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The Impact of Monetary Policy on Unemployment Hysteresis

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Engelbert Stockhammer[♦] and Simon Sturn[♠]

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Abstract

This paper investigates the hypothesis that the extent to which hysteresis occurs in the aftermath of recessions depends on monetary policy reactions. The degree of hysteresis is explained econometrically by the extent of monetary easing during a recession and by standard variables for labour market institutions in a pooled cross-country analysis using quarterly data. The sample includes 40 recessions in 19 OECD countries for which the required data is available. The time period lasts from 1980 to 2007. The paper builds on Ball (1999) and extends the sample of countries, the time period under investigation and the set of control variables.

Keywords: monetary policy, NAIRU, structural unemployment, hysteresis, endogenous NAIRU

JEL-Classification: E24, E39, E50

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The Impact of Monetary Policy on Unemployment Hysteresis

1 Introduction

Can Central Banks affect structural unemployment? The ECB's answer is a resounding no. "Real income or the level of employment in the economy are, in the long run, essentially determined by real (supply-side) factors ([…] welfare policies and other regulations determining the flexibility of markets […])" (ECB, 2004, p. 41). On the other hand, Olivier Blanchard, Chief Economist of the IMF, argues that "monetary policy affects both the actual and the natural rate of unemployment" (Blanchard, 2003, p. 4). A look at the development of unemployment over time suggests that unemployment is growing in steps. As can be seen in Figure 1, unemployment is growing dramatically during recessions. While unemployment returns to pre-recession levels in some countries, it does not in others. These countries also experience an increase in the NAIRU. The hypothesis to be explored is that monetary policy explains an important part of these different patterns.

Insert Figure 1 about here

Monetary policy affects economic activity through several channels including interest rates, bank credits, asset prices, exchange rates and expectations (Mishkin, 1996; ECB, 2004). Romer and Romer (1994) have argued that monetary policy has been the key variable to end recessions. There is also substantial evidence that monetary policy is most effective during recessions (Lo/Piger, 2005). Peersman and Smets (2001) find for large European countries that the effect of an interest rate shock on output almost doubles during a recession. This suggests that monetary policy reactions may be important in understanding the behaviour of unemployment over time.

In a well known paper, Laurence Ball (1999) found that differences in monetary policy during recessions of the early 1980s explain a substantial part of how much of the cyclical increase in unemployment has become structural. His study was based on an in-depth analysis of selected

countries and on econometric analysis which covered the recessions of 17 OECD countries in the early 1980s.

This paper takes Ball's approach as a starting point and updates and extends it. A pooled cross-country analysis with quarterly data is used to investigate the impact of a reduction in short-term real interest rates during a recession on the NAIRU five years later (relative to the maximum increase in unemployment during the recession). This paper extends Ball's (1999) analysis along four dimensions. First the sample is significantly extended by investigating the recessions of OECD countries between 1980 and 2003. Second, quarterly rather than annual data is used to measure the period of recessions and the reaction of monetary policy. Third, a richer set of labour market institutions is controlled for. Fourth, several tests of robustness are performed by varying the definition of key variables.

The rest of the paper is structured as follows: Section 2 discusses briefly the theory behind the structural rate of unemployment, the NAIRU. Section 3 surveys the relevant empirical literature explaining unemployment and the NAIRU. Section 4 continues with methodology and data issues. In Section 5 the results of the econometric analysis are presented. Section 6 addresses several tests of robustness, and Section 7 concludes.

2 The NAIRU theory and unemployment hysteresis

The NAIRU is defined as the rate of unemployment at which inflation is stable. Sometimes it is referred to as long-run or structural unemployment. If unemployment drops below the NAIRU, workers can achieve a higher rate of growth of money wages in wage bargaining, which in turn leads firms to increase the growth rate of prices. Rising inflation will again cause rising nominal wage claims and trigger a wage-price spiral (e.g. Layard et al., 1991; Carlin and Soskice, 2006).

The NAIRU model is a rather general macroeconomic framework, for which different interpretations exist. In particular there is a debate on the determinants of the NAIRU itself and on the disequilibrium dynamics (Stockhammer, 2008). According to the New Consensus Model, Central Banks (assuming they follow a Taylor Rule or are inflation-targeting) will react to the wage-price spiral by raising real interest rates. It is generally assumed that the Central Bank is able to increase (short-term) real interest rates via the variation of (short-term)

nominal interest rates. The increased interest rates will affect real output negatively and increase unemployment. Rising unemployment deteriorates the bargaining position of workers and makes income claims of workers and employers compatible. This mechanism is assumed to work symmetrically so that Central Banks are able to stimulate growth by lowering interest rates.

The level of the NAIRU is determined ceteris paribus by the degree of competition on goods markets, which influences the profit claims, and labour market institutions, such as the generosity and duration of unemployment benefits, the tax wedge, or employment protection legislation, which influence the wage claims. According to what one might call the *exogeneity view* these are the *only* determinants of the NAIRU. This interpretation is expressed in the opening quotation from the ECB and is also associated with the OECD which has used it in its early recommendations to argue that inflexible labour markets are the reason for persistently high unemployment in Europe (OECD, 1994).

Alternative interpretations emphasize the *endogeneity* of the NAIRU. Endogeneity is either rooted in economic variables which simultaneously affect actual unemployment and the NAIRU or in *hysteresis* which means that actual unemployment influences the NAIRU. In the latter case the unemployment rate serves as an attractor for the NAIRU and demand policy which influences unemployment will also (indirectly) affect the NAIRU.

Several explanations for hysteresis have been put forward. First, in the insider-outsider model it is assumed that the labour force is divided between these two groups, the insiders and outsiders: employed vs. unemployed, highly qualified vs. less qualified, trade union members vs. non-trade union members, etc. While the insiders have a strong position in wage bargaining, e.g. because of their firm specific know-how, the outsider group is not a perfect competitor for the insider-position and has therefore little or no influence on the wage bargaining process. In this case a higher unemployment rate may not have any impact on wages (Blanchard and Summers, 1986). Second, deskilling of the long-term unemployed may make them imperfect substitutes for employed workers:

> "The higher is the proportion of long-term unemployment in the overall pool of unemployment, the less impact will any given level of unemployment have on wage setting. If this is the case, then since a long period of high unemployment is likely to eventually push up the proportion of the long-term unemployed, equilibrium unemployment will rise." (Carlin and Soskice, 2006, p. 119)

Third, fairness considerations can give rise to endogenous wage aspirations (Skott, 2005). If workers' view of the appropriate wage level is determined by prevailing wages, unemployment may not be able to affect wages.[1] These explanations give reasons why a temporary increase in unemployment (whatever its cause) may have lasting effects on the NAIRU.[2]

There are also some macroeconomic variables that may affect the NAIRU itself. Among these, two prominent factors are capital accumulation and the interest rate. Capital scrapping during long-lasting recessions will lead to a decline in the capital stock (in parallel with rising unemployment). If there is limited (ex-post) substitutability between capital and labour, a positive demand shock will have inflationary effects at lower levels of employment – the NAIRU has risen (Rowthorn, 1995, 1999; Bean, 1989). Increases in the interest rate may affect the NAIRU directly because it may increase firms' target mark up (Hein, 2006) and it will have a negative effect on capital accumulation.

