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Engelbert Stockhammer • Erik Klär

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DIW Berlin
German Institute for Economic Research
Mohrenstr. 58
10117 Berlin
Tel. +49 (30) 897 89-0
Fax +49 (30) 897 89-200
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Capital accumulation, labour market institutions, and unemployment in the medium run

Engelbert Stockhammer[1]

Erik Klär[2]

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Abstract

According to the mainstream view, labour market institutions (LMI) 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 (Baker et al 2005, Baccaro and Rei 2007). The Keynesian view holds periods of high real interest rates and insufficient capital accumulation responsible for unemployment (Arestis et al 2007). Empirical work in this tradition has paid little attention to role of LMI. This paper contributes to the debate by highlighting the role of autonomous changes in capital accumulation as a macroeconomic shock. In the empirical analysis, medium-term unemployment is explained by capital accumulation, labour market institutions and a number of macroeconomic shocks in a panel analysis covering 20 OECD countries. The economic effects of institutional changes, variations in capital accumulation and other macro shocks 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 larger effects than LMI.

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

JEL codes: E12, E20, E24, E60

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[1] Institut für Geld- und Fiskalpolitik, Wirtschaftsuniversität Wien, Augasse 2-6, A 1090 Wien, Austria. Email: Engelbert.stockhammer@wu-wien.ac.at

[2] Universität Trier, Fachbereich IV – Volkswirtschaftslehre, Lehrstuhl für Geld, Kredit und Währung, Universitätsring 15, 54296 Trier, Germany, and DIW Berlin, Mohrenstraße 58, 10017 Berlin, Germany. E-Mail: erikklaer@aol.com

1 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 implications. 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 the liberalization and flexibilization of labour markets.

However, this explanation of European unemployment has come under considerable criticism in academic research. 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). Similarly, Baccaro and Rei (2007) conclude that "the claim that it would be possible to reduce unemployment simply by getting rid of labor market rigidities appears unwarranted" (Baccaro and Rei, 2007, 563). Remarkably, the OECD itself has presented a reassessment of its policy recommendations in its *Employment Outlook 2006*, which notes 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.

The alternative approach is the *Keynesian view*, which holds inadequate capital accumulation and/or (closely related) high interest rates responsible for persistently high unemployment. Arestis et al (2007, 145) report „a robust negative relationship between capital accumulation and unemployment." Lawrence Ball, who has performed a careful analysis of the differences between reactions in monetary policy during recessions, concludes that "monetary policy and other determinants of aggregate demand have long-run effects on unemployment" (Ball, 1999, 234). These and similar studies, however, usually control only for a limited number of LMI.

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.[3] While monetary policy exerts some impact on investment

[3] 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

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. We thus regard investment as the genuine Keynesian variable in explaining unemployment.[4]

This paper aims at filling a gap in the literature. An extensive empirical literature focuses on the role of LMI with attention paid to some macroeconomic shocks, but ignores the potential role of capital accumulation (Baccaro and Rei (2007) and Howell et al (2007). On the other hand, the (much smaller) literature on the role of capital accumulation (e.g Arestis et al 2007) usually controls for few if any LMI. This paper thus analyses the role of capital accumulation while controlling for a rich set of LMI based on two different datasets. 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 because LMI change slowly and accurate data are often not available on annual basis.

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.

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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*.

[4] 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).

2 A review of the literature

The NAIRU model has become the standard reference model in the discussion of (aggregate) unemployment. As the NAIRU theory is well-charted terrain in the literature and the contribution of this paper is of empirical nature, there is no need to rehearse the model in detail.[5] Rather, this section will focus on the empirical literature to highlight how our approach relates to, builds on, and differs from previous research. In contemporary policy debates, the NAIRU theory is often associated with a particular explanation for high levels of unemployment in Europe. Stockhammer (2008) distinguishes between the NAIRU *theory* and the NAIRU *story* of European unemployment: While the NAIRU *theory* is a flexible framework that entails a priori 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. Second, that the NAIRU serves as a strong attractor for actual unemployment and thus changes in the NAIRU effectively *cause* (in the strong sense of the word) changes in actual unemployment (rather than vice versa or with a third variable affecting both). 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 closely related to what we call the mainstream view.

