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ABSTRACT

An EMU with Different Transmission Mechanisms*

We develop and compute a dynamic equilibrium model where economies differ on the relative efficiency of financial intermediaries and, therefore on households portfolios and currency holdings. Our model economies have some of the features of the different financial structures in countries of the European Union and respond to monetary shocks in a way similar to the observed responses, which we also estimate. It follows that if differences on the relative efficiency of financial intermediaries persist in a monetary union, conflicts of interests in the pursuit of a common monetary policy can arise.

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NON-TECHNICAL SUMMARY

In spite of the high level of economic and financial integration in Europe in the last ten years, there are still marked differences across countries regarding: (1) efficiency of the banking sector; (2) portfolios holdings and firms' financing, and (3) output and price responses to monetary shocks. This paper develops an equilibrium model with limited participation, which is consistent with these three facts.

In the paper, we study two economies (which can be identified with Germany and France) differing for the degree of efficiency of the banking sector (fact 1). As a result, agents in the two countries hold different portfolios and firms are financed with a different mix of debt and equity (fact 2). When we calibrate the model for the two economies, impulse responses to a monetary shock differ in a way similar to the observed impulse responses for Germany and France (fact 3).

We then study the effect of integrating these two economies in a Monetary Union. We find that, when countries are in a monetary union, and to the extent that the differences in the financial systems persist (likely to happen in the first stage of EMU), endogenous preferences for monetary policy may be even more diverse than when countries are separated. In particular, the same monetary policy gives rise to redistribution effects not present if countries were more isolated.

Finally, we estimate VAR for France and Germany over the period 1973–97 and we show that the output responses to monetary shocks are very similar to the theoretical reactions derived from our model and similar to other existing results.

1 Introduction

The transmission mechanism of monetary policy may be defined as the ways in which monetary impulses from the central bank affect output and prices. Changes in monetary policy are transmitted to the real economy through various channels, each of them can consist of several stages. Hence, national transmission mechanisms are likely to be different: different channels may be at work in different countries and the intensity by which a monetary impulse is transmitted can vary, even substantially. But differences in national monetary transmission processes between European countries, in turn, are likely to affect the magnitude and timing of the price and output effects of alternative monetary policies of the European Central Bank (ECB). They may also have implications for the scope and nature of policy coordination in the current state and for evaluating possible benefits of joining a monetary union for individual countries. Hence, even in the absence of cyclical divergences and differences in policy preferences across countries, the stance of monetary policy to be followed by the ECB can be a source of conflicts between member states of EU. This, in turn, may imply a decrease of support for the monetary policy of the ECB[1].

In what follows, we do not enter the debate on the relative importance of the different channels of transmission of monetary policy. We believe that monetary policy affects output and prices (at least in the short to medium run) and may do so through different channels, not mutually exclusive, simultaneously at work and likely to reinforce each other. Our aim is to focus on the fact that a certain (common) monetary stance may have different macroeconomic consequences from one country to another. While the existing literature has mainly analyzed partial equilibrium models emphasizing specific channels or, when approaching the issue in a general equilibrium framework, has concentrated on liquidity effects, we show that the differences in the speed and magnitude of a monetary impulse into economic activity depend on differences in the financial structure, on different role of financial institutions and on different portfolios composition of households and firms in different countries as well as on different liquidity constraints. In this framework, when (or if) a common monetary policy is implemented (and to

[1]For instance, the ERM crises of 1992-93 highlighted cross-country differences in the monetary transmission mechanism which seemed to substantially affect the cost of maintaining the parities.

the extent that the effects of it are different for different countries) unwanted distortions and/or conflicts may arise.

An empirical (statistical) examination of the role of banks, stock markets and portfolios compositions of the European economies suggests that they differ significantly in many ways. First of all, in some European countries (e.g. UK) markets for privately issued debt and stock markets are highly developed, so that bank credits are (almost) perfect substitutes for bonds, while in others (e.g. Italy and Germany) these markets are less developed and bank credit and loans cannot be seen as substitute sources of financing. This can substantially affect the liquidity of markets and the ways in which a money injection (or reduction) is translated into households and firms. There are also differences in regulations, in procedures, in the relative use of short term versus long term financing, in the relative share of fixed versus floating rates, in the degree and composition of indebtedness of firms, households and governments. Also, the financial structure of the different countries has evolved differently in the last two decades, with changes in the competitiveness of the banks and growth of non bank financial intermediaries in some countries but not in others, with different evolution of stock markets and changes in the composition of assets and liabilities of households and firms. At the same time, mainly in the last decade, capital markets have become more integrated and some EU countries (e.g. France and Italy) have been compelled to lift previously operating administrative controls.

There are, of course, some areas where convergence is likely at the outset of a Monetary Union. First of all, the convergence of inflation rates should lead to a more uniform pattern of short-term versus long term financing across countries, at least to the extent that these differences have emerged as a result of different inflation records; also the increased competition across financial intermediaries should imply that the pass-through of changes in market rates to lending rates should become more similar. We maintain that some structural differences will stay; the transmission of monetary impulses to the real activity and the distribution of gains and losses amongst EMU members is likely to depend on these differences.[2]

Our aim is to capture some of the existing differences in the financial structure and portfolios compositions of European countries in an equilib-

[2]Of course differences exist also within the national borders. They tend, however, to be smaller, since between countries there are more differences in regulations and institutions.

rium model where economies differ for the relative efficiency of the financial intermediaries (i.e. households portfolios and currency holdings) and to study the implications of a common monetary policy for different economies under two different regimes: with and without a Monetary Union. We find that the same monetary policy gives rise to redistribution effects, not present when countries are isolated.

The paper is organized as follows: Section 2 presents some stylized "-facts" emphasizing the heterogeneity of financial markets in 4 big European countries: Germany, France, Italy and the UK. Section 3 outlines a simple dynamic equilibrium model which allows to account for (at least some of) the detected differences and analyze the consequences for the transmission mechanism of monetary policy. It is an overlapping generation model with cash in advance constraints. A monetary expansion induces a decrease of the interest rate and an expansion of output through a substitution of consumption of cash and credit goods and revisions of plans about deposits and assets holding. The different efficiency of the banking system implies different liquidity constraints across countries, so that the degree of substitution and therefore the real effects are different. Contrary to most G.E. models, using this framework, we get persistence of an independent shock. Section 4 calculates the theoretical impulse responses for an interest rate shock, under different scenarios (autharkic countries, Monetary Union, the same and different cash/deposit ratios). Our model economies, which we call for convenience France and Germany, have some features of the true financial structure of France and Germany and respond to shocks in a way similar to the observed response. Section 5 presents some VAR estimates of the effect of an interest rate shock on output of France and Germany over the 1973-97 period and Section 6 concludes. The Appendix contains the description of the data set and unit root tests on the variables used in the VAR estimation.

2 The heterogeneity of European financial markets: Some stylized "facts"

Despite the implementation of the single market from 1992, despite all the changes brought about by deregulation, capital liberalization and technological innovation in the last two decades, the financial systems of European

countries are still characterized by a high degree of heterogeneity. Furthermore, their convergence over time has been quite limited and some of the fundamental differences existing in the 1980s have survived all the changes. In the following we point out two related differences in the financial markets of France, Germany, Italy and the UK[3], which we believe can affect the transmission mechanism of monetary policy and therefore induce conflicts in the monetary policy decisions of the European Central Bank: the degree of development of financial markets and portfolio decisions of households, firms and institutional investors.

2.1 The degree of development of financial markets:

There are two main channels through which funds flow from savers to ultimate borrowers within each economy. Savers can invest directly, through the purchases of securities such as stocks or bonds issued by a non financial corporation (direct finance) or their flow of savings can be intermediated by financial firms (indirect finance). Direct finance takes place in capital markets. The prevalence or absence of financial intermediation in a national economy structures the relationships within the private sector.

European countries are very different with respect to the mix of direct and indirect finance that characterizes their financial systems. According to European Economy (1997) "This is mostly explained by the relative role of domestic banking: countries with high financial intermediation equally show a high degree of banking intermediation" (p.10). As shown in Table 1, Germany is characterized by a much higher degree of financial intermediation (more than 50%) and bank intermediation (above 80%) than any other European country. Because of the dominant role of bank intermediation, many financing demands which could be met by bonds or equities are provided by bank loans. Accordingly (or because of) the most efficient banking sector amongst European countries -no matter what criteria is used to assess efficiency[4] is in Germany. The existing data, not fully harmonized and there-

[3]While here we concentrate on these four countries, Gennari and Giovannetti, 1998 provides data on the financial structures, liquidity constraints and portfolio choices for 15 EU countries. It must be noticed that, in Europe, there is also a significant heterogeneity regards the links between the central banks and the financial sector, cf. Giovannetti and Marimon, 1995.

[4]Different crietria can be applied to assess the efficiency of the banking sector. Gual

fore to be used with caution, show that classical banking intermediation (i.e. taking deposits from consumers and making loans to people and firms) is still the main channel of saving and investment in all EU countries. However, there are relevant differences in the use of loans versus shares, which reflects differences in market capitalization. In Germany, security markets are underdeveloped with respect to other major EU countries (namely France and the UK, see Table 1). In1995, stock capitalization represented only 29% of GDP in Germany versus almost 150% of GDP in the UK (it was 39% in France, and 22% in Italy, see again table 1). The number of firms quoted in the stock market is much larger in the UK and in France (both in terms of consistency and new quotations) than in Germany and Italy and new issues are particularly low in Germany[5]. As a result, equities issues by firms are a significant share of GDP in the UK and France (respectively 65 and 70% in 1994) but almost irrelevant in Germany (25% in 1994)[6]. It must be also noted that most European stock markets mainly trade domestic equity and that financial integration has not changed this type of segmentation. Only in London foreign shares are usually traded (2/3 of total trading in London is foreign shares, which amounts to around 95% of total EU trading in foreign shares).

Table 1 here

2.2 Portfolio decisions

The different mix of direct and indirect finance reflects in portfolio decisions of the private sector. Even though, as far as *households* are concerned, the share of deposits over gross assets has fallen everywhere in the last twenty

and Neven (1993) suggest to evaluate the staff costs per deposit, which give information on the cost side of intermediation, or the net interest income per deposti, which also allows to account for possible lack of competition.

[5]In Germany the capital market was fragmented into eight independent regional stock exchanges till fairly recently and this can at least partially explain the differences in the degree of stock market capitalization. Also, German banks conduct both direct and indirect finance and have therefore made the capital markets largely endogenous to the banking system. To the extent that industries have access to the securities market, their access has been governed by banks.

[6]There also seems to be a correlation in the 4 European countries between equity market capitalization and the size of financial institutions, but a discussion of this issue is outside the scope of this paper. Cf. Davis, 1996.

years (table 2), the extent of the fall is very different: in Germany deposits were 59% of gross assets in 1980 and still constitute 45% of households financial assets in 1994, while, for instance in France they dropped from 59% to 32% and in Italy from 58% to 29% (households savings has been fairly stable in this period, despite cyclical fluctuations). While bonds have remained fairly constant between 1980 and 1994 (see Table 2), direct securities holding have been in general declining (France represents an exception). Transactions costs in securities markets (including the bid-ask spread) makes it difficult for households of average means to diversify via direct securities holdings especially because liquidity is low in the case of direct holdings. Hence a feature of UK, Germany and Italy has been that the share of households portfolios held in the form of securities has tended to decline (table 2) while the proportion of equities and bonds held via institutions has tended to increase (see again table 2). Only in France direct holding of securities passed from 14% in 1980 to 32% in 1994 (possibly because of a successful privatization process), with institutional investors also increasing their weight (from 7% to 29%). This seems to indicate that in France households tend to directly supply funds to the ultimate borrower even if this means to bypass the financial sector.

