DO LABOUR MARKETS REALLY MATTER?
Monetary Shocks and Asymmetric Effects across Europe*

Iolanda Lo Cascio

Department of Economics, University of Essex
Istituto di Economia Politica "F. Ferrara", Università di Palermo

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Abstract

This paper employs a VAR approach to examine whether or not a common monetary policy shock produces asymmetric effects to output and prices across 11 European countries (Austria, Belgium, Denmark, Finland, France, Germany, Italy, Netherlands, Spain, Sweden and UK) from 1979Q1 to 1998Q4. As an additional step, it provides evidence on the causes underpinning the measured cross-state differential responses, some of them ignored by the previous studies on this topic. The results are striking, revealing a fundamental role of the labour market structures in explaining these eterogeneities and forming a fertile ground of debate for their policy implications.

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Introduction

The way in which monetary policy affects the real activity is not a new topic of discussion among economists; but nowadays there is a controversial debate in the light of the problems raised by the implementation of a common monetary policy throughout the Euro Zone.

Perhaps a *one-size-fits-all* monetary policy may not be appropriate within an area typically characterised by strong differences in the national economic structures, more particularly, differences in industrial, financial and labour market structures. As a consequence, there may be a potential source of tensions between the member countries, owing to the asymmetric effects of common policy actions or common disturbances across them. For that reason, the question of whether a single currency for the European union (EU) is desirable may be cast into doubt.

Unfortunately, the differential implications of a common policy shock across Europe had not been considered extensively. Indeed, the issue of asymmetric responses to common shocks had been largely overshadowed by the traditional OCA preoccupation into national responses to asymmetric shocks (Mundell, (1961)[1].

In this paper we attempt to address this imbalance. In particular, we study the transmission of monetary policy shocks to economic activity (output and prices) in 11 European countries (Austria, Belgium, Denmark, Finland, France, Germany, Italy, Netherlands, Spain, Sweden and UK) during the period spanning from 1979:1 to 1998:4 by means of a structural VAR, in order to verify if the real economic responses are very different from one country to another. As it is well known, the VAR approach does not give an answer to the question of the overall role of monetary policy, made up of its systematic and unsystematic components, but it is very much helpful in estimating the effects of a policy shock after isolating the exogenous component of monetary policy from its endogenous response to the economy. From the analysis of the impulse response functions we find evidence of heterogeneity across the countries, and the estimated differences allow us to identify state-level variables underlying the varying country-specific responses. Of course, this exercise is retrospective in character, as historical data about EMU are not available, and we cannot gain direct implications for an assessment of policy transmission and its determinants in the Euro-area economy. As a consequence, the Lucas critique may apply here since the coefficients describing the impact of monetary policy on the macroeconomic variables of interest depend on the monetary policy regimes. With this caveat in mind, we proceed by considering the standardised maximum effect on output for each country in order to simulate the response to

[1] Mundell, R. (1961).

the same policy shock across them; then we provide evidence on the causes underpinning the measured cross-state differential responses by regressing absolute values of the standardised maximum response of output on state level variables capturing differences in the economic structures.

A number of studies suggest that industrial and financial structures are important factors in accounting for these heterogeneous responses to common shocks. This is because, for example, those countries with a relatively large incidence of highly interest-sensitive sectors, such as manufacturing and constructions, will be more exposed and very sensitive to policy shock. On the other hand, the degree of integration of financial markets, the intensity of competition in the European banking industry, the different operation procedures and the credit access constraints of certain agents (typically households and small firms) may affect the availability and the terms of loans accorded to non financial agents and, in turn, the real activity.

Surprisingly, labour market structures are usually ignored. The present paper attempts to correct for this omission. In fact we take a step further in taking into account also the labour market structure as an additional source of variability. To do so, we use measures of real wage rigidity and hysteresis. We think that the results are better done and form a fertile ground of debate for their policy implications.

The paper is organised as follows: section 1 reviews the main monetary policy transmission mechanisms; section 2 summarises the international literature on monetary policy shocks. Sections 3 and 4 address methodological issues and the model specification (and identification) respectively. In section 5 and 6 we discuss the results and we conclude in section 7 discussing some policy implications for the future.

1. Monetary transmission channels

A full and deep understanding of the EMU perspectives should be related to the process through which monetary policy decisions are transmitted into changes in real variables.

As a matter of fact, the effectiveness of monetary policy is related to the monetary transmission mechanism that prevails and that can be different from one country to another but also in different periods of time in the same country.

The effects of a monetary shock can operate, at least, through different channels.

According to the traditional *Keynesian/Monetarist* approach, the short term interest rate is determined by the supply and demand for money; therefore, a change in monetary policy results in a change in the interest rate which in turn cause a variation in the same direction of the cost of capital, affecting investments and output. In other words, higher borrowing costs decrease

producer investments in inventories and capital goods and consumer spending in durable goods causing aggregate spending falls after a monetary contraction and rises after an expansion. The effects of a change in the money supply on the short-term rates last over time as prices adjust. But, because of sticky prices, it is possible to find real effects in the short run.