Keynesian economists thus interpret the NAIRU not as the long-run equilibrium rate of unemployment, but as a short-term inflation barrier, which shifts with economic activity and depends on the real rate of interest (Arestis and Sawyer, 2005; Hein, 2004, 2006; Lavoie, 2006; Stockhammer, 2008).

3 A survey of the empirical literature

The view that differences in unemployment across countries and over time can be explained by changes in labour market institutions has been forcefully put forward by the *OECD Jobs Study* (OECD, 1994) and since shaped policy making. While this view is at times almost treated as an economic fact, the available evidence is surprisingly mixed. IMF (2003) and Nickell et al. (2005) report strong effects of labour market institutions on unemployment.[3] Others (to be discussed presently) are much more sceptical. What is at stake is not *whether* labour market institutions influence the NAIRU – this view is generally shared – but whether

[1] The *near-rationality* approach of Akerlof et al. (2000) and Akerlof (2007) leads to similar policy conclusions regarding the influence of monetary policy on the long-run Phillips curve.
[2] Additional explanations for hysteresis are summarized in Røed (1997).
[3] For a critical discussion of OECD (1994) see OECD (2006), especially chapter 6, and Blanchard and Katz (1997). For a critical discussion of IMF (2003) see Baker et al. (2004), Freeman (2005) and Baccaro and Rei (2007).

they can be regarded as the *prime determinants* of actual unemployment (and the NAIRU). For example Fitoussi et al. find "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, p. 257). Similar conclusions are drawn by Blanchard and Katz (1997), Baker et al. (2005) and Freeman (2005). Remarkably, the *OECD Employment Outlook 2006* acknowledges that highly different combinations of institutional settings can result in low unemployment (OECD, 2006).

Hysteresis suggests a different approach to explaining differences in unemployment: demand shocks will determine unemployment and the NAIRU will be dragged along. There is a rich empirical literature testing for the existence (or absence) of hysteresis. In their pioneer work, Blanchard and Summers (1986) find evidence for unemployment hysteresis in the European countries. They estimate the impact of lagged employment and unemployment in wage equations for the United Kingdom, France, Germany, and the United States, for the period 1953 to 1984, where the combination of 'bad times' with rigid labour markets seems to be the main source of hysteresis. Several other surveys find evidence for the hysteresis explanation of unemployment especially in European countries, less often for the United States, by testing for a unit root in the unemployment rate (Mitchell, 1993; Røed, 1996; León-Ledesma, 2002). Stanley (2004) performs a meta-regression analysis of 24 publications with 99 regressions on the determinants of unemployment and finds a persistence coefficient of past unemployment of 0.86. The coefficient rises to 0.96 after weighting the small sample biased-results according to their quality. This value is close to unity which indicates full hysteresis.

When structural changes in the stationarity tests are allowed for, the null hypothesis of a unit root in unemployment is often rejected (Arestis and Biefang-Frisancho Mariscal, 1999; Papell et al., 2000; Camarero et al., 2006). However, these results also suggest that structural breaks are crucial to describe the development of unemployment over time and "that shocks have highly persistent […] effects on unemployment" (Camarero et al., 2006, p. 180). Using a similar approach León-Ledesma and McAdam (2004) argue that it is difficult to distinguish transition effects and hysteresis in empirical research.

Jaeger and Parkinson (1994) apply an unobserved components analysis using a Kalman-filter to decompose unemployment into a structural component and a cyclical component and find evidence for hysteresis in Canada, Germany and the UK, but not for the USA. The impact of lagged cyclical unemployment on the NAIRU is interpreted as hysteresis. A similar approach is followed by Logeay and Tober (2005) who find a strong impact of hysteresis in explaining the rise of the NAIRU in the Euro-zone.

One important stream of the literature links unemployment to capital accumulation. Rowthorn (1995) regresses (the changes in) unemployment on (the changes in) capital accumulation in a cross-section of OECD countries and finds that capital accumulation is able to explain employment at a statistically significant level. Stockhammer (2004) tests the mainstream and Keynesian views in explaining unemployment for Germany, Italy, France, UK and the USA using a time-series approach. He finds that the rate of accumulation has a statistically significant effect, controlling for capacity utilisation and several labour market institutions. Arestis et al. (2007), using time-series and panel data, find evidence that the capital stock is an important determinant of unemployment and wages in EMU countries.

Several studies have found that interest rates have important effects on unemployment. Based on a regression explaining the change in unemployment between the 1980s and the 1990s in 19 OECD countries, Fitoussi et al. (2000, p. 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 real interest rates and conclude that the real interest rate can affect the NAIRU through capital accumulation. 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 a 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 period 1982 to 2003 and find that besides some labour market institutions, the long-run real interest rate has a statistically significant impact on unemployment.

With respect to the influence of monetary policy on output there is substantial evidence that monetary policy has asymmetric effects.[4] Peersman and Smets (2001) estimate an area-wide VAR for the years 1978-1998 and combine their results with a multivariate Markov Switching Model which allows them to endogenously determine booms and recessions and to test if the effects of policy depend on the state of the economy. They find for 7 EMU countries that effects of monetary policy "are significantly larger in a recession compared to those in an expansion" (Peersman/Smets, 2001, p. 12). Similar conclusions have been reached for the Euro-zone (Maria-Dolores 2002), as well as for several individual countries including the USA (Garcia/Schaller, 2002; Lo/Piger, 2005), Germany (Kakes, 2000; Kuzin/Tober, 2004) and Spain (Dolado/Maria-Dolores, 2001).

Combining these results with the literature highlighting the role of shocks in explaining unemployment, Laurence Ball (1999) focuses on the role of monetary policy in recessions when explaining structural unemployment. First Ball analyzes the effect of monetary policy in the recessions of the early 1980s by using descriptive statistics based on quarterly data for the G7 countries and by means of regression analysis for 17 OECD countries (using annual data). Second, to account for differences in the decrease in unemployment rates he discusses monetary policy and labour market policies in four successful countries and six countries with disappointing performance. Ball concludes that "[m]onetary policy and other determinants of aggregate demand have long-run effects on unemployment. Throughout the OECD, the reactions of policy to recessions in the early 1980s helped determine whether unemployment rose temporarily or permanently." (Ball, 1999, p. 234)

The sample of his econometric analysis is rather small as it includes only the 17 recessions of the early 1980s. There has been surprisingly little effort to check whether Ball's results can be generalized, i.e. to apply his approach to other periods. This is where this paper comes in. This paper broadly follows Ball's econometric approach in analysing recession episodes. It extends his analysis along four dimensions. First we extend the sample by investigating the recessions of OECD countries between the 1980s and the early 2000s. This constitutes the most important step in the attempt to check the validity of Ball's results. In using a much broader and more diverse sample, we move well beyond the experience of the recessions of

[4] Theoretically these results are based on the *financial accelerator* model of Bernanke and Gertler (1989) or on convex short-run aggregate supply curves (see Peersman/Smets, 2001 and Kuzin/Tober, 2004). Additionally some authors focus on the psychological effects of the behaviour of monetary policy authorities in recessions (Blanchard, 2003).

the early 1980s, which are often regarded as having been engineered by Central Banks. Second, we use quarterly instead of annual data to measure the period of recessions and the reaction of monetary policy. This allows for a more exact determination of the monetary response to recessions. Third, a richer set of labour market institutions is controlled for. While Ball controls econometrically only for unemployment benefits (and discusses the tax wedge in his case studies), we utilize a broad set of nine labour market institutions employing the latest OECD dataset. Fourth, several tests of robustness are performed to investigate whether results are sensitive to minor changes in definitions.

