPS (the coefficient ought to be positive for TOTS and LDS, and negative for TFPS, as unexpectedly high productivity growth tends to lead to lower negotiated real wages). TOTS is significant in several cases (assuming an import share of 30%, a 10% increase in import prices would increase unemployment by 0.42 percentage points in specification 3), whereas the labour demand and TFP shocks are typically not.

Finally, the capital stock growth is statistically significant at least at the 5% level with the expected negative sign in all specifications. An increase in the rate of capital accumulation by 1% decreases unemployment by 0.87 percentage points in the specifications with time effects (and by 0.92 percentage points in the specification without time effects). Moreover, the inclusion of capital accumulation has only a modest impact on the effect of interest rates: the coefficient on INT drops from 0.74 (specification 2) to 0.54 in (specification 3).

The inclusion of the difference in inflation rates has no notable effect on the results (specification 5). The coefficient estimate on the change in inflation itself is not statistically significant. It can thus be concluded that the use of 5-year averages has indeed served to smooth out most cyclical fluctuations. In other words, the five-year mean of the unemployment rate is a reasonably good proxy for structural unemployment.

Finally, specification (6) estimates the same regression in difference form. This is the preferred specification of Baccaro and Rei (2007), who find that other specifications tend to suffer from autocorrelation problems. However, this is not the case with specifications summarized in Table 2. The results in difference form are thus reported only for comparability. This exercise confirms our previous findings: Capital accumulation has a strong and statistically significant (at the 1% level) effect with a coefficient estimate of -162.23 that is substantially higher than in 'levels'. Among the labour market institutions, BD, UD and CBC remain statistically significant.

The regression results from using the BGHS database (Table 3) are generally in line with those derived from BD82-03. Contrary to the results for the BD82-03 dataset, however, serious autocorrelation problems now plague the regressions. The results for specifications (1) through (5) are thus only reported for consistency with the previous results. The interpretation will focus on specification (6). Among the institutional variables, the measure of union density is again the only variable that exerts a statistically significant effect on unemployment, except for EPL, which has a perverse sign. Specification (6) suggests that a 1 percentage point decrease in union density would entail a reduction in unemployment of nearly 0.06 percentage points. Interest rates also show a statistically significant effect (at the 5% level) An increase of the interest rate by 1 percentage point increases unemployment by

0.16 percentage points. ACCU is statistically significant (at the 1% level). An increase in the accumulation rate by 1 percentage point would decrease unemployment by 0.93 percentage points.

insert table 3 about here

5.2 Interactions of labour market institutions

Interactions among LMI as well as between LMI and macroeconomic shocks have attracted considerable attention in recent empirical research (Blanchard and Wolfers 2000, Bélot and van Ours 2004, Nickell et al 2005, Bassanini and Duval 2006). The theoretical foundation for these interactions is weak, or to be more precise, it is unspecific. This is a major problem for any attempt to statistically evaluate the effects of interactions: since there are numerous potential interactions, the inclined researcher is bound to find some that prove statistically significant.

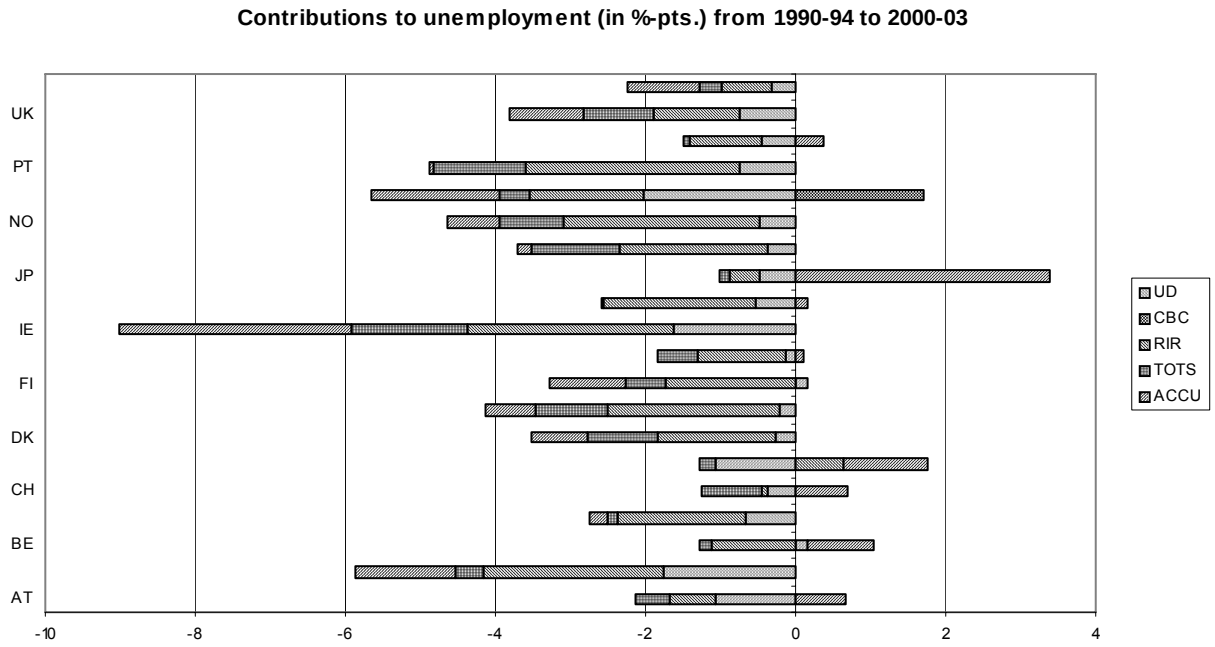
To illustrate this problem, Table 4 summarizes all 2x2 interactions of LMI variables with other LMI variables and the shock variables using the DB82-03 dataset. There are 60 interactions in total, of which nine are statistically significant at the 5% level. Among these, three have reinforcing signs, while the other six have counteracting signs. For example, we find that higher interest rates reduce unemployment if benefit duration is long or that the employment protection lowers unemployment if unemployment benefits are high (both coefficients have t-values well above 3). While the inclined economist could probably construct a model that yields such results or find a reason to ignore these interactions and focus on others instead, the prudent interpretation of the results is to conclude that the evidence in favour of strong interaction effects is underwhelming.

