Monetary Policy Transmission Mechanisms within the European Monetary Union

Fabrizio Spargoli[1]
Università Politecnica delle Marche

The interest in transmission mechanisms has revived since the EMU was established. Within such a heterogeneous framework, in fact, it is fundamental to appraise how the one size fits all monetary policy affects every single member. This paper presents an analysis in this direction through the estimation of a VAR model using nation-wide time series. Furthermore, given that data coverage is now becoming wide enough, it provides a verification of the impulse-response functions structural stability. This paper provides evidence of a structural break for Austria and Germany and of asymmetric effects within the EMU, which are not so big to make the one size fits all monetary policy a challenging task, however.
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Introduction

Within a monetary policy strategy, the knowledge of transmission mechanisms is a fundamental prequisite because, through them, the initial monetary shock turns into the desired objective in terms of real variables. First of all, the timing and the strength of the shock necessary to achieve that goal are determinant for a correct formulation of the policy action. Furthermore, realizing the extent to which the same shock may

[1] <*f.spargoli@univpm.it*>. The Author wishes to thank Prof. Pietro Alessandrini and Prof. Riccardo Lucchetti for their suggestions for this paper. He is also grateful to the *referees* of the *Rivista di Politica Economica* for their detailed comments and advice. The Author is entirely responsible for any mistakes and oversights.

produce geographically heterogeneous results is necessary in order to evaluate the feasibility of a common monetary policy within a given context.

Especially with regard to the latter, a rising interest among researchers developed since the European Monetary Union (EMU) was established. Many studies[2] emphasize that a *one size fits all* monetary policy involves the risk of asymmetric effects within the EMU countries because of their different financial, goods and labour markets[3]. Moreover, this occurs in a context that lacks an authority, similar to the European Central Banks System (ECBS) as regards monetary policy, responsible for the conducting of fiscal policies.

However, being based on time series at most contemporaneous with the introduction of the euro, those studies are not exempt from the Lucas' critique[4]. In other words, the establishment of the EMU may have represented a structural break in the behaviour of economic agents, which may have caused a change in the transmission mechanisms with respect to before. Therefore, in this paper the effect of monetary policy on real variables will be estimated on updated time series. Moreover, a test for the hypothesis of a structural break in the impulse-response functions will be calculated.

This paper is structured as follows. The first paragraph provides a survey of the transmission mechanism theories, distinguishing between *money* and *lending view* with regard to the

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[2] Among them, see: EHRMANN M. *et* AL. (2003); ANGELONI I. *et* AL. (2002); GUISO L. *et* AL. (2000); CECCHETTI S. (2001); RAMASWAMY R. - SLOCK T. (1998); MIHOV I. (2001); CLEMENTS B. - KONTOLEMIS Z. - LEVY J. (2002); DORNBUSCH R. - C. - GIAVAZZI F. (1998).

[3] BERBEN R. *et* AL. (2004), however, show that the evidence of asymmetries in transmission mechanisms may depend on particular features of the econometric model, such as the treatment of expectations or wealth, besides the heterogeneity of the framework.

[4] ANGELONI I. - EHRMANN M. (2003); CICCARELLI M. - REBUCCI A. (2002), are noteworthy exceptions. The formers focus their analysis of monetary policy transmission on the banking, the interest rate and the asset-market channels using post-1999 time series. They argue that transmission mechanisms have changed after euro came into circulation, and become more homogeneous. CICCARELLI M. - REBUCCI A., using a particular VAR model which allows the parameters to change over time, find evidence of asymmetries in the time lags of monetary policy transmission which have not been weakened by the introduction of the euro in 1999.

main conclusions and implications. The second paragraph deals with the feasibility of a *one size fits all* monetary policy within the EMU context. In this sense, an examination of those factors that literature believes to hinder a homogeneous working of transmission mechanisms will be provided. Finally, the third paragraph is aimed at estimating the size of the asymmetric effects of monetary policy among the EMU countries and at testing the hypothesis of a structural break in the impulse-response functions. The main conclusions will be drawn in the fourth paragraph.

1. - Monetary Policy Transmission Mechanisms: The Main Theories

Monetary policy transmission mechanisms can be defined as those channels allowing monetary authorities to achieve given goals in terms of real variables. Therefore, they represent a sort of link between financial and real sectors, whose existence requires two necessary conditions. First, monetary authorities must control the supply of a financial asset for which there is both no perfect substitute and a demand from the economy. Second, there must be some form[5] of market imperfections hindering prices to adjust after a monetary policy action.

Both the *money view* and the *lending view*, that is the two main schools of thought about transmission mechanisms, arise from these commonly recognized conditions. The essential difference between them concerns the theoretical approach, as well as the implications for monetary policy.

1.1 *The Money View*

What is commonly labelled the *money view*, is a school of thought which groups together both keynesian and monetarist

[5] Broadly speaking, they take the form of nominal rigidities according to the *money view* and information asymmetries in financial markets according to the *lending view*.

authors. In fact, even if they keep their distances from each other, they both share substantially the same theoretic background. Namely, they both have a portfolio approach to the demand for money so much so that Patinkin D. (1965) writes that Friedman's theory «can only be seen as a continuation of the keynesian theory of liquidity preference» and can be considered «an elegant exposition of the modern portfolio approach to the demand for money»[6].

Within the analysis of the interaction between monetary and real variables, the *money view* assumes that economic agents share their own wealth among a range of financial and real assets according to their preferences and their balance constraint. Furthermore, markets where those assets are traded are believed to be always cleared, that is able to reach an equilibrium by themselves through changes in the price level.

As regards the theoretic approach, the fundamental difference between monetarists and keynesians concerns the substitution relationships among the assets considered. Keynesians believe they are stronger between money and financial assets than between money and real assets, which means emphasizing the liquidity concept. By contrast, monetarists claim the role of money as an abode of purchasing power, that is a sort of special asset which can be equally substituted for both financial and real assets.

In the end, these differences influence the interpretation of the monetary policy transmission mechanisms and, broadly speaking, the importance attached to monetary policy. According to the Keynesian view, monetary policy actions are transmitted to the real economy through changes in some relative prices, which cause an alteration in spending decisions. For example, the cost of capital channel arises from the difference between the rate of interest and capital marginal efficiency. Moreover, the Tobin's *q* depends on the *ratio* of the rate of return on shares to capital marginal efficiency or, alternatively, on the ratio of the companies' market value to the replacement cost of its equipment. Furthermore, the exchange rate channel is related to the difference

[6] PATINKIN D. (1969), page 93.

between national and foreign rates of interest. Finally, wealth and income effects depend respectively on the changes in the rate of interest and the related ones in the asset prices.

In contrast, the monetarist transmission mechanism works more directly. The main variable is money, which determines real effects independently of changes in the rate of interest, once its own portfolio weight has been altered. In fact, economic agents tend to restore the original composition through the adjustment of the portfolio weights of both real and financial assets.

Beyond these differences and the related ones in the role of monetary policy, both keynesian and monetarist transmission mechanisms share a common implication, besides a common theoretic approach. In particular, both the keynesian and monetarist view involve the social efficiency of monetary policy effects. In other words, economic agents are believed to react to the new monetary stance by renouncing to/realizing only those spending decisions which are less/more proable than the previous ones.

1.2 *The Lending View*

The *money view* of the monetary policy transmission mechanisms seemed to be not at all convincing, so much so that several empirical and theoretical doubts have been raised[7]. These criticisms originated dissatisfaction among researchers, which stimulated a deeper study of transmission mechanisms and resulted in the birth of the *lending view*. With respect to the *money view*, it repudiates the assumption of a monetary policy transmission relying only on a portfolio approach. In fact, it believes economic agents to be not always able to take decisions according to their related costs and revenues, because their behaviour is constrained by financial market imperfections, which are not easy to overcome especially in some circumstances.

[7] A fundamental paper is surely that of BERNANKE B. - GERTLER M. (1995) who find evidence of three «puzzles» in the cost of capital channel. Other relevant papers are those of CHRISTIANO L. - EICHENBAUM M. - EVANS C. (2001); MEESE R. - ROGOFF K. (1983).

The first of them concerns companies' financing decisions, which become not at all irrelevant to the real economy, in contrast to the monetarist and keynesian view[8]. In fact, the *lending view* claims that the adjustment of both bonds and loans markets through arbitrages is hindered because a necessary condition does not hold anymore. In fact, some companies, especially the smaller ones, are shut out of the capital markets because, on the one hand their needs are too small compared to the costs required by the access to those markets and, on the other, they involve severe information asymmetry problems, which make the role of banking intermediaries unavoidable. Therefore, in case the offer of bank loans decreases, such companies would be constrained and, consequently, forced to a sharp cut in their production, which strengthens the monetarist and keynesian effects. This is exactly the essence of the bank lending channel.