4 Methodology and data

The hypothesis to be tested is that restrictive behaviour of monetary policy during the recession will trigger a hysteresis effect: the cyclical increase in unemployment will become permanent and result in an increase in structural unemployment in the period after the recession. The increase in the NAIRU in different countries and time periods will be affected by the severity of recessions. Thus the dependent variable will be the increase in the NAIRU relative to the increase in unemployment, rather than the increase in the NAIRU itself. In the econometric analysis this *degree of hysteresis* will be explained by the extent of monetary easing, labour market institutions and other control variables.

$$H = b_1 ME + b_2 L + b_3 C + b_4 T + \varepsilon$$

Where H, ME, L, C, and T are the degree of hysteresis, monetary easing, a vector of labour market institutions, a vector of other control variables and a vector of time dummies, respectively.

A *recession* is defined here as two or more consecutive quarters of decline in real GDP and an increase in unemployment.[5] The first part of this definition follows convention. The additional requirement that unemployment has to increase is necessary for our dependent variable to have a meaningful interpretation. Only in one case (Italy 2001) is there a GDP recession without an increase in unemployment. As some recessions are followed by a short recovery

[5] The NBER Business Cycle Dating Committee "gives relatively little weight to real GDP because it is only measured quarterly and it is subject to continuing, large revisions" (Business Cycle Dating Committee 2001, p. 1). Unfortunately their classification is only available for the USA.

period, and then return to negative rates of output growth, we treat two recessions within an eight quarter period as the same recession.

The dependent variable is the *degree of hysteresis (H).* It is defined as the increase in the NAIRU (Δu_N) in the 5 years after the peak of the business cycle relative to the maximum increase in actual unemployment ($\Delta^{\max} u$) in the same period ($H = \Delta u_N / \Delta^{\max} u$). More technically, the numerator is the change in the OECD's (ex post) NAWRU from the (mean of four quarters prior to the) beginning of the recession to (the mean of four quarters) five years later.[6] If within these five years (but not in the first two years) another recession begins, the period is shortened so that those recessions (and their following periods) are not overlapping. The denominator of the degree of hysteresis is the greatest increase in actual unemployment from the quarter before the recession to at most 18 quarters later (for all countries in the sample quarterly data is available).

The degree of hysteresis measures the degree of the rise in actual unemployment during a recession which has become structural. If this variable is zero, this means that the NAIRU remained unchanged, and the recession did not lead to a rise in structural unemployment. If its value is one, this means that an increase in unemployment directly translates into an increase in the NAIRU.

Monetary easing is the cumulated change of the ex post short-term real interest rate per quarter between the first quarter of the recession and the second quarter after the recession. In these last two quarters growth rates are positive again, but absolute values of output are still below trend in most cases.[7] Monetary policy is expected to show an especially strong impact in this vulnerable period. The real interest rate is constructed (as in Ball 1999) as the nominal short-term interest rate (i_t) minus the average consumer price inflation in the periods $t_{(-4)}$ to $t_{(-1)}$ and $t_{(-3)}$ to t.

[6] In five cases (Belgium, Switzerland, Denmark, Spain and Portugal) only annual NAWRU-data are available. Here, the starting point was chosen according to the quarter of the year in which the recession started. If the recession started in the first or second quarter of a year, the NAWRU from the year before to five years later was measured. If the recession started in the third or fourth quarter of the year, the NAWRU from this year to five years later was measured. As the NAWRU obtained by a Kalman filter is by design very smooth, for countries where quarterly data are available the results with both procedures are virtually identical.

[7] And in several cases output growth becomes positive after a recession for one, two or more quarters, and then returns to negative growth again. Therefore the quarters after the recession also seem to be crucial.

The real interest rate has an impact on various economic variables, but it is not strictly a policy-controlled variable. The analysis presupposes that (during a recession) changes in the real interest rate are driven by changes in nominal rates rather than inflation. Moreover, our sample includes countries that are part of the Euro area and have lost the ability to autonomously set interest rates. Rather, they will be affected by different real interest rates that result from the same Euro area-wide nominal interest rate. This indeed has been the case in the recessions of the early 2000s. In the 2002 recession, real interest rates were 0.93 in Germany, but -0.52 in Portugal. We will return to the issue of real and nominal interest rates in section 6.

In line with the relevant literature we use various indicators for *labour market institutions* as control variables: active labour market spending per unemployed to GDP per capita (*ALMP*), employment protection legislation (*EPL*), product market regulation (*PMR*), tax wedge (*TW*) union density (*UD*), unemployment benefit duration in years (*UBD*), average unemployment benefit replacement rate (*UBR*), as well as a dummy for high (*HIGHCORP*) and low corporatism (*LOWCORP*).[8] The labour market institutions variables were taken in levels at the year the recession started. The data for the control variables are taken from Bassanini and Duval (2006).[9]

A high level of spending on active labour market policy is expected to decrease the degree of hysteresis, therefore a negative sign is expected. For the other labour market institution variables a high level should correlate with a high degree of hysteresis. The dummies for high as well as low corporatism are expected to decrease the degree of hysteresis, while intermediate corporatism is expected to result in high hysteresis. Finally to control for other macroeconomic shocks the change in the terms of trade (*d_TOT*) was included. This is the weighted change of import prices relative to domestic prices from the beginning of the recession to (maximal) five years later. A reduction in relative import prices should reduce wage pressure and, eventually, the degree of hysteresis (see e.g. Layard et al., 1991; Bassanini and Duval, 2006).

[8] Product market regulation is, strictly speaking, not a labour market institution. It is supposed to impact upon the NAIRU because it has an effect on firms' mark up and is routinely included in unemployment regressions.
[9] Detail descriptions of these data can be found in Appendix 2 of Bassanini and Duval (2006). The time series start with 1982 and are ending with 2003. In several cases the ALMP-series starts some years later and ends some years earlier. Where the observed recessions started before 1982 and in the case of ALMP the closest available value is taken.