Insert Table 4 about here

5.3. Illustrations of the economic impact

Statistical significance can be a misleading guide in assessing the economic impact of explanatory variables, as it merely indicates the likelihood that a coefficient in the underlying population differs from zero. A statistically significant coefficient estimate does not necessarily imply that the variable also has an economically significant impact (McCloskey and Ziliak 1996). To illustrate the economic impact, some simulations and calculations based on the preferred estimation equations, i.e. specification (3) for the BD82-03 dataset and specification (6) for the BGHS dataset, are reported below.

First, we want to investigate the relative impact of variables *across countries*. This calculation is based on the BD1982-03 dataset. The contributions to unemployment were determined by multiplying the changes in the relevant variable with the respective coefficient estimate. We compare the change from the period 1990-95 to 2000-03 because over this period unemployment decreased in most countries (with the exception of Japan). Figure 1 plots the results.



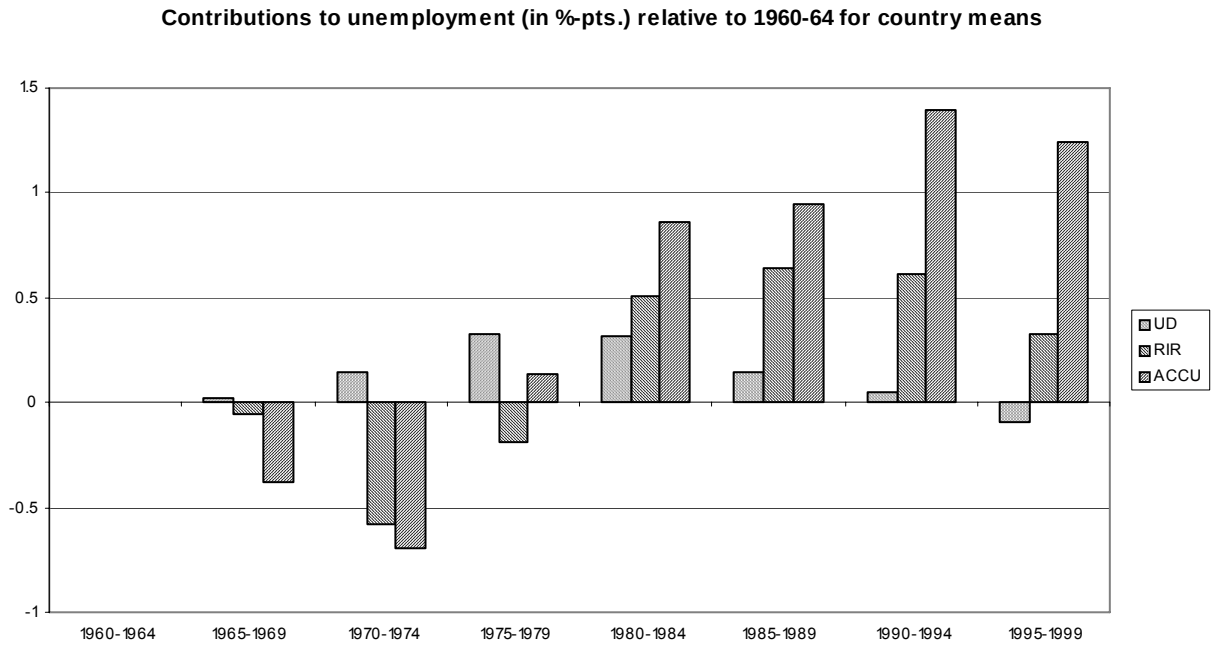
Visual inspection suggests that the interest rate and capital accumulation made the largest contributions to changes in unemployment, with labour market institutions having played a substantial role in some countries. Changes in union density explained changes in unemployment of more than 1 percentage point in five countries (though the one in New Zealand was almost exactly offset by the simultaneous change in bargaining coverage). The changes in the interest rate contributed to changes to unemployment of more than 1 percentage point in 14 countries. Capital accumulation explained changes in the unemployment rate of more than 1 percentage point in six countries. Clearly, changes in labour market institutions were not the key determinants of changes in medium-term unemployment.