The NAIRU *theory*, on the other hand, is a general theory that can be given New Keynesian, Post Keynesian, and Marxian interpretations depending on the closures with respect to demand and the assumption regarding NAIRU endogeneity or exogeneity. If the NAIRU is endogenous, there will be a short-run trade off between (the acceleration of) inflation and unemployment, but in the medium run demand may determine actual unemployment and the NAIRU. This is the Keynesian view. It is in this sense that we will use the terms medium-run unemployment and NAIRU interchangeably.

Following Blanchard and Wolfers (2000) the NAIRU is determined by institutions and macroeconomic shocks. The contribution of this paper will be to consider capital accumulation as an additional shock. This is summarized in the following equation:

$$(1)\quad u_N = u(L; MS; K),$$

[5] Carlin and Soskice (2005) as well as Layard, Nickell and Jackman (2005) offer good introductions to the NAIRU model.

where u_N, L, MS, and K are the NAIRU, a vector of institutions, a vector of macroeconomic shocks, and capital accumulation, respectively. Available empirical studies differ with regard to the variables used to proxy the vectors L and MS.

Labour market institutions, which are expected to shift workers' bargaining position, have received most - and often exclusive - attention in empirical work. Table 1 presents an overview of selected recent studies. As will become clear, the literature on the role of labour market institutions and that on capital accumulation on unemployment have proceeded along independent lines, with the former effectively ignoring the latter.[6] Studies focusing on the effects of LMI typically include institutional variables measuring unemployment benefits, employment protection legislation, union density, the degree of coordination of collective bargaining, and the tax wedge.

The studies 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, total factor productivity shocks, technological labour demand shocks, and terms of trade. 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. LMI typically change only slowly, and accurate data are often not available on 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 because estimations with annual data suffer from autocorrelation problems (presumably due to a lack of annual data for most institutions).[7]

[6] 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.

[7] A third difference is the degree to which studies try to control for price push variables. Bassanini and Duval (2006) are basically alone in including a variable for product market regulation. Indeed, the lack of research on the determinants of price (mark-up) setting in the medium run in the context of explaining unemployment is one of the blind spots in the literature. There is of course a rich literature on the cyclical behaviour of the mark-up (see Rotemberg and Woodford 2000 for a survey).

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

Overall, there is disagreement regarding the performance of labour market institutions in explaining medium-run unemployment. Some authors have found strong effects of labour market institutions. IMF (2003) estimates a panel of 20 OECD countries and finds significant effects for employment protection, union density, the tax wedge, the interest rate and productivity shocks. Nickell et al (2005) employ a non-linear least square panel with country-specific time trends and find significant effects of the unemployment benefit replacement ratio and (the change in) union density, some interactions, labour demand shocks and import price shocks. Both find a very high degree of unemployment persistence. However, many other studies find mixed, weak or no effects of LMI. 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 (…) equilibrium unemployment has fallen in the absence of net reform, (…) whereas in others the net reform has apparently not affected equilibrium unemployment significantly" (Fitoussi et al 2000, 257). Baker et al (2005) attempt to replicate previous findings by means of a panel with 5-year averages and conclude that there is "no meaningful relationship between [the] OECD measure of labor market deregulation and shifts in the NAIRU" (Baker et al 2005, 107).[1] Bassanini and Duval (2006) employ a newly constructed OECD institutional data set in dynamic panel analysis and find that benefit generosity is the only remaining 'classic' LMI to have a significant effect. The tax wedge and product market regulation impact on aggregate unemployment as well. Baccaro and Rei (2007) offer an extensive attempt to replicate previous estimations employing various econometric estimation techniques and find significant effects of union density among the labour market institutions (as well as of interest rates and central bank independence among the control variables). None of these studies include capital accumulation.