The second concerns the extent to which the offer of bank loans respond to monetary policy shocks, which is believed to be weaker than the portfolio approach predicts because of constraints and imperfections affecting financial markets. For example, capital adequacy requirements prevent an increase in the offer especially when they are binding. Furthermore, customer care needs induce banks to preserve loan offer even following a monetary tightening.

However, Kashyap A. and Stein J. (1993) have a contrary opinion maintaining that the constraints indicated before, in turn, involve others in terms of financing needs. To meet them, banks can realize their bond portfolio or borrow funds directly from capital markets, which involves, respectively, a decrease in the liquidity reserves against banking risks and a rising marginal financing costs schedule because of information asymmetries between banks and their lenders. Therefore, meeting their total financing needs may be difficult for banks, which means that the bank lending channel remains a relevant transmission mechanism.

The third is about the response of real variables to changes in the interest rate, which is affected by constraints in economic

[8] In particular, this is what the MODIGLIANI F. - MILLER M. (1958) theorem states.

agents' behaviour too. In particular, if they are in the shape of information asymmetries between banks and firms, such constraints involve that the loan rate, namely the external finance premium component, must be inversely related to the firms' creditworthiness. As regards this, the *lending view* claims a determinant role for monetary policy[9], from which a further transmission mechanism, that is the balance sheet channel, originates.

Therefore, the firms' creditworthiness represents a further way monetary authorities have to influence investment decisions, besides the market interest rate. In addition to the cost of capital channel, the lending view recognizes also that «in terms of a simple textbook analysis, policy moves both the IS and the LM curves»[10]. In other words, deciding whether to implement or not an investment project becomes determinant in terms of both capital marginal efficiency and creditworthiness, by affecting positively or negatively the expected sales and profits. Among these and monetary policy, therefore, what emerges is a spiral-shaped link, which strengthens and amplifies the effects of the initial policy action winding itself up.

Finally, an implication opposite to that involved by the *money view* descends from the previous analysis. In particular, it is that monetary policy produces asymmetric and socially inefficient effects, forcing both bank-dependent and not creditworthy firms to give their investment projects up even if they are profitable.

2. - Monetary Policy Transmission Within the EMU

Having introduced the main topics about transmission mechanisms in the previous section, it is now appropriate to focus the analysis on the European Monetary Union. Indeed, in such a

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[9] BERNANKE B. - GERTLER M. - GILCHRIST S. (1998); GREENWALD B. - STIGLITZ J. (1988) relate this influence to the effects of changes in the interest rate on firms' cash-flow while KYOTAKI N. - MOORE J. (1997, 1993) to those on the market value of firms' collateral.

[10] CECCHETTI S. (1995), page 6.

new and heterogeneous framework it seems fundamental to assess both the feasibility and the structural break hypothesis.

In what follows, therefore, the objective is to achieve both these goals. First of all, this paragraph deals with the feasibility of a *one size fits* all monetary policy within the EMU, which is related to the heterogeneity of such framework. The next paragraph, instead, is aimed at reaching both goals through the estimate of a VAR model, which allows an assessment of the actual monetary policy response for each EMU country, as well as the possibility to test the hypothesis of a structural break.

2.1 *Transmission Mechanisms Asymmetries: The Background*

In order for a *one size fits* all monetary policy to be feasible in a given framework, it is necessary to have transmission mechanisms which produce homogeneous effects within that framework. In other words, monetary policy shocks must affect the real economy in a symmetrical way, in order to avoid the threat of territorial imbalances. Therefore, it is fundamental to recognize those factors from which the asymmetries of monetary policy transmission originate, to take them into account when implementing the policy action and, if necessary, to find suitable remedies.

With regard to feasibility, the literature[11] agrees on the determinant role assumed by the framework and, in particular, by its heterogeneity in terms of some factors. Among them, those generally recognized are the business cycle, the legal system, the financial, goods and labour markets. The following paragraphs are aimed at explaining the role each of them has and possibly at providing relevant data.

[11] Among them, see: EHRMANN M. *et* AL. (2003); ANGELONI I. *et* AL. (2002); GUISO L. *et* AL. (2000); CECCHETTI S. (2001); RAMASWAMY R. - SLOCK T. (1998); MIHOV I. (2001); CLEMENTS B. - KONTOLEMIS Z. - LEVY J. (2002); DORNBUSCH R. - FAVERO C. - GIAVAZZI F. (1998).

2.1.*a The Business Cycle*

The business cycle is a factor affecting monetary policy transmission independently of a single mechanism. In fact, the problem does not regard the way a given channel works, but the formulation of the policy action. In particular, when countries of a same monetary union are not aligned on the same business cycle stage, monetary authorities have to decide whether favouring some countries instead of others or weighing the action according to the conditions of the whole union. However, in both cases the decision results in asymmetric effects, which are deeper, respectively, for the less important countries and for those further from the average.

Appraising whether a group of countries shares the same business cycle stage or not is a quite difficult matter. First, it is necessary that external shocks affecting economic systems are the same for all countries. In the literature about the EMU[12], the prevailing opinion with regard to this aspect is a negative one, which maintains that the correlation of some macroeconomic series is generally higher among a group of countries (Austria, Germany, France and Benelux) than among others. Second, countries must be able to absorb by themselves idiosyncratic shocks affecting their economic system. Among the necessary condition indicated by the literature[13], nominal rigidities and labour mobility seem to be the main weaknesses of the EMU.

However, the negative opinion about the business cycle alignement of EMU countries is not at all decisive, because the introduction of the euro is likely to enhance cross-border transactions and cycle synchronization according to the «optimal currency area endogeneity hypothesis»[14].

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[12] See BAYOUMI T. and B. (1996); DEMERTZIS M. - HUGHES E. - RUMMEL O. (2000); PEERSMAN G. - SMETS F. (2001).

[13] MUNDELL R. (1961); MCKINNON R. (1963); KENEN P. (1969); INGRAM J. (1962).

[14] MCCALLUM J. (1995); FRANKEL J. - ROSE A. (1998).

2.1.*b* *The Financial Markets*

Financial markets assume a fundamental role in the monetary policy transmission because the initial shock goes through them, at least in the first stage. At the same time, they represent a source of asymmetric effects, which is related to a range of factors that, substantially, can be grouped in demand, offer and structural ones.

Among demand factors, the preferences about financing decisions as well as some characteristics of financial wealth surely have a vital significance. To the financing decisions, and in particular to the importance of bank loans in companies' financial structure, both the balance sheet and bank lending channels are strongly related. Moreover, they influence Tobin's q, which in fact requires companies to raise money by issuing shares. By contrast, wealth and income effects are those channels whose importance depends on financial wealth particularly in terms of size and spending propensity. Moreover, it is reasonable to assume that the financing decisions of the economy, in particular the ratio of direct financing to indirect financing, significantly affects the time lags the pass through from policy rates to banking rates takes.

Given the significance of these factors, it is appropriate to provide data about them. First of all, Table 1 concerns the financing decisions of the economy, which are separated into bonds, bank loans and shares. At first sight, what emerges is a high degree of heterogeneity among the countries, as indicated by the value of the variance. Direct financing is the largest in the United Kingdom, both through bonds and shares. Within the EMU context, the Netherlands ranks first with regard to bond issues, which are more than twice the EMU average. On the contrary, Greece, Belgium and Germany show the highest share of bank loans. With regard to the shares market, Finland and Luxemburg are those countries where the number of quoted companies per million of inhabitants is the largest. By contrast, Austria shows low values of both variables, as well as Italy with regard only to the number of quoted companies.

Continouing with demand factors, Table 2 reports the size and the composition of households' financial wealth. Belgium, France

TABLE 1

COMPANIES' FINANCING DECISIONS (2003)

Country	Share market capitalization (in % of GDP)	Quoted companies (per mln. of inhabitants)	Private bonds to bank loans
EMU			
Austria	19.82	15.43	15.04
Belgium*	–	–	12.36
Finland	94.74	27.88	30.63
France*	–	–	60.97
Germany	40.20	10.50	14.27
Greece	53.77	30.18	6.87
Ireland	50.03	16.50	–
Italy	37.47	4.80	32.30
Netherland*	–	–	82.18
Portugal*	–	–	60.08
Spain	77.30	79.00	35.85
Euronext	*68.28*	*14.13*	–
Mean	*55.20*	*24.80*	*35.06*
Variance	*505.37*	*481.32*	*568.85*
NON EMU			
Denmark	49.94	35,93	21.27
Sweden	86.49	31.33	63.64
United Kingdom	125.30	45.32	161.01
Mean	*87.24*	*37.53*	*81.97*
Variance	*946.74*	*33.88*	*3422.60*

Source: National Central Banks, BIS Quarterly Review (2004), International Federation of Stock Exchanges, Our calculations.