The *money view* shares the same traditional IS/LM description of the transmission mechanism. It rests on the imperfect substitutability between bonds and money and emphasises the role of the liability side of bank balance sheet while creating money by issuing demand deposits. Again, a fall in reserves decreases the banking sector's ability to issue demand deposits. This, in turn, implies that banks must hold fewer bonds, and the household sector must hold less money and more bonds.

But prices do not adjust fully and instantaneously and so household will have less money in real terms and equilibrium will require an increase in real interest rates.

The final outcome is a decrease of investments and of aggregate economic activity.

But the validity of this mechanism has received several criticisms: first, it does not take into account the adjustment of asset stocks as new investment in capital accumulates. Second, many of the changes on the short-term interest rates are transitory disturbances that do not affect spending decisions. The IS/LM approach does not distinguish these transitory movements from permanent or persistent changes in nominal and real returns.

An alternative view is offered by *the asset prices* channel, which works through two different ways of transmission:

- the *exchange rate channel* according to which, after a monetary tightening, the exchange rate affects the domestic currency value altering the attraction of the goods produced in the country and the higher interest rate makes more attractive the deposits relative to the deposits in foreign countries. Moreover, any increase on prices of the goods makes exports decrease causing also a decrease in the output.
- the *equity price channel*. This channel has been strongly advocated by Franco Modigliani and his MIT-Penn-SSRC (MPS) model. According to Modigliani's life cycle model (1971), consumption spending is determined by lifetime resources of consumers, which are made up of human capital, real capital and financial wealth. It means that when stock prices fall after a contractionary monetary policy, there will be a fall in consumer and business investments and, therefore, in the aggregate output as the result of a declining wealth.

It is superfluous to stress that the *exchange rate channel* works only if we are not taking into account an economic environment characterised by a fixed exchange rate.

The recent literature has pointed to the *credit view* of monetary transmission mechanism as the most appealing explanation of the response of the economy to shocks in monetary policy.

In contrast to the *money view*, this approach emphasises the asset side of bank balance sheet and the imperfect substitutability between bank credit and alternative sources of financing for a large part of borrowers, typically households and small firms. As a consequence, monetary policy works not only through its impact on the bond market rate of interest, but also through the impact of the supply of loans (*lending view*). Thus, the contractionary impulses of monetary policy are transmitted trough declines in bank lending, affecting the borrowing and spending of bank-dependent customers. It is obvious that the effect depends on the structure of the financial system and its regulation.

But monetary policy influences aggregate demand by affecting borrowers' balance sheets (*balance sheet channel*). An increase in interest rates reduces firm's ability to borrow and cuts back their investments reducing their future revenues and the market value of their collateral. So they became more and more constrained, amplifying the contractionary shock and the impact of disturbances on borrowers' spending decisions.

The credit channel will be relevant in the EMU because most of the firms' credit is provided by the banks. In that environment capital market imperfections (informational asymmetries, lack of competition...) play an essential role for the propagation and the amplification of an initial monetary shock.

2. Literature review

The existing empirical literature on the transmission mechanism of monetary policy is typically based on 'large' econometric models (built in order to capture the speed and/or the magnitude of a temporary 1% increase in the interest rate controlled by the local central bank) and on 'small' econometric models, easier to estimate once a few identifying restrictions have been appropriately set.

The U.S. experience is widely thought as a benchmark source of information about the potentially different effects of a common monetary policy across EMU economies. The reason is that, as the countries participating in EMU, U.S. states and regions are characterised by different industry-mix and financial structures and by a single currency. But we should keep in mind that *Europe* is not equipped with the federalised fiscal system that serves as a

stabiliser of the regional economies and, moreover, it suffers of stronger rigidities on the labour market.

In a fundamental paper Carlino and De Fina (1998)[2], using structural VAR for 48 contiguous U.S. States estimated over the period 1958:1 to 1992:4, derive the dynamic impact of policy shocks on personal income growth via the cumulative impulse response functions. In doing so, they allow for a contemporaneous effect of a country-specific shock only in the state of origin, although it is possible to find spill-over into other regions with a one-quarter lag. They also assume that Federal Reserve policy actions, shocks to inflation, changes in the leading indicators capturing a variety of macro-economic real-sector variables and in the relative price of energy do not affect state income growth no sooner than with a one-quarter lag; finally, neither state income growth nor Fed policy actions have contemporaneous effect on core inflation, on the leading indicators or in the relative price of energy. They find substantial differences in state responses, with a noticeable within and between-region variability at various horizon when compared with the average response. But this is only the first step of the analysis. In a second step, they are able to explain the different responses in terms of heterogeneity in the economic structures. They regress absolute values of the long-run responses on the share of a state's GSP accounted for by each of eight major industry groupings, on the share of small firms in a state and on 3 different variables used to capture the effects of bank size. They assess the presence of an interest rate channel for monetary policy because of the positive relation of the long-run response to the share of manufacturing and constructions, but the impact of banking and financial structure do not result to be clear. And, finally, they are able to simulate the possible sensitivity of each EMU country to a common monetary policy shock using the percent of country real GDP accounted for by manufacturing and a measure of bank concentration. According to them, Finland, Ireland and Spain will be the most sensitive, while France, Italy and the Netherlands will be least affected. Austria, Belgium, Portugal, Germany and Luxembourg will have a relatively moderate response.