The second vector in equation (2) summarises the impact of adverse macroeconomic shocks. Their effects are transitional unless there is persistence in unemployment, in which case demand shocks, import price shocks, technology shocks and other shocks may affect actual unemployment as well as the NAIRU. The most common explanations for unemployment persistence are insider bargaining, skill-loss in unemployment and queuing (Røed 1997). Wage demands, in the respective models, depend on a weighted average of current and past unemployment (or long-term unemployment) rather than on current unemployment alone.

[1] Similar conclusions were drawn earlier by Blanchard and Katz (1997, 67-68), Madsen (1998, 862), Stockhammer (2004a), and Freeman (2005).

The case for an endogeneity of the NAIRU, however, is broader than a dampening of the unemployment elasticity of wages. First, 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. Second, a (lasting) rise in the real interest rate may impact on the mark-up as capital costs increase (Hein 2006) and consequently affect the NAIRU directly.

Keynesians have long highlighted the role of insufficient capital formation as a cause of unemployment. Three channels through which capital accumulation may affect unemployment and the NAIRU have been distinguished; the first channel presupposes the existence of hysteresis while the other two suggest mechanisms that give rise to hysteresis. First, capital accumulation may play a role 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. It is in this sense that Keynes (1936, 1937) argued that "the level of output and employment as a whole depends on the amount of investment" (Keynes 1937, 221). Investment, however, will only influence the NAIRU if the latter is endogenous. The second channel is limited substitutability: Rowthorn (1999) demonstrates that unless an elasticity of substitution of one is assumed (as in Layard, Nickell and Jackman 1991) equilibrium unemployment will depend, among other factors, on the capital stock even in a standard NAIRU model. Thirdly, 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 for unemployment hysteresis.

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 "changes 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. Bassanini and Duval (2006) also find

that the long-term real interest rate has a statistically significant impact on unemployment in a panel of 21 OECD countries over the 1982-2003 period.

The empirical literature on the effects of capital accumulation (see Table 1) is substantially smaller than that on LMI. Unlike interest rates, capital accumulation is not routinely controlled for in studies that focus on the effects of LMI. Rowthorn (1995) and Alexiou and Pitelis (2003) report significant effects of capital accumulation with a cross-section and panel approach, respectively. Neither control for any LMI. Stockhammer (2004) uses time-series analysis for five countries and controls for the tax wedge, unemployment benefits and union density. Arestis et al (2007) apply a vector error correction model for nine countries and control for unemployment benefits and strike activity. Both find strong effects of capital accumulation.

Given the extensive empirical literature on the causes of unemployment on might wonder why there is need for yet another paper. Our assessment of the literature is the following. There is a rich literature that focuses on the effects of LMI, typically employing some sort of panel analysis. While some authors have made grand claims, overall the literature can only be regarded as inconclusive, and there have been several recent studies that question the prominent role attached to LMI. What most of the mainstream literature shares is that macroeconomic shocks are not at the centre stage of the analysis. In many cases, interest rates are controlled for, but none of these papers includes a role for capital accumulation. On the other hand there is a body of literature (though substantially smaller) that analyses the role of capital accumulation and/or of interest rates. Typically, time series methods are employed and support for a role of capital accumulation is found. What this literature shares is that few, if any, LMI are controlled for, which is to some extent to due the fact that time series data is only available for a small number of LMI.

There is no analysis that investigates the role of capital accumulation using a full set of LMI. This is where the contribution of this study lies. We employ the latest OECD dataset on LMI (as well as another dataset) to examine the role of capital accumulation and LMI on unemployment in the medium run. In the panel analysis 5-year-averages will be used because accurate data for many LMI are not available on annual basis. Additionally, this approach has the advantage that 5-year-averages largely smooth out business cycle fluctuations. Its main drawback is that homogeneity of coefficients is imposed across countries.[2]

[2] The use of 5-year-averages has another cost, which is that we cannot perform causality tests. Arestis et al (2007) offer a careful time series approach to many of the issues involved here. As mentioned, however, their approach forces them to exclude the majority of LMI.

