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THE SYMMETRY OF ECB MONETARY POLICY IMPACT UNDER SCRUTINY: AN ASSESSMENT

Massimiliano Serati[*] [§], *Andrea Venegoni*[**] [§]

1. Introduction

After a long-standing debate the literature now widely agrees that monetary policy can affect the course of the real economy in the short run through different channels that constitute the transmission mechanism (Bernanke and Gertler, 1995 and Koop, 2009). In order for a central bank to successfully perform its task, it is crucial to understand the functioning of this transmission mechanism, focusing on how policy actions affect not only the target variables but also the ones that are involved in the intermediate steps of the process.

This issue gains further relevance in a currency union, as the monetary authorities have to pursue their policy goals taking into consideration the diverse structures of the economies under their influence. It becomes essential, hence, to know which channels of the transmission mechanism are the more integrated and in which cases the asymmetries are the source of discontinuity. This is a matter of high policy relevance, as allows to understand whether the monetary policy actions can be a source of synchronization of the EMU business cycles or, otherwise, add to the pre-existing differences among individual economies.

For this reason, the first seventeen years of ECB operations were constantly accompanied by concerns about possible changes in the propagation dynamics of monetary shocks.

At first, the researchers were interested in assessing whether the very constitution of the currency area would have caused a structural break in the transmission mechanism evolution and, more generally, how it has worked after the inception of the new regime.

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Indeed, ever since the institution of the European Monetary Union (EMU) was announced, the debate about whether it could be considered an Optimal Currency Area inflamed, given that a group of countries with mature economic architectures and previously independent monetary policies can be subject to asymmetric transmission effects (Ehrmann et al., 2003). Along with independent research, an institutional framework, the Eurosystem Monetary Policy Network (EMPN), was ad-hoc created in order to provide new evidence about the degree of synchronization of the newly established Currency Union and to assess whether the transmission mechanism of monetary policy was bound to function in different ways across the member countries (see Ehrmann et al. 2003, Chatelain et al. 2003, Mojon et al. 2002).

The evidence emerged from this impressive amount of empirical inquiries helps us to shed some light on which are the ex-ante differences in the economic and financial structure across EMU countries (see Dornbusch et al. 1998, Angeloni et al. 2003), but leaves unsolved the main question: do these differences determine any asymmetry in the EMU's transmission mechanism?

According to the first empirical evidences gathered in literature, both the standard interest rate channel and the credit channel seem to play a crucial role in determining the propagation of monetary innovations to the economy. Adopting a standard VAR approach, Mihov (2001) finds that the output (GDP) responses to interest rate innovations are homogeneous in intensity, but remarkably different in the timing for a large pool of EMU countries, relating this evidence to differences in the banking systems. Such findings are confirmed by Ciccarelli and Rebucci (2002), who find the same heterogeneity in the timing of the transmission process on the basis of a Bayesian time-varying structural VAR model. Non homogenous output responses to monetary shocks are observed also by Clausen and Hayo (2001), who find that output in France displays a different response from the Italy's and Germany's ones, by Ramaswamy and Slok (1998) whose work presents common patterns for Italy and France and a distinct behaviour in the case of Germany and by Van Els et al. (2001) which analysis detected different behaviours for two groups of countries. Bean (1998) reports similar findings, attributing the source of output asymmetries to the heterogeneous productive structures and, hence, to the interest rate channel of transmission. An opposite picture emerges from the works by Kieler and Saarenheimo (1998), Barran et al. (1997) and Mojon and Peersman (2001): their VAR analyses suggests a substantial homogeneity in the transmission mechanism of the economies considered.