Another way to assess the relative impact of the variables is to look at the standard deviations *of the contributions* to unemployment. The largest standard deviations of the contributions are from interest rates (0.97) and from capital accumulation (1.28). The standard deviation of

accumulation is higher because accumulation fell in some countries (notably Japan), whereas interest rates declined universally. The contributions of union density and collective bargaining coverage have standard deviations of 0.58 and 0.37 respectively, though the only country where bargaining coverage changed (according to the CBC dummy variable) is New Zealand.

Second, we investigate the effect of various variables *over time* based on specification (6) and the BGHS dataset. For each period, the mean for each variable is calculated across available countries, and then multiplied with the respective coefficient estimates. Statistically insignificant and perverse coefficient estimates are ignored. The results are plotted in Figure 2. The reference point for the calculations is the 1960-64 period, as this period is represents a situation of full employment by historical standards. Changes in the interest rate and in capital accumulation clearly have the strongest impact on unemployment. Both had a dampening effect on unemployment in the early 1970s. Real interest rates contributed slightly more than half a percentage point to unemployment from the early 1980s to the mid-1990s. The contribution declined thereafter. Inadequate capital accumulation contributed slightly less than 1 percentage point to unemployment during the 1980s and more than 1 percentage point in the 1990s.

Among labour market institutions, union density was the only one with a statistically significant effect. Rising organisational strength of labour unions peaked in the mid-1970s when it contributed around 0.3 percentage points to unemployment (from the mid-1970s to the mid-1980s). As unions' strength declined thereafter their contribution fell. By the late 1990s the contribution turned negative.



The standard deviations of the contributions are 0.14, 0.41and 0.73 for UD, RIR and ACCU respectively, which confirms the visual impression of Figure 2. Over long periods, capital accumulation has had a dominant effect on unemployment, with moderate effects of union density and interest rates. Again, changes in labour market institutions clear do not run the show.

5.4 Measures of capital accumulation

In this paper the rate of capital accumulation has been used as a demand shock variable. One may dispute this measure. First, it could be argued that gross investment is the proper measure when it comes to assessing the demand impulse. Second, one might suggest that it is the capital stock that matters (as a supply-side variable) rather than its growth rate. As discussed in section 2, much of the literature on capital shortage takes this view. To address these concerns, table 4 reports results from regressions including (log) real gross investment and the

(log) real capital stock. As for the first, using actual investment expenditure as a measure for a demand shock is in fact rather straightforward. The main reason for employing capital accumulation rather than log investment was that since it can both rise and fall, accumulation has a more convenient interpretation than real investment, which is strictly increasing in our sample.

Specification (1) in Table 5 lists the results from our preferred specification (specification 3 in Tables 2 and 3) if we include the log of gross fixed capital formation (at constant prices) rather than the growth in the capital stock in the regressions using the BD82-03 series. Compared to the original variant (specification 1), investment as a demand variable performs just as well as capital accumulation, and in fact slightly better in terms of statistical significance. As for institutions, the most notable impact is the PMR variable becoming significant (at the 1% level) upon the inclusion of investment expenditures. With regard to the macro shocks, one noteworthy effect is that the impact of the real interest rate on unemployment, while remaining statistically significant (at the 10% level), is much smaller when investment is incorporated as an explanatory variable instead of capital stock growth.

insert table 4 about here

The second set of alternative regressions includes the capital stock in levels rather than differences. Such a procedure obviously relates to a different line of argument in which the capital stock becomes a supply side variable, as inadequate capital accumulation over time results in a capital stock that is not sufficiently large to guarantee a high level of employment. This, of course, is the central claim of the Post Keynesian literature on capital shortage briefly surveyed in section 2.

Our findings suggest that the capital stock can work as an explanatory variable in regressions in which we also control for LMI and macro shocks, but that its performance is sensitive to the specification and/or the data set. With BD82-03 series, the results are favourable: the capital stock inserted in (log) levels rather than first differences is statistically significant (specification 3) and also remains significant once ACCU is additionally included in the regression (specification 4). Only when we incorporate investment instead, the capital stock loses its statistical significance (specification 5).[10]

6. Conclusions

The paper has presented a medium-term panel analysis of the determinants of unemployment. We found strong effects of capital accumulation and the real interest rate, but only moderate and for the most part non-robust effects of labour market institutions. These results hold over time and across countries in two different LMI datasets. Regarding labour market institutions, we find statistically significant and robust effects only for union density and the coordination of collective bargaining. Other LMI variables are either statistically insignificant, sensitive to the specification or show perverse signs. These findings are in line with those of Baker et al (2005), Baccaro and Rei (2007) and Howell et al (2007).

Labour market institutions do have an effect on unemployment, but it is a minor one. It is macroeconomic variables have a much greater impact, among the capital accumulation and the real interest rate are the most important one. Remarkably, capital accumulation is has a strong impact even when real interest rates are controlled for. We interpret this as vindication

of Keynes' assertion that investment is to a significant extent driven by animal spirits rather by economic variables. It is harder to explain why the coefficient of interest rates decreases only moderately once capital accumulation is included. The results are similar when capital accumulation is measured by capital stock growth or by (the log of real) investment. Capital accumulation seems to matter as demand factor rather than as a supply-side variable.