* The Euronext groups the Stock Exchanges of Belgium, France, Netherlands and Portugal.

and Germany are those countries where the stock of financial wealth is the highest and, at the same time, show, respectively, the biggest share of long-term bonds, of shares and of long-term debts. On the contrary, Austria shows the lowest stock of financial wealth, as well as the smallest share of long-term debts and shares among the EMU countries. Table 3 concerns the companies' balance sheets. First of all, what should be noted is the substantial homogeneity of the EMU context, especially with regard to leverage. Moreover, Italy emerges as that country in which short-

TABLE 2

HOUSEHOLD'S FINANCIAL ACCOUNTS
(in % of GDP); 2003

Country	Bonds		Shares	Bank loans		Net financial
	Short-term	Long-term		Short-term	Long-term	wealth
Austria	0.08	10.38	8.66	5.48	42.85	88.10
Belgium	0.28	49.09	32.85	1.66	38.26	207.30
France	3.44	0.24	52.54	2.66	39.60	152.34
Germany	0.06	28.42	15.71	6.26	92.79	152.09
Italy	0.81	29.11	28.73	2.52	12.89	115.70
Spain	0.31	4.00	37.87	3.35	52.42	94.15
Mean	*0.83*	*20.21*	*29.39*	*3.66*	*46.47*	*134.95*
Variance	*1.42*	*289.81*	*206.19*	*2.74*	*572.71*	*1676.81*
NON EMU						
Denmark	0.05	12.58	7.86	6.35	94.48	46.00

Source: National Central Banks, Our calculations.

TABLE 3

COMPANIES' DEBTS IN SOME EUROPEAN COUNTRIES
(2002)

Country	Short-term bonds (%)	Short-terms loans (%)	Leverage
EMU			
Austria	36.6	24.71	59
Belgium	35.5	57.20	58
Finland	19.4	–	–
France	36.3	17.63	49
Germany	44.9	28.32	61
Ireland	28.1	–	–
Italy	50.3	51.91	62
Netherlands	32.5	36.50	64
Portugal	62.3	–	–
Spain	39.5	31.74	56
Mean	*38.54*	*35.43*	*58.43*
Std. deviation	*10.76*	*177.51*	*4.82*
NON EMU			
Denmark	–	26.14	50

Source: CLEMENTS B., KONTOLEMIS Z.G., LEVY J. (2002), National Central Banks, Our calculations.

term financing, both through bank loans and bonds, as well as leverage has the highest values. By contrast, Austrian firms are those borrowing less with long-term funds.

Moving on to offer factors, the economic and financial conditions of the banking system assume a determinant role within the monetary policy transmission. First of all, they influence its creditworthiness and financing needs, which affect the bank loan response to monetary policy shocks, especially following a tightening. At the same time, they impact on the time lags required by the pass-through from policy rates to banking rates. In this sense, Table 4 reports some balance sheet indeces

TABLE 4

PROFITABILITY AND EFFICIENCY
OF SOME EUROPEAN BANKING INDUSTRIES (2001)

Country	Interest Margin (in % of total assets)	Operative Costs (in % of total assets)	Gross Profits to Interm. Margin (in %)
Austria	1.23	1.67	22.43
Belgium	1.00	1.22	29.49
Finland	1.73	1.82	60.43
France	0.96	1.62	4.14
Germany	1.28	1.39	10.61
Grecee*	4.45	4.17	31.12
Ireland	1.53	1.29	37.38
Italy	1.68	1.83	22.61
Luxemburg*	0.65	0.56	44.47
Netherlands	1.47	1.88	22.60
Portugal	1.87	1.52	29.21
Spain	2.45	1.88	25.39
Mean	*1.69*	*1.74*	*28.32*
Variance			
NON EMU	0.90	0.67	199.24
Denmark	1.95	1.70	34.91
Sweden	1.24	1.82	38.15
United Kingdom	1.77	1.80	34.70
Mean	*1.65*	*1.77*	*35.92*
Variance	*0.09*	*0.00*	*2.49*

Source: OECD, Bank Profitability 2002, Our calculations.
*Only commercial banks are included.

which indicate the profitability and efficiency conditions in the EMU banking systems. First of all, what should be noted is the homogeneity in terms of the ratio of both the interest margin to the total assets and the intermediation margin to the total assets. By contrast, this homogeneity disappears when considering the ratio of gross income to the intermediation margin, which has the highest value for Finland and the lowest for France. The other EMU countries show values substantially close to the average.

Finally, with regard to structural factors, the banking system has again a fundamental role within monetary policy transmission. As well as economic and financial conditions, the banks' size represents a relevant factor affecting the adjustment of the bank loan offer to the monetary stance. In this sense, a significant role is played also by bank-firm relationship, especially when they are long-lasting or housebank-shaped. Moreover, these affect the balance sheet channel too because they are determinant for the degree of information asymmetries between lender and borrower. Finally, both these factors influence the time lags the pass-through from policy rates to banking rates takes, together with the concentration of the banking system. Table 5 reports some indicators of the structure of banking systems within the EMU. The United Kingdom and the Netherlands are those countries where banks' average size is the largest and, at the same time, which rank opposite position with regard to the concentration index. In particular, in the Netherlands there are few big banks and the banking system appears to be the most concentrated, in contrast to the United Kingdom. By contrast, Austria emerges as that country where there are the most numerous and smallest banks. Finally, the German banking system shows the lowest concentration index among the EMU countries.

2.1.*c* *The Goods Markets*

As well as financial markets, the role of goods markets within monetary policy transmission comes from demand, offer and structural factors.

TABLE 5

THE STRUCTURE OF EUROPEAN BANKING SYSTEMS

Country	Number of bank	Average size*	Number of banks (per min. of inhabit.)	Concentration index**
EMU				
Austria	927	629	114,44	48
Belgium	112	7.557	10,77	57
Finland	342	454	65,77	78
France	1067	3.632	17,35	40
Germany	2370	2.411	28,73	17
Greece	54	2.865	4,91	71
Ireland	55	7.829	13,75	41
Italy	821	2.383	14,13	25
Luxemburg	189	3.815	472,50	–
Netherlands	84	20.975	5,19	79
Portugal	218	1.306	20,96	76
Spain	281	4.256	6,89	44
Mean	*543,33*	*4842,67*	*64,62*	*52,36*
Std. deviation	*648,78*	*5360,36*	*126,74*	*20,59*
NON EMU				
Denmark	117	2.277	21,67	17
Sweden	128	2.683	14,22	90
United Kingdom	385	12.899	6,48	28
Mean	*210,00*	*5953,00*	*14,12*	*45,00*
Variance	*123,83*	*4914,36*	*6,20*	*32,14*

Source: OECD, Bank Profitability: Financial Statements of Banks (2002), CECCHETTI S.G. (1999).

* *Ratio* of total banks' assets tothe number of banks (Mln. of Euros; 2001).

** Share of the total assets of the largest 5 banks (1999).

Demand factors include the aggregate demand composition and, in particular, the share of housing and durables in general. Being the most sensitive component to changes in interest rates, they affect the significance of the cost of capital channel. On the contrary, offer factors concern the sectorial composition of the productive system, particularly in terms of the share of investment-intensive sectors.

An analysis of those factors can be drawn from Table 6, which reports the sectorial contribution to the domestic added value.

TABLE 6

INDUSTRIES' CONTRIBUTION TO THE ADDED VALUE AND TRADE OPENNESS (2002)

Country	Food	Textile	Machineries	Means of transport	Buildings	Trade openness*
EMU						
Austria	2.4	0.8	4.7	1.5	7.4	10.9
Belgium	2.6	1.0	2.6	1.6	4.9	26.4
Finland	1.6	0.4	8.4	0.9	5.4	16.8
France	2.6	0.7	–	2.4	4.9	10.6
Germany	2.1	0.5	6.4	3.4	4.5	12.9
Greece	2.5	1.9	0.8	0.7	8,1	–
Italy	2.1	2.6	4.2	1.1	4.9	9.4
Ireland	–	–	–	–	–	38.5
Luxemburg	1.0	0.7	1.1	0.0	5.9	–
Netherlands	3.2	0.3	2.4	0.7	5.9	23.5
Portugal	–	–	–	–	–	10.4
Spain	–	–	–	–	9.2	7.6
Mean	*2.23*	*0.99*	*3.83*	*1.37*	*6.11*	*16.7*
Variance	*0.36*	*0.52*	*6.07*	*0.92*	*2.27*	*87.6*
NON EMU						
Denmark	2.6	0.4	4.1	0.5	5.0	–
Sweden	–	–	-	–	4.4	–
United Kingdom	2.2	0.6	3.2	1.8	5.9	–
Mean	*2.40*	*0.50*	*3.65*	*1.15*	*5.10*	_
Variance	*0.04*	*0.01*	*0.20*	*0.42*	*0.38*	–

Source: OECD, Stan Industrial Database, Our Calculations.
* It refers to the degree of trade openness to non European countries.