Quarterly data for output, short-term interest rates, the consumer price index, unemployment and the NAWRU are from the OECD Economic Outlook (volume 2007, release 02).[10] The data set includes all recessions beginning between 1980 and 2003 for 19 OECD countries. Greece, Austria, Luxembourg and Iceland had to be excluded due to lack of data.[11] Turkey, Mexico, Republic of Korea and the eastern European countries were excluded because their economies are structurally very different. The total number of observations is 40.[12]

5 Empirical results

Table 1 summarizes the estimation results. Several specifications are reported. For some of these the White-Test indicated heteroskedasticity.[13] If this is the case, t-values are based on heteroskedasticity-consistent standard errors. Specifications 1 through 3 differ with respect to the time dummies included. Specifications 4 through 14 include different sets of labour market institutions.

Specification 1 includes all labour market institutions and no time dummies. Specification 2 includes time dummies *t1*, *t2* and *t3*, which take on the value one if the recessions began in the period 1980-1986, 1987-95 and 1996-2003 respectively. These dummy variables should capture changes in the international environment or changes common to all countries that are not adequately captured by the control variables. It turns out that the values for *t1* and *t2* are virtually identical and differ substantially from *t3*. Therefore specification 3 includes an intercept and only *t3*. This specification then forms the basis for further variations of the specifications. *ME* is statistically significant at the 1% level in all reported specifications. Among the labour market institutions *PMR* and *d_TOT* are statistically significant and show

[10] In the case of Ireland the OECD-data was complemented with data form the IMF International Financial Statistics for the quarterly short-term interest rate until 1983q4.
[11] The quarterly GDP data for Greece are unreliable according to the OECD Help Desk and no labour market institutions data are available. No quarterly GDP data is available for Austria. No data on labour market institutions is available for Luxembourg and Iceland. No quarterly data are available for Germany prior to 1991, as a consequence the German recession 1991/92 had to be excluded.
[12] Two observations had to be excluded. The degree of hysteresis is designed such that the variable lies between 0 and 1. Indeed this is the case for most countries. However there are some exceptions. The Finnish recession in 2001 shows a degree of hysteresis of -17.2. This is because the NAIRU was decreasing by 1.3 percent points, while the unemployment rate rose slightly by 0.07 percent points. Also, the Norwegian recession of 1980 is a statistical outlier as the monetary easing indicator lies more than three and a half standard deviations under the mean. The Finnish case results from definitions used and thus illustrates the limitations of this approach.
[13] As the critical value for not rejecting the null hypothesis of no heteroskedasticity we choose a probability value of 0.15.

the expected sign in specification 1. But in specification 2 and 3 both are insignificant and *PMR* even changes its sign. The adjusted R-squared varies between 29 and 41%.

Insert Table 1 about here

The variables for labour market institutions could be correlated among each other as they may measure different aspects of a given welfare regime. The lack of statistically significant effects may thus be due to multicollinearity problems. *PMR* and *UD*, and *TW* and *EPL* are the only two variable pairs that show correlation coefficient of above 0.5 (see Table A.2). Specification 4 thus drops *PMR* and *TW* to check whether the low level of statistical significance was due to multicollinearity. This is not the case. In specification 4 only *d_TOT* gains statistical significance (at the 10% level with the expected sign) and its coefficient estimate shows similar values as in the previous specifications. Finally specifications 5 through 14 include the labour market institution variables one by one. Only *TW* and *d_TOT* show a statistically significant impact with the expected sign, the former at the 10% level the latter at the 5% level. For the rest of the labour market control variables no statistically significant effect in determining the degree of hysteresis was found. The other variables consistently show t-values well below 1.

The variable of main interest, monetary easing, shows a statistically significant impact at the 1% level on the degree of hysteresis in all specifications. The coefficient has the expected sign and varies between 0.52 and 0.70, with the preferred estimate (specification 3) being 0.69. Economically this is a substantial effect. On average the countries in the sample reduced their real interest rates by 0.22 percent points each quarter of the monetary easing period. Taking the preferred estimate of *ME*, a one standard deviation change in monetary easing (0.39) reduces the degree of hysteresis by 0.27. This is roughly half of the standard deviation of the dependent variable.

6 Robustness

To check the robustness of these results, several tests were performed. First, different variations of the definition of the monetary easing period were tried. This period was initially defined as starting in the first quarter of a recession and ending two quarters after the recession. In variation 1 the monetary easing period was redefined so that it starts in the first

quarter of a recession, but ends one quarter after the recession (like in Romer and Romer, 1994). In this variation only *ME* is statistically significant in explaining the degree of hysteresis (see Table 2). Specification 15 includes all control variables, while specification 16 is without *PMR* and *TW*. The coefficient varies between 0.34 and 0.38, which is somewhat lower than in the baseline version.

Insert Table 2 about here

Second, this monetary easing period was redefined so that it starts one quarter before the recession (and ends two quarters after the recession). It could be argued that this quarter before the actual beginning of the recession is also of importance for anticyclical stabilization policy as interest rate shocks take time to become effective. Results with this alternative definition of the monetary easing period are reported in Table 2 (specification 17 and 18). In both specifications *ME* and *d_TOT* are statistically significant and show the expected sign. Again, the other control variables do not show a significant impact. The coefficient of ME ranges between 0.78 and 0.85, which is slightly higher than in the baseline version.

Variation 3 measures inflation by the GDP-deflator (OECD data) instead of the consumer price index. In specification 19 in Table 2, including all control variables, no explanatory variable is statistically significant. After excluding *PMR* and *TW* (specification 20) the *ME* becomes statistically significant at the 10% level. If control variables are included individually *ME* is statistically significant in eight of this ten specifications (four times at the 5% level and four times at the 10% level). Also *TW* is statistically significant (see Table A. 3). The coefficient of *ME* varies between 0.29 and 0.42, which is slightly lower than in the baseline version.

Fourth, the definition of the real interest rates is altered to allow for forward-looking inflation expectations. In the baseline version real interest rates are defined as the nominal interest rates minus the average consumer price inflation in the periods $t_{(-4)}$ to $t_{(-1)}$ and $t_{(-3)}$ to t. This definition assumes adaptive expectations. But literature on monetary policy often stresses that economic agents are forward-looking (e.g. Clarida et al. 1999). As a simple way to a more forward-looking definition of inflation expectations, we assume that expected inflation is a weighted average of past and (actual) future inflation. The average consumer price inflation in the period $t_{(-2)}$ to $t_{(+2)}$ is used. The results of this fourth variation again show a statistically

significant impact of *ME*, at the 10% level also of *d_TOT*, and in one specification of *EPL* (see Table 2, Specification 21 and 22).[14] The coefficient of *ME* varies between 0.41 and 0.46, which lies somewhere between the baseline version and variation 1.

In variation 5 the changes in labour market institutions (from the year when the recession started to five years later) rather than their levels are included. The coefficients estimates for monetary easing as well as their statistical significance are again robust against this variation (see Table 2, specification 23). The coefficient of *ME* lies at 0.66. EPL and UD show a statistically significant impact, but with a perverse sign.

Overall the results seem reasonably robust against variations in the definitions. In general, *ME* shows a significant impact in the different variations and specifications. But hardly any control variable besides the change in terms of trade shows a statistically significant impact on the degree of hysteresis.