Table 2 here

As far as *non-financial firms* are concerned, there has been an overall increase in financial liabilities in the last two decades which has been covered with different mix of debt and equities. The existing data (OECD financial accounts statistics) show particularly large differences in the use of loans versus shares (see Table 3). Loan financing is particularly high in Germany and substantially lower in France and the UK (when considering loans as proportion of gross financial assets, respectively (50%, 28% and 12%). Hence, the role played by German banks in lending to non-financial corporations is substantially bigger[7]. Furthermore, over time, the loan ratio declined substantially in the UK and remained fairly constant in other European countries. The equity ratio, on the other hand, has risen everywhere except in Germany, reaching the remarkable value of 70% in France and 65% in the UK, while staying at a mere 25% in Germany.

Table 3 here

[7]In 1991 more than 60% of bank loans were provided in a long term form in Germany, while the same figure was around 50% for the UK, cf. OECD Non-Financial Entrerprises Financial Statements, 1991.

Structure of equity holdings, however, has tended to move away from the household sector and towards institutional investors everywhere apart from France, where, as we said, households hold directly substantial shares of equities (see Table 4). In Germany, for instance, financial institutions own 30% of the total amount outstanding (14% are directly owned by banks and the remaining 16% by other financial institutions)[8].

Table 4 here

2.3 Monetary aggregates

Per capita currency holding (expressed in common currency, i.e. dollars) differs substantially amongst European countries despite similar levels of development[9]. Germany has a much higher figure than other European countries (with the exception of Switzerland), possibly because of the large holdings of DM abroad. Theoretically, the currency holding should decrease over time as a result of financial innovation and use of electronic money, but in Germany if anything, currency holding has increased.

Composition of monetary aggregates also varies substantially in Europe. For instance, the ratio of cash to the different measures of money supply (respectively, M1, M2 and M3) is higher in Germany[10] (see Table 6) than in the other countries.

Also, official reserves are lower in France and the technical features of the reserve requirements differ significantly across countries, reflecting functional and structural differences between national financial systems. The main differences are reflected in the definition of bank liabilities (type and currency), the rates applied, and the existence and level of remuneration. In Germany for instance, a 5% reserve requirement is levied on sight deposits and 2% on

[8]Many bank customers, furthermore, keep their shares deposited with banks and allow banks to exercise voting proxies on their behalf.

[9]The presumption is that per capita currency holdings differs with different level of developments. In particular, less developed countries have a lower average level of currency holding, also because of unstable environment. However, the big differences existing between countries with similar levels cannot be explained merely by reference to differing payment habits and rates of inflation.

[10]It must, however, be noted that Eastern European countries use DM (and no other European currency) and this can impart a bias on the total amount of cash, cf. Seitz, 1995. Overall, Seitz concludes that roughly 40% of the German money supply is held abroad.

other types of deposits, without remuneration. In France, the ratio is 1% on sight deposits, and 0,5% on other types of deposits, also not remunerated. In Germany, the required reserves in 1994 were 1.3% of GDP and in France only 0.1%. This is likely to affect the costs of the intermediation.

Table 5 here

These different characteristics of the financial systems obviously reflect in empirical analysis of the transmission mechanism, but do not translate in clear-cut conclusions about the likely impact of a monetary shock. At the empirical level, in fact, the different characteristics of a country in terms of financial structure can have off-setting effects[11]. At the theoretical level, the work on the transmission mechanism has mainly focussed on limited participation models (see for all, Christiano et Al, 1997), without emphasizing the possibility of different financial structures.

Having in mind that the mix of direct and indirect finance is very different in the four major European countries, that the ratio cash to monetary aggregates also varies substantially, we propose a limited participation model where we allow for different ways of saving and firms' financing (which is the endogenous result of different efficiency of the financial sector across countries). This is the object of the next section.

3 A model with financial diversity

We develop a model that tries to incorporate some of the features that, as we have done in the previous section, can be identified as potential sources of diversity –and conflict– in the way that the Transmission Mechanism may work in the early stages of the EMU. The model is an *Overlapping Generations Model with Cash-in-advance* features. The OLG structure allows for alternative savings decisions. In particular, agents live for three periods, receive an endowment in their two initial periods and consume in their last two periods. They can diversify their portfolios between outside money (cash), bank deposits and equity, in the form of asset holdings of an underlying technology, that –after two periods– realizes a positive real return. There is no uncertainty and Cash-in-advance constraints guarantee that the

[11]For instance, sluggish adjustment of bank lending rates can protect firms from shocks but banks can ration credit (non price rationing) and amplify the effects of a shock.

–return dominated– outside money is being held by households. Nevertheless, economies may differ in the extent that goods must be purchased with cash. Agents can get a positive return on their savings by either making deposits in financial intermediaries or directly holding the two-period asset. Whether they directly hold assets depends on the relative efficiency of the banking system, another feature that will differentiate our economies. However, even with relatively inefficient banking systems, agents will typically use financial intermediaries to obtain one-period returns.

The financial intermediaries, resembling the behavior of banks, accept funds from households and return them to the household in the form of interest and principal payment. Financial intermediaries use their deposits (and, possibly, monetary injections) to purchase two-period assets (as if they were lending to firms). Given that they are infinitely-lived institutions they can provide households with one-period returns at a cost. Given that there is perfect competition in the sector, financial intermediaries' returns correspond to the outside asset return net of operating costs. Banks account for indirect channels of supply of funds; the stock market on the other hand, is an example of a direct channel, since it lets households to directly purchase assets. As in most developed economies, central monetary authorities deal primarily (uniquely, in our model) with financial intermediaries and, therefore, new money enters the economy by an injection from the monetary authority into the financial intermediaries. Government bonds and open market operations can easily be incorporated in our model but, for simplicity, we do not include bonds and we limit our analysis to the case an exogenous injection (subtraction) of cash to (from) financial intermediaries.

With respect to the stylized facts previously discussed, our model economies could represent, broadly speaking, France (and the UK) and Germany (and Italy). As we have seen in Section 2, in the former household directly hold assets (shares) and, in general, they do not channel a large part of their saving into deposits. In the latter, on the other hand, indirect channels are the norm. Households loan to the financial intermediaries their money and get in exchange a return.

3.1 Goods, assets, households and financial intermediaries

There is a continuum of consumption goods, exogenous endowments, and a real asset giving a return of R^2 after two periods[12]. Consumption goods only differ in the form on how they can be purchased. In fact, real assets and endowments can be –without costs and linearly- transformed into consumption goods, independently of their type. One can think of our economies as having goods in different locations where some locations (e.g. street vendors) only accept cash while others are willing to sell for what, effectively is, credit (e.g. stores that accept debit cards, checks or other forms of credit). In terms of consumption, however, the agent is indifferent on where the good is being purchased. An agent of generation t (born in period $t-1$) only values consumption in the last two periods of his life. That is, household's preferences are represented by

$$U(c_{1t}) + \beta U(c_{2t}) \tag{1}$$

where c_{1t} is –the average– consumption in the intermediate period of his life and c_{2t} of his last period. The utility from cash and credit goods is given by:

$$U(c) = \int_0^{\gamma} u(c_i)di + \int_{\gamma}^{1} u(c_i)di \tag{2}$$

where γ is the parameter indicating how goods can be purchased[13]. Goods in the range (location) $[0,\gamma]$ can only be purchased with cash while goods in the range $[\gamma,1]$ can also be purchased with credit[14].

In period $t-1$ an agent of generation t has the following budget constraint:

$$M_{1t} + D_{1t} + p_{t-1}a_t \leq p_{t-1}\omega_0 \tag{3}$$

[12] R^2 denotes the real return net of transactions costs. These can be different for financial intermediaries and for individual agents, as well as they can differ across different economies.

[13] We make the standard concavity and differentiability assumptions. That is, $u' > 0, u'' < 0$.

[14] As we have said, γ is one of the parameters that will differentiate our economies. It should be noticed that this formulation allows for a simple characterization of a richer transactions technology, by making γ endogenous (e.g. a function of effort and society's technology). Here, however, we consider γ an exogenous technological parameter.

where ω_0 is the first period's (average, i.e.,$\omega_0 = \int_0^1 \omega_{0i} di$)[15] endowment. Its value is allocated in a portfolio of cash, $M_{1t} \geq 0$, nominal deposits in financial intermediaries, D_{1t}, and holdings of the real asset, $a_t \geq 0$. In the intermediate period of his life, the agent faces the following budget and cash-in-advance constraints:

$$M_{2t} + D_{2t} + p_t \int_0^1 c_{1t} \leq M_{1t} + D_{1t} I_t + p_t \omega_1 \tag{4}$$

$$M_{1t} \geq p_t \int_0^\gamma c_{1t} \tag{5}$$

where I_t is the nominal return on (positive) deposits. Notice that we already imbedded in these definitions the fact that all goods face the same prices, as well as the fact that the agent has no interest in purchasing two-period assets in the intermediate period of his life. Finally, in the last period of his life, the agent faces constraints

$$p_{t+1} \int_0^1 c_{2t} \leq M_{2t} + D_{2t} I_{t+1} + p_{t+1} a_t R^2 \tag{6}$$

Agents can also borrow from financial intermediaries. However, an agent borrowing from a financial intermediary faces a higher interest rate. Such spread corresponds to financial intermediaries costs, which are discussed below. In the class of equilibria that we study agents do not borrow. Notice that generations overlap for two periods. When generation t-1 decides how much to consume of respectively cash and credit goods (i.e. how to allocate the endowment ω_1), generation t gets an endowment ω_0 and decides how much to deposit and how much to invest in real assets.

3.1.1 Financial intermediaries

In the model financial intermediaries accept loans from households, which are repaid at the end of each period at a market interest rate, and purchase assets. Alternatively, the purchase of assets can be viewed as loans to private firms that pay back –after two periods– a real return. Financial intermediaries also

[15]For simplicty of exposition, we will denote integrals simply as $\int_0^1 \omega$ from now on.

receive new cash injections from the monetary authority[16]. The balance of financial intermediaries, in absence of money injections, can be written as:

$$D_{t+1} = p_t a^b_{t+1} \tag{7}$$

where a^b_{t+1} denotes assets in the hands of banks, $d_{t+1} = \frac{D_{t+1}}{p_t}$ denotes deposits in real terms and $D_t = D_{1,t} + D_{2,t-1}$, i.e. total deposits in period $t-1$ are given by the sum of generation t first period deposits and generation $t-1$deposits in their intermediate period.

We consider the following financial intermediation technology. First, financial intermediaries can obtain a two-period return $(R+\theta_1)^2$ from (borrowing to) private firms. $\theta_1 \geq 0$ denotes the technological advantage of financial intermediaries with respect to households. Second, financial intermediaries can transform a two-period asset into a one-period asset, with return $(R+\theta_1)$ at a real cost $\theta_2 + \theta_3$, where θ_2 corresponds to the cost of making the asset more liquid and θ_3 to the cost of handling the one period asset. In other words, the financial intermediation technology generates one-period assets with a real return $(R-\theta)$, where $\theta = \theta_2 + \theta_3 - \theta_1$, from the existing two-period assets. The relative efficiency of different financial communities will be represented by differences in θ. The cash flow of financial intermediaries (CF) can, therefore, be written as:

$$CF_t = p_t a^b_t R - p_t a^b_{t+1} + D_{t+1} - D_t I_t - p_t a^b_t \theta \tag{8}$$

Since there is free entry in the financial intermediation sector, the zero profit condition implies that:

$$a^b_t(R-\theta) = \frac{D_t}{p_{t-1}} \frac{p_{t-1}}{p_t} I_t \equiv d_t R^d_t$$

i.e., $R^d_t = R - \theta$, where R^d_t is the one-period real return on (real) deposits.