The policy implications of these findings are relatively straight forward. Labour market reforms will not cure unemployment. Economic policy should instead focus on stimulating aggregate demand and investment. Monetary policy in particular is not neutral with respect to unemployment in the longer run.

Two obvious avenues for future research have been highlighted in this paper. First, there are black spots in the empirical literature on the NAIRU when it comes to the role of prices-push (or mark up-push) variables. Second, the determinants driving investment expenditures are still remarkably poorly understood.

[10] The results with the BGHS dataset (reported as table A3 in the appendix), show similar results if the specification in differences is used: the capital stock is significant with the correct sign, except for the specification including investment as well..

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Table 1: An overview of selected empirical studies on the causes of aggregate unemployment

	Data and estimation technique	LMI variables	Macro shocks	Capital accumulation	notes
Studies focusing on the effect of LMI					
Nickell (1997)	20 OECD countries (1983-1994) panel with 2 6-yr-averages)	UB, BD, UD, EPL, CBC, TW, ALMP			points at interaction between institutions (e.g. UD and COORD)
Elmeskov et al (1998)	19 OECD countries (1983-1995) panel (annual)	UB, UD, EPL, CBC, TW, ALMP; minimum wages			
Blanchard and Wolfers (2000)	20 OECD countries (1960-1996) panel with 5-yr-averages,	UB, BD, UD, COORD, TW, ALMP; minimum wages	INT, TFPS, TOTS, LDS		highlights interaction of shocks and institutions
Bertola et al (2002)	20 OECD countries (1960-1996) panel with 5-yr-averages	UB, BD, UD, EPL, COORD, TW, ALMP	INT, TFPS, LDS,		also controls for youth share
IMF (2003)	20 OECD countries (1960-1998) dynamic panel (annual)	UB, EPL, UD, COORD, TW	INT, TFPS		also controls for Central Bank independence
Nickell et al (2005)	20 OECD countries (1961-1995) dynamic panel (annual)	UB, BD, UD, EPL, COORD, TW	INT, TFPS, LDS, TOTS, money supply		controls for house ownership
Baker et al. (2005)	20 OECD countries (1960-1999) panel with 5-yr averages	UB, BD, UD, EPL, COORD, TW, ALMP			Replication of various specifications of the literature and test of robustness
Bassanini and Duval (2006)	21 OECD countries (1982-2003) dynamic panel (annual)	UB, BD, EPL, UD, COORD, TW, ALMP; PMR	INT, TFPS, TOTS, LDS		various specifications, basis of OECD (2006)
Baccaro and Rei (2007)	18 OECD countries (1960-1998) dynamic panel; panel with 5-yr-averages	UB, BD, UD, EPL, COORD, TW	INT, TFPS, TOTS, LDS		extensive analysis of robustness of previous studies; in particular different econometric techniques
Studies focusing on the effect of capital accumulation					
Rowthorn (1995)	10 OECD countries cross section (change between 1960-73 and 1973-92)			Log (K)	Experimentation with total capital stock, manufacturing capital stock and service sector capital stock
Alexiou and Pitelis (2003)	13 OECD countries panel (annual)		various macro variables	Log(K)	
Stockhammer (2004)	5 OECD countries (1962-93) time series	UB, UD, TW	TOTS	D log(K)	
Palacio Vera et al (2006)	USA 1964:2-2003:1 time series (VECM)		TOTS	Log(K)	NAWRU as dependent variable
Arestis et al (2007)	9 OECD countries (quarterly data, varying samples, max 1979-2002) time series (VECM)	UB, strike activity		Log(K)	unemployment as well as wages as dependent variables

Note. Abbriviations as in the text. Short-term control variables like change of inflation or the output gap not reported.

Table 2: Unemployment effects of Institutions, macro shocks, and capital accumulation
Bassanini and Duval dataset (1983-2003)