As noted earlier, real interest rates can be an inaccurate measure for monetary policy because real interest rates may be driven by inflation differences rather than by differences in policy-determined nominal rates. One important question is whether the monetary easing variable is indeed measuring Central Bank behaviour. Figure 2 plots the monetary easing indicator relative to the change in the *nominal* interest rates in the same period. They are clearly correlated. The outlier on the left above the regression line is Ireland during its recession in the early 1980s. Without this outlier the correlation coefficient lies at 0.62. It is thus plausible to assume that (during our recession episodes) changes in real interest rates are mainly driven by changes in nominal interest rates.

Insert Figure 2 about here

The monetary easing variable in the regression analysis is the *change* in real interest rates. Therefore countries in the Euro area with different *level*s of the real interest rates may experience the same extent of monetary easing due to changes in monetary policy. In the 2002 recession, real interest rates were 0.94 in Germany, but -0.53 in Portugal. However, their respective values for monetary easing were -0.20 and -0.14; thus much more similar. Including the level of real (ex-post) short-term interest rates in the regression specification

[14] In this specifications consist of 41 observations, as Norway is not an outlier according to this definition of real interest rates.

reported in the previous sections does not alter the results, nor is the level of the interest rate statistically significant. Therefore, what matters in explaining the degree of hysteresis is the change in real interest rates in the recessions, not their level.

7 Conclusion

This paper investigated the hypothesis that the extent to which unemployment hysteresis occurs in the aftermath of recessions depends on monetary policy reactions. The degree of hysteresis was regressed on monetary easing, standard labour market institution variables and a terms of trade shock. The results of the econometric analysis suggest strong effects of monetary policy, and depending on the specification also of the change in the terms of trade, but weak (if any) effects of labour market institutions *during recession periods*. Those countries which more aggressively reduced their real interest rates in the vulnerable period of a recession experienced a much smaller increase in the NAIRU (relative to the maximum increase of unemployment) five years later.

While these results may go against conventional wisdom, and certainly against the wisdom of the ECB, it is in line with much of the economic literature. Fitoussi et al. find that "monetary policy across countries made a difference for their unemployment experience over the course of the decade" (Fitoussi et al., 2000, pp. 259-260). Similarly Blanchard argues that "real interest rates appear to play an important role in accounting for the evolution of the natural rate of unemployment" (Blanchard, 2000, p. 297).

Our findings have important policy implications. If disinflationary monetary policy has lasting effects on unemployment, inflation-targeting (as opposed to a mixture of inflation and unemployment targeting) has high and permanent social costs. Central Banks should respond actively to recessions.

In the Euro area, one interest rate is the monetary policy instrument for many different economies. It has been widely observed that the same monetary policy translates into rather different *levels* of the real interest rate in different countries. Our analysis highlighted the crucial role of monetary easing, that is, the *change* in real interest rates. This has two implications for the conduct of monetary policy in the Euro area. First, if recessions are synchronized, monetary policy may still be able to achieve the same extent of monetary

easing in countries with different inflation rates because changes in real interest rates in times of recession typically depend primarily on changes in nominal rates. Monetary policy may still be effective under these circumstances. The second implication is that if countries enter recession at different times (and even a few quarters may make a big difference here) monetary policy can become ineffective. While inflation differences may present a challenge for the effectiveness of monetary policy by the ECB, the lack of synchronization of the business cycles may be the prime challenge in bad times.

8 Literature

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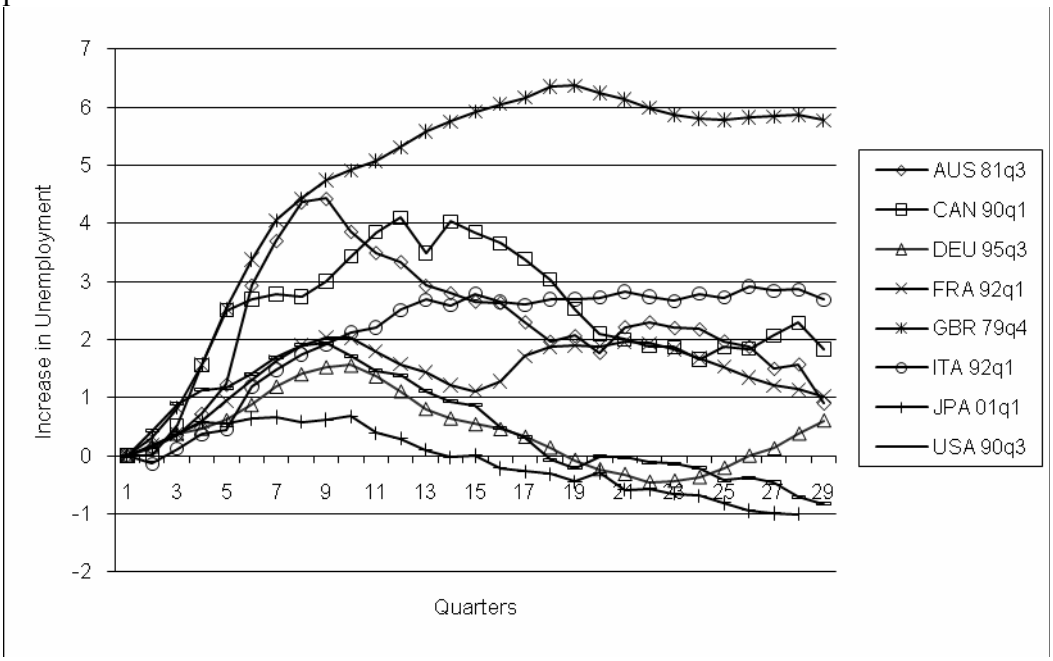
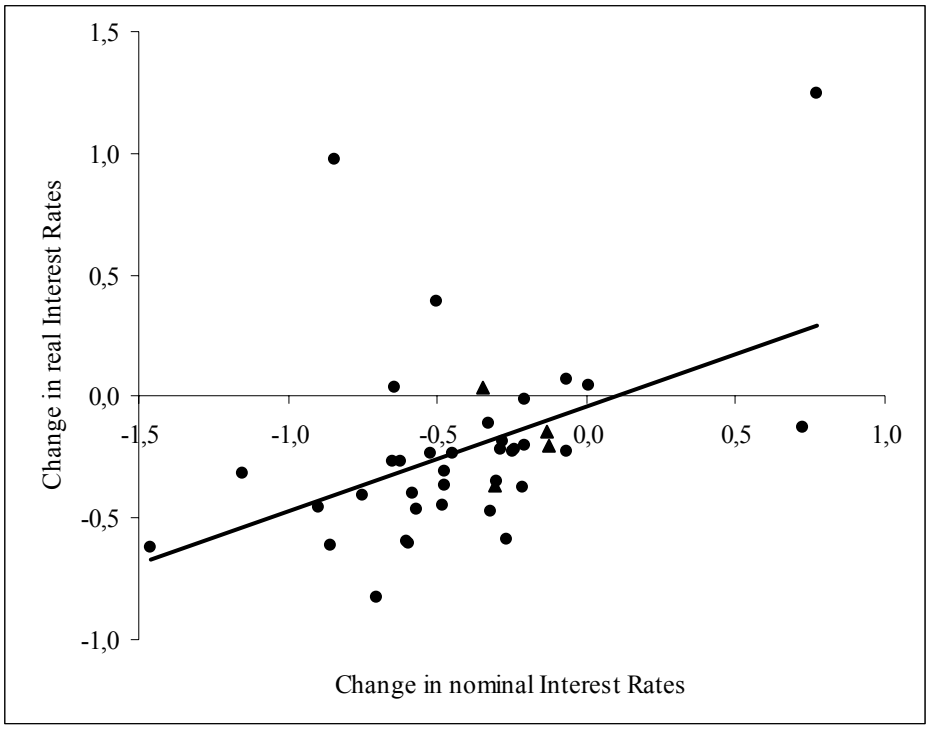
9 Figures and Tables