As we said, households can borrow from financial intermediaries, signing one-period debt contracts. In such a case, they will face the nominal rate $I_t + \pi_t \theta_3$. We *assume* that $\theta_1 \geq \theta_2$ which guarantees that, even when $\theta < 0$,

[16]For simplicity we do not include government bonds into financial intermediaries' balance sheets. This can be done without any difficulty (the standard non-arbitrage conditions will equate the returns of different assets in circualtion) and will allow for government's open market operations.

households will not borrow to finance the purchase of assets, since $R_t^d + \theta_3 = R + \theta_1 - \theta_2 \geq R$; the last inequality following from our assumption.

3.1.2 Monetary policy

We consider a very simple class of monetary policies. At the beginning of the initial period 0 agents of generation 0 are endowed with per-capita money holdings of M_1 and agents of generation -1 with per-capita money holdings of M_2. Money supply is constant thereafter, although we will consider the experiment of unexpectedly increasing (decreasing) the money supply by X_{t+1} in period t. This is done through financial intermediaries. In such a case, their consolidated balance sheet is $D_{t+1} + X_{t+1} = p_t a_{t+1}^b$. That is, financial intermediaries can purchase (or sell) assets with the proceeds (the claims) of the Central Bank and return, the following period, $(D_{t+1} + X_{t+1})I_{t+1}$ to depositors. To maintain the deterministic nature of our model we will only consider "once and for all surprises."

3.1.3 The initial period

Notice that in our economies there is not enough to characterize the initial distribution on money holdings, we must also characterize the initial distribution of assets and deposits. We assume that at the beginning of the initial period agents of generation 0 have real claims in financial intermediaries of $d_{1,0}$ giving them a real return $d_{1,0}R_0^d$. Similarly, agents of generation -1 start period 0 endowed with assets $a_{-1}$and deposits $d_{2,-1}$, giving them returns $a_{-1}R^2$and $d_{2,-1}R_0^d$, respectively. Finally, financial intermediaries start period 0 endowed with a_{-1}^bassets and satisfy their commitments on initial deposits $d_0 = d_{1,0} + d_{2,-1}$. As we will see, stationary equilibria can be easily characterized; however, their existence requires an appropriate initial distribution of assets and deposits. For example, we will consider economies where $a_{-1} = 0$ and economies where $d_{2,-1} = 0$. Alternatively, it can be shown that, given an initial distribution of assets and deposits, the economy converges to a stationary equilibrium from period one on.

3.2 Monetary equilibria in a closed economy

A monetary equilibrium is achieved, for a given initial distribution $(M_1, M_2, d_{1,0}, d_{2,-1}, a_{-1}, a^b_{-1})$, when there are prices $(p_0, \{\pi_t, I_t\}_{t=1}^{\infty})$, such that (i) financial intermediaries choose asset holdings and supply deposits, $\{a^b_t, D_t\}$ that maximize profits, under a free-entry condition;(ii) households choose consumptions and portfolios $\{c_{1,t}, \tilde{c}_{1,t}, c_{2,t}, \tilde{c}_{2,t}, M_{1,t}, M_{2,t}, D_{1,t}, D_{2,t}, a_t\}$[17] that maximize their utility subject to their budget, and cash-in-advance, constraints and, finally, (iii) all markets clear. In particular, feasibility in the goods market requires that:

$$\gamma c_{1,t} + (1-\gamma)\tilde{c}_{1,t} + \gamma c_{2,t-1} + (1-\gamma)\tilde{c}_{2,t-1} + a_{t+1} + a^b_{t+1} = \omega_0 + \omega_1 + a_{t-1}R^2 + a^b_t R^d_t \tag{9}$$

In order to characterize equilibria, notice that from the first order condition of the households maximization problem we obtain different solutions depending on whether assets returns dominate deposits or vice-versa because depending on the sign of θ agents will decide to directly purchase assets (if $\theta > 0$), in which case they will not hold second period deposits (i.e., $D_{2,t} = 0$), or they will put all their savings into financial intermediaries (i.e., $a_t = 0$ if $\theta > 0$). To distinguish among these economies, we will denote by *economy A*, an economy where *Assets returns dominate deposits* and by an *economy B* one where consumers *prefer Banks to the stock market* as a way to channel their savings.

In an economy of type A ($\theta_A > 0$), we get the standard condition equating the marginal rate of substitution between cash and credit goods (of period one) to the nominal interest rate (the cost of assigning part of the portfolio to an intermediary is the lost liquidity of not holding cash and the gain is the interest that can be used for future purchases):

$$\frac{u'(c_{1,t})}{u'(\tilde{c}_{1,t})} = I^d_t \tag{10}$$

where, from now on, $\tilde{c}$ denotes a credit good and c a cash good. However, for period 2 we get:

[17] Since consumers decide to consume the same quantities of all the cash goods of one period, and similarly for credit goods, we denote by $c_{1,t}$ the generation t consumtion of cash-goods in their interemediate period and $\tilde{c}_{1,t}$ the consumption of credit goods for the same period, etc.

$$\frac{u'(c_{2,t})}{u'(\tilde{c}_{2,t})} = I^d_{t+1}\left[\frac{R}{R-\theta}\right]^2 \tag{11}$$

On the other hand, in an economy of type B ($\theta_B \leq 0$), we get the standard condition for both periods:

$$\frac{u'(c_{k,t})}{u'(\tilde{c}_{k,t})} = I^d_{t-1+k},\ \text{k=1,2} \tag{12}$$

We obtain the following intertemporal Euler equations, respectively for economy B and economy A:

$$u'(\tilde{c}_{1,t}) \geqslant \beta u'(\tilde{c}_{2,t}) R^d_{t+1} \tag{13}$$

$$u'(\tilde{c}_{1,t}) \geqslant \beta u'(\tilde{c}_{2,t}) R^2 (R^d_t)^{-1} \tag{14}$$

Furthermore, as we have seen, competition in the financial intermediation sector implies that $R^d_t = R - \theta$.

To simplify the analysis, we consider the case of a log utility: $u(c) = log(c)$.With a logarithmic utility function demands take a simple form. Let $W = \frac{\omega_0 + \omega_1 (R-\theta)^{-1}}{(1+\beta)}$, then in economy A generation t has the following demands

$$\begin{aligned}
c_{1,t} &= W_A \pi_t^{-1}; \quad \tilde{c}_{1,t} = (R-\theta_A) W_A; \quad c_{2,t} = \beta (R-\theta_A) W_A \pi_{t+1}^{-1} \\
\tilde{c}_{2,t} &= \beta R^2 W_A; \quad d_{1,t} = \omega_0 - [(1-\gamma_A)\beta + \gamma_A] W_A; \quad d_{2,t} = 0; \\
a_t &= (1-\gamma_A)\beta W_A; \quad m_{1t} = \gamma_A W_A \quad \text{and} \quad m_{2t} = \gamma_A \beta (R-\theta_A) W_A
\end{aligned}$$

Substituting for consumptions, assets and deposits expressed in the feasibility constraint (9) we obtain an equation in one variable, namely the inflation rate:

$$M(\pi_t^{-1} - 1) = 0 \tag{15}$$

where $M_A = \gamma_A W_A [1 + \beta(R - \theta_A)]$. Notice that for $\theta_A \in (0, R)$, (15) has a solution $\pi_t = 1$, for $t \geq 1$, showing that there is a unique monetary equilibrium which is stationary from period one on.

Similarly, for economy B we obtain the following demands

$$\begin{aligned} c_{1,t} &= W_B\pi_t^{-1}; \quad \tilde{c}_{1,t} = (R-\theta_B)W_B; \quad c_{2,t} = \beta(R-\theta_B)W_B\pi_{t+1}^{-1}; \\ \tilde{c}_{2,t} &= \beta(R-\theta_B)^2W_B; \quad d_{1,t} = \omega_0 - \gamma_B W_B; \quad d_{2,t} = (1-\gamma_B)\beta(R-\theta_B)W_B \\ a_t &= 0; \quad m_{1t} = \gamma_B W_B \quad \text{and} \quad m_{2t} = \gamma_B\beta(R-\theta_B)W_B \end{aligned}$$

and (15) also characterizes the equilibrium inflation rate, $\pi_t^* = 1$, $t \geq 1$.

3.3 Open economies with segmented financial sectors

If an economy A and an economy B have a common market, but financial disparities are maintained and -consistently with the well known "home bias puzzle"- consumers tend to use their home financial institutions, then the situation is similar of that of two independent closed economies. To see this, consider a flexible exchange regime within the countries and that the cash-in-advance constraints must be satisfied with the domestic currency. Furthermore, assume that, in spite of the single market, there is a cost θ_4 from operating across borders, such that $\theta_B + \theta_4 > \theta_A$ (and financial intermediaries maintain the same domestic cost structure with no arbitrage opportunities). Then, as long as $\pi_{Bn}^{-1} < (R-\theta_A)$ and $\pi_{An}^{-1} < (R-\theta_B)$, $n = t, t+1$, generation t demands are as in the close economy case and monetary equilibrium inflation rates are solutions to

$$M_A(\pi_{At}^{-1} - 1) + M_B(\pi_{Bt}^{-1} - 1) = 0$$

In particular, the stationary solution is $\pi_{At} = \pi_{Bt} = 1$ defines a monetary equilibrium for the flexible exchange regime. Notice, however, that there is a continuum of equilibria given by

$$\frac{\pi_{At}^{-1} - 1}{\pi_{Bt}^{-1} - 1} = -\frac{M_B}{M_A}$$

satisfying the above restrictions on asset return dominance. These solutions, however, involve a trade imbalance, and a corresponding permanent devaluation of one of the currencies. We will focus in the stationary equilibrium that parallels the closed economies case.

3.4 Monetary Union equilibria (with segmented financial sectors)

We finally consider the case in which countries A and B form a monetary union, but "national," or "regional," disparities persist. That is, "trans-national" (or "trans-regional") financial transactions are subject to the cost θ_4. We can also consider that, even if all consumers in the monetary union can satisfy their cash-in-advance constraints with the common currency, there may still persist differences regarding the range of goods that can be purchased with credit; that is, γ_A and γ_B may differ. As in the flexible exchange regime with segmented financial markets, demands are as in the closed economies case. In particular, monetary equilibrium inflation rates for the MU are solutions to

$$[M_A + M_B](\pi_t^{-1} - 1) = 0$$

As in the case were both countries are separate, stationary output will differ across countries even if they have the same underlying (asset) technologies, endowments and preferences, but they maintain their differences regarding the efficiency of the financial intermediation sector.

4 Unexpected monetary shocks

We now consider a monetary expansion [contraction] taking the form of a once-and-for-all monetary injection [absorption] X_{t+1} in period t. We consider first the case of independent countries (which also characterizes the stationary equilibrium of the common market with flexible exchange rates) and then the case of a monetary union. As it is well known, the effects of monetary policies (in models of limited participation and in real economies) depend on the "when and how" monetary interventions take place. By a monetary injection in period t we mean a unexpected monetary intervention that takes place after period t decisions have been made. In our model, the monetary injection is done through the financial intermediaries, which have the following consolidated balance sheet

$$D_{t+1} + X_{t+1} = p_t a^b_{t+1}$$

That is, financial intermediaries purchase [sell] assets (make loans) and the proceeds are paid back to the depositors who –on aggregate- receive a return

$(D_{t+1} + X_{t+1})I$. The effects of an identical monetary shock will be different depending on the type of financial structure; i.e., whether the economy is a type A economy, a type B economy or a *monetary union* (of a country of type A and a country of type B). In particular, we are interested in how prices (i.e., nominal interest) and portfolio allocations change and the effect of these changes on consumption and output. We can distinguish three types of effects: (i) an income effect (due to the fact that only people holding deposits get a share of the shock); (ii) an effect through different portfolio choices, and (iii) a pure liquidity effect (due to different $\gamma's$).