3 Regression specification

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 it 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 bargaining coordination, are expected to have a positive sign.[3]

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

One innovation of this paper is to include the rate of capital accumulation as a macroeconomic shock. As will be shown later (section 6), econometrically it makes little difference whether capital accumulation – that is the rate of growth of the 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. Long-term capital accumulation depends on technology (for neoclassical economists) or on expected profitability (for Post Keynesians). Either way, in the context of 5-year-averages capital accumulation is no more endogenous than the interest rate or labour market institutions themselves.

[3] The tax wedge is in fact often regarded as a price push variable (Layard et al 2005, Carlin and Soskice 2005). Nothing of substance hinges on the classification in our context.

4 Data

In our empirical investigation, we include data from 20 OECD countries.[4] Annual data on unemployment rates (*u*), the real net capital stock of the total economy (the logarithmic growth of which will be denoted as *ACCU*), 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 come from two different sources. The first source is the most recent OECD database on institutional variables, which formed the basis for the OECD *Employment Outlook 2006*. Bassanini and Duval (2006) have compiled two time series databases, covering the 1982-2003 (henceforth BD82-03) and 1970-2003 (henceforth: BD70-03) periods, respectively.[5] We will use the former. The dataset includes variables for employment protection legislation (*EPL*), the unemployment benefit replacement ratio (*UB*), benefit duration (*BD*), union density (*UD*), and the tax wedge (*TW*). There is a dummy variable for collective bargaining coverage (*CBC*) that is 1 if the coverage is high and 0 otherwise.[6] Furthermore, BD provide an index measuring product market regulation (*PMR*) in seven energy and service sectors that takes values between 1 (lowest) and 6 (highest level of regulation).[7]

In order to check the robustness of our findings by extending the period covered, we additionally employ the LMI database compiled by Baker et al. (2005; henceforth BGHS), which extends and revises the Nickell and Nunziata LMI database that has been used widely in econometric studies during the 1990s. It covers the same type of institutions as BD82-03 (except for a CBC) over the period from 1960 to 1999.[8]

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[4] 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.

[5] The latter database is widely regarded as a major improvement over previous institutional datasets (e.g. Howell et al 2007, section 2), notably for its carefully constructed new series on employment protection legislation (EPL).

[6] 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.

[7] While the BD82-03 dataset gives annual values for the institutional variables, it is clear that not all of these data points qualify as genuine and accurate annual data. Only TW and UD are unambiguous annual data (though UD is extremely smooth). UB and BD are based on data for every other year and interpolated in between. Moreover, for the majority of countries BD has only one or no substantial change in the entire period. The same is true of EPL. CBC and COORD are dummy variables with very little variation. Given these time series properties and the methodological problems in the construction of the series, these indicators are best regarded as reasonable proxies for the medium run.

[8] For reasons of simplicity, the same identifiers are used throughout the paper for the same *type* of labour market institution in the different datasets employed. Table A1 in the appendix lists the variable identifiers used in this paper and the corresponding notations employed by the respective researchers for their original series.

There are three main advantages of using BGHS rather than the alternative BD70-03. First, BGHS has substantially more variation in its variables than BD70-03.[9] Second, BGHS also covers the 1960s, thus a longer time period. Third, BGHS includes a series measuring bargaining coordination (*COORD*), a variable treated unsatisfactorily in the Bassanini and Duval datasets, which have a variable measuring the degree of corporatism (low, medium, or high) that exhibits very little variation across countries over time. As an additional check for robustness, however, all regressions were also performed on the BD70-03 dataset.[10]

The macro shocks considered likewise vary with the data set employed. BD82-03 as well as BGHS contain a real interest rate (*INT*) and a terms of trade shock (*TOTS*; measured as the relative prices of imports[11]). Both are expected to have a positive effect on unemployment. Furthermore, in BD82-03, 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.[12] 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).