Figure 1: The change in unemployment from the quarter before the beginning of the recession to 28 quarters later in selected countries



Source: OECD 2007

Figure 2: Change in real vs. nominal interest rates during the monetary easing period



Note: The values concerning euro-countries after the euro-introduction are symbolized with triangles; they belong to Portugal, Ireland, Germany and Belgium.
Source: OECD 2007, IFS 2007

Table 1: Determinants of the degree of hysteresis

	1	*2*	*3*	*4*	*5*	*6*	*7*	*8*	*9*	*10*	*11*	*12*	*13*	*14*
ME	**0.517*** **	**0.686*** **	**0.687*** **	**0.699*** **	**0.565*** **	**0.593*** **	**0.548*** **	**0.572*** **	**0.561*** **	**0.571*** **	**0.559*** **	**0.579*** **	**0.580*** **	**0.652*** **
t-stat	2.937	3.701	3.712	4.281	3.422	3.816	3.165	3.647	3.392	4.026	3.322	3.830	3.461	5.608
ALMP	**-0.002**	**-0.001**	**-0.001**	**-0.001**	**0.000**									
t-stat	-0.610	-0.337	-0.415	-0.339	-0.148									
EPL	**-0.039**	**0.095**	**0.074**	**0.123**		**0.060**								
t-stat	-0.341	0.793	0.607	1.656		0.939								
PMR	**0.141** **	**-0.015**	**0.007**				**0.021**							
t-stat	2.462	-0.138	0.068				0.302							
TW	**0.012**	**0.005**	**0.006**					**0.013***						
t-stat	1.193	0.466	0.559					1.941						
UBD	**-0.270**	**-0.220**	**-0.231**	**-0.234**					**-0.052**					
t-stat	-0.698	-0.688	-0.723	-0.754					-0.204					
UBR	**-0.005**	**0.000**	**0.000**	**0.001**						**0.003**				
t-stat	-0.737	0.061	-0.030	0.169						0.661				
UD	**0.002**	**-0.001**	**0.000**	**0.000**							**0.001**			
t-stat	0.402	-0.123	-0.049	-0.024							0.155			
HIGHCORP	**0.023**	**0.218**	**0.210**	**0.263**								**0.120**		
t-stat	0.078	0.752	0.722	1.009								0.935		
LOWCORP	**-0.069**	**0.122**	**0.108**	**0.204**									**-0.071**	
t-stat	-0.148	0.279	0.250	0.557									-0.500	
D_TOT	**6.687***	**5.934**	**5.766**	**5.977***										**5.618** **
t-stat	1.729	1.660	1.619	1.778										2.134
c	**-0.202**		**0.205**	**0.211**	**0.385*** **	**0.262** **	**0.277**	**0.010**	**0.408** **	**0.286***	**0.350***	**0.321*** **	**0.405*** **	**0.485*** **
t-stat	-0.440		0.406	0.488	3.722	2.173	0.822	0.048	2.271	1.666	1.895	3.135	4.057	7.179
t1		**0.313**												
t-stat		0.530												
t2		**0.229**												
t-stat		0.439												
t3		**-0.319**	**-0.534***	**-0.574*** **	**-0.522*** **	**-0.512*** **	**-0.482** **	**-0.434*** **	**-0.523*** **	**-0.531*** **	**-0.513*** **	**-0.560*** **	**-0.542*** **	**-0.569*** **
t-stat		-0.653	-1.980	-3.197	-3.463	-2.794	-2.383	-2.885	-3.467	-2.658	-3.136	-2.838	-3.501	-3.223
adj R2	**0.293**	**0.358**	**0.377**	**0.414**	**0.328**	**0.349**	**0.329**	**0.391**	**0.328**	**0.336**	**0.328**	**0.343**	**0.332**	**0.447**
n	40	40	40	40	40	40	40	40	40	40	40	40	40	40
HC SE	yes	yes	yes	yes	no	yes	no	no	no	yes	no	yes	no	yes

Note: *, **, and *** refer to statistical significance at the 10%, 5%, and 1% level respectively. ME = indicator for monetary easing; ALMP = spending on active labour market policy per unemployed to GDP per capita; EPL = employment protection legislation; HIGHCORP = dummy for countries with high corporatism in the wage-bargaining system; LOWCORP = dummy for countries with low corporatism in the wage-bargaining system; PMR = product market regulation; TW = tax wedge; UBD = unemployment benefit duration; UBR = average unemployment benefit replacement rate; UD = union density; d_TOT = change in relative prices of imports weighted by the share of imports in GDP; adj R2 = adjusted R-squared; n = number of observations; HC SE = estimated with White heteroskedasticity-consistent standard errors. Estimated with E-Views 5.1