In a closed economy the equilibrium condition in period t is

$$M(\pi_t^{-1} - 1) + \frac{X_{t+1}}{p_t} = 0$$

which implies that

$$\pi_t = 1 + \frac{z_t}{M}$$

where $z_t = \frac{X_{t+1}}{p_{t-1}}$. If $X_{t+1} > 0$, i.e. if we consider a monetary expansion, then there will be a contraction of cash goods in period t affecting generations $t-1$ and t. In economy A, generation $t+1$, the only one holding deposits, revises its decisions knowing that will be getting a higher (lower) return from their deposits than the one originally foreseen. Let $\tilde{c}'_{1,t+1}$ be the variation on the consumption of credit goods (i.e., $'$ denote variations). we have that generation $t+1$ shares the extra returns from his deposits, $d_{1,t+1}$, $x_{t+1}(R-\theta_A)$, as follows:

$$\begin{aligned} \tilde{c}'_{1,t+1} &= x_{t+1}\frac{R-\theta_A}{(1-\gamma_A+\beta)}; \quad m'_{2,t+1} = \beta x_{t+1}\frac{R-\theta_A}{(1-\gamma_A+\beta)} \\ \text{and} \quad d'_{2,t} &= \beta(1-\gamma_A)x_{t+1}\frac{R-\theta_A}{(1-\gamma_A+\beta)} \end{aligned}$$

Notice that after a monetary shock, an agent of generation $t+1$ would like to change his portfolio, but, in economy A, the assets, a_t, are not liquid and, therefore, the agent must deposit or borrow from the bank (a less attractive intermediation technology). When he saves (i.e. $x_{t+1} > 0$) this results in $\tilde{c}'_{2,t+1} = \beta(R-\theta_A)d'_{2,t}$, while when he borrows in $\tilde{c}'_{2,t+1} = \beta(R-\theta_A+\theta_3)d'_{2,t}$. These costs of readjusting the portfolio are a crucial distinct feature of economy A.

If instead the economy that experiences the X_{t+1}shock is of type B , both generations, t and $t+1$, holding deposits, will change their credit-goods consumption. Let $\alpha = \frac{d_{i,t+1}}{d_{t+1}}$ be the share of deposits corresponding to generation $t+1$. Then, $\tilde{c}'_{2,t} = (1-\alpha)x_{t+1}(R-\theta_B)$ and generation $t+1$ will revise their consumption plans as in economy A (except that they only receive $x_{t+1}(R-\theta_B)$). The difference, however, is that since in economy B, $d'_{2,t} > 0$, and agents always want to have positive consumption of credit goods, $d_{2,t} + d'_{2,t} > 0$. That is, there is no borrowing from financial intermediaries following a monetary contraction in economy B. In other words, in economy B the adjustments, following a monetary shock, are less costly than in economy A (agents use the same intermediation technology with the same returns as when they where making consumption plans in their initial period).

The adjustments of generation $t+1$, however, result in an excess supply (demand) in the goods market in period $t+1$ (due to $m'_{2,t+1} \neq 0$), resulting in a variation of prices given by

$$\pi_{t+1} = \left[1 + \frac{\beta\gamma_A}{1-\gamma_A+\beta}\frac{x_{t+1}}{M_A}(R-\theta_A)\right]^{-1}$$

in economy A and, similarly, in economy B

$$\pi_{t+1} = \left[1 + \frac{\beta\gamma_B}{1-\gamma_B+\beta}\frac{\alpha x_{t+1}}{M_B}(R-\theta_B)\right]^{-1}$$

If both countries form a *monetary union* but financial structures remain the same and households use their countries' financial intermediaries, households will adjust their portfolios in the same manner as they do when countries are separate. There is, of course, an important difference in that there is a unique price reaction for both countries. That is, with a shock X_{t+1}, inflations in period t and $t+1$ are, respectively,

$$\pi_t = 1 + \frac{z_t}{M_A + M_B}$$

and

$$\pi_{t+1} = \left[1 + \left(\frac{\beta\gamma_A}{1-\gamma_A+\beta}(R-\theta_A) + \frac{\alpha\beta\gamma_B}{1-\gamma_B+\beta}(R-\theta_B)\right)\frac{x_{t+1}}{M_A+M_B}\right]^{-1}$$

Notice that if countries are of the same (endowment) size, the country with a larger γ will absorb most of the shock in consumption, which will result in a redistributive effect in period t (and $t+1$).

4.1 The quantitative effect of a money shock in our economies

The real effects of monetary shock can be quite different depending on the type of financial structure that a country has or wether countries are integrated in an heterogeneous monetary union or not. Even if our aim is not to exactly mimic observed economies, the parameters underlying figures have been chosen as to approximate Economy A with France and Economy B with Germany (see Table 6)[18].

Table 6 here

Figure 1a illustrates the effects of a monetary contraction on output (and Figure 1b for consumption) when economies A and B are independent (the shock is in period 6). As it can be seen, the effect on output is higher and slightly more persistent for economy A than for economy B. In other words, the economy (Germany) with a higher cash/deposit ratio and indirect finance prevailing over direct access to the market ($\theta_A > \theta_B$), because of lower transaction costs and higher efficiency, is partially protected from the effects of a monetary restriction. Figure 2a, reproduces the same experiment for a Monetary Union (and a shock twice the size). As in the closed economies case, at the time of the shock, aggregate output does not change, but there are important redistribution effects between countries due to different cash/deposit ratios, output of economy B is increased at the time of the shock, indicating that in relative terms economy B is better off. In the next period, however, aggregate output decreases and also output of economy B drops, even though still less than output of country A. This pattern can explain, at least to a certain extent, differences in preferences for a tighter monetary policy for countries of a B type (in relative terms economy B is better off with monetary tightening and worst off with monetary expansion).

In order to isolate the effect of large differences in the cash/deposit ratio we replicate the same exercise with the same γ for both countries. In other words, we concentrate on income and assets effects. If we take again autarchic countries we see that, as in the case with different cash/deposit ratios, in

[18]The two main differences are in the degree of efficiency of the banking sector - approximated in our calibration by the parameter θ, substantially higher in Germany than in France (the banking sector has a higher technological advantage with respect to households and the transaction costs are lower, Cf also Rodriguez, 1998)- and in the cash holding of domestic currency, i.e the parameter γ,again higher for Germany.

economy A the output effect is larger (Figure 3). When we consider the monetary union case, there is no redistribution of consumption, but there are still output differences (Figure 4). Here total output decreases but less than it would had been for an economy A in isolation. In other words, endogenous preferences for monetary policy may be diverse.

Figure 1b and 2b show the behavior of *total consumptions*, it increases at the time of a monetary contraction (as expected) because of cash in advance constraints, to decrease in the subsequent periods. Total consumption of economy A is more volatile, than that of economy B, when economies are independent, but less volatile when countries joint a monetary union. This is due to differences in γ (with equal γ the period t reaction is the same in both countries and, as in figures 1b-2b, the -negative- effect is more persistent in economy A).

Finally, figure 5 shows how prices (i.e., gross inflation π) react to a monetary contraction, when countries are independent or in a monetary union. As it can be seen, our model does not predict a "price puzzle", as it has been observed in some European economies (see, for example, Sims, 1992). Following a monetary contraction prices fall (the "puzzle" being that it seems to first increase), to then experience a small increase, before returning to their stationary level.

5 The calculated VAR for France and Germany

The issue of empirical testing the existence of possible differences in the impact of monetary policy on output and prices in European countries is not easy and far from having a definite answer (see Dornbusch et Al, 1998). The case for asymmetric impact of a monetary shock is easy to make, since, as we have documented in Section 2, there are marked cross-country differences in the financial structure (e.g. mix of direct and indirect finance, share of fixed and variable rate contracts, degree of indebtedness etc.). But differences in the financial structure do not translate easily into clear-cut results and, in any case, they prompt forces which are likely to offset each other (see Gennari and Giovannetti, 1998 for a discussion). Furthermore, EMU represents a change in regime, difficult to account for properly (we are back to "Lucas's

critique"). Against this background, many studies have tried to identify cross-country differences in monetary policy transmission[19], at least in the current set-up (i.e. before the start of EMU), but no consensus seem to exist on the extent or nature of possible differences. More precisely, it seems that very different results can be obtained for the same country using different models and that the ranking of the strength of a common monetary shock on output is not consistent across different studies.

In what follows, we do not enter into the debate of what is the best way to estimate the effect of a common monetary shock in different countries (see BIS, 1995) nor what is the best identifying scheme, even though we are aware of the possibility of getting different results when using different methods or identification schemes. Our aim is simply to see whether the implications of our theoretical model are consistent with the actual response of output to monetary shocks - i.e.e that differences in the **efficiency** of the financial structure and banking system affecting consumers' portfolio choices and firms' financing reflect in different output response to interest rates shocks, higher in the country with the least efficient banking system. To this aim, we estimated VAR, which have the advantage of avoiding the need for a complete specification of a structural model[20]. In principle, to evaluate correctly the effects of monetary policy, we should solve an identification problem: policy actions which are endogenous responses to current developments in the economy must in fact be separated from exogenous policy actions. Only when the latter are identified, the dynamic analysis of the VAR system can give reliable information on the monetary transmission mechanism. In the following, we use the Choleski decomposition[21] for a parsimonious VAR specification which includes 3 endogenous variables: output (industrial production), prices, and

[19]Different methods have been used to this purpose: national and multi-country econometric models, structural VAR with their impulse response function, single equation models among others. Cf. Britton and Whitley, 1997 for a comprehensive survey; Dornbusch et al, 1998, and Ramaswamy and Sloeck, 1997 for estimation on groups of countries.

[20]There is an extens literature on pro and cons of VAR to study the transmission mechanism of monetary policy well summarized in Christiano, Eichenbaum, Evans, 1998. Also there are problems related to the so-called price puzzle, pointed out by Sims, 1992 and suggestions to include import price to avoid it and so on (see also Bagliano e Favero, 1997).

[21]In a 3 variable system this means that the last variable influences the first two, without feedbacks from them and the second variable influences the first without feedbacks from it.

interest rates. We estimate the model over the period 1973-97[22] for France and Germany and here we only report the impulse response functions[23], i.e. the responses of output, prices and interest rates to unexpected shocks to interest rates.

All our variables are non-stationary (see Table 7): output (industrial production[24]) seems to be integrated of order 1 both in levels and logarithms, while CPI is I(2) (i.e. inflation is I(1)). Hence, we used inflation in our VAR estimates.

Table 7 here

For both countries, the VARs are specified with 2 lags; in our preferred specification, we add a trend, a set of orthogonal seasonal dummies (CPI are not adjusted) and some country dummy (for further details, see Appendix and Gennari and Giovannetti, 1998).

Graph 6 and 7 show the impulse responses to a standardized monetary shock together with 95% confidence intervals. In Germany (output) bottoms out about ten quarters after the contractionary shock, and a similar pattern is observed in France. The numerical effect, however, is higher in France (around -0.004 against -0.002) than in Germany[25]. This implies that

[22]Data are described in the Appendix. Unit root tests are done using PCGive. Estimations are done using the package E-views, version 2.0 and PCFIML. The period corresponds to the longest available with fairly homogeneous data. We have also reduced the period of estimation to consider only the ERM period (1979-97) and results do not change. The same applies when exogenous variables are added to the estimates, such as exchange rate developments, raw material prices etc. or dummies to account for the 1992 ERM crisis and the 1993 enlargement of fluctuation bands.

[23]Even though impulse responses are not a valid model selection criteria, because they are determined by the chosen methodological framework in which a model is built (i.e. the imposed identifying restrictions, its specification and its estimation method), they are widely used in the empirical literature because they easily convey the message and provide a simple graphical assessment of the differences in the trasmission mechanism.