Ramaswamy and Slok (1998)[3], pointing their interest on the way in which the action of the central bank affect the real economy, focus on short term-interest rates rather than on money or reserve aggregates in order to identify policy-induced shocks. They estimate a VAR model with two lags, covering all EU countries except Greece, Luxembourg and Ireland over the period 1972:1 to 1995:4 with three variables: the level of output, the level of prices and a short term interest rate. According to them, the EU countries can be grouped into two blocks. In Austria, Belgium, Finland, Germany, the Netherlands and the UK, the full effects of a contractionary monetary policy

[2] Carlino, G. and R. De Fina (1998) .
[3] Ramaswamy R. And T. Slok (1998).

tend to dissipate after about 12 quarters but they are almost twice as deep as in the other group (Denmark, France, Italy, Portugal, Spain and Sweden). The same conclusions are driven from imposing cointegration restrictions on the VAR. The shape of the impulse responses does not change but the deviation of output from baseline for some EU country results to be altered. As many other researchers, they refer, yet without doing any econometric test, to the different pattern of the impulse responses as a consequence of cross-country differences in financial structures (the importance of fixed versus flexible mortgages, bond versus bank financing...). But for example, it is not clear why, though the substantial differences in their financial structures, the UK and Germany have similar impulse responses. Perhaps it has something to do with the interaction between financial structures and labour market flexibility.

Also Barran, Coudert and Mojon (1996)[4] use VAR models to study the dynamics of the economy after a policy shock and to stress the importance of different transmission channels. They compare 9 European countries: Austria, Denmark, Finland, France, Germany, Italy, the Netherlands, Spain and the UK, taking the money market rate as the monetary policy instrument which appears as the last variable in the ordering of the VAR. It means that the authorities take into account the simultaneous evolution of all the other variables while they decide their policy. A first model including GDP in constant prices, the CPI, the exchange rate versus DM (and versus dollar for Germany), a world export price index and the money market interest rate is estimated with quarterly data from 1976:1 to 1994:4. The impact on GDP of a restrictive shock is fairly similar in scale and in time across the countries. Output begins to fall quite immediately and the full effects are transitory. The maximum effects are reached between 4 and 10 quarters in most countries. Moreover, in some countries there is a "price puzzle" because the prices continue to rise for more than a year after the shock.

An interesting result comes from a second VAR model which adds, one by one, different categories of expenditures such private consumption, private investment and residential investment. As expected, investment is affected more than household consumption by an interest rate shock. In particular, it is possible to explain the lowest effect on the real economic activity in Italy and France (from 0.2 to 0.5%) as the consequence of the smallest indebtedness levels of these countries.

Another VAR is used to assess the importance of different transmission mechanisms. This model includes also the exchange rates, credit to private domestic sector, long-term interest rate. No exchange rate channel does exist except for Spain where the shock in the interest rate results in an appreciation of the currency which, in turn, leads to a decline in output and prices.

Finally, using a VAR model including output, CPI, the world export price index, the money aggregate M2, credit to private sector and the money

[4] Barran, F., V. Coudert, and B. Mojon (1996).

market interest rate, they stress the possible existence of a credit channel in most countries except in the UK; but, a further sectoral analysis does not seem to confirm this hypothesis.

Dornbush, Favero and Giavazzi (1998)[5], using a 2-steps procedure, estimate the impact of a monetary policy shock on the real activity in 6 countries of the EMU group: German, 3 "core"[6] European countries (France, Italy and Spain), and 2 "non-core" countries (the UK and Sweden).

First, they estimate by FIML (Full Information Maximum Likelihood) the reaction functions that describe the way in which the central banks choose the interest rates in deviation from their long-run equilibrium values to reflect anticipated deviations of inflation, real output and the exchange rate from their target levels. Obviously, in the EMU we have a unique reaction function describing how the single interest rate is optimally set given anticipated deviations of EMU inflation, output and exchange rate from their target levels. They use monthly data about the short-term interest rate (3-month Eurocurrency rates, except in Sweden where they use the call money rate) as the policy variable, the yearly CPI inflation, the industrial production as the indicator for the real activity. All central banks raise interest rates after an increase on the expected inflation, on the output gaps and when the DM appreciates against the US dollar, with some differences in magnitude across the countries. For example, the effect on the long run equilibrium interest rate of the expected deviation of inflation from its target value is lower in France, Italy and Sweden. It means that higher inflation does not result in an equivalent rise in nominal interest rate targets nor in actual interest rates in the long run.

In a second step, they estimate the equations describing the economic structure of each country, after controlling for intra-European exchange rate channel. They regress real output growth of each country on past values of its own output growth, past values of each of the other countries' output growth, present and past values of its own interest rate both expected and unexpected and present and past values of its bilateral exchange rate against the DM and the dollar. They find a significant impact effect on output which differs across countries. In particular, the impact elasticities are similar in Germany, France and UK but these are smaller than in Sweden and in Italy.

They interpret these results as a consequence of the different financial structures. For example, in Sweden and the UK more than one half of total loans is backed by collateral, suggesting that a change in the interest rates may have a stronger effect on real activity. Different is also the net asset position of the European consumers. In Northern Europe consumer borrowing is a common practice and households have substantial liabilities. In contrast, consumer credit is underdeveloped in the South. So, the extreme sensitivity of Italy to interest

[5] Dornbush, R., C. Favero and F. Giavazzi (1998)
[6] Core countries used to peg their currency to the DM

rate shocks can be related to the high proportion of short term credit at variable interest rate and to the high level of interest income associated with the high public debt levels held by Italian households.