With regard to demand factors, it is reasonable to think that, when the sector producing a component sensitive to interest rates has a significant contribution to the added value, the same component will be important in the aggregate demand. From the analysis of table 6, what emerges is that the sectorial composition of the productive systems is quite homogeneous within the EMU countries, except for two fundamental industries such as machinery and building. With regard to the first, Finland and Germany show a contribution well above the EMU average, while Greece ranks last. On the contrary, the building industry is particularly relevant in Spain, Greece and Austria, while Sweden is the country where it counts less.

Among structural factors, finally, it is possible to include trade openness, which affects the exchange rate channel. Moreover, factors such as the elasticities of importations, exportations and domestic prices to changes in exchange rates are relevant too. The lower these variables are, the weaker the exchange rate channel is within monetary policy transmission. In this sense, Table 6 reports the trade openness of some European countries to non European ones, which has the highest values in Ireland and Belgium while in Italy and Spain the lowest.

2.1.*d The Labour Market*

Asymmetries of the monetary policy transmission are likely to depend on the labour market too. This possibility is related to two kinds of considerations.

The first does not regard single mechanisms, but it affects one of the necessary conditions allowing monetary policy to influence real variables. In particular, it deals with nominal rigidities, which depend strongly on labour market rigidities in terms of employment protection legislation. Therefore, the more this market is regulated, the longer transmission lags are and the weaker the effects of monetary policy, especially in case of contractionary shocks.

The second consideration has to do with the bargaining system of salaries, which influences the expectations channel. Bruno M. and Sachs J. (1985) believe that the increase in salaries is easier to contain when bargaining occurs in a centralized system. By contrast, if the system is based on a plurality of labour unions, the incentive to claim for higher salaries in order to attract new members prevails over the awareness of the link between price expectations and monetary policy, which is instead typical of the centralized system.

2.1.*e The Legal System*

Factors related to the legal system affect monetary policy transmission mainly through those channel indicated by the lending view. In fact, they determine the incentive that both firms and banks have to *moral hazard* behaviours.

For example, the rigour of law enforcement influences the riskiness of a bank loan and, consequently, the external finance premium charged to firms. On the contrary, the role of the government in the economy, the banking bankruptcy rules and the deposit insurance schemes are examples of factors affecting the degree of riskiness involved in financing banks.

With regard to the legal system, Table 7 reports three indicators for a group of European countries. The first, labelled "Shareholder rights", has higher values when shareholders find it less costly and

TABLE 7

THE LEGAL SYSTEM OF SOME EUROPEAN COUNTRIES

Country	Shareholders rights	Creditors rights	Law enforcement	Origin of the legal system
EMU				
Austria	2	3	10	German
Belgium	0	2	10	French
Finland	2	1	10	Scandinavian
France	2	0	8,98	French
Germany	1	3	9,23	German
Greece	1	1	6,18	French
Ireland	3	1	7,8	Anglo-Saxon
Italy	0	2	8,33	French
Netherland	2	2	10	French
Portugal	2	1	8,68	French
Spain	2	2	7,8	French
NON EMU				
Denmark	3	3	10	Scandinavian
Sweden	2	2	10	Scandinavian
United Kingdom	4	4	8,57	Anglo-Saxon

Source: CECCHETTI S.G. (1999), Table 7.

difficult to vote directors out. The second, named "Creditor rights", has lower values when creditors experience less difficulty gaining possession of property that has been used to collateralize a bond or loan. The third, labelled "Enforcement", has higher values when countries are more rigorous in carrying out their laws. Finally, the last column reports the legal family from which each country's laws are derived. With regard to the present analysis, the second and third indeces are the most relevant. What emerges from Table 7 is that creditor rights are strongly protected in Finland, Ireland and Portugal while the enforcement is more aggressive in Austria, Belgium, Finland and the Netherlands.

2.2 *Monetary Policy Transmission within the EMU: Concluding Remarks*

According to the previous analysis, the framework in which transmission mechanisms are working does not seem to be homogeneous. Therefore, it should be taken into account that the centralized European monetary policy is likely to produce asymmetric effects in terms of both GDP and price level. However, it is not possible to definitely recognize those countries having the biggest advantages or disadvantages, but only those countries where a given transmission mechanism is likely to impact more strongly. The more these channels are numerous in a given country, the more it is reasonable to expect higher monetary policy effects in that country.

In particular, this is the case of Italy and Germany. In both countries, companies' financial structure, which is mainly composed of bank loans[15], as well as the banking structure, which is made of small-medium size banks[16], are likely to favour the bank lending channel.

The relevant shares of short-term financing in companies' financial structure and government bonds in households'

[15] The high leverage and the small share of direct financing represent a proof of that (see Table 1 and Table 3).

[16] See Table 5.

portfolios[17], furthermore, are expected to make the income effect particularly effective. With regard to Italy, the balance sheet channel may have a strong impact on firms because of their financial structure, which has just been analysed, the low value taken by th "Enforcement" index[18] and given that firms' size is generally small. With regard to Germany, the high contribution of the machinery industry to the added value[19] is likely to make the cost of capital channel fairly strong.

On the contrary, two mechanisms at most are likely to impact more deeply in the remaining countries. This is the case of Belgium, where the stock of financial wealth and the trade openness, which are among the largest in Europe[20], should favour the wealth effect and the exchange rate channel. In Finland as well, two mechanisms are expected to be particularly effective: namely, they are the Tobin's *q* and the cost of capital channel because of the high share market capitalization and the importance of machinery and building industries in the composition of the added value[21]. Finally, there are no mechanisms expected to have their maximum effects within the rest of the EMU countries.

3. - The Transmission Mechanisms Asymmetries: A VAR Estimate

The conclusions drawn from the previous sections will now be assessed empirically, together with the hypothesis of a structural break. In this sense, the strategy is to estimate a VAR model, which is a commonly used technique mainly because it makes possible to find the response of each variable included in the system to monetary policy shocks. In particular, the strategy consists in selecting a guideline paper among the wide VAR literature, re-estimating the model using updated time series and, finally, comparing the results through both the graphic analysis

[17] See Table 2 and Table 3.
[18] See Table 7.
[19] See Table 6.
[20] See Table 1 and Table 2.
[21] See Table 1 and Table 6.

and a Chow test. Among the huge number of papers relying on VAR models, that of Ramaswamy and Slock (1998) has been selected mainly because, compatibly with data availability, the authors analyse all the EMU countries and provide an estimate of the impulse-response functions for each of them.