	1 LMI only			2 LMI + MS			3 LMI + MS + ACCU			4 LMI + MS + ACCU (no period effects)			5 LMI + MS + ACCU (incl. ΔINFL)			6 LMI + MS + ACCU (in differences)		
UB	0.08	*3.56*	***	0.02	*1.08*		0.01	*0.58*		0.02	*1.06*		0.02	*0.75*		-0.03	-1.00	
BD	-0.47	*-0.22*		-1.15	*-1.16*		-1.09	*-0.82*		-0.03	*-0.02*		-1.08	*-0.83*		-2.35	-2.21	**
EPL	-1.32	*-0.98*		-0.90	*-1.35*		-0.72	*-1.05*		-0.63	*-1.05*		-0.77	*-1.12*		-0.79	-1.20	
UD	0.11	*1.83*	*	0.14	*4.32*	***	0.13	*4.01*	***	0.09	*2.25*	**	0.13	*4.14*	***	0.09	3.02	***
COORD	-0.72	*-0.93*		-0.44	*-0.89*		-0.77	*-1.09*		-1.25	*-2.78*	**	-0.97	*-1.35*		-0.63	-0.71	
CBC	-0.06	*-5.06*	***	-0.04	*-4.35*	***	-0.04	*-4.16*	***	-0.03	*-2.76*	***	-0.04	*-4.32*	***	-0.05	-3.89	***
TW	0.33	*3.73*	***	0.14	*2.36*	**	0.08	*1.18*		0.10	*1.61*		0.08	*1.27*		0.04	0.73	
PMR	0.65	*1.22*		0.21	*0.46*		0.39	*0.94*		-0.13	*-0.41*		0.41	*1.00*		0.66	1.79	
INT				0.74	*4.47*	***	0.54	*3.02*	***	0.55	*4.77*	***	0.55	2.99	***	0.22	1.62	*
TOTS				0.21	*4.48*	***	0.14	*2.27*	**	0.06	*1.30*		0.13	2.27	**	0.02	0.45	
LDS				0.15	*2.22*	**	0.11	*1.46*		0.12	*1.85*	*	0.11	1.58		0.07	1.00	
TFPS				-0.07	*-0.63*		0.01	*0.10*		0.06	*0.65*		0.00	0.02		0.09	1.59	
ACCU							-0.87	*-2.61*	**	-0.92	*-3.31*	***	-0.87	*-2.61*	**	-1.69	-7.03	***
ΔINFL													0.14	*0.56*				
R^2 (adj.)	0.84			0.91			0.92			0.99			0.92				0.72	
n	100			93			93			93			93				73	
DW	1.77			2.65			2.18			2.16			2.22				1.74	

Dependent variable: U; panel least squares; specifications 1-3 and 5: cross section and period fixed effects; White period standard errors & covariance (d.f. corrected); no weights (except variant 4: cross section weights, variant 6: period weights).
*,**,*** denote significance at the 10, 5, and 1% level, respectively.

Table 3: Unemployment effects of Institutions, macro shocks, and capital accumulation

Baker et al dataset (1960-1999)

	1			2			3			4			5			6		
	LMI only			**LMI + MS**			**LMI + MS + ACCU**			**LMI + MS + ACCU** (no period effects)			**LMI + MS + ACCU** (incl. ΔINFL)			**LMI + MS + ACCU** (in differences)		
UB	-2.34	*-0.99*		-2.40	*-1.07*		-2.64	*-1.00*		-1.57	*-1.07*		-2.62	*-1.00*		-1.19	-0.70	
BD	-1.78	*-1.06*		-1.29	*-0.71*		-1.63	*-0.90*		-0.33	*-0.33*		-1.65	*-0.91*		-1.77	-1.37	
EPL	-0.82	*-0.52*		-1.09	*-0.71*		-1.09	*-0.73*		-0.55	*-0.50*		-1.06	*-0.71*		-2.05	-3.32	**
UD	7.02	*2.14*	***	7.87	*2.75*	***	6.02	*1.54*		-0.93	*-1.45*		-0.93	*-1.41*		5.78	3.01	***
COORD	-1.12	*-1.59*		-0.66	*-0.94*		-0.94	*-1.42*		2.78	*1.27*		6.39	*1.62*		-0.14	-0.35	
TW	4.94	*0.74*		3.48	*0.52*		3.14	*0.43*		11.51	*3.51*	***	2.77	*0.38*		2.36	1.34	
INT				0.27	*2.62*	**	0.25	*3.10*	***	0.28	*3.99*	***	0.23	*2.80*	**	0.16	2.90	**
TOTS				-0.23	*-0.67*		-0.25	*-0.73*		-0.32	*-1.06*		-0.28	*-0.83*		-0.14	-0.42	
ACCU							-0.59	*-1.51*		-1.05	*-4.66*	***	-0.55	*-1.39*		-0.93	-3.30	***
ΔINFL													-0.21	*-1.05*				
R^2 (adj.)	0.78			0.79			0.81			0.84			0.81			0.48		
n	156			149			149			149			149			129		
DW	0.98			1.04			0.92			1.13			0.92			1.68		

Dependent variable: U; panel least squares; specifications 1-3 and 5: cross section and period fixed effects; White period standard errors & covariance (d.f. corrected); no weights (except variant 4: cross section weights, variant 6: period weights).
*,**,*** denote significance at the 10, 5, and 1% level, respectively.

Table 4: Interactions between LMI and between LMI and Macro Shocks
Bassanini and Duval dataset (1982-2003)

	BD	EPL	UD	COORD	CBC	TW	PMR	INT	TOTS	LDS	TFPS
UB	-0.01	-0.04	0.00	0.02	-0.08	0.00	-0.01	0.00	-0.16	-0.04	-0.15
	-0.22	-3.33	-1.23	0.30	-1.94	-0.19	-0.72	0.20	-1.23	-0.13	-0.34
BD		1.74	-0.24	-1.37	-8.88	0.40	-0.94	-1.26	-6.69	-0.44	19.62
		1.30	-2.67	-0.56	-1.25	2.55	-0.87	-3.57	-0.41	-0.01	0.61
EPL			-0.01	1.38	-2.60	-0.03	-0.20	-0.14	-0.98	-0.77	9.05
			-1.13	2.46	-1.45	-0.83	-1.14	-1.27	-0.29	-0.16	1.01
UD				-0.03	-0.06	0.00	-0.01	-0.01	-0.06	0.41	-0.56
				-0.38	-0.91	0.13	-1.98	-1.83	-0.55	1.61	-1.42
COORD					-3.19	0.10	0.06	-0.08	-1.10	-8.08	2.54
					-0.76	1.51	0.16	-0.31	-0.18	-0.86	0.13
CBC						0.28	-0.58	-0.49	-1.51	15.16	14.97
						2.68	-1.72	-2.35	-0.23	1.73	0.96
TW							-0.02	0.01	-0.30	1.23	1.39
							-1.23	0.39	-0.78	3.12	1.70
PMR								-0.10	-1.00	-5.29	1.04
								-1.05	-0.37	-2.52	0.09

Intercations that are significant at least at the 5% level are highlighted. Green indicates an expected, red a perverse sign.