Finally they also try to explain the asymmetric effects on inflation as a consequence of heterogeneous labour markets, without being supported by an empirical analysis.

In conclusion, we cannot derive a formal statement concerning the differential impacts of a common shock from the empirical literature examined because the results are extremely variable, perhaps as a consequence of different hypothesis and estimation strategies. Even though, there is a widespread agreement on the asymmetric effects of monetary policy on activity among the large EU countries, and a surprising omission of labour market variables in attempting to represent these differences.

3. The methodology

As we have seen, VAR models are widely used in the empirical literature concerning policy issues in order to capture the response of macroeconomic variables to monetary policy impulses and to discriminate between alternative theoretical models of the economy. They provide a way to estimate dynamic relationships among jointly endogenous variables without imposing strong a-priori restrictions, via impulse response analysis. The technique of response impulse analysis, introduced by Sims (1972, 1980), is a descriptive device representing the reaction of each variable to shocks in the different equations of the system. In other words, VAR models help us to understand the propagation process on the economic system of an unanticipated impulse without providing an estimate of the total effects of monetary policy (they do not measure the effect of a systematic component of monetary policy). The increased interest and importance of these models in the analysis of the effects of policy changes dates since the first ’80 after the appearance of a paper by Sims (1980) in which he defined the theoretical restrictions imposed on structural simultaneous equation models as *incredible*.

Structural econometrics focused on the building of large models of economies, sometimes containing several thousand of endogenous variables, which were used for forecasting and policy analysis. The major critique concerned the assumption of zero-restrictions and the endo-exogenous division of the variables. Thus, they are often estimated adding some variables without much economic justification or deleting other fundamental variables with the only purpose of achieving the identification. Structural models tend to identify the impact of a policy on macroeconomic variables in order to derive the value to be assigned to the monetary instruments used to achieve a given target for the macroeconomic variables, after having assumed the exogeneity of the policy

variables as instruments controlled by the policy-maker. The identification of the model does not require the orthogonality of structural disturbances and, as a consequence, it is impossible to apply an impulse response analysis. Only dynamic multipliers can be computed but they are not able to discriminate and separate changes in the monetary variables into their expected and unexpected components. Moreover, they result inappropriate for policy analysis when monetary policy reacts endogenously to macroeconomic variables.

On the other hand, the Sims methodology is often labelled as *atheoretical macroeconometrics* because:

- there is no a-priori endo-exogenous division of variables;
- no zero-restrictions are imposed;
- there is no strict and prior to modelling economic theory within which the model is based on.

The starting point is an unrestricted VAR model, in which each current variable is regressed on all the variables in the model lagged a certain number of times, as:

$$Z_t=\Sigma^{p}_{i=1}A_iZ_{t-i}+v_t$$
$$(v_t/I_t)\sim N(0,\Omega) \qquad (1)$$
$$I_t=(z_{t-1}, z_{t-2},.....z_{t-p})$$

where Z_t is a column vector of observations on the current values of all the variables in the model and v_t is a column vector of random errors usually assumed to be contemporaneously correlated but not autocorrelated, so that they have a non-diagonal covariance matrix. The matrices A_i do not contain any zero elements.

In order to make the interpretation of policy analysis in a VAR model easier it is common practice to derive a model with orthogonal innovations, thus with zero contemporaneous covariance.

The system above can be written as:

$$Z_t=A(L)Z_t+v_t$$
$$A(L)=A_1L+A_2L^2+..... +A_pL^p \qquad (2)$$
$$(v_t/I_t)\sim N(0,\Omega)$$

If I-A(L) is invertible and such that $B(L)=(I-A(L))^{-1}$, we can derive the VMA (Vector Moving-Average) representation of the VAR process as:

$$Z_t= v_t+B_1v_{t-1}+ B_2v_{t-2}+.....+ B_sv_{t-s} \qquad (3)$$

We can interpret the matrix B_s as:

$$B_s = \delta z_{t+s} / \delta v_t \qquad (4)$$

In other words, the (i,j)-element of B_s identifies the consequences of a unit increase on the innovation concerning the j-th variable on the i-th variable at time t+s, taking equal to zero all the others innovations at different dates between t and t+s.