3.1 *The Approach of Ramaswamy and Slock*

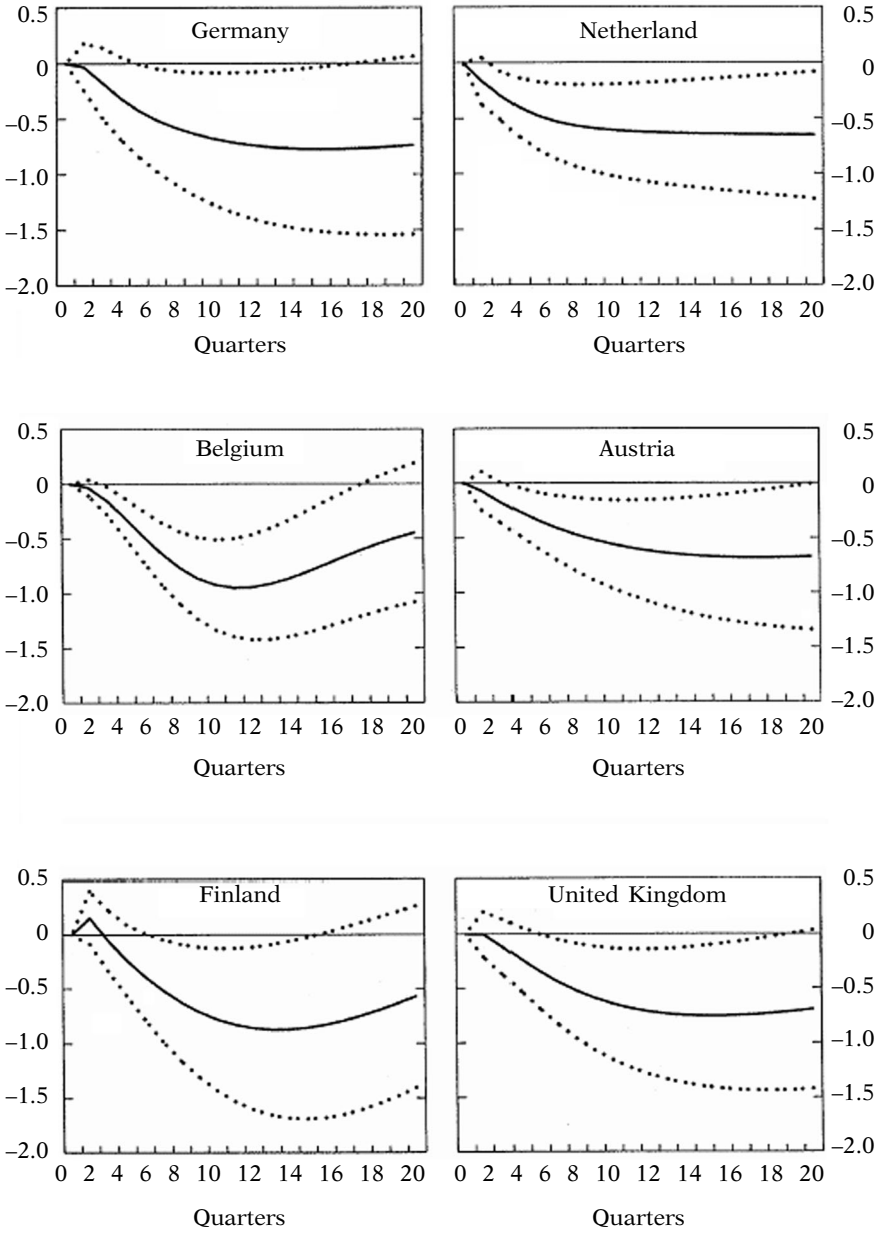
Ramaswamy R. and Slock T. (1998) analyse the asymmetries of monetary policy transmission by estimating and comparing the impulse-response functions of each European country considered. In particular, these include a group of EMU countries, that is Austria, Belgium, Finland, France, Germany, Italy, the Netherlands, Portugal and Spain, as well as others, that is Denmark, the United Kingdom and Sweden. Impulse-response functions, concerning only the GDP response, have been calculated through a VAR model which includes, in order, real GDP, a consumer price index in levels and a three-months inter-bank interest rate. Finally, the model has been estimated using quarterly time series covering the period from 1972 to 1995, except for Portugal for which the time series finish in 1994. The estimated response of real GDP to interest rate shocks is reported in Graph 1.

When explaining their results, Ramaswamy R. and Slock T. (1998) emphasize that the full effects of a contractionary monetary shock on real GDP take roughly twice as long to occur but the resulting decline is almost twice as deep in one group of countries, which includes Austria, Belgium, Finland, Germany, the Netherlands and the United Kingdom, as in the other group, which includes Denmark, France, Italy, Portugal, Spain and Sweden. For this reason, authors label the first group "core" and the second "periphery" and they state that «the important question is to what extent these differences are likely to carry through once the euro comes into circulation»[22]. They believe also that «the task of conducting monetary policy at the EU-wide level is likely to be a

[22] RAMASWAMY R. - SLOCK T. (1998), page 383.

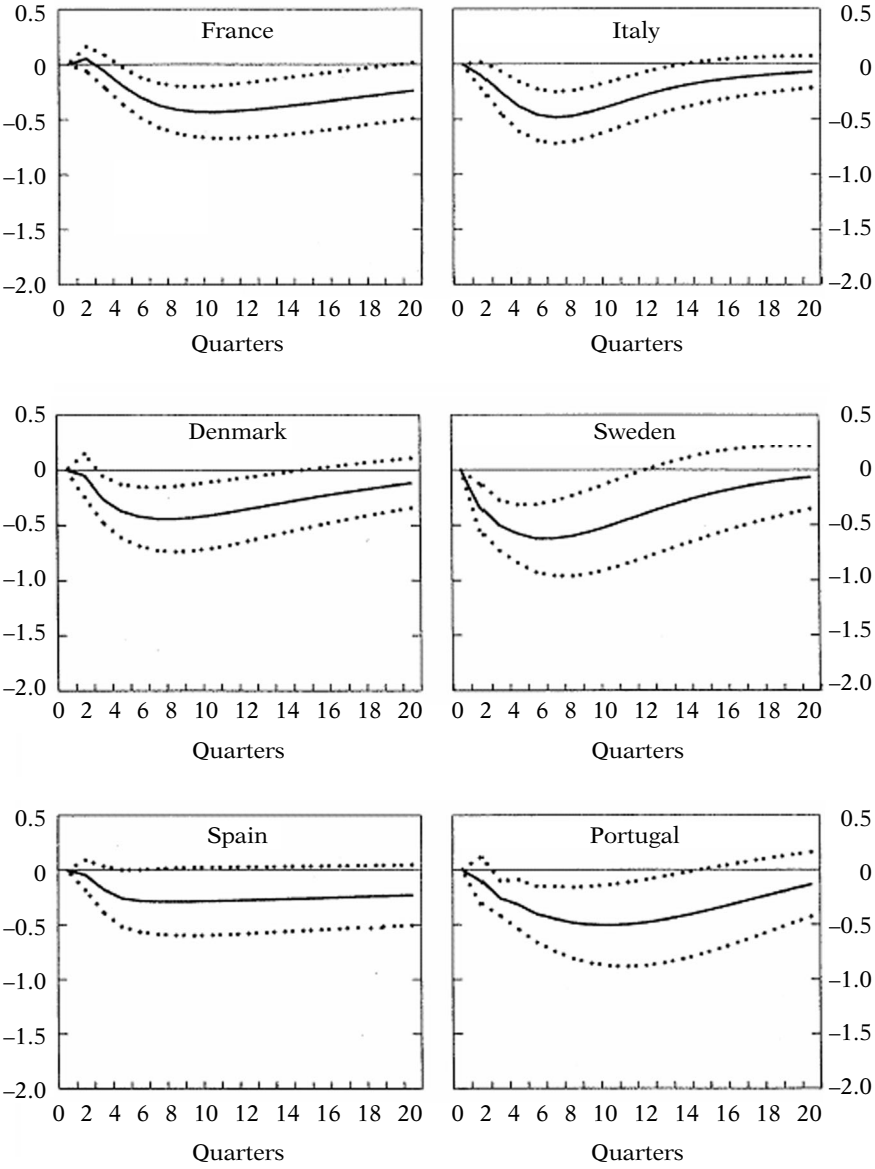
GRAPH 1

GDP RESPONSE TO AN INTEREST RATE SHOCK
(in % of the initial value)



(cont.) GRAF. 1

GDP RESPONSE TO AN INTEREST RATE SHOCK
(in % of the initial value)



Source: RAMASWAMY R. - SLOCK T. (1998).

challenging one in the initial years of the monetary union»[23]. At the same time, they rely on financial integration and monetary policy centralization to cushion those differences.

3.2 *The Re-estimated VAR Model*

Once the paper of Ramaswamy and Slock has been introduced, it is easy to re-estimate their VAR model on the basis of updated time series in order to assess the depth of asymmetric effects among the EMU countries again.

Besides using more updated series, which cover the period 1972-2004:2, the VAR model is therefore the same as the previous one, except for a detail. In particular, this deals with the time lags of variables, which are three, instead of two, in the case of Austria, France, Germany and the Netherlands, according to both the Akaike and Schwartz information criteria and the Ljung-Box Q test. The re-estimated impulse-response functions of real GDP are reported in Graph 2 together with those of the price level. To assess the depth of asymmetric effects, the EMU countries have been compared in terms of both the full effects and the time lags they take to occur.