Table 5: Inclusion of (log) capital stock in the regressions
Bassanini and Duval dataset (1982-2003)

	1			2			3			4			5		
	ACCU			INV			K			K + ACCU			K + INV		
UB	0.01	*0.58*		0.01	*0.36*		0.01	*1.05*		0.01	*0.46*		0.01	*0.36*	
BD	-1.09	*-0.82*		-0.40	*-0.43*		-1.28	*-1.09*		-1.21	*-0.78*		-0.44	*-0.44*	
EPL	-0.72	*-1.05*		-1.18	*-2.63*	**	-1.23	*-2.19*	**	-1.04	*-1.87*	*	-1.21	*-2.53*	**
UD	0.13	*4.01*	***	0.08	*2.63*	**	0.11	*4.39*	***	0.10	*3.2*	***	0.08	*2.52*	**
COORD	-0.77	*-1.09*		-1.63	*-2.85*	***	-0.77	*-1.44*		-1.06	*-1.57*		-1.63	*-2.88*	***
CBC	-4.18	*-4.16*	***	-2.77	*-3.31*	***	-2.94	*-3.03*	***	-3.14	*-3*	***	-2.70	*-3.31*	***
TW	0.08	*1.18*		0.05	*0.91*		0.18	*3.75*	***	0.11	*2.16*	**	0.06	*0.93*	
PMR	0.39	*0.94*		0.90	*3.04*	***	0.54	*1.28*		0.69	*2.1*	**	0.92	*2.93*	***
INT	0.54	*3.02*	***	0.28	*1.88*	*	0.67	*4.86*	***	0.48	*3.37*	***	0.29	*1.92*	*
TOTS	0.14	*2.27*	**	0.08	*2.01*	**	0.20	*4.98*	***	0.13	*2.34*	**	0.09	*2.1*	**
LDS	0.11	*1.46*		0.09	*1.9*	*	0.17	*3*	***	0.13	*2.18*	**	0.09	*1.86*	*
TFPS	0.01	*0.1*		0.08	*0.83*		-0.05	*-0.44*		0.03	*0.31*		0.08	*0.8*	
ACCU	-0.87	*-2.61*	**							-0.83	*-3.03*	***			
INV				-0.23	*-5.48*	***							-0.23	*-4.26*	***
K							-0.09	*-4.56*	***	-0.08	*-4.65*	***	-0.01	*-0.43*	
r2 (adj.)	0.92			0.94			0.92			0.93			0.94		
n	93			93			93			93			93		
DW	2.18			2.15			2.81			2.35			2.18		

Dependent variable: U; panel least squares; cross section and period fixed effects; White period standard errors & covariance (d.f. corrected); no weights; *,**,*** denote significance at the 10, 5, and 1% level, respectively.

Appendix

Table A1: Notations of LMI and macro variables in different datasets

	Notation in dataset			
Variable	Bassanini and Duval (70-03)	Bassanini and Duval (82-03)	Baker et al	Nickell and Nunziata
EPL	eplcm	epl	ep	ep
UB	arr[1]	rr1	brr_alt	brr
BD[2]	--	ubendur1	bd_alt	bd
TW	wedgena	twcoup[3]	tw_alt2	tw
UD	undens	undens	ud_alt	udnet
CBC	uncovcm	uncovhigh	--	--
COORD	highcorp	highcorp	bc2	cow
ALMP	almpucm	slmp1to5	almp_fill	--
INT	rintshock1	rintshock	rir	rirl
TOTS	totshock	totshock	tots	ttsfc
LDS	ldshock	ldshock	--	lds
TFPS	ltfpshock	ltfpshock	--	d2tfp
PMR	regrefext	regref	--	--

The Bassanini and Duval datasets can be downloaded at www.oecd.org/dataoecd/25/25/37431112.zip. Detailed definitions of the variables can be found in Bassanini and Duval (2006), annex 2.
The dataset by Nickell and Nunziata and its modified version by Baker et al have been combined, corrected where appropriate, and made available by Costain and Reiter, who provide an exemplary overview and comparison of alternative series for the institutional variables at www.econ.upf.es/~reiter/webbcui/combineddata/combineddata.html, as well as inks to the original data and data descriptions. We have employed the corrected dataset by Costain and Reiter for testing our specification with the Baker et al and Nickell/Nunziata datasets.
[1] Bassanini and Duval calculate an average replacement ratio across different income and family situations over time. The “arr” variable thus in fact comprises the element of “benefit duration” as well - cf. Bassanini and Duval (2006: 106-07). The respective variables in the NN and Baker et al datasets report the replacement ratio for the first year of unemployment only. In regressions with the short BD sample, we use “rr1” and “ubendur1” rather than “arr”. Employing the latter variable instead does not cause any significant changes to the results.
[2] Note that in the NN and Baker et al datasets, “benefit duration” does not measure the actual period during which unemployment benefits are paid, but rather the replacement ratio in year 1 in relation to that in subsequent years. In contrast, “ubendur1” in the short BD sample measures the actual duration of benefit payments in years.
[3] Alternative calculations with the “wedgena” variable instead of “twcoup” in the short BD sample yield largely identical results. twcoup has been used by default because unlike wedgena it has no missing data points.