The typical shock whose effects we are about to discuss are positive residuals of one standard deviation unit in each equation of the system. The impulse response function analyses all the partial derivatives for s that goes from zero to a given k; but this partial derivative has a meaning only if the innovations are orthogonal. In order to solve the identification problem, it is necessary to consider the structural form:

$$\begin{aligned} &Z_t = \Sigma^p_{i=0} C_i Z_{t-i} + Bu_t \\ &(u_t / I_t) \sim N(0,1) \qquad (5) \\ &I_t = (z_{t-1}, z_{t-2}, \ldots\ldots z_{t-p}) \end{aligned}$$

The u_t's are the shocks of interest because they are the *primitive impulses* of the structural form (5) of which (2) is the reduced form; and it is with respect to them that it has sense to analyse the impulse response functions. The relation between the Unrestricted Reduced Form (URF) and the structural form can be expressed by means of:

$$\begin{aligned} &A_i = [I - C_0]^{-1} C_i \\ &[I - C_0] v_t = B u_t \end{aligned}$$

The problem is to identify the parameters in B and C_i and the variances of the structural shocks, given the variance-covariance matrix of the URF innovations. There is no unique best way to transform residuals into orthogonalized innovations. But, perhaps, more suitable for our purpose is to follow Sims' solution. In other words, we apply to the system the Cholewsky decomposition by imposing a lower triangular structure on the matrix $[I-C_0]^{-1}$, a recursive decomposition of the Ω matrix, and by considering B=I. It means that a shock on variable 'i' affects variable 'j' if and only if j>=i and, therefore, the ordering of the variables in the VAR plays a fundamental role.

4. Model specification

We estimate a 3-variable VAR, for 11 countries, including: Gross Domestic Product in constant prices (GDP); the Consumer Price Index (CPI) and a short-term interest rate as policy variable. All the regressions of the systems include an intercept and a time trend. The chosen ordering implies that monetary policy does not have any contemporaneous effect on real activity and that monetary decisions are taken after considering the simultaneous evolution of the economic variables of the system. All series are quarterly and spanning the period from 1979 to 1998[7]. GDP and CPI are in logs.

As we can see from the ADF[8] tests in Table A1 in the Appendix, all the variables display a non-stationary behaviour for all countries. Nevertheless, we estimated the systems in levels, with no imposition of cointegration relations[9]. In doing so, we avoid a long-run identification problem, with no loss of information on the long-run properties of the system. As already pointed out by Ramaswamy and Slok (1998), by using levels rather than first differences we are taking into account the trade-off between statistical efficiency and the potential loss of information arising from differentiated time-series. Moreover, we are supported by an economic argument concerning the persistent or transitory character of the effects of a shock. Thus, we implicitly assume that monetary shocks have a transitory impact on the real activity; this is, of course, a widely accepted view.

Our systems are estimated with a different number of lags, ranging from 1 to 4, because of the different dynamics implicit in the data that are sometimes available for different sample periods. We chose the order of the VAR according to two opposing considerations, the "curse of dimensionality" and the correct specification of the model. Since the numbers of parameters to be estimated increase with the number of lags included and the number of degree of freedom in a VAR depends on the total number of free parameters, moderately sized systems become highly overparametrized relative to the number of observations. This leads to insignificant or inefficient estimates of short run parameters. On the other hand, a too short lag length produce a model where only a subset of the relevant information is used to characterise the data, leading to serial correlation in the residuals which, in turn, induce spurious significance and inefficient estimates. All these information are combined with

[7] Data are described in the appendix.

[8] The Augmented Dickey-Fuller (ADF) test is regarded as being the most efficient test among the simple tests for integration and is the most widely used in practice.

[9] The cointegration relations are not the main focus of our analysis. Moreover, if we impose inappropriate cointegration relationships we produce biased estimates and impulse responses.

the inspection of formal selection criteria as the Akaike and the Schwartz-Bayesian-Criterion[10].

Prior to analysing monetary policy identification issues, we performed several tests[11] on the benchmark VAR for each country of the sample until we found the "best" dynamically well-specified model in terms of functional form, residual correlation, heteroscedasticity and, possibly, normality of residuals[12].

5. Results

Figure 1 and 2 in the Appendix trace the response of output and prices in the 11 countries to a standard deviation unit in the interest rate after 50 quarters.

It is worth noting that VAR results could have been influenced by the sample period choice. In fact, we started from the beginning of the European Monetary System (EMS), when European countries were characterised by deeper heterogeneities in their economic system than today.

Except in Denmark and Spain, in all the remaining countries prices are subject to the so-called *price puzzle* (Sims, 1992). There is a positive effect of a monetary restriction on prices because they continue to rise for more than a year after a monetary shock. The price puzzle is normally attributed to omitted variables, such as current and lagged values of commodity prices, containing information about future development of prices. It usually takes place, for example, if central banks can observe these variables gaining information about a future increase in inflation and, at the same time, they raise their interest rates but not sufficiently to offset the future inflation.

But our main variable of interest is output. From Figure 2 we can see that a restrictive shock results in a decline in output in all the countries just after one quarter. The timing of the responses is quite similar and the effects are transitory, as if the increase on the interest rates comes from a positive shock in the aggregate demand. In particular, the maximum decline on output (relative to the baseline) is reached within 8-9 quarters after the shock[13] and then it tends to dissipate. But the magnitude is quite different and sometimes substantial. It is

[10] Given a sample size T, they choose the lag length p^* if the reduction of the loss function of the system arising from the addition of the p^*+1 lag is smaller than the increase in the loss function caused by the additional uncertainty introduced adding new parameters.

[11] The econometric analysis is performed using Microfit 4.0 by Pesaran & Pesaran.

[12] We refer to the Lagrange-Multiplier test of residual serial correlation, the Ramsey RESET test for functional form misspecification, the Jarque-Bera's test of normality and the Heteroschedasticity Test based on the regression of squared residuals on squared fitted values.