[24]Industrial production is preferred to output in the empirical literature, and the effects of a monetary shocks are more visible; however here we report the impulse responseof output for consistency with our theoretical model where we have consumption and assets rather than production. Cf. Simms, 1992; Mojon, 1997 amongst others for discussion on the use of industrial production and Gennari and Giovannetti, 1998, for VAR using the same data set and methodology but industrial production instead of output.

[25]If industrial production is used instead of output, the numerical values are respectively -0.008 for France and -0.005 for Germany, so the results are confirmed. When using the output data a step dummy and an impulse dummy have to be included for Germany in order to account for the break in the series due to German Unification.

Germany is partially protected from a monetary tightening (at the same time it benefit less from a monetary expansion), with consequences on the preferences for monetary policy.

These results are very stable in the case of France. Different measures of interest rates (Pibor, Tbill rate), different sample sizes, inclusion of a dummy variable to account for the EMS crises, inclusion of import prices to deal with the price puzzle did not change the response of output in any dimension (shape, numerical size, lags) while impacting on the price response to an interest rate shock[26].

As for Germany, however, the results seem to be more sensitive to the sample size, most likely because German Unification represents a change in regime which is difficult to account for when the more recent period has a higher weight[27]. Interesting enough, when a shorter sample size is selected (e.g. 1983-97), the effect of the shock on German output is substantially weaker (not different from zero) and the standard errors much larger.

The effects of the shock are transitory in both countries but seem to be slightly more persistent in France (as in the computed responses from our model). Overall, the estimated impulse response for France and Germany have a shape very similar to the theoretical response calculated from our model: the effect of a monetary shock in the current situation is different in the two countries and has a bigger impact in France where agents are more illiquid. The asymmetry can have important consequences for the behavior of the European Central Bank, at least up to when(if) the financial structures in Europe will converge.

[26]As most of the empirical studies we have reviewed, we found weak evidence of a price puzzle, i.e. a perverse response of prices. The inclusion of import prices in the VAR reduces the positive response of prices to a monetary contraction, without eliminating it completely. Clarida and Gertler (1996) provide two explanations for the price puzzle: either the magnitude of an interest rate rise which represents a policy shock is not strong enough to have a decreasing impact on inflation, or there is an identification problem in the sense that the Central Banks have additional news about inflation which are not captured by the model.

[27]We replicated our exercise with the data set kindly provided by Ramaswamy and Sloeck, 1997. Again, the output response of Germany changes with different sample sizes while that of France is very stable. In particular the standard errors for Germany become very large on a shorter sample. The price response, not reported in their study, seems to be much worst.

6 Conclusions

The focus of the debate on Monetary union has been so far mainly on "real convergence". Real convergence is very important to achieve consensus on harmonization of policies in a MU. However, differences in the financial structure can be crucial to achieve consensus on the -by definition- harmonized monetary policy in EMU. Cross-country effects of a common monetary policy can be different as a result of differences in financial structures and in the transmission channels of monetary policy. While these issues are often discussed, they had not been appropriately modeled and quantified. This paper is novel in these regards. First describes the underlying differences across the main EMU countries, second provides a theoretical model accounting for these differences, where is possible to study the effects of an unexpected monetary shock, and, third, provides new estimates of the effects of a monetary shock in France and Germany. Such estimates are consistent with the predictions of the theoretical model.

Our work suggests that there are possibilities of conflicts over monetary policy, at least in the early stages of EMU, even if countries' representatives in the ECB share the same principles over monetary policy and there are no cyclical differences across countries. It is to be expected, however, that financial sectors will be progressively less segmented, which, according to our theory, will result in more homogeneous effects. The European experience, since 1992, and the US experience, shows, however, that such convergence may be slow. This can be important for the EMU since policy consensus will be crucial in its first stage.

References

[1] Alvarez, F., A. Atkenson and P. Kehoe, 1996, Money and interest rates in segmented assets markets, *mimeo*, July;

[2] Bagliano, F. and C. Favero, 1997, Measuring monetary policy with VAR models: an evaluation, *mimeo*, May;

[3] Bank for International Settlements, 1995, **Financial structure and the monetary policy transmission mechanism**, Basle, March;

[4] Barran Fernando, Coudert Virginie and Benoit Mojon, 1996, the transmission of monetary policy in the European countries, *CEPII, Paris, document de travail, 96-03*;

[5] Bernanke Ben and Mark Gertler, 1995, Inside the Black box: the credit channel of monetary transmission mechanism, *Journal of Economic Perspectives*, 9, pp.

[6] Bernanke B. and I. Mihov, 1995, Measuring monetary policy, *NBER wp 5145;*

[7] Borio, Claudio, 1995, The structure of credit to the non-government sector and the transmission mechanism of monetary policy: a cross-country comparison, *Bank for International settlements working paper*, Basle, April.

[8] Borio, Claudio and Wilheim Fritz, 1995, The response of short term bank lending rates to policy rates: a cross-country perspective, *Bank for International Settlements, Wp n. 27*, Basle, May;

[9] Britton E. and J.Whitley, 1997, Comparing the Monetary Transmission Mechanism in France, Germany and the UK: some issues and Results, *Bank of England Quarterly Bulletin*, May;

[10] CEPR, 1997, Options for the Future Exchange Rate Policy of the EMU, *mimeo*, July 8, London;

[11] C. Carlstrom and T. Fuerst, 1995, Interest rate rules vs money growth rules, *Journal of Monetary Economics*, 36, pp. 247-267;

[12] Chakravarty, S.P. and P. M. Molyneux, 1996, The Single European Market in financial services, *European Business Review*, 96, 5;

[13] Christiano, L., 1991, Modeling the liquidity effect of a money shock, *Federal reserve Bank of Minneapolis Quarterly Review*, Winter;

[14] Christiano, L. and M. Eichenbaum, 1992, Liquidity effects and the monetary transmission mechanism, *American Economic Review*, vol 82, p346-353;

[15] Christiano, Lawrence, Eichenbaum Martin and Charles Evans, 1996, Sticky Price and Limited Participation Models of Money: A comparison, *mimeo*, October;

[16] Christiano, Lawrence, Eichenbaum Martin and Charles Evans, 1997, Modelling Money, mimeo, *paper presented in Perugia*, January 1997;

[17] Christiano, Lawrence, Eichenbaum Martin and Charles Evans,1998, Monetary Policy Shocks: What have we learned and to what end? NBER WP 6400, February;

[18] Clarida R and M. Gertler, 1996, How the Bundesbank conducts Monetary Policy, *NBER WP 5581*;

[19] Cottarelli, Carlo and A. Kourelis, 1994, Financial structure, bank lending rates and the transmission of monetary policy, *IMF working papers*, Washington, March;

[20] Davis, Paul, 1996, The role of institutional investors in the evolution of financial structure and behavior, LSE Financial Market Group, Special paper 89, November;

[21] Dornbusch R, C, Favero and F. Giavazzi, 1998, Immediate Challenges for the European Central Bank, *Economic Policy*, 26, April, 15-64 (including discussion);

[22] European Monetary Institute, 1994, Differences in monetary transmission processes in the European Union and policy implications, *interim report*, December;

[23] European Economy, Supplement A, 1997, Advancing Financial Integration, n. 12, December;

[24] Fuerst T., 1992, Liquidity, loanable funds, and real activity, *Journal of Monetary Economics*, 29, 3-24;

[25] Giovannetti G., 1997, Some evidence on the heterogeneity of the financial structure and the monetary transmission channels in Europe, *mimeo*, EUI, Florence, June;

[26] Gual J and D. Neven, 1993, Banking in European Economy, reports and studies 1993 (3);

[27] Goodfriend M. and R. King, 1997, The neoclassical synthesis and the role of monetary policy, *mimeo*, paper presented at Perugia, June;

[28] Kneeshaw J.T., 1995, A survey of non-financial sector balance sheets in industrialized countries: implications for the monetary policy transmission mechanism, *Bank for International settlements, working papers* n. 25, Basle, April.

[29] Lucas, R. E.Jr., 1972, Expectations and the neutrality of money, *Journal of Economic Theory*, 4, 103-124;

[30] Lucas, R. E. Jr., 1990, Liquidity and Interest Rates, *Journal of Economic Theory,* 50, 237-264;

[31] Miron, J., C. Romer and D. Weil, 199., Historical Perspectives on the Monetary Transmission mechanism, 263-306;

[32] Mishkin, Frederic, 1996, The channels of monetary transmission: lessons for monetary policy, *NBER working paper 5464*, February;

[33] Ramaswamy R. and T. Sloeck, 1997, The Real Effect of Monetary Policy in the EU: What are the differences? IMF WP 97/160, forthcoming IMF Staff Papers, 1998;

[34] Rodriguez Mendizabal H., 1998, Monetary Unions and the Transaction Cost Saving of a single Currency, UPF, Barcelona, May, *mimeo*;

[35] Seitz F., 1995, The circulation of Deutsche Mark abroad, DP 1/95 Deutsche Bundesbank, May;

[36] Sims C.A., 1992, Interpreting the macroeconomic time series facts: the effects of monetary policy, *European Economic Review*, 36, 975-1011;

[37] Taylor, John, the monetary transmission mechanism: an empirical framework, *Journal of Economic Perspectives*, 9, pp.

7 Tables

Table 1: Structure of Financial markets, 1996

	FIR	BIR	Market capitalization (% GDP)	Trading volume % GDP
France	42.4	**73.8**	38.9	**63.5**
Germany	52.8	**80.3**	29.6	**33.3**
Italy	39.9	70.3	21.7	8.6
UK	na	na	149.9	66.1
EU	na	na	53.0	38.5

Source: Bundesbank, Monthly Report, January 1997 and European Economy, Supplement A, Economic Trends, n.12, December 1997. FIR stands for Financial Intermediation Rate and is Financial assets of FI% total assets; BIR stands for Banking Intermediation Rate and is Fin. assets of Banks%of Fin. Assets of Fin. sector.

Table 2: Financial assets of Households
(as proportion of gross financial assets)

	1980				1994			
	Banks	bonds	equities	inst.inv.	Banks	bonds	equities	inst. inv.
France	.59	.09	.14	.07	**.32**	.04	**.32**	.29
Germany	.59	.12	.04	.17	**.45**	.14	**.06**	.28
Italy	.58	.08	.1	.06	.29	.2	.24	.09
UK	.43	.07	.12	.3	.26	.01	.12	.54

Source: Davis, 1996.

Table 3: Corporate sector balance sheets, 1980 and 1994
(as proportion of gross financial assets)

	1980			1994		
	bonds	equit.	loans.	bonds	equit.	loans.
France	0.4	.34	.28	.03	.70	**.28**
Germany	.02	.2	.52	.08	.25	**.50**
Italy	.04	.52	.43	.03	.46	.44
UK	.02	.37	.22	.001	.65	.12

Source: Davis, 1996 and OECD, Financial Statistics, various issues;

Table 4: Ownership of listed shares by sector,1995

	Households	Non fin. corp.	Public	tot non-fin sector	Fin. Inst.	Foreign
France	19.4	58.0	3.4	**80.8**	8.0	11.2
Germany	14.6	42.1	4.3	**61.0**	30.3	8.7
Italy	17	32	28	**77**	19	5
UK	29.6	4.1	0.2	**33.9**	52.4	13.7

Source: Deutsche Bundesbank Monthly Report, January 1997 and OECD Financial Markets Trends, November 1995.

Table 5: Monetary Aggregates, 1995

	France	Germany	Italy	UK
cash/M1	9.1	29.1	15.9	4.7
cash/M2	**7.8**	**18.9**	8.1	na
cash/M3	4.7	11.8	na	na
Per capita currency holding (US $)	**850**	**1983**	1066	575

Sources: Banque de France, Banca d'Italia and Deutsche BundesBank, annual reports and OECD Financial Statistics.