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Table A2: Unemployment effects of Institutions, macro shocks, and capital accumulation

Bassanini and Duval dataset (1970-2003)

	1			2			3			4			5			6		
	LMI only			**LMI + MS**			**LMI + MS + ACCU**			**LMI + MS + ACCU** (no period eff.)			**LMI + MS + ACCU** (incl. ΔINFL)			**LMI + MS + ACCU** (in differences)		
UB	-0.01	*-0.36*		0.02	*0.39*		0.00	*0.07*		0.04	*1.66*		0.00	*0.07*		0.00	-0.12	
EPL	-2.33	*-3.45*	***	-2.32	*-2.62*	**	-2.50	*-3.42*	***	-3.03	*-6.14*	***	-2.50	*-3.38*	***	-5.06	-4.17	***
UD	0.05	*1.15*		0.09	*2.26*	**	0.08	*1.88*	*	0.04	*1.68*	*	0.08	*1.86*	*	0.08	1.51	
COORD	-0.98	*-0.95*		-0.04	*-0.04*		-0.63	*-0.65*		-0.85	*-1.70*	*	-0.63	*-0.61*		-0.71	-1.42	
CBC	-0.10	*-2.39*	**	-0.14	*-3.14*	***	-0.16	*-3.76*	***	-0.16	*-6.23*	***	-0.16	*-3.59*	***	0.21	3.68	**
TW	0.18	*1.66*	*	0.17	*1.51*		0.12	*1.03*		0.14	*2.11*	**	0.12	*1.04*		0.14	2.00	**
PMR	0.30	*0.67*		0.24	*0.60*		0.55	*1.61*		0.20	*1.04*		0.55	*1.61*		0.73	1.82	
INT				0.35	*3.13*	***	0.30	*3.15*	***	0.28	*3.06*	***	0.30	*4.09*	***	0.24	4.68	***
TOTS				0.06	*0.82*		-0.01	*-0.24*		0.00	*0.02*		-0.01	*-0.26*		0.04	0.90	
LDS				-0.05	*-0.60*		-0.07	*-0.81*		-0.11	*-2.00*	**	-0.07	*-0.77*		0.09	1.29	
TFPS				-0.07	*-0.56*		0.11	*1.02*		0.03	*0.31*		0.11	*0.81*		0.15	1.92	*
ACCU							-0.88	*-2.11*	**	-1.19	*-3.92*	***	-0.88	*-2.16*	**	-1.44	-5.90	***
ΔINFL													0.04	*0.00*				
r^2 (adj.)	0.75			0.80			0.82			0.90			0.82			0.69		
n	140			126			126			126			126			106		
DW	1.22			1.33			1.18			1.47			1.18			1.90		

Dependent variable: U, d(U) (6); panel least squares; specifications 1-3 and 5: cross section and period fixed effects; White period standard errors & covariance (d.f. corrected); no weights (except variant 4: cross section weights).
*,**,*** denote significance at the 10, 5, and 1% level, respectively.

By and large, the results from the BD70-03 dataset parallel the ones derived from BD82-03. However, autocorrelation appears to be a more serious problem in several specifications of this longer sample, and remains a problem even in the specification in differences. Therefore, cross section effects were included in the differences specification (6), which essentially amounts to inserting a time trend into the regression. This essentially removed the auto-correlation problem.

The measure for union density again features a positive coefficient, but is substantially less robust compared to the short sample. The degree of collective bargaining coverage, in turn, again exerts a statistically highly significant negative impact on unemployment, which is notable as the respective series is not identical with the one from the shorter BD dataset (cf. data section in the main text). However, this effect is exactly reversed in the difference specification.

Among the macro shocks, only the real long-term interest rate shock exerts a robust unemployment-raising effect throughout all specifications. In specification (3), a 1 percentage point increase in the real interest rate increases unemployment by 0.3 percentage points, in specification (6) it is slightly lower. The other shocks are typically insignificant and more often than not carry the wrong sign, as opposed to the results with the shorter sample.

The capital stock growth variable is once more significant at least at the 5% level with the expected negative sign in all tested specifications. An increase in the rate of capital accumulation by 1% decreases unemployment by 1.44 percentage points in specification (6) (and by 1.19 percentage points in specification 4, which is the one plagued least by autocorrelation among the standard specifications).