[13] The only exception is in Spain.

the case of Finland where a shock of 0.4 point base on the interest rate results in a decline of output of 1.29 percentage points. Also in Sweden there is a strong positive effect on output. On the opposite, we can observe a negligible effect in Spain where a decrease of only 0.05 percentage points on output follows an interest rate shock of 0.9 points base. Moreover, for a quite similar shock in the interest rate in Austria, Finland and Germany (0.46, 0.43 and 0.48 points base respectively) we have an extremely differentiated effect on real activity. Output falls of 0.11 percentage points in Austria, 1.29 in Finland and 0.27 in Germany. From the impulse response functions analysis we derive the effect on output (in percentage points) to a one standard error shock in the interest rate for each country. As a consequence, when we look at the results we should consider them in relative terms. For example, even if the effect on the real GDP in France and Belgium is of the same order of magnitude (-0.243 and -0.246) we cannot say that their responses are similar because, at the same time, they are subject to extremely different policy shocks (+0.53 and +0.89 respectively). For that reason we calculate the standardised effect on output[14] in order to draw better insights on the differences in the real effects of monetary policy actions and to simulate a unique interest rate shock. As we can see from Table 1 heterogeneity across countries is even more evident than before.

Table1: standardised effect on output to
an interest rate shock (% points)

Country	**Effect on output** (% points)
Austria	0.25
Belgium	0.46
Denmark	0.18
Finland	2.98
France	0.27
Germany	0.57
Italy	0.46
Netherlands	0.22
Spain	0.05
Sweden	0.84
UK	0.58

[14] We divided the maximum effect on output by the initial interest rate shock.

6. What are the sources of these asymmetries?

Previous studies on the implications of a common monetary policy shock have typically focused their attention on the identification of differential responses without providing empirical evidence of the reasons for this measured cross-state heterogeneity.

But nowadays, in the contest of the changeover from national monetary policies to a common ECB policy, it is very important to discriminate among them.

There are several reasons why a common shock can have different impact on different regions in EMU. We try to identify state specific attributes underlying the varying state level responses and we mainly focused on the industrial, financial and labour market structures by considering some variables as their proxies in two cross-state models.

Industrial structure. At national level both the magnitude and the timing of a monetary policy shock are different across the industries because of varying interest-sensitivities in the demand for products. Since manufacturing goods are very responsive to interest rate changes, we considered the employment in manufacturing as a percentage of civilian employment (average 1980-90) as a proxy of the industrial structure.

Financial structure. As we already pointed out in Section 1, the credit channel of monetary transmission mechanism will be relevant in EMU because of the special role played by the banking sector.

The *credit view* is defined by Gertler and Gilchrist (1993)[15] as a *story about impulse to the economy*. In particular, owing to reserve requirements on deposits, the central bank perturbs the economy by directly altering the quantity of bank lending. Credit market imperfections help to propagate the impact of monetary policy by forcing certain class of borrowers, typically households and small firms, to rely primarily on bank credit; as consequence of the imperfect substitutability between bank credit and other sources of financing, banks can alter the transmission mechanism. In other words, the *credit view* theory gives information concerning the behaviour of banks and borrowers after a change in monetary actions. From the bank side, the impact on the credit supply depends on their ability to isolate themselves from the effects of monetary policy through the management of the asset and liability sides of their balance sheet. According to that, small banks with a simple balance sheet structure would be more influenced by monetary shocks. From the borrower side, households or small firms, suffering from stronger informational asymmetries and restrained access to alternative sources of financing, would be more sensitive to monetary restrictions. These two effects reinforce each others resulting in a noticeable asymmetry in the monetary transmission when bank size and borrower size are

[15] Gertler, M., and S. Gilchrist (1993).

positively correlated. As also pointed by Kashiap and Stein (1997), we conclude that monetary policy actions would have a stronger impact in those countries with a relatively low percentage of small banks and few bank-dependent borrowers.

Following them, we use the share of total assets of all credit institutions controlled by the three largest commercial banks as our bank-size variable and we take this variable directly from its original source[16].

Labour market structure. There is no doubt that there are remarkable institutional differences in the labour markets across Europe; and owing to them the same policy of the European Central Bank is likely to produce different effects. Price stability is the main objective pursued by the ECB and in the recent years there has been a noticeable convergence towards low inflation rates. Unfortunately, the unemployment in Europe has remained high and widely different between regions and across countries. Many explanations for the persistence of unemployment in the 1990's have been advocated and, in principle, they depart from the standard argument of the natural rate or NAIRU (Non-Accelerating-Inflation Rate of Unemployment: the rate toward which the economy tends to gravitate in the long run and at which inflation remain constant). In other words, it would be difficult for the ECB and the national authorities to determine a constant rate of inflation associated with a corresponding stable level of low unemployment.
Institutional differences in the wage-setting process play a fundamental role in explaining the heterogeneous rates of unemployment.

In a recent paper, Cukierman and Lippi (1997) stressed the importance of the degree of centralisation of wage bargaining to explain the divergent wage and price developments (even if countries are facing the same disturbances) and they show that, in a *corporatist* environment the strategic interaction among many unions and a single central bank results in a worse output-inflation trade-off compared to that resulting from the interaction with a less centralised wage bargaining framework.