All those findings were subjected to some criticism about the soundness of the empirical framework applied. Mojon and Peersman themselves, Favero et al. (1999) and Ehrmann et al. (2003) among others, note that basing the empirical analysis on pre-EMU data exposes the results to the Lucas critique, as the introduction of the new regime may cause a structural break and may lead the economies to adapt to the new environment and the new regulatory framework in a

relatively short time. Moreover, the comparability of the responses to the monetary innovations obtained through those standard VAR procedures is questionable, given the dimension of the confidence bounds that are very large and lead to accept the null hypothesis of symmetric transmission effects even when the medians of the impulse responses are sizably different (Favero et al. 1999). In addition to that, the use of standard VARs forced researchers to focus their exam of impulse responses on variables such as output and inflation, that constitutes the main targets of a central bank policy conduct, while to appreciate the transmission mechanism attention must be put on the economic drivers involved in the intermediate steps of the propagation process.

Once the two crises of 2007/2008 and 2011 erupted, the policy efforts have moved their focus on understanding how the financial turmoil have changed the structure both of the American economy and of the Eurozone one and their business cycles, to assess how the shocks that have hit the Eurozone have affected the structural coherence of the diverse economies and, hence, the homogeneity of policy shocks propagation.

All the evidences previously gathered by the literature were called into question and emphasis was put on the credit channel of monetary policy transmission. Since then, a large literature examining the impact of the crisis on credit channel dynamics developed, in order to determine whether it has changed its functioning before and after the propagation of the financial turmoil.

Acharya et al. (2015) find that liquidity injections operated by the ECB did not cause asymmetries in corporate deposit and loan spreads before 2007, but that after the crises burst, loan spreads of low risk banks reacted to the monetary impulse, while the ones of high risk banks did not. From this evidence it can be deduced that countries with a more distressed banking system have experienced a considerable drop in the functioning of credit channel. Gambacorta and Marques-Ibanez (2011), De Santis and Surico (2013) and Leroy and Lucotte (2014) find that diverse sources of heterogeneity acted on the credit channel making it a generator of asymmetries in the transmission of monetary policy innovations. Ciccarelli et al. (2013) find, through a time varying panel VAR, that lending standards show a significantly different evolution in the post crisis time, with countries under sovereign debt stress that showed a deterioration of credit conditions. They try also to infer whether heterogeneous effects are also verified on output and price dynamics, but the not structural nature of their model does not allow to obtain sound estimates.

An updated assessment of the functioning of the monetary transmission mechanism in the EMU is, thus, of prominent interest, as understanding how structural differences affect economies' responses to monetary policy is particularly relevant in the context of currency unions and also of great importance for monetary economics and policy in general (Jaroczinski, 2009).

Hence, it is necessary to understand whether the only source of asymmetry lies in the financial structures or it is widespread to other sectors, and how these non-homogeneities affect the fundamental economic variables (i.e. output and prices) and the business cycle dynamics, in order to provide a guideline for future reform implementation to make homogeneous the impact of ECB policy conduct across the whole EMU.

This paper is related to the corpus of literature just mentioned: it aims at giving a picture of the evolution of the monetary policy transmission mechanism in the Eurozone since inception of ECB, so to determine how the transmission dynamics have changed in these seventeen years.

Our core innovation lies in specifying an eclectic framework of analysis, that combines different features of already existing models, but at the same time allows for a fix to all the issues that were found in the previous literature: a Bayesian Time-Varying-Parameters FAVAR model (TVP BFAVAR).

Within this framework it is indeed possible to estimate how different Eurozone economies have reacted to policy innovations and if their responses to shocks have evolved through time and moreover to comply with all the remarks that were made to the cited VAR analyses conducted in literature.

First of all, in order to avoid comparability issue, in the spirit of Clarida and Galì (1994) and Amisano et al (2005) we build our variables, except the policy rate, as a ratio between the data of each one of the analysed member countries and the German data, following the track set by Mojon and Peersman (2001), who group the EMU countries on the basis of their economic integration with Germany, leaving it alone as reference entity.

Secondly, the use of a FAVAR specification allows to avoid the well-known monetary VARs problems in the identification and, more importantly for our specific application, permits to appreciate the reaction of the many intermediate variables that determine the transmission mechanism.