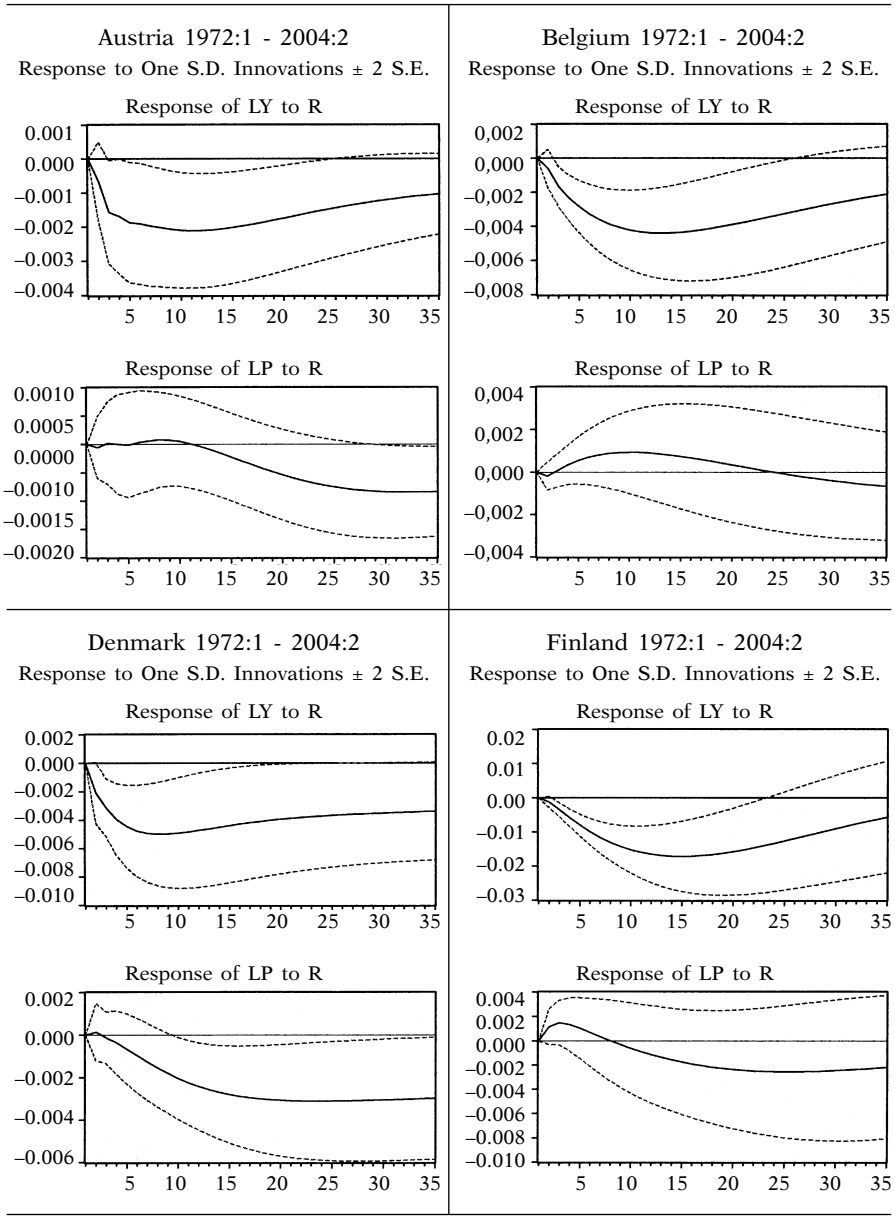
With regard to the response of GDP, what emerges from Graph 2 and Table 8 is a substantial homogeneity among the EMU countries, except for Finland where the full effect is more than threefold the EMU average. On the contrary, in Austria and Portugal monetary policy do not seem to have a significant impact on real GDP. Furthermore, the GDP response for Germany and Austria seems to be quite weak, being roughly half the EMU average. Finally, close to this value is the GDP response of the rest of the EMU countries.

Continouing with the GDP response, deeper asymmetries emerge when considering the time lags that the full effects take to occur. Beside being that country in which the effect is the highest, Finland shows also the longest time lag. Moreover, it is

[23] RAMASWAMY R. - SLOCK T. (1998), page 384.

GRAPH 2

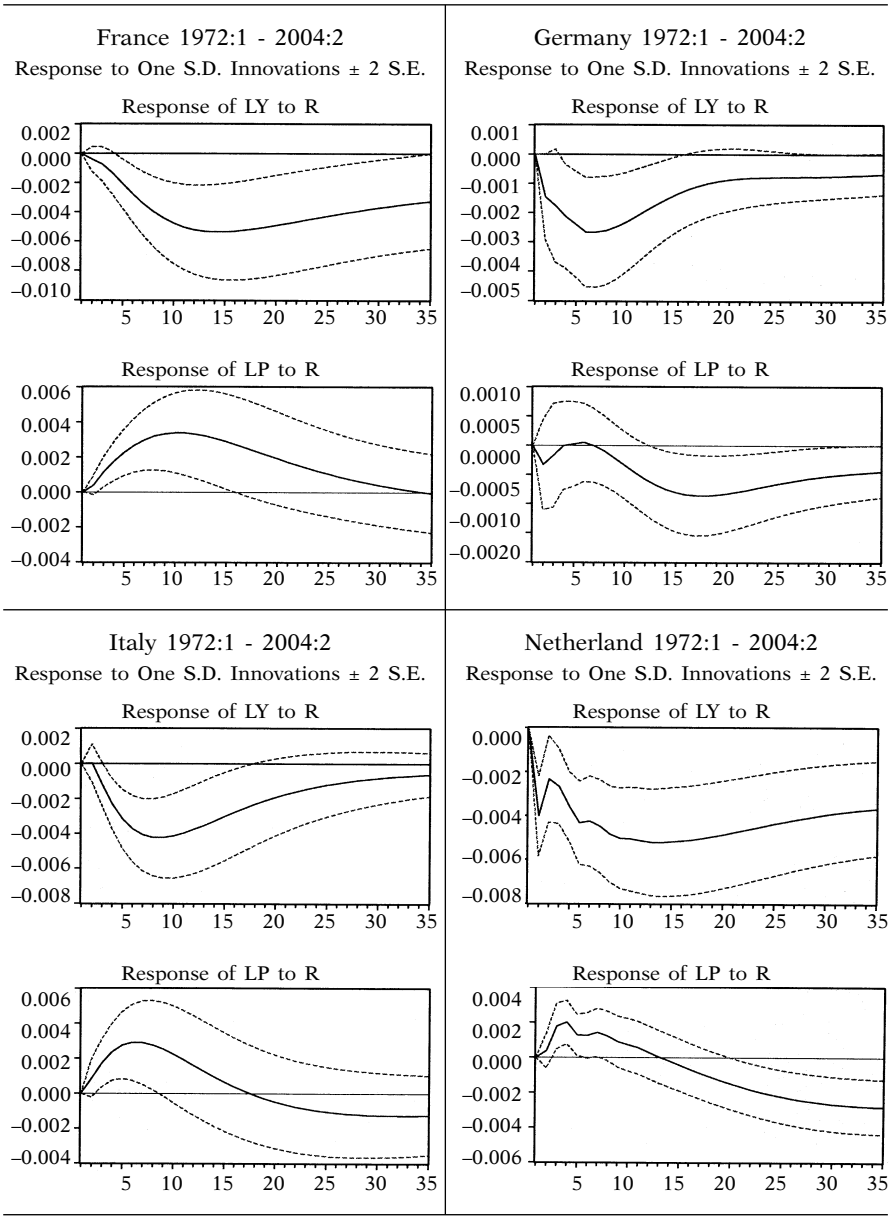
RESPONSES OF REAL GDP AND PRICE LEVEL TO AN INTEREST RATE SHOCK (*)



(*) The responses to interest rate shocks are in values.