Moreover, the persistence of high regional unemployment can be associated with rigidities in labour markets. Often it is the outcome of a low flexibility of regional real wage structures set by national wage bargaining without reflecting the interregional productivity differentials.

After these considerations and given the past history of unemployment in Europe it is difficult to explain its high degree of persistence by the standard natural rate or NAIRU (as a temporary deviation from its long-run tendency). Rather, theories allowing for a very high dependence of current unemployment to past unemployment or *hysteresis* are better equipped to explain it. According to them, temporary shocks tend to have persistent effects on human capital accumulation: unemployed workers lose their skills; their jobs search effort

[16] Barth, Nolle, and Rice (1997), Table 3.

decrease and, with it, the probability to find a job. At the same time skill updating may cause cut in wage offers below the reservation wage rate encouraging the unemployed to exit from the labour force and, therefore, reducing the effective supply of labour. On the other hand, it is quite unusual for an employer to choose a long-term unemployed. As a consequence, it is not easy to reduce unemployment falling once it has been allowed to rise. From an empirical point of view, the existing literature does not provide any explanation of the different effects on real activity to a monetary shock in terms of dissimilarity of labour market structures. In order to fill this gap, we chose two variables as labour market proxies and specifically a measure of Real-Wage Rigidity and of Hysteresis[17]. We, then, run two different cross-state models relating the standardised effect on output to the state-level variables described along this section. We should expect such kind of relationship:

$$\text{STANDARDIZED EFFECT} = f(\underset{(+)}{\text{MANUF.}}, \underset{(-)}{\text{CR3}}, \underset{(+)}{\text{RWR or HYS}})^{18}$$

where the signs into parentheses are those justified by the economic theory.

Unfortunately, the country-specific variables are available only for 7 of the 11 countries of our sample (Austria, Belgium, Finland, France, Germany, Italy and Spain) and for that reason we are conscious that some cautions should be used in the interpretation of our results.

The regression presented in Table 2 for both models explain between 96 to 98 percent of the cross-state variation in the output responses and the joint significance of the explanatory variables is very high. The employment in manufacturing displays a positive and significant relationship with the size of state's response to policy shock in both models and this can be obviously interpreted as evidence of an interest rate channel. On the contrary, the credit channel is not working as we can see from the positive coefficient on the 3-Bank concentration ratio in both models. It contradicts Kashiap and Stein theory because, according to our results, the recession is stronger in those states with a higher percentage of large banks.

Consistent with our expectations is the sign of both labour market variables. We find a positive and significant effect of the real wage rigidity and even a more significant effect of hysteresis in explaining the amplitude of the recession in our cross-state model. In other words, countries experiencing a persistent level of unemployment and high real wage rigidity will be more affected by a common policy shock.

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[17] See the Appendix.

[18] MANUF denotes the percentage of manufacturing employment; CR3 denotes the 3-Bank Concentration Ratio, RWR is the Real Wage Rigidity and HYS is a measure of hysteresis

Table 2 Explaining Cross-State Variations in Policy responses

Variable	**Model 1**	**Model 2**
Intercept	-16.6746*** (2.5930)	-3.9811** (1.0486)
Percentage of Manufacturing Employment	14.2654*** (2.0986)	9.0155* (3.7318)
3-Bank Concentration Ratio	0.52440*** (0.0046773)	0.038273** (0.011529)
Hysteresis	14.9104*** (3.1387)	
Real Wage Rigidity		0.20874* (0.083237)
R^2	0.9866	0.96331
F(3,3)	74.0268***	26.2584***

Note: Standard errors in parentheses.
*, ** and *** indicates that a null hypothesis of zero is rejected at 10%, 5% and 1% levels respectively.

7. Policy implications and Conclusion

This paper uses a time series approach to examine whether or not a common monetary policy shock produces asymmetric effects across 11 European countries during the period spanning from 1979Q1 to 1998Q4. It also identifies alternative causes underpinning these asymmetries, some of them ignored by the previous studies on this topic.

The results are striking, revealing a fundamental role of the labour market structures in explaining these heterogeneities. Obviously, a recurrent question asks if the implementation of a unique monetary policy and the creation of a single financial market are likely to reduce or amplify[19] over time these differences.

EMU may have sense for those countries characterised by a similar set of preferences. If these countries are also relatively open and they share the same structural similarities which can make the use of national instruments, as the exchange rates, of limited relevance and efficacy, then the case for union is obviously strengthened. But problems could arise if different preferences were to coincide with asymmetric shocks and most importantly with asymmetric responses to common shocks. In such a case, EMU membership could severely reduce state's ability to attain national goals.

Even though one should treat the results with some caution, we believe that it is appropriate to consider their policy implications, especially in terms of industrial and employment policies.

In fact, the positive relation between the size of a state's recession, measured by the absolute value of the maximum decrease on output over a 50 quarters horizon, and the concentration of large banks can be considered as a symptom of the decreasing importance of the credit channel. Perhaps this monetary transmission mechanism will become less important because further deregulation and liberalisation of financial markets will support EMU, promoting the integration of European capital markets and the growth of non-bank financing and *securitisation*. It means that, the creation of common European financial area will tend to create greater homogeneity in banking practice and financial instruments and this will tend to reduce differences in the transmission that are due to heterogeneous capital market structures. Financial institutions will be less effective in transmitting monetary policy by altering credit availability given the growth of domestic and international capital markets and the subsequent shift of the demand for debt finance from banks to market (increased attractiveness of commercial paper, bond and equity finance to companies relative to bank loans). An homogeneized european capital market is the outcome of deep and remarkable transformations responsible, on the other hand, of the progressive elimination of national regulations and conventions across the european bond markets and, therefore, of the comparability across them.