Both the institutional and the macro data were transformed into 5-year-averages, yielding five data points for BD82-03 and eight points for the BGHS series. The first and final period of BD82-03 were counted as full periods, and the macro data also cover these reduced periods.[13]

[9] 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 two 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 generosity measure (see also table A1 in the appendix).

[10] The results are documented in Table A2 in the appendix.

[11] 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.

[12] For some of the observed 20 OECD countries, the series for the latter two shocks (and *LDS* in particular) feature several missing values that reduce the sample in several of our regressions.

[13] 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.

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

Table 2 summarizes the main empirical findings employing the BD82-03 dataset. We present results for six different specifications. In specification (1), 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 (INT, TOTS, LDS, and TFPS). These first two specifications 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 Keynesian specification. It is our preferred specification. The final three specifications are checks of robustness. Whereas the first three contain fixed country and time effects, the fourth variant employs cross-section fixed effects only. Specification (5) is a variation of (3), in which the change in 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).

Looking first at the institutional variables in Table 2, two of them – UD and CBC – are statistically 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 collective bargaining features 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. In a given 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).[14]

[14] 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, interestingly, remains statistically insignificant with one exception (specification 4 without time effects) if included in the BD82-03 dataset, and without exception in the longer sample (cf. table A2 in the Appendix).

Table 2: Unemployment effects of Institutions, macro shocks, and capital accumulation																		
Bassanini and Duval dataset (1983-2003)																		
	1			**2**			**3**			**4**			**5**			**6**		
	LMI only			**LMI + MS**			**LMI + MS + ACCU**			**LMI + MS + ACCU**			**LMI + MS + ACCU**			**LMI + MS + ACCU**		
										(no period effects)			(incl. ΔINFL)			(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.																		

The coefficient for EPL is positive but 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. 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. UB is statistically significant only in specification (1) but becomes insignificant once macroeconomic shocks are included. The PMR variable is insignificant throughout all specifications.

Among the macro shocks, only INT 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 carry the expected sign, with the exception of TFPS. 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 LDS and TFPS are typically not.

ACCU 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). Interestingly, 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).

Including 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, and that the 5-year mean of the unemployment rate is a reasonable proxy for the NAIRU.

Finally, specification (6) estimates the standard regression (3) 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 our specifications summarized in Table 2. The results in difference form are thus reported only for comparability. The exercise confirms our previous findings: Capital accumulation has a strong and statistically significant (at the 1% level) effect with a coefficient estimate of -1,69 that is substantially higher than in ‘levels’. Among the labour market institutions, BD, UD and CBC remain statistically significant.

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**			**LMI + MS + ACCU**			**LMI + MS + ACCU**		
										(no period effects)			(incl. ΔINFL)			(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			0.47		
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.																		

The regression results from using the BGHS database (Table 3) are broadly in line with those derived from BD82-03. Contrary to the results for the BD82-03 dataset, however, serious autocorrelation problems plague the regressions (1) through (5). The interpretation will thus focus on specification (6). Among the institutional variables, UD is again the only variable that exerts a statistically significant effect with the expected sign on unemployment. EPL shows a statistically significant perverse sign. Specification (6) suggests that a 10 percentage point decrease in union density would entail a reduction in unemployment of nearly 0.6 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.

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, IMF 2003, 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. For example, IMF (2003) argues that the effects of different LMI are reinforcing, without specifying ex ante *which* LMI should interact. This poses a 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. While some interactions have the expected (reinforcing) effect, others have 'perverse' effects. The statistically significant interaction between TW and BD is in line with the IMF argument. On the other hand we find, for example, 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). Overall there are 60 interactions, of which nine are statistically significant at the 5% level. Among these, three have reinforcing signs, while the other six have counteracting signs. The prudent interpretation of the results is to conclude that the evidence in favour of strong reinforcing interaction effects is underwhelming.