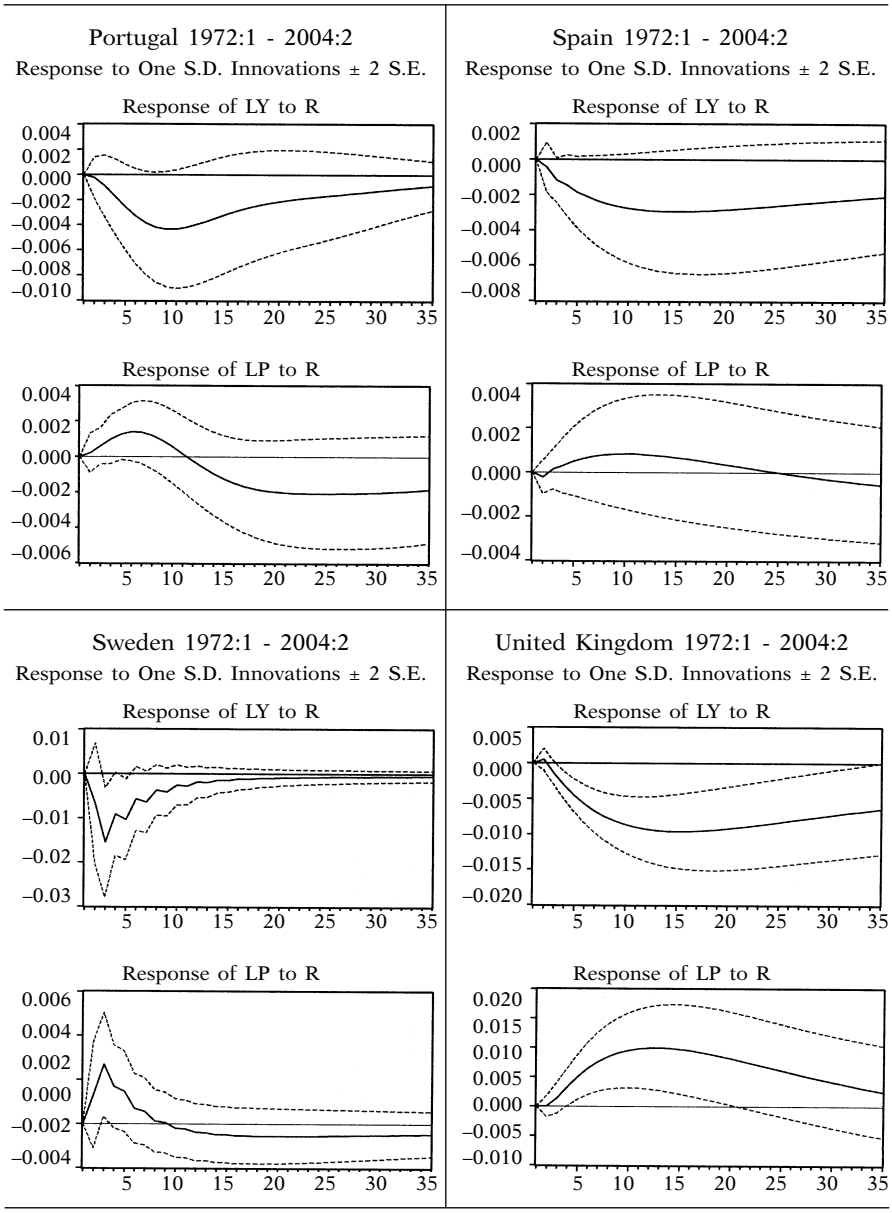
(cont.) GRAPH 2

RESPONSES OF REAL GDP AND PRICE LEVEL
TO AN INTEREST RATE SHOCK



(cont.) GRAPH 2

RESPONSES OF REAL GDP AND PRICE LEVEL TO AN INTEREST RATE SHOCK



Sources: Our calculation.

TABLE 8

FULL EFFECTS OF MONETARY POLICY
ON GDP AND PRICE LEVEL

Country	Real GDP			Price level		
	Maximum reduction	Time lag of the max red.	Maximum increase	Maximum reduction	Lag of max inc.	Lag of max red.
EMU						
Austria	–0.2	10.5	0	0	–	–
Belgium	–0.45	11.5	0	0	–	–
Finland	–1.7	15	0	0	–	–
France	–0.55	14.5	0.3	0	10	–
Germany	–0.27	6	0	–0.08	–	17
Italy	–0.45	9	0.3	0	6.5	–
Netherland	–0.5	12.5	0.2	–0.25	5	24
Portugal	0	–	0	0	–	–
Spain	0	–	0	0	–	–
Mean	*–0.463*	*11.64*	*0.267*	*–0.165*	*7.167*	*20,5*
Variance	*0.23*	*7.62*	*0.016*	*–0.006*	*4.389*	*12.25*
NON EMU						
Denmark	–0.5	7,5	0	–0.3	–	23
Sweden	–1.5	4	0.55	0	4	–
United Kingdom	–1	15	1	0	10.5	–

Source: Our calculation.

also the country in which significant GDP responses occur taking the shortest lag, together with the Netherlands. After Finland, France ranks second and, at the same time, it appears to be the country where significant GDP responses take the longest lag to occur. On the contrary, in Germany and Italy the time lags related to the full effects are the shortest within EMU while those related to significant GDP responses are close to the EMU average. Finally, the full effects take a lag close to the EMU average to occur in the rest of the EMU countries.

With regard to the price level responses, what emerges is a higher heterogeneity. First of all, it should be noted that Germany and the Netherlands are the only EMU countries where the price level has a significant reduction while, at most, it does not diminish significantly in other countries. Moreover, there is

evidence of a significant price increase in France, Italy and the Netherlands, which is generally[24] known as «price puzzle» in the literature. However, this is believed to depend on misspecification problems of the model and, in particular, on the omission of a relevant variable to monetary policy. In fact, in this case changes in the interest rates related to the omitted variables are erroneously considered as monetary policy shocks, so that the price increase does not represent the real response to a policy action but an endogenous reaction within the VAR model. An important strand of literature, starting from Sims (1992), maintains that the "price puzzle" can be solved including a "leading indicator" of the price level in the model, such as commodity prices. By contrast, Giordani (2004) believes that a "price puzzle" emerges whenever a measure of the output gap is omitted. In fact, this variable reflects not only demand shocks, but also technology ones which affect real GDP too.

Again with regard to the price level response, it should be noted that the full reduction seems to be stronger, but also more delayed, in the Netherlands than in Germany. In those countries where there is evidence of a "price puzzle", on the contrary, the full effects are substantially the same as well as the time lags they take to occur, except for France where they are longer. Finally, there are no significant price level reductions in the rest of the countries.

3.3 *The Birth of EMU: Was there a Structural Break?*

By re-estimating the VAR model on updated time series it is also possible to assess whether or not the adoption of the Euro caused a structural break in the impulse-response functions of the EMU countries. The strategy used to investigate this matter is twofold. First, a graphic comparison between the estimates of

[24] On the contrary, BARTH M.J. - RAMEY V.A. (2001) believe that the evidence of a price increase following a monetary tightening is not puzzling once it is assumed that monetary authorities react to supply-side shocks and not only to demand shocks.

Ramaswamy and Slock and the new ones will be carried out. Second, a Chow test will be calculated in order to appraise the statistical significance of the differences previously found.

With regard to the first strategy (Table 9), what emerges is that the evidence of a "core" and a "periphery" group seems to be less strong. As regards the first group, the exceptions are Finland and the United Kingdom, which still show the highest and the most delayed responses. The Netherlands too remains in the "core" group showing a substantially unchanged response, even if the time lags have lightly diminished. As regards the "periphery" group, Portugal and Spain confirm their position, being their impulse-response functions not significantly different from zero. A further confirmation in this sense comes from Table 9, which shows that both countries keep their previous ranking.

TABLE 9

RANKING OF EUROPEAN COUNTRIES ACCORDING TO THE GDP RESPONSE

RAMASWAMY R. - SLOCK T. (1998)		Updated estimations	
Full effect*	Time lag of the full effect**	Full effect	Time lag of the full effect
1. Spain	1. Sweden	1. Portugal	1. Sweden
2. Denmark	Denmark	Spain	2. Germany
3. France	2. Spain	2. Austria	3. Denmark
Italy	3. Italy	3. Germany	4. Austria
Portugal	4. France	4. Belgium	5. Italy
4. Netherland	5. Portugal	Italy	6. Belgium
Austria	6. Belgium	5. Denmark	7. Netherland
5. Sweden	7. Finland	France	8. France
Germany	8. Germany	Netherland	9. Finland
6. United Kingdom	9. United Kingdom	6. United Kingdom	United Kingdom
7. Belgium	10. Austria	7. Sweden	
Finland	11. Netherland	8. Finland	

Source: Our calculations, RAMASWAMY R. - SLOCK T. (1998).
* In absolute values and in increasing order.
** In increasing order.

From Table 9, what emerges is also the case of Germany, which had a strong reduction both in the full effect and in the time lags it takes to occur. The same considerations can be done for Austria, in particular as regards time lags. On the contrary, Italy kept the full effect substantially unchanged but it experienced an increase in the time lags necessary for it to occur. By contrast, Sweden did not show changes in the time lags but it had an increase in the intensity of the monetary policy effect.

Finally, what comes out from the previous analysis is that Germany and Austria are those countries which experienced substantial changes in the impulse-response functions more than the others. In the next paragraph, this conclusion will be compared to those drawn from the Chow test.