Table 2: Determinants of the degree of hysteresis in different variations

	Variation 1		Variation 2		Variation 3		Variation 4		Variation 5
	15	*16*	*17*	*18*	*19*	*20*	*21*	*22*	*23*
ME	**0.343***	**0.377****	**0.785****	**0.849*****	**0.291**	**0.357***	**0.413****	**0.455****	**0.662*****
t-stat	1.994	2.284	2.553	2.911	1.373	1.797	2.110	2.459	3.899
ALMP	**-0.002**	**-0.001**	**-0.001**	**-0.001**	**0.000**	**0.000**	**0.000**	**0.000**	**-0.002**
t-stat	-0.503	-0.447	-0.307	-0.396	0.003	0.093	-0.006	-0.031	-0.637
EPL	**-0.027**	**0.081**	**0.034**	**0.093**	**-0.014**	**0.078**	**0.093**	**0.169***	**-0.436***
t-stat	-0.187	1.121	0.266	1.151	-0.095	0.855	0.630	1.900	-1.350
PMR	**0.070**		**0.080**		**0.095**		**0.102**		**0.340**
t-stat	0.601		0.820		0.881		1.036		1.808
TW	**0.011**		**0.003**		**0.007**		**0.003**		**0.007**
t-stat	0.879		0.294		0.53		0.259		0.305
UBD	**-0.301**	**-0.318**	**-0.238**	**-0.249**	**-0.225**	**-0.221**	**-0.421**	**-0.456**	**-0.111**
t-stat	-0.847	-0.923	-0.700	-0.802	-0.629	-0.629	-1.295	-1.432	-0.120
UBR	**-0.006**	**-0.003**	**-0.002**	**0.000**	**0.001**	**0.005**	**0.005**	**0.008**	**-0.014**
t-stat	-0.844	-0.582	-0.233	0.039	0.117	0.598	0.553	1.037	-1.009
UD	**0.002**	**0.003**	**0.000**	**0.001**	**0.000**	**0.001**	**-0.002**	**-0.001**	**-0.034****
t-stat	0.386	0.589	0.018	0.217	0.031	0.216	-0.346	-0.164	-2.157
HIGHCORP	**0.096**	**0.206**	**0.193**	**0.250**	**0.269**	**0.385**	**0.341**	**0.427**	
t-stat	0.313	0.773	0.605	0.846	0.776	1.232	1.048	1.457	
LOWCORP	**-0.024**	**0.165**	**0.052**	**0.134**	**0.224**	**0.398**	**0.418**	**0.551**	
t-stat	-0.058	0.502	0.109	0.317	0.477	0.993	0.920	1.439	
D_TOT	**5.394**	**5.197**	**8.322****	**7.914****	**3.57**	**2.630**	**5.822***	**5.001***	**6.756***
t-stat	1.386	1.534	2.227	2.242	1.088	0.906	1.967	1.848	1.853
c	**0.137**	**0.306**	**0.124**	**0.326**	**-0.329**	**-0.140**	**-0.447**	**-0.246**	**0.542*****
t-stat	0.269	0.710	0.221	0.649	-0.614	-0.296	-0.895	-0.548	4.893
t3	**-0.382**	**-0.545****	**-0.500**	**-0.651*****	**-0.327**	**-0.519****	**-0.318**	**-0.491****	**-0.551*****
t-stat	-1.223	-2.468	-1.672	-3.068	-1.144	-2.485	-1.235	-2.557	-3.396
adj R2	**0.189**	**0.214**	**0.275**	**0.307**	**0.137**	**0.166**	**0.217**	**0.240**	**0.492**
n	40	40	40	40	40	40	41	41	40
HC SE	yes	yes	yes	yes	yes	no	no	no	yes

Note: *, **, and *** refer to statistical significance at the 10%, 5%, and 1% level respectively. ME = indicator for monetary easing; ALMP = spending on active labour market policy per unemployed to GDP per capita; EPL = employment protection legislation; HIGHCORP = dummy for countries with high corporatism in the wage-bargaining system; LOWCORP = dummy for countries with low corporatism in the wage-bargaining system; PMR = product market regulation; TW = tax wedge; UBD = unemployment benefit duration; UBR = average unemployment benefit replacement rate; UD = union density; d_TOT = change in relative prices of imports weighted by the share of imports in GDP; adj R2 = adjusted R-squared; n = number of observations; HC SE = estimated with White heteroskedasticity-consistent standard errors. Estimated with E-Views 5.1

10 Appendix

Table A.1: Pooled cross section data used for the regression analysis

Country	Beginning of recession	H	ME	ALMP	EPL	PMR	TW	UBD	UBR	UD	HIGH-CORP	LOW-CORP	D_TOT
Australia	1981q4	0,11	-0,60	11,36	0,90	4,02	13,90	1,01	22,26	47,96	1,00	0,00	0,01
Belgium	1980q4	0,43	-0,22	25,47	3,20	5,48	37,50	0,86	44,13	52,12	1,00	0,00	0,14
Canada	1980q2	0,10	-0,23	12,00	0,80	4,31	13,30	0,33	18,60	35,84	0,00	1,00	-0,02
Switzerland	1981q4	-0,19	-0,41	41,94	1,10	4,17	20,20	0,33	12,72	29,75	1,00	0,00	-0,07
Denmark	1980q1	0,29	-0,60	36,87	2,30	5,52	34,70	0,70	55,20	80,21	1,00	0,00	0,04
Finland	1980q4	-0,14	-0,47	34,24	2,30	5,40	34,96	0,77	24,45	68,42	1,00	0,00	0,04
United Kingdom	1980q1	0,64	-0,38	13,71	0,60	4,47	29,90	0,78	22,96	48,72	0,00	1,00	0,00
Ireland	1982q4	0,76	0,98	23,53	0,90	5,70	25,85	0,57	30,22	56,12	0,00	1,00	0,08
Ireland	1985q4	1,48	1,25	23,87	0,90	5,48	29,54	0,60	29,01	51,62	0,00	1,00	-0,03
Italy	1982q1	0,67	-0,11	3,33	3,60	5,83	41,70	0,33	0,60	46,69	0,00	1,00	0,08
Netherlands	1980q1	0,46	-0,59	29,14	2,70	5,56	41,60	0,73	47,67	32,78	1,00	0,00	0,05
New Zealand	1982q4	0,60	0,39	50,09	0,90	4,53	17,48	1,03	31,40	64,46	1,00	0,00	0,06
Portugal	1983q1	-0,65	-0,13	8,98	4,10	5,92	27,51	0,33	7,18	57,79	0,00	0,00	0,16
United States	1980q2	-0,07	0,04	7,60	0,20	2,83	25,90	0,44	14,19	20,23	0,00	1,00	0,04
Australia	1990q2	0,30	-0,32	7,40	0,90	3,93	14,90	1,01	25,51	40,50	1,00	0,00	-0,02
Belgium	1992q4	0,13	-0,35	24,27	3,20	4,55	38,60	0,86	40,39	54,98	1,00	0,00	-0,10
Canada	1990q2	0,06	-0,83	12,59	0,80	2,68	17,30	0,33	19,25	32,92	0,00	1,00	-0,08
Switzerland	1990q3	0,23	-0,45	21,15	1,10	4,17	18,00	0,33	21,92	22,65	1,00	0,00	-0,15
Germany	1995q4	0,74	-0,22	33,13	3,09	3,29	35,00	0,73	26,01	27,75	1,00	0,00	-0,04
Denmark	1987q1	0,36	-0,20	36,10	2,30	5,52	35,50	0,68	49,40	74,97	1,00	0,00	-0,05
Denmark	1990q3	-0,02	-0,02	24,62	2,30	4,73	32,50	0,69	51,90	75,78	1,00	0,00	-0,07
Spain	1992q4	-0,15	-0,61	5,44	3,80	4,47	32,90	0,49	31,67	17,96	0,00	0,00	-0,10
Finland	1990q2	0,30	-0,27	60,04	2,30	4,62	34,60	0,62	36,35	72,25	1,00	0,00	-0,06
France	1992q2	0,31	-0,36	23,29	3,00	5,16	38,20	0,64	37,64	10,18	0,00	0,00	-0,04
United Kingdom	1990q3	-0,21	-0,27	12,00	0,60	2,78	23,70	0,79	18,14	37,22	0,00	1,00	-0,07
Italy	1992q2	0,32	-0,31	5,87	3,60	5,68	42,60	1,09	9,60	38,87	0,00	1,00	-0,06
Japan	1993q2	0,21	-0,23	21,85	2,12	3,31	16,00	0,33	9,92	24,34	1,00	0,00	-0,04
New Zealand	1991q1	0,33	-0,62	17,59	0,90	3,33	20,85	1,03	30,43	44,44	0,00	1,00	-0,05
Portugal	1992q3	0,05	-0,46	31,82	3,85	5,12	25,32	0,54	35,39	28,58	0,00	0,00	-0,07
Sweden	1990q2	0,33	-0,24	173,73	3,50	4,36	43,40	0,33	29,16	80,02	0,00	0,00	0,00
United States	1990q4	-0,24	-0,40	6,36	0,20	2,29	24,80	0,48	11,10	15,47	0,00	1,00	0,03
Belgium	2002q4	0,06	-0,36	30,51	2,20	2,13	39,10	0,90	42,15	55,76	1,00	0,00	-0,11
Switzerland	1998q4	-0,55	-0,23	39,89	1,10	3,25	17,80	0,50	37,25	20,96	1,00	0,00	-0,21
Switzerland	2002q3	-0,01	-0,19	29,98	1,10	2,79	17,50	0,44	33,12	21,48	1,00	0,00	-0,23
Germany	2002q4	-0,25	-0,20	29,18	2,35	1,74	33,40	0,72	27,20	23,22	1,00	0,00	-0,06
Ireland	2001q2	-1,15	0,04	67,33	0,90	3,54	12,80	1,00	35,84	35,92	1,00	0,00	-0,16
Japan	1997q2	0,39	0,04	16,46	2,00	3,11	15,60	0,33	10,81	22,79	1,00	0,00	-0,04
Japan	2001q2	0,35	0,07	10,58	1,80	2,38	20,40	0,33	9,13	20,88	1,00	0,00	-0,04
New Zealand	1997q4	-1,17	-0,48	16,83	0,90	2,00	14,82	1,01	28,28	22,34	0,00	1,00	-0,09
Portugal	2002q3	0,18	-0,14	30,36	3,70	2,58	23,69	0,59	40,81	23,43	0,00	0,00	-0,16