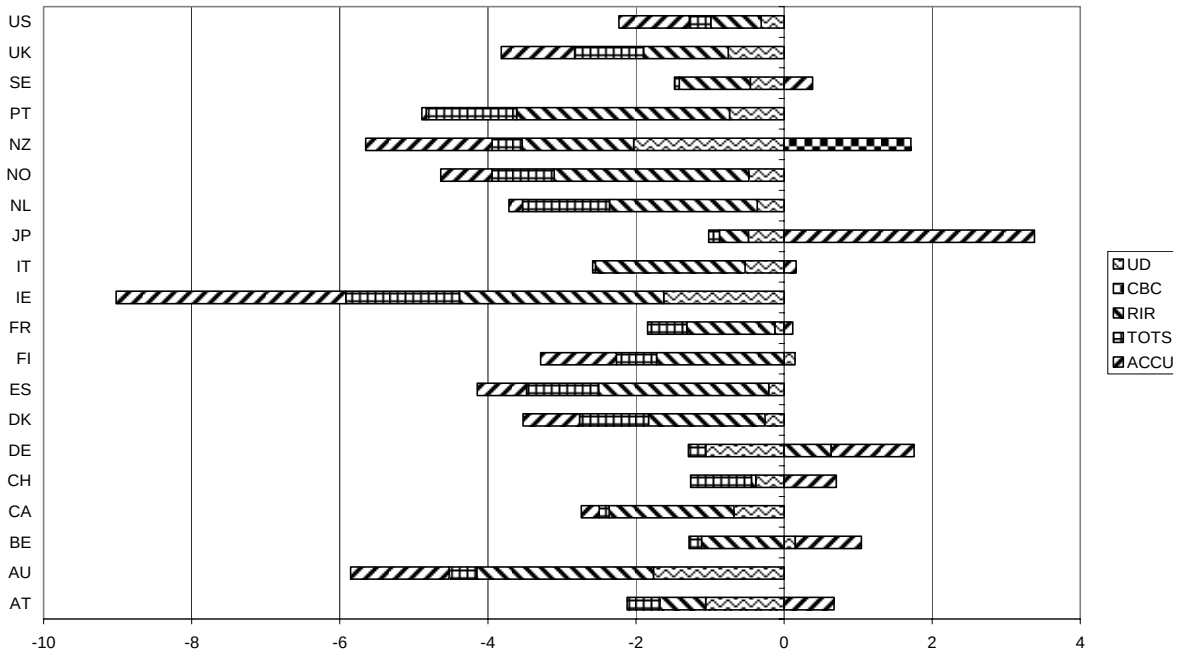
Table 4: Interactions between LMI and between LMI and Macro Shocks											
Bassanini and Duval dataset (1982-2003)											
	BD	EPL	UD	COORD	CBC	TW	PMR	INT	TOTS	LDS	TFPS
UB	-0.01	-0.04	0.00	0.02	-0.08	0.00	-0.01	0.00	-0.16	-0.04	-0.15
t-value	*-0.22*	*-3.33***	*-1.23*	*0.30*	*-1.94*	*-0.19*	*-0.72*	*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
t-value		*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
t-value			*-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
t-value				*-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
t-value					*-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
t-value						*2.68***	*-1.72*	*-2.35***	*-0.23*	*1.73*	*0.96*
TW							-0.02	0.01	-0.30	1.23	1.39
t-value							*-1.23*	*0.39*	*-0.78*	*3.12***	*1.70*
PMR								-0.10	-1.00	-5.29	1.04
t-value								*-1.05*	*-0.37*	*-2.52***	*0.09*
Interactions that are significant at least at the 5% level are marked (**).Grey shades indicate an unexpected sign.											