3.4 *The Chow Test*

Assessing the structural stability of a VAR model through the Chow test is more complicated than in the univariate case, because it involves comparing a system of equations, not just a single one, on the basis of two different sub-samples. In fact, the point is that the possible acceptance of the null hypothesis for every single equation does not guarantee the structural stability of the whole model. The way out is to resort to a likelyhood ratio test, given by the following formula:

$$(1) \qquad LR = n \cdot [\ln(det(\sum{}^{l})) - \ln(det(\sum{}^{v}))] \rightarrow \chi^2_p$$

where $det(\sum^{l})$ is the covariance matrix determinant of the unconstrained model, $det(\sum^{v})$ is that of the constrained model[25] and n is the number of observations. The distribution of the test is a χ^2 with degrees of freedom equal to the number of parameters to be annulled.

[25] The unconstrained model is the VAR which has just been estimated. The constrained one, instead, is a model to which two more variables have been added, namely a dummy variable (taking value 1 for all the observations following the structural break and 0 for the remaining ones) and an other one obtained by multiplying the regressors of the unconstrained model by that dummy.

Besides these technical considerations, the estimate of a Chow test requires the identification of a supposed date of break. To the present analysis, it is quite difficult to define the date of birth of the Euro because the adoption of the common currency required a long process of macroeconomic convergence. Therefore, the way out has been to estimate the Chow test referring to an intermediate date between 1992, when the Maastricht Treaty was signed, and 2002, when the Euro actually came into circulation. In particular, the 1997:2 was chosen as supposed date of break.

Table 10 shows the results. The conclusions drawn from the graphic comparison seem to be confirmed for Austria and Germany, for which in fact the hypothesis of a structural break is accepted. Moreover, the null hypothesis is refused also for Sweden and Portugal, in contrast with the result found from the previous analysis as regards the latter. However, it should be specified that the scanty number of available observations could have affected the results. On the contrary, the result for Sweden seems to be in line with the intensification of the real GDP response, for which this country is placed two positions higher in the ranking with respect to the estimates of Ramaswamy and Slock.

Subsequently, the hypothesis of structural break has been tested considering two more dates of break, in order to check the robustness of the results. In particular, the time series have been split at the third quarter of 1996 and first quarter of 1998. Consistent with the previous results, the Chow test refuses the null hypothesis for Austria, Germany and Sweden, for which it is reasonable to state that the impulse-response functions had a break caused by the adoption of the Euro. With regard to Portugal, on the contrary, the null is refused again at the first quarter of 1998 but not at the third quarter of 1996. However, it should be specified that the *p-value* is close to 5% and, therefore, the result is not at all decisive also because the null is accepted at the other dates. The hypothesis of a structural break is definitely refused for the rest of the countries. Therefore, consistent with the graphic comparison are the results found for Finland and the United Kingdom, which were believed to remain in the "core" group.

Finally, it is possible to state that the adoption of the Euro

TABLE 10

RESULTS OF THE CHOW TEST

	1996Q3				1997Q2				1998Q1			
	χ^2	D.F.	P-VALUE	BREAK	χ^2	D.F.	P-VALUE	BREAK	χ^2	D.F.	P-VALUE	BREAK
Austria	75.1553	30	0	yes	77.9616	30	0	yes	67.1657	30	0.00012	yes
Belgium	19.0176	21	0.585	no	17.0117	21	0.7111	no	16.944	21	0.769	no
Denmark	22.0096	21	0.399	no	24.8047	21	0.293	no	27.3472	21	0.17	no
Finland	15.8088	21	0.822	no	16.6767	21	0.769	no	16.9848	21	0.769	no
France	28.6439	30	0.57	no	22.4278	30	0.854	no	22.4564	30	0.854	no
Germany	49.2459	30	0.015	yes	48.113	30	0.0198	yes	63.5129	30	0.0003	yes
Italy	23.5392	21	0.343	no	17.809	21	0.711	no	16.1952	21	0.759	no
Netherland	44.3297	30	0.047	yes	40.2646	30	0.104	no	41.0181	30	0.086	no
Portugal	30.7836	21	0.091	no	37.3912	21	0.016	yes	50.5512	21	0.0003	yes
Spain	21.1008	21	0.458	no	14.8322	21	0.869	no	10.8576	21	0.978	no
Sweden	72.096	21	0	yes	64.232	21	0	yes	61.3248	21	0	yes
United Kingdom	7.1296	21	0.998	no	4.8315	21	0.999	no	6.8992	21	0.999	no

Source: Our estimations.

caused a structural break in the impulse-response functions of Austria, Germany and Sweden[26].

4. - Concluding Remarks

This paper dealt with monetary policy transmission mechanisms, a topic to which researchers showed a rising interest contemporaneously with the process of monetary unification in Europe. In such a new and heterogeneous framework, in fact, understanding how monetary policy is transmitted to real variables becomes a fundamental prequisite. This occurs mainly because of doubts about the feasibility of a *one size fits all* monetary policy in such a context, which therefore needs to be assessed, and because the adoption of the Euro was likely to cause a structural break in the behaviour of economic agents. Therefore, this paper was aimed at investigating both these matters, once a theoretical survey of transmission mechanisms had been introduced.

With regard to feasibility, the main conclusions drawn from the first section were that the transmission mechanisms recognized by the *lending view*, opposite to those identified by the *money view*, involve asymmetric effects of monetary policy. On the contrary, this implication emerged from the second section independently of the theoretic background of the transmission mechanisms. In fact, it was related to the heterogeneity of the context where monetary authorities operate, in terms of the business cycle, the legal system, the financial, goods and labour markets. Therefore, an analysis of these factors within the EMU was carried out in order to assess the feasibility of a EMU-wide level monetary policy. However, the results did not make possible to identify those countries obtaining the greatest advantages or disadvantages, but only to recognize those where transmission mechanisms were expected to produce their maximum effect.

[26] With regard to Sweden, however, it must be stressed that the evidence of a structural break, as well as the increase in the intensity of monetary policy effects on GDP (See par. 3.3), can hardly be interpreted as a consequence of the ECB' policy because Sweden did not join the EMU.

Therefore, it was necessary to estimate a VAR model in order to find the response of both real GDP and price level to monetary policy shocks for each EMU country, as well as for Sweden, Denmark and the United Kingdom for a comparison. Being rarely significant and showing evidence of the "price puzzle", the price responses did not seem to be suitable for a comparison, which in fact was carried out on the basis of the real GDP response. As expected, there is evidence of asymmetries in terms of both the full effect and, especially, the time lag they take to occur. Finland emerges as the country where monetary policy produces the highest effect which, at the same time, takes the longest lag to occur. On the contrary, the real GDP response to an interest rate shock is not significant in Spain and Portugal. Finally, Belgium and Italy show the responses closest to the EMU average.

At this point, it is possible to appraise the consistency of the results found in Sections 2 with those in Section 3. What emerges is that the expectations are substantially confirmed, except for Germany, the Netherlands and France. In fact, Finland, Italy and Belgium, that is those countries where at least two channels were likely to produce their maximum effect, show real GDP responses close to, or higher than, the EMU average. On the contrary, Germany has one of the weakest responses even if there were three channels expected to impact more strongly. By contrast, the The Netherlands and France show real GDP responses close to the EMU average although there were no channels likely to produce their maximum effect. As expected, the responses found for Austria, Portugal and Spain are the weakest within the EMU countries.

With regard to the hypothesis of structural break, the strategy was to carry out a graphic comparison between the estimates of Ramaswamy and Slock and the updated ones, as well as to calculate a Chow test for the impulse-response functions. In both cases, there is evidence of a structural break for Austria and, surprisingly, for Sweden and Germany. In fact, Alesina and Grilli (1993) believed that it was necessary to allow this country favourable treatment in order to induce it to join the EMU[27].

[27] This because the bargaining power Germany had, being the country with the lowest inflation rate, made it indifferent to whether joining the EMU or not.

Moreover, Rotondi Z. and Vaciago G. (2003) identify this favourable treatment with the choice of ECB to follow the *Bundesbank* reaction function[28]. With regard to Sweden, instead, the result seems puzzling because the exercise of monetary policy is still on the responsibility of national authorities. It would be worth, therefore, to analyse the reasons of the structural breaks found for those two countries.

Referring to the conclusions drawn by Ramaswamy R. and Slock T. (1998), finally, it is possible to state that the *one size fits all* monetary policy still produces asymmetric effects, which are not so deep as to make the task of ECB a challenging one, however. In fact, that of asymmetries in the monetary policy transmission is a problem that National Central Banks had to cope with before the EMU was established. Moreover, the process of European integration is likely to cushion those factors causing asymmetric effects.

[28] Authors find that the interest rates estimated according to ECB reaction function are closer to the actual ones when considering German data instead of EMU ones. Moreover, they find no evidence of structural break in the Bundesbank reaction function.

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