Table A3: Inclusion of (log) capital stock in the regressions
Baker et al dataset (1960-1999)

	1		2		3		4		5	
	ACCU		**INV**		**K**		**K + ACCU**		**K + INV**	
UB	-1.19	-0.70	-1.44	*-0.93*	-0.64	*-0.37*	-1.15	-0.62	-1.48	*-0.94*
BD	-1.77	-1.37	-0.98	*-0.77*	-0.88	*-0.50*	-1.17	-0.82	-0.98	*-0.78*
EPL	-2.05	-3.32 ***	-2.56	*-3.30* ***	-2.10	*-2.19* **	-2.32	-3.53 ***	-2.59	*-3.34* ***
UD	5.78	3.01 ***	3.91	*1.97* *	8.86	*2.71* ***	5.29	2.56 **	4.10	*1.97* *
COORD	-0.14	-0.35	-0.58	*-1.34*	-0.50	*-1.11*	-0.55	-1.24	-0.57	*-1.30* *
TW	2.36	1.34	4.76	*2.02* **	2.94	*0.71*	4.18	1.88 *	4.57	*2.08* **
INT	0.16	2.90 **	0.08	*1.41*	0.21	*2.25* **	0.13	2.35 **	0.07	*1.34*
TOTS	-0.14	-0.42	-0.37	*-1.02*	-0.44	*-0.96*	-0.43	-0.99	-0.35	*-0.92*
ACCU	-0.93	-3.30 ***	0.00		0.00		-1.00	-3.23 ***	0.00	
INV			-0.19	-3.98 ***	0.00		0.00		-0.20	*-4.22* ***
KSTOCK					-0.06	*-1.91* *	-0.05	-1.66 *	0.02	*1.01*
r2 (adj.)	0.48		0.56		0.34		0.50		0.55	
n	129		129		129		129		129	
DW	1.68		1.56		1.97		1.65		1.59	

Dependent variable: d(U); panel least squares; period fixed effects; White period standard errors & covariance (d.f. corrected); no weights; *,**,*** denote significance at the 10, 5, and 1% level, respectively.

The overall results from employing different measures of capital accumulation with the BGHS dataset are roughly similar to those derived with BD82-02. Table A3 documents the same exercise reported in table 5 in the paper for BD82-03, calculated in differences in order to deal with the autocorrelation problem in this sample. Once more, the use of investment instead of capital stock growth yields satisfactory results. Regarding the capital stock as a supply side variable, the coefficients are significant at the 10%-level, with the exception of the specification including log investment, which again is a result analogous to the one derived from BD82-03.

Table A4: Variants of regressions with BD82-03

	default specification			with ALMP			without LDS			with COORD variable from BGHS		
UB	0.01	*0.58*		0.04	*0.97*		0.02	1.07		0.01	0.52	
BD	-1.09	*-0.82*		-2.04	*-1.05*		-0.80	-0.58		-0.63	-0.38	
EPL	-0.72	*-1.05*		-0.38	*-0.32*		-0.76	-1.09		-1.14	-0.96	
UD	0.13	*4.01*	***	0.13	*1.85*	*	0.12	3.60	***	0.14	4.13	***
COORD	-0.77	*-1.09*		-1.65	*-1.54*		-0.45	-0.68		-1.02	-1.63	
CBC	-4.18	*-4.16*	***	-3.57	*-2.86*	***	-4.28	-4.59	***	-4.65	-4.58	***
TW	0.08	*1.18*		0.06	*0.82*		0.10	1.17		0.10	1.05	
ALMP				0.52	*1.19*							
PMR	0.39	*0.94*		0.28	*0.61*		0.32	0.88		0.21	0.40	
INT	0.54	*3.02*	***	0.52	*2.68*	**	0.46	2.33	**	0.46	2.66	**
TOTS	0.14	*2.27*	**	0.17	*1.87*	*	0.12	2.03	**	0.11	0.02	
LDS	0.11	*1.46*		0.05	*0.51*		0.00			0.10	0.01	
TFPS	0.01	*0.10*		0.18	*1.44*		0.00	0.01		0.01	0.00	
ACCU	-0.87	*-2.61*	**	-1.17	*-2.37*	**	-1.05	-3.41	***	-1.03	-0.03	***
R^2 (adj.)	0.92			0.93			0.92			0.93		
n	93			75			97			78		
DW	2.18			2.12			1.88			2.29		

Table A5: Fixed effects from the preferred specification

BD82-03 (specification 3)				BGHS (specification 6)	
Cross section effects		Period effects		Period effects	
AT	-0.96	82-84	-2.90	65-69	-0.45
AU	3.46	85-89	-0.77	70-74	0.10
BE	-0.03	90-94	0.35	75-79	0.65
CA	-1.37	95-99	1.65	80-84	0.42
CH	-3.43	00-03	1.67	85-89	0.04
DE	2.76			90-94	-0.51
DK	-6.81			95-99	-0.37
ES	12.49				
FI	-4.06				
FR	3.82				
IE	5.58				
IT	2.49				
JP	-2.23				
NL	0.62				
NO	-6.71				
NZ	-1.35				
PT	-3.03				
SE	-12.85				
UK	-1.44				
US	-2.67				

Table A4 reports variations of the default specification with BD82-03 that were not discussed in he text as they yielded no particular new insight.

Table A5 lists the values for fixed effects from the preferred specifications in BD82-03 and BGHS.