5.3 Illustrations of the economic impact

Statistical significance can be a misleading guide in assessing the economic impact of explanatory variables, as 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 investigate the relative impact of variables *across countries*. This calculation is based on the BD82-03 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 all countries with the exception of Japan. Figure 1 plots the results.

Figure 1: Contributions to unemployment (in %-age points) from 1990-94 to 2000-03

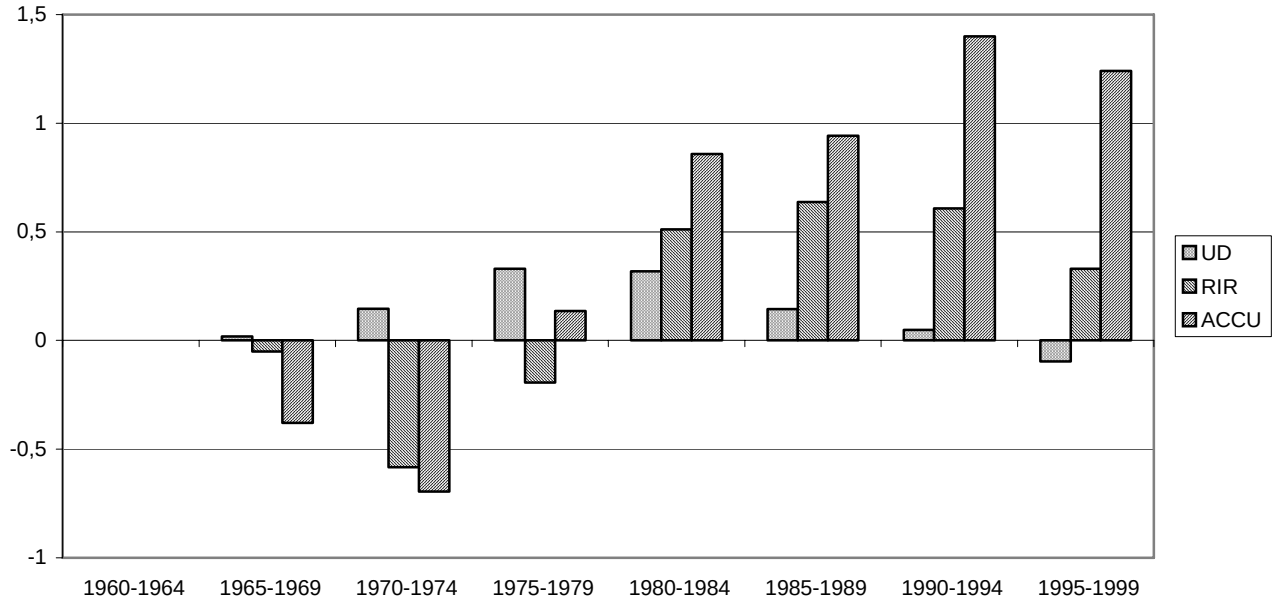


Visual inspection suggests that the interest rate and capital accumulation made the largest contributions to changes in unemployment, with labour market institutions having played a substantial role in some countries. Changes in union density explained changes in unemployment of more than 1 percentage point in five countries (though the one in New Zealand was almost exactly offset by the simultaneous change in bargaining coverage). 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 real interest rates declined universally over the period in question. 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 because it offers a longer time-span. 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 because it represents a situation of virtually full employment by historical standards. Changes in the interest rate and in capital accumulation clearly have had 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.

Figure 1: Contributions to unemployment (in %-age points) relative to 1960-64 for country means



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, 0.41, and 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 clearly do not run the show.

5.4 Measures of capital accumulation

In this paper, the rate of capital accumulation has been used as the key variable. One may dispute this choice. First, it could be argued that gross investment is the proper measure if one attributes a substantial role to the demand impulse. Second, one might maintain that it is the size of 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 5 reports results from regressions including (log) real gross investment and the (log) real capital stock as explanatory variables. Regarding 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.