H = degree of hysteresis; ME = indicator for monetary easing; ALMP = spending on active labour market policy per unemployed to GDP per capita; UBD = unemployment benefit duration; UBR = average unemployment benefit replacement rate; EPL = employment protection legislation; PMR = product market regulation; CB = collective bargaining coverage; TW = tax wedge; UD = union density; d_TOT = change in relative prices of imports weighted by the share of imports in GDP
Source: OECD 2007, IFS 2007, Bassanini/Duval 2006

Table A.2: Pairwise correlation matrix of the control variables

	ALMP	EPL	HIGH-CORP	LOW-CORP	PMR	TW	UBD	UBR	UD	D_TOT
ALMP	1.000	0.193	0.143	-0.360	0.083	0.235	-0.066	0.300	0.433	0.003
EPL	0.193	1.000	-0.016	-0.451	0.433	0.653	-0.095	0.170	0.180	-0.133
HIGHCORP	0.143	-0.016	1.000	-0.727	-0.046	-0.064	0.164	0.322	0.192	0.101
LOWCORP	-0.360	-0.451	-0.727	1.000	-0.080	-0.090	0.022	-0.414	-0.126	0.093
PMR	0.083	0.433	-0.046	-0.080	1.000	0.476	0.027	0.184	0.549	-0.289
TW	0.235	0.653	-0.064	-0.090	0.476	1.000	0.092	0.295	0.411	0.137
UBD	-0.066	-0.095	0.164	0.022	0.027	0.092	1.000	0.390	0.243	0.185
UBR	0.300	0.170	0.322	-0.414	0.184	0.295	0.390	1.000	0.384	0.230
UD	0.433	0.180	0.192	-0.126	0.549	0.411	0.243	0.384	1.000	-0.103
D_TOT	0.003	-0.133	0.101	0.093	-0.289	0.137	0.185	0.230	-0.103	1.000

ALMP = spending on active labour market policy per unemployed to GDP per capita; EPL = employment protection legislation; HIGHCORP = dummy for countries with high corporatism in the wage-bargaining system; LOWCORP = dummy for countries with low corporatism in the wage-bargaining system; PMR = product market regulation; TW = tax wedge; UBD = unemployment benefit duration; UBR = average unemployment benefit replacement rate; UD = union density; d_TOT = change in relative prices of imports weighted by the share of imports in GDP. Estimated with E-Views 5.1

Table A.3: Determinants of the degree of hysteresis in variation 3

	24		*25*		*26*	*27*		*28*		*29*		*30*		*31*		*32*		*33*	
ME	**0.356**	**	**0.348**	*	**0.328**	**0.320**		**0.366**	*	**0.401**	**	**0.363**	**	**0.419**	*	**0.364**	**	**0.335**	*
t-stat	2.155		1.668		1.593	1.515		1.832		2.017		2.224		1.910		2.156		1.722	
ALMP	**0.001**																		
t-stat	0.250																		
EPL			**0.011**																
t-stat			0.170																
PMR					**0.066**														
t-stat					0.938														
TW						**0.010**	**												
t-stat						2.083													
UBD								**0.073**											
t-stat								0.256											
UBR										**0.006**									
t-stat										1.073									
UD												**0.003**							
t-stat												0.926							
HIGHCORP														**0.185**					
t-stat														1.295					
LOWCORP																**-0.047**			
t-stat																-0.303			
D_TOT																		**3.503**	
																		0.992	
c	**0.332**	***	**0.324**	**	**0.044**	**0.051**		**0.305**		**0.207**		**0.197**		**0.278**	**	**0.368**	***	**0.398**	***
t-stat	2.997		1.993		0.153	0.259		1.399		1.121		1.056		2.085		3.260		4.314	
t3	**-0.517**	***	**-0.512**	***	**-0.388**	**-0.442**	**	**-0.517**	**	**-0.532**	**	**-0.456**	**	**-0.575**	***	**-0.527**	***	**-0.537**	***
t-stat	-3.157		-2.586		-1.659	-2.380		-2.535		-2.535		-2.622		-2.769		-3.127		-2.864	
adj R2	**0.211**		**0.210**		**0.227**	**0.247**		**0.211**		**0.234**		**0.228**		**0.243**		**0.211**		**0.258**	
n	40		40		40	40		40		40		40		40		40		40	
HC SE	no		yes		yes	yes		yes		yes		no		yes		no		yes	

Note: *, **, and *** refer to statistical significance at the 10%, 5%, and 1% level respectively. ME = indicator for monetary easing; ALMP = spending on active labour market policy per unemployed to GDP per capita; EPL = employment protection legislation; HIGHCORP = dummy for countries with high corporatism in the wage-bargaining system; LOWCORP = dummy for countries with low corporatism in the wage-bargaining system; PMR = product market regulation; TW = tax wedge; UBD = unemployment benefit duration; UBR = average unemployment benefit replacement rate; UD = union density; d_TOT = change in relative prices of imports weighted by the share of imports in GDP; adj R2 = adjusted R-squared; n = number of observations; HC SE = estimated with White heteroskedasticity-consistent standard errors. Estimated with E-Views 5.1

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