Table 6: Parameters of the simulations

	ω_0	ω_1	β	γ	R	θ_1	θ_2	θ_3	$R-\theta$
Country A	8	6	.996	0.78	1.05	.018	.01	.012	1.046
Country B	8	6	.996	.189	1.05	.02.	.005	.005	1.06

Table 7:Unit root tests

a) France

		test	statistic		test	statistic
infl rate	lev	ADF(1)	-1.521	Δlev	ADF(1)	-4.806**
	logs	ADF(1)	-2.788	Δlogs	DF	-3.968*
gdp	lev	ADF(4)	-2.572	Δlev	ADF(3)	-3.45*
	logs	ADF(2)	-2.18	Δlogs	ADF(1)	-4.493**
import prices	lev	ADF(1)	-2.705	Δlev	DF	-5.249**
	logs	ADF(1)	-2.628	Δlogs	DF	-5.646**
ind. prod	lev	ADF(2)	-2.392	Δlev	ADF(1)	-4.178**
	logs	ADF(2)	-2.385	Δlogs	ADF(1)	-4.285**
call m rate	lev	ADF(5)	-4.512**	Δlev	ADF(5)	-3.651**
int.rate 3mth T.Bills	levels	ADF(1)	-3.081	Δlevels	DF	-6.651**
PIBOR 3 months	levels	ADF(1)	-3.073	Δlevels	DF	-6.981**

b) Germany

		test	statistic		test	statistic
gdp	lev	ADF(1)	-2.116	Δlev	DF	-8.248**
	logs	ADF(4)	-2.278	Δlogs	ADF(3)	-3.01*
infl rate (cpi)	lev	ADF(1)	-1.521	Δlev	ADF(1)	-9.171**
	logs	ADF(4).	-3.54*	Δlogs	DF	-4.46**
import prices	lev	ADF(1)	-3.25	Δlev	DF	-4.21**
	logs	ADF(1)	-3.55*	Δlogs	DF	-4.18**
w. mkt p. (raw mat).	lev	ADF(3)	-3.49*	Δlev	ADF(2)	-3.17*
	logs	ADF(3)	-3.66*	Δlogs	ADF(2)	-3.25*
call m rate	lev	ADF(5)	-2.077	Δlev	ADF(4)	-5.97**
LT int.rate (7-15 y)	lev	ADF(3)	-2.32	Δlev	ADF(2)	-3.51*

* significance at 5%, ** significance at 1%

Appendix I:Data Sources

Data are obtained from IFS and Analytical Database of the OECD. The period used is 1973 first quarter, 1997 fourth quarter. Output is in logs and is seasonally adjusted. The series on real GDP is defined in national currency and is obtained from the OECD database (GDPVol). The series on consumer price index is obtained by IFS (n. 64 for each nation). The nominal interest rate is the call money rate and is also from IFS. We also used industrial production from OECD database, UN commodity price index (IFS), DM- dollar exchange rate series (IFS), French franc- DM exchange rate series (IFS). For Germany a step dummy for GEMU was used (0-1) and an impulse dummy for changes in the mean in 1991. For France a dummy accounting for the oil crisis and the ERM crises.

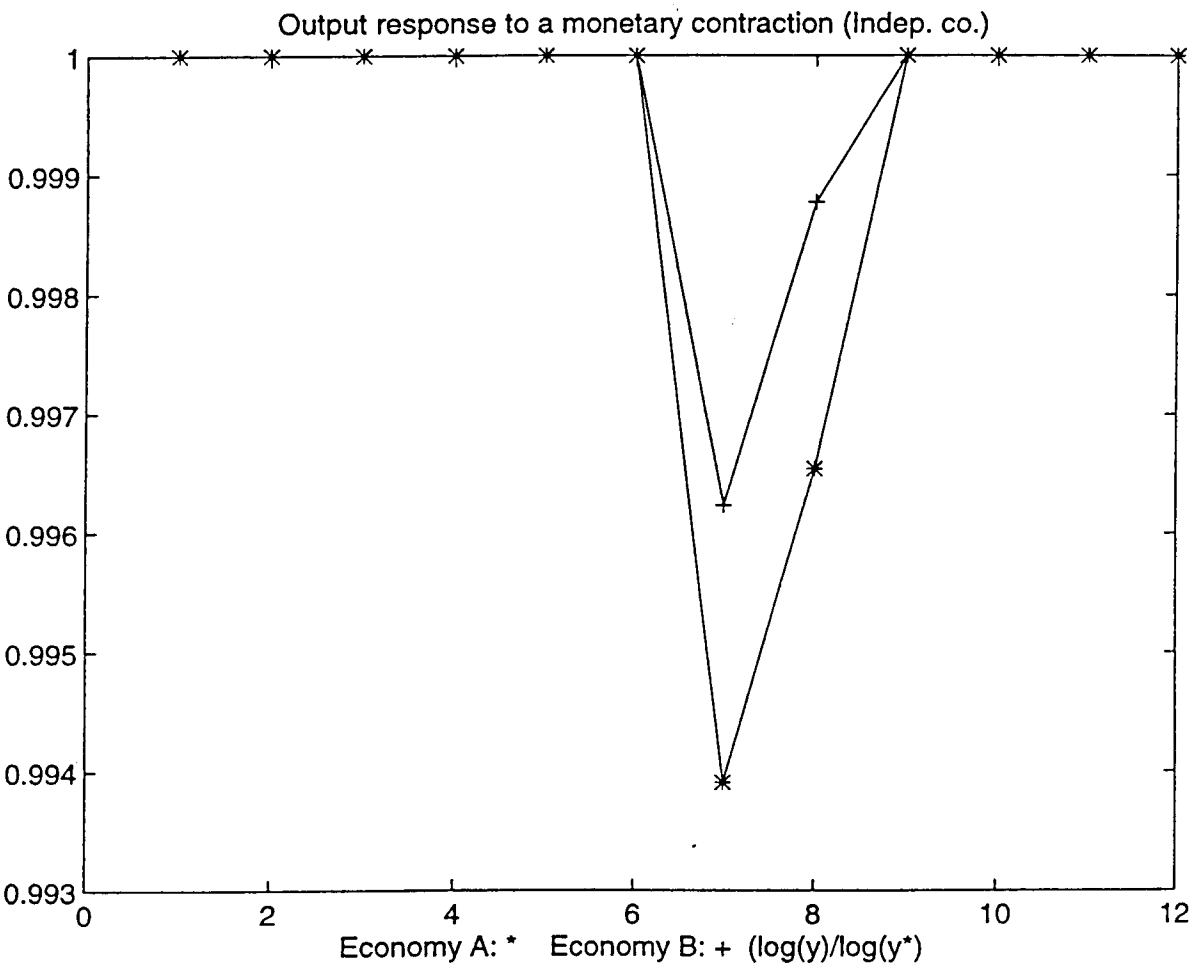

Output response to a monetary contraction (Indep. co.)
1
0.999
0.998
0.997
0.996
0.995
0.994
0.993
0
2
4
6
8
10
12
Economy A: * Economy B: + (log(y)/log(y*)

Fig. 1a

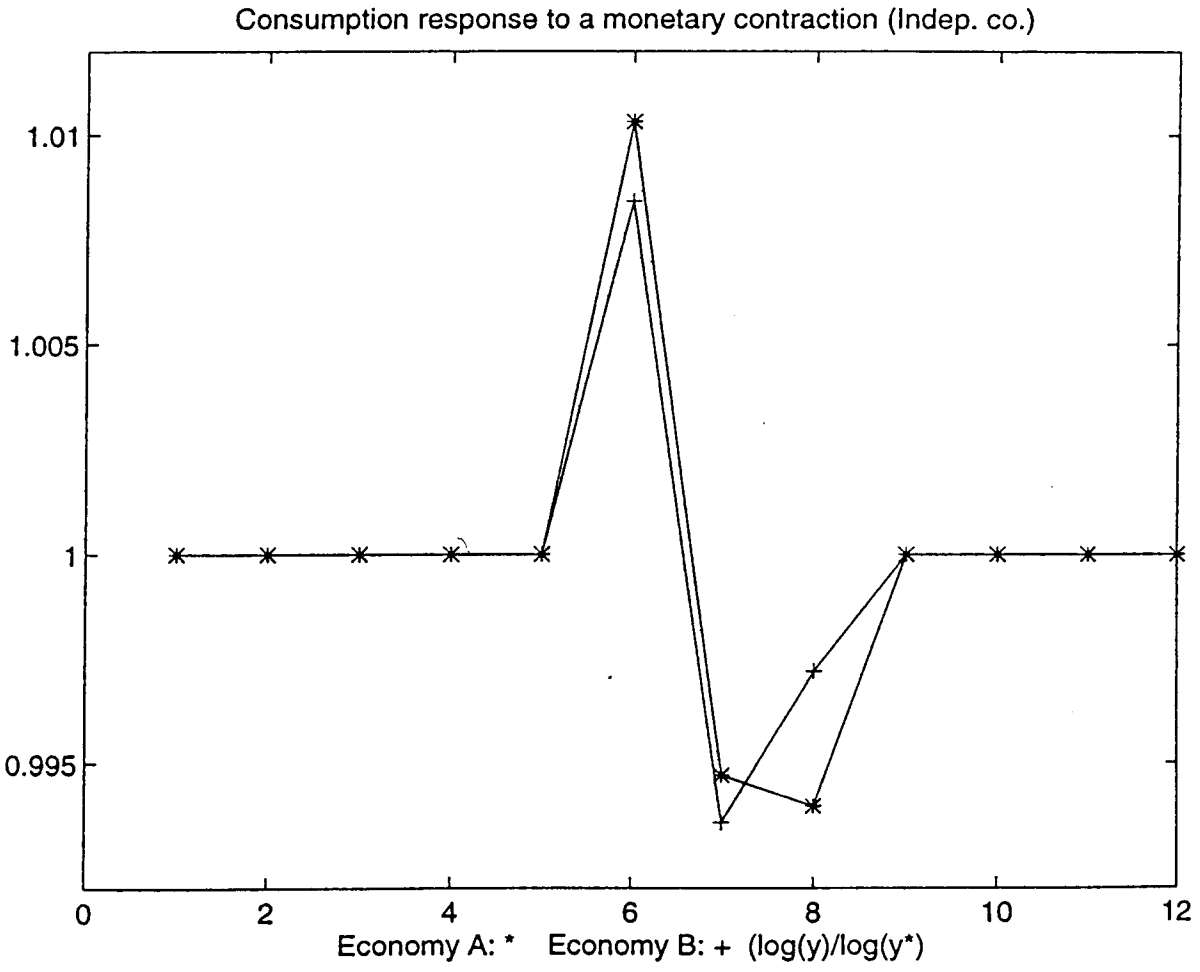

Consumption response to a monetary contraction (Indep. co.)
1.01
1.005
1
0.995
0
2
4
6
8
10
12
Economy A: * Economy B: + (log(y)/log(y*)