The second set of alternative regressions includes the (logarithm of) capital stock in levels rather than differences. Such a procedure corresponds to the capital shortage argument, which holds an inadequate capital stock as a supply side variable responsible for medium-run unemployment.

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.																

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. 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).[1]

[1] 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 (albeit only at the 10% level) with the correct sign, except for the specification including investment as well.

6 Conclusions

The paper has presented a medium-term panel analysis of the determinants of unemployment. We report strong effects of capital accumulation (in line with Arestis et al 2007) and the real interest rate (in line with Ball 1999). Regarding labour market institutions, we find only moderate and for the most part non-robust effects (in line with the observations of Baker et al 2005 and Baccaro and Rei 2007). Statistically significant and robust effects were detected 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 results hold over time and across countries in two different LMI datasets. Labour market institutions do have an effect on unemployment, but it is a comparatively minor one. Macroeconomic variables have a much greater impact, and among these capital accumulation (whether measured by capital stock growth or by (log) real investment) and the real interest rate are the most important ones. Remarkably, capital accumulation maintains its strong impact even when real interest rates are simultaneously controlled for. We interpret this as vindication of Keynes' assertion that investment is to a significant extent driven by animal spirits rather than by economic variables. Moreover, additional regressions suggest that capital accumulation matters as a demand factor rather than as a supply-side variable.

The overall message of these findings is that in order to understand the development of unemployment, one has to look primarily at the goods markets (and investment expenditures in particular) and not at the labour market. This is a restatement of the basic Keynesian insight. The straightforward *negative* policy implication of these findings is that labour market reforms will not cure unemployment. The *positive* policy implication is to stimulate capital accumulation. However, this is easier said than done as the determinants of investment expenditures are still poorly understood. Aggregate demand is widely considered the prime determinant of investment. Thus economic policy should focus on stimulating aggregate demand and recognise in particular that monetary policy 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 when it comes to the role of prices-push (or mark up-push) variables, such as insufficient competition on goods markets, on the NAIRU. Second, in the light of the scant empirical success in tracing investment back to underlying macro variables, renewed efforts need to go into determining factors that drive business investment expenditures.

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Appendix

Table A1: LMI and macro variables in different datasets

	Identifier in dataset			
Variable	Bassanini and Duval (BD82-03)	Baker et al. (BGHS)	Bassanini and Duval (BD70-03)	Nickell and Nunziata
EPL	epl	ep	eplcm	ep
UB	rr1	brr_alt	arr[1]	brr
BD[2]	ubendur1	bd_alt	--	bd
TW	twcoup[3]	tw_alt2	wedgena	tw
UD	undens	ud_alt	undens	udnet
CBC	uncovhigh	--	uncovcm	--
COORD	highcorp	bc2	highcorp	cow
ALMP	slmp1to5	almp_fill	almpucm	--
INT	rintshock	rir	rintshock1	rirl
TOTS	totshock	tots	totshock	ttsfc
LDS	ldshock	--	ldshock	lds
TFPS	ltfpshock	--	ltfpshock	d2tfp
PMR	regref	--	regrefext	--

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.

Estimation results with the BD70-03 dataset [23]

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**			**LMI + MS + ACCU**			**LMI + MS + ACCU**		
										(no period eff.)			(incl. ΔINFL)			(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.																		

[23] In the BD70-03 dataset 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.

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 effectively 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 BD82-03 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).

Inclusion of (log) capital stock in the regressions in BGHS dataset

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 A3: Inclusion of (log) capital stock in the regressions

BGHS 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.

Table A4 reports variations of the default specification with BD82-03 that were not discussed in the text as they yielded no particular new insight. Finally, table A5 lists the values for the fixed effects from the preferred specifications in BD82-03 and BGHS.

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				