[19] An highly integrated market leads to greater specialisation at regional level and this is the reason why, for example, industry shocks end up to be regional shocks (Krugman and Venables (1996)). Actually, higher degree
of specialisation together with higher factors mobility and the loss of the national monetary policy as regional shocks absorber, results in problems of stabilisation at European regional level.

European countries are likely to be affected asymmetrically by monetary shocks because there are differences in their respective industry portfolio. It, thus, means that the ECB's monetary policy might well create asymmetric effects as long as European countries have different industry portfolios. On the other hand our analysis suggests that, at state level, it seems to be appropriate to promote investments in those sectors that are less interest-sensitive. Such a policy could help to mitigate the measured cross-state differential policy response.

But still much can be done to narrow the differences in the labour markets.

Monetary stability is the priority of the BCE but, obviously, it would be more profitable for European countries if it is combined with policies promoting balanced growth with maximum employment. This would require an integrated cohesion strategy including policies for employment and regional development, which would cause and speed up the real convergence for all the regions of the countries participating in EMU. In fact, in some European economies (e.g., Italy and Spain), unemployment is mainly structural rather than cyclical; in such circumstances, disequilibria would have to be corrected through changes in regulations or reforms in trade union structures.

The longer-term target of a low level of unemployment should be pursued by collaborative action of the member states co-ordinated by the Community. Labour market liberalisation can be the solution and they can act in order to reach a higher degree of regional wage differentiation compatible with regional difference in productivity.

APPENDIX

Data sources

Data used for the VAR analysis come from the International Financial Statistic of the International monetary Fund (IFS), Quarterly National Account of the OECD (QNA) and from national statistical institutions.

The series on real GDP is defined in national currency and is obtained from OECD database for most of the countries and from national sources for few of them. The series on Consumer Price Index (CPI) is obtained from the IFS. The nominal interest rate is the money market rate and is obtained from the IFS.

All variables but R were logged and, unfortunately, the sample period differs from country to country. Below are the samples used for the analysis with quarterly data as well as the number of lags in the VAR.

Country	**Sample**	**Lags**
Austria	1980Q1-1995Q4	4
Belgium	1984Q1-1998Q4	1
Denmark	1980Q1-1995Q4	4
Finland	1979Q1-1996Q4	2
France	1979Q1-1996Q4	1
Germany	1980Q1-1995Q4	4
Italy	1980Q1-1995Q4	3
Netherlands	1981Q1-1994Q4	4
Spain	1979Q1-1996Q4	2
Sweden	1980Q1-1997Q4	3
UK	1979Q1-1995Q4	3

For the cross-section analysis we used 4 state-level variables for Austria, Belgium, Denmark, Finland, France, Germany, Italy and Spain:

- the 3-Bank Concentration Ratio (average from mid 1970s to the early 1990s): the proportion of assets of all credit institutions in 3 largest commercial banks. We take this indicator directly from the original source (Barth, Nolle, and Rice (1997), Table 3)
- the Employment in Manufacturing as a percentage of civilian employment (average 1980-90) is taken from Historical Statistics 1960-90, Paris: OECD (1992).
- the Real-Wage Rigidity, defined as the increase in equilibrium unemployment that is needed to accommodate a permanent upward shock to wages and the Hysteresis. In the first case, real wage react to the level of

current unemployment more than to the level of lagged unemployment. In the other case, real wage react to changes in unemployment. They are obtained from the estimation of a simple labour market model following the VAR approach. These estimates are directly taken from the original source (Layard, Nickell, and Jackman (1991).

Table A1. Unit Root Analysis

COUNTRY	VARIABLE	ADF	CRITICAL VALUE (5%)
Austria	LY	-2.95	-3.48
	LP	-3.65	
	R	-2.09	
Belgium	LY	-1.64	-3.49
	LP	-1.57	
	R	-1.91	
Denmark	LY	-2.03	-3.48
	LP	-3.14	
	R	-2.60	
Finland	LY	-2.35	-3.47
	LP	-0.82	
	R	-1.78	
France	LY	-1.96	-3.47
	LP	-3.35	
	R	-2.25	
Germany	LY	-2.49	-3.48
	LP	-3.34	
	R	-2.73	
Italy	LY	-1.37	-3.48
	LP	-3.39	
	R	-2.61	
Netherlands	LY	-3.40	-3.49
	LP	-2.80	
	R	-2.00	
Spain	LY	-1.96	-3.49
	LP	-2.06	
	R	-1.15	
Sweden	LY	-2.00	-3.47
	LP	-0.16	
	R	-2.35	
Uk	LY	-2.32	-3.48
	LP	-2.33	
	R	-2.16	

Notes: LY denotes the log of real GDP; P denotes the log of the consumer price index; and R denotes the short-term interest rate.

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