Fig. 1b

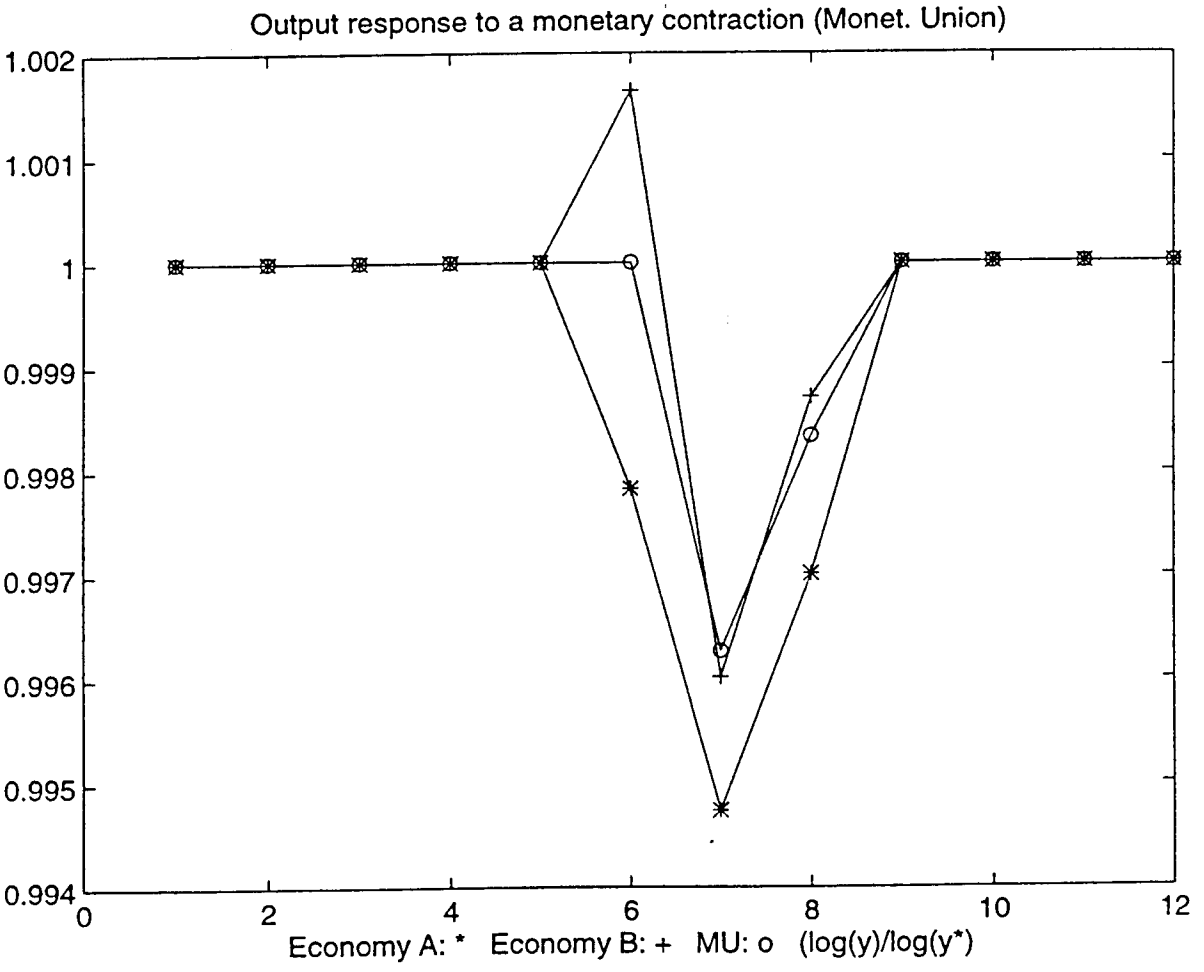

Output response to a monetary contraction (Monet. Union)
1.002
1.001
1
0.999
0.998
0.997
0.996
0.995
0.994
0
2
4
6
8
10
12
Economy A: * Economy B: + MU: o (log(y)/log(y*)

Fig. 2a

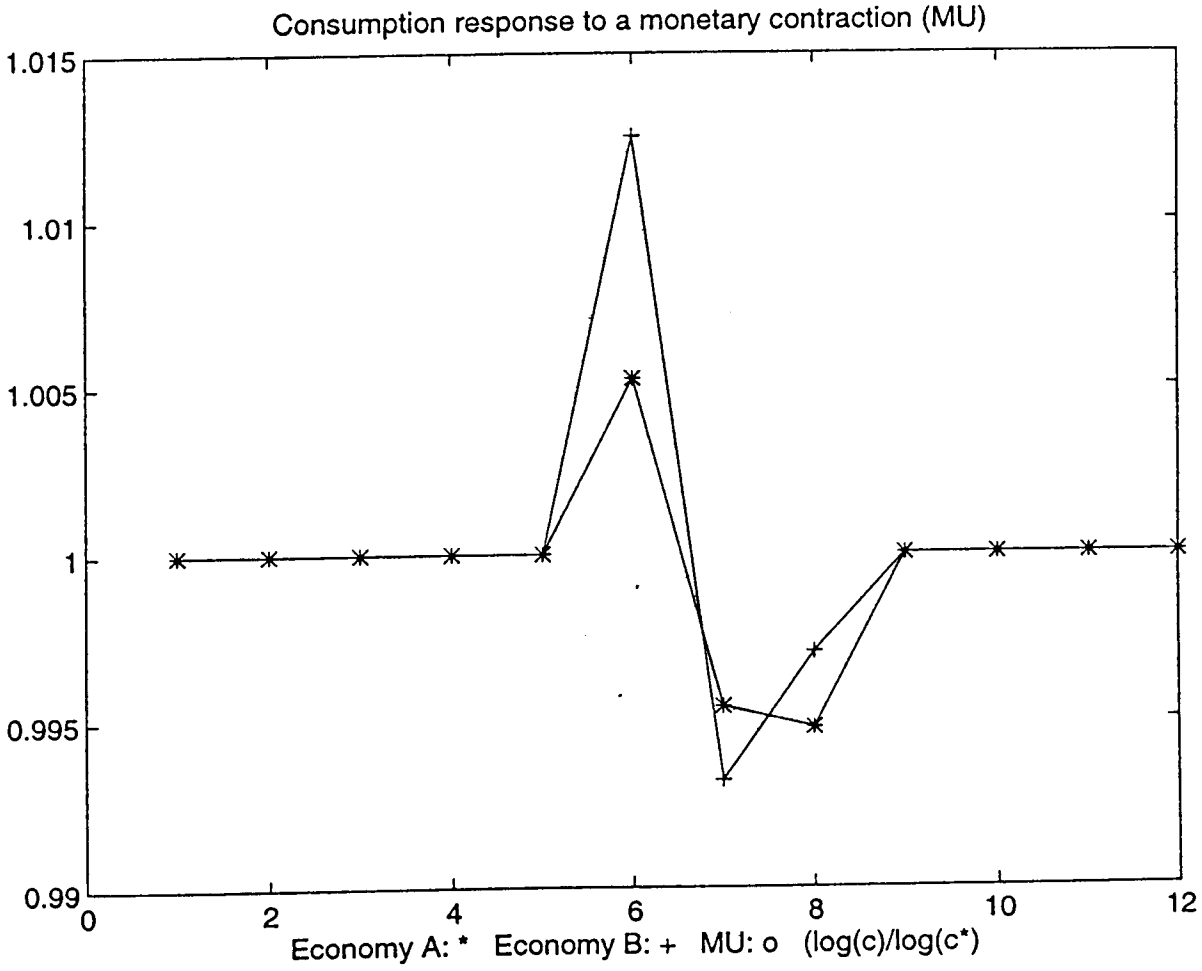

Consumption response to a monetary contraction (MU)
1.015
1.01
1.005
1
0.995
0.99
0
2
4
6
8
10
12
Economy A: * Economy B: + MU: o (log(c)/log(c*)

Fig. 2b

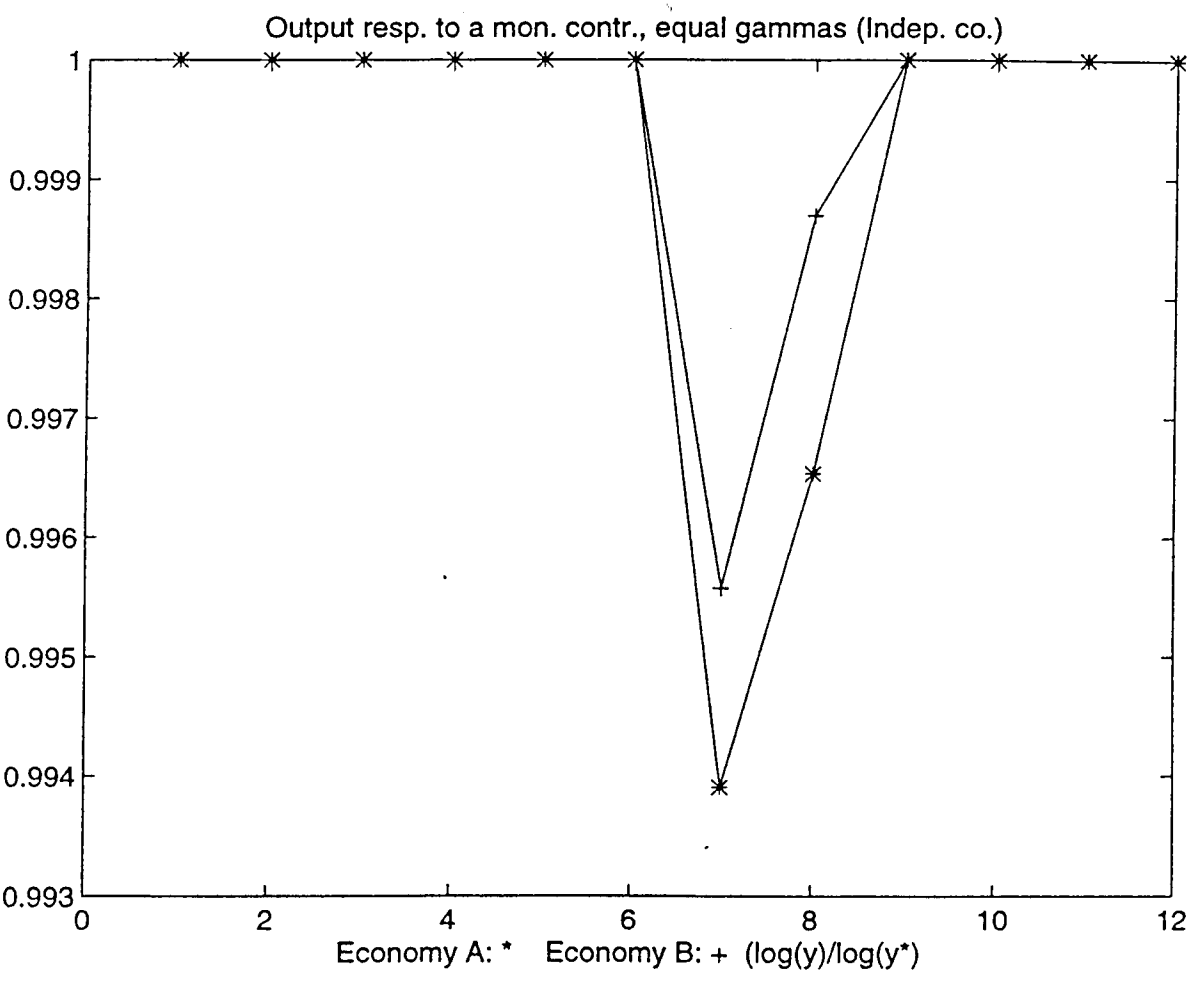

Output resp. to a mon. contr., equal gammas (Indep. co.)
1
0.999
0.998
0.997
0.996
0.995
0.994
0.993
0
2
4
6
8
10
12
Economy A: * Economy B: + (log(y)/log(y*)

Fig. 3

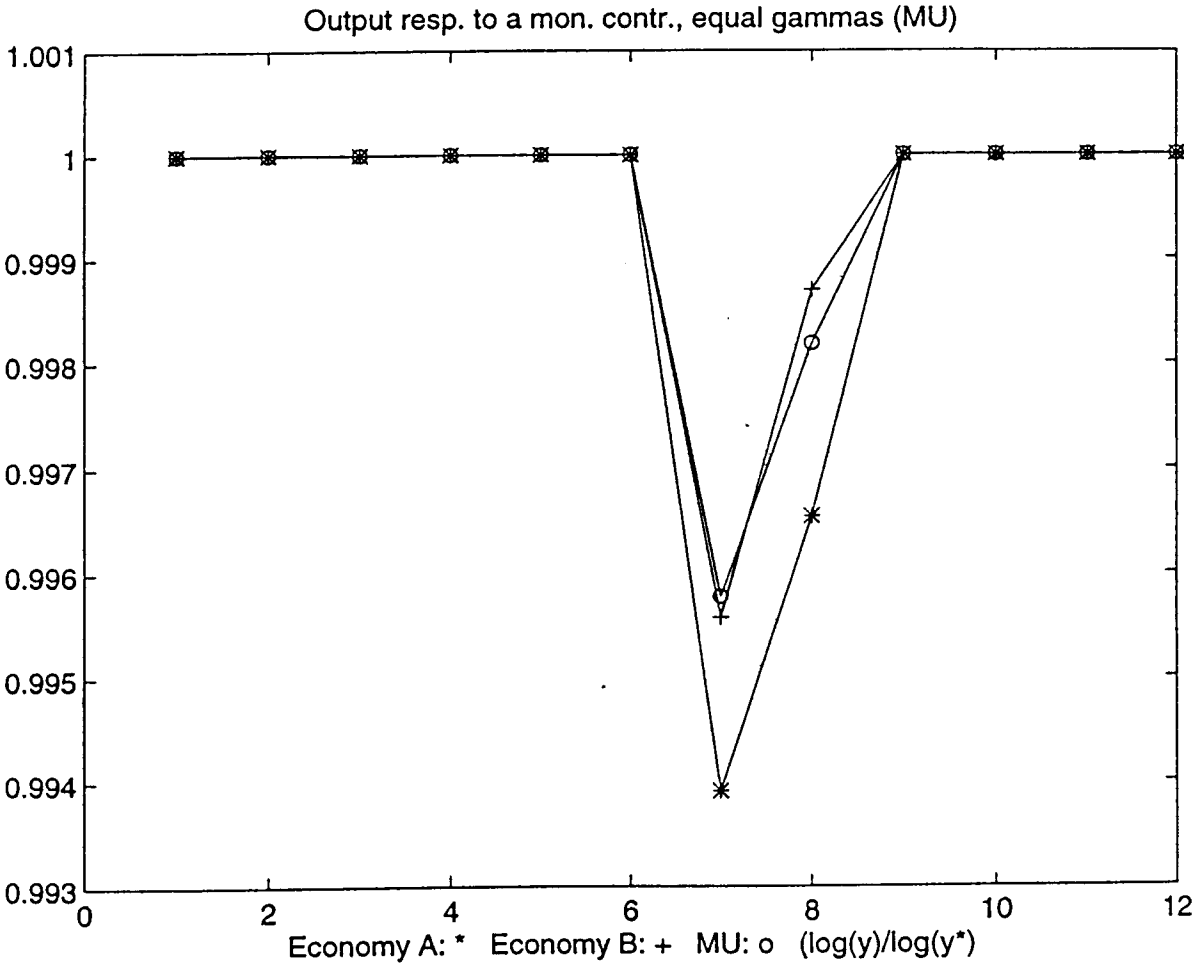

Output resp. to a mon. contr., equal gammas (MU)
1.001
1
0.999
0.998
0.997
0.996
0.995
0.994
0.993
0
2
4
6
8
10
12
Economy A: * Economy B: + MU: o (log(y)/log(y*)

Fig. 4

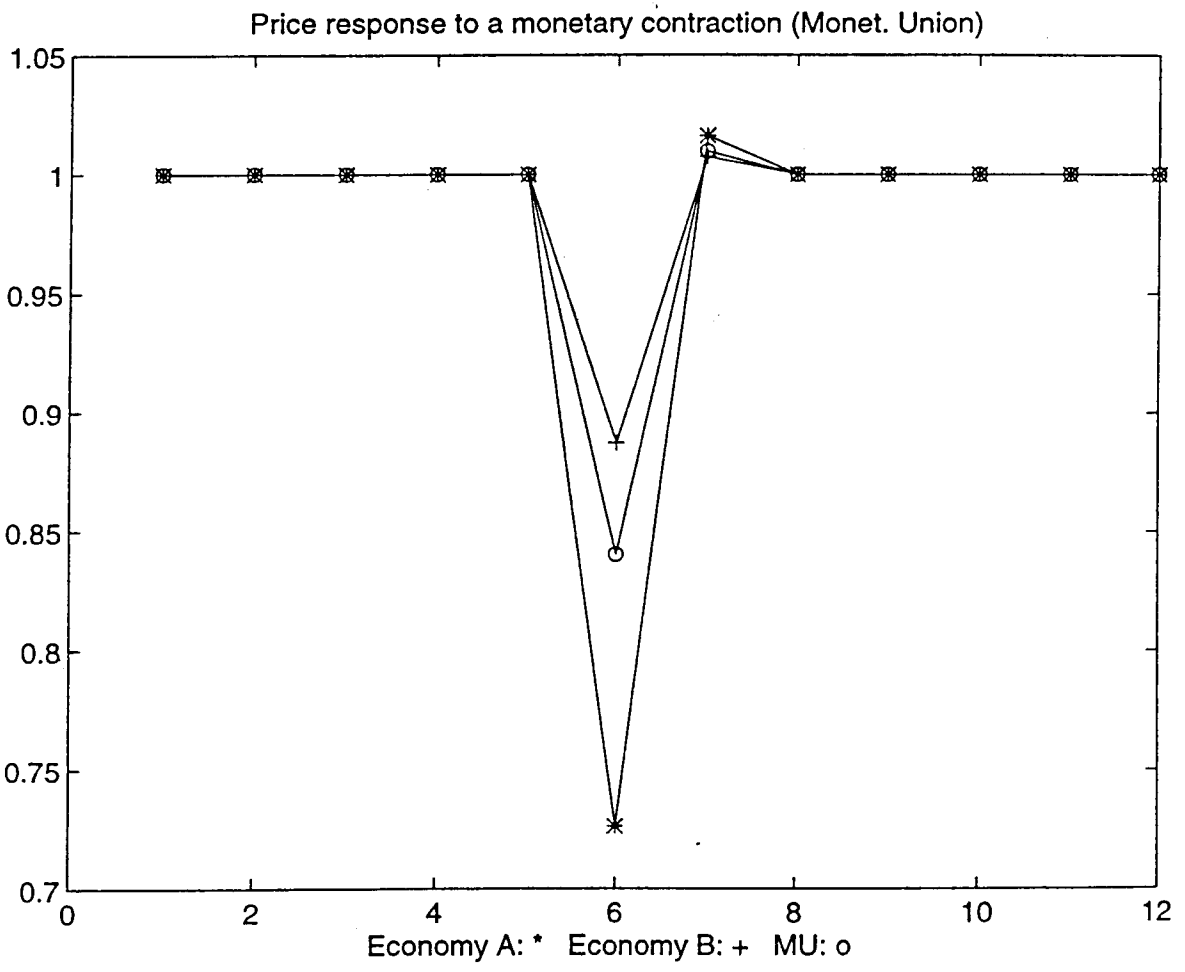
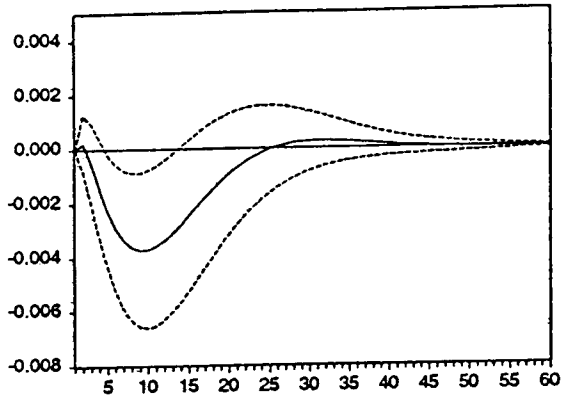

Price response to a monetary contraction (Monet. Union)
1.05
1
0.95
0.9
0.85
0.8
0.75
0.7
0
2
4
6
8
10
12
Economy A: * Economy B: + MU: o

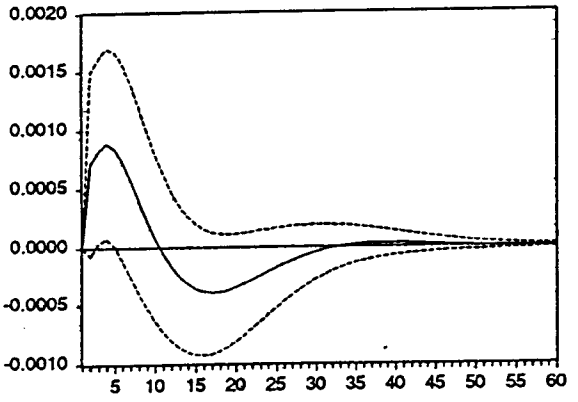
Fig. 5

Fig. 6: France Response to inn.± 2 S.E.

Response of LGDPVOL to CALLMONEY



Response of INFL to CALLMONEY



Response of CALLMONEY to CALLMONEY

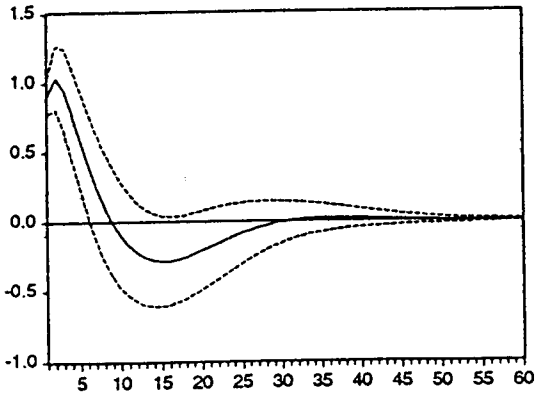
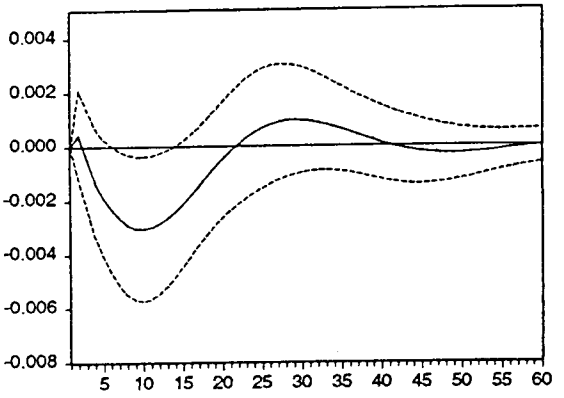
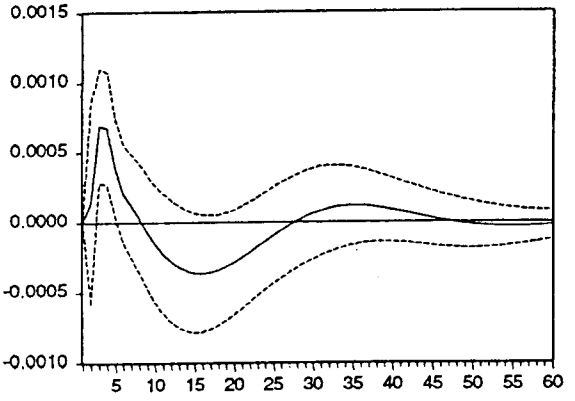


Fig7: Germ. Response to inn. inn. ± 2 S.E.

Response of LGDPVOL to CALLMONEY



Response of INFL to CALLMONEY



Response of CALLMONEY to CALLMONEY