Finally, as one of the main purposes of this work is to understand whether changes in policy (the inception of the monetary union) and exogenous shocks (the two crises of 2007 and 2011) affected the economic structure and the interaction between the economy and the monetary innovations (the transmission mechanism) the model implemented must consider the variance covariance matrix of the innovations as time variant. This is fundamental as it allows to infer whether, during time, the economic structures of the Eurozone countries followed an integration process and whether the transmission mechanism evolved according to the new policy regime; moreover it is necessary to appreciate whether the many shocks that have hit the Eurozone economies have altered the structural dynamics of policy innovations' propagation (Primiceri 2005, Korobilis 2009).

The availability of long enough time series to achieve efficient estimates of the post 2011 crisis period, strengthened by the adoption of Bayesian estimation techniques, allows our analysis to bring an original contribution both at the empirical setting level and in terms of results and policy perspectives.

What emerges from our study is that there was no structural break between the pre-EMU and post-EMU period, hence making the transition process designed by European authorities a benchmark to be applied in the management of political and economic changes of this entity. Contrarily to the inception of the currency union, the 2008 financial crisis increased inhomogeneity in the country specific reaction to central bank interventions. This might be due to an increase in the magnitude and frequency of asymmetric exogenous shocks on the labour market, especially evident in Italy and France. Coherently, more than credit and financial sector dynamics, the country specific real economy's structures seems to have been altered, as heterogeneous reactions are traced for country specific investments, consumptions and exports, among others. From the analysis conducted it does clearly emerge the evolution of the degree of symmetry of the transmission mechanism since the inception of the EMU: after a first phase in which some differences existed but where under control, the shock induced by the global financial turmoil have contributed to exacerbate the asynchronies in the business cycles of the member countries, separating the reference entity, *id est* Germany, from the other member economies. From the policy point of view, hence, it appears that reforms are much needed in order to favour the convergence of demand structures, that seems to be the source of the inhomogeneous functioning of transmission mechanism, and to allow a homogeneous recovery of all the economies of the currency area.

2. Methodology

2.1 The model

As put forward in the introduction, the empirical models employed in past research on this topic present weaknesses that would call for some refinements.

The main flaws were (a) in the use of a dataset that included only or mostly pre-EMU data and (b) in the adoption of standard VAR techniques (Bean 1998, Favero et al. 1999, Angeloni et al. 2003) which impulse response functions, having large confidence bands, made the cross-country comparison scarcely reliable. This because large uncertainty around the median value of estimated dynamic multipliers makes fall the power of the test for differences in the reactions.

Another issue regarding the model features, forgiven by past literature, is that low dimensional monetary VARs might be underspecified as they do not consider a variety of economic indicators

that surely influence the decision-making process of central bankers. Sims (1992) pointed out that adopting such specifications can lead to inconsistent impulse response functions, as exemplified by the so-called price puzzle, *id est* a positive reaction of prices to a monetary tightening, contrary to the conventional theory. According to this claim, not only the impulse response functions present in this literature were not comparable, but probably they were not even consistent, due to misspecification issues. Furthermore, focusing only on few variables, usually the conventional economic drivers as output, inflation, unemployment and interest rates, does not allow to infer how the variables that constitute the transmission mechanism and that function as intermediaries between the policy instrument and the final targets react to the innovations (Bernanke and Gertler, 1995 and Bernanke et al. 2005, henceforth BBE). Given that this field of research is focused on the functioning of such mechanism this is an essential gap to be filled.

To overcome this hurdle, we resort to a Factor Augmented VAR (FAVAR) model (see BBE and Stock and Watson, 2005) in order to enlarge the information set used for estimation, without losing the statistical advantage of dealing with a small number of variables. This solution in fact allows to condensate the information of a vast number of economic time series into a small number of unobserved factors. In particular, in a standard FAVAR model, the information enclosed in a vector of observed variables x_t of size **n** is condensate into a smaller vector of factors f_t which size is k, such as k<<n, as follows:

$$g_t = c + b_1 g_{t-1} + .. + b_p g_{t-p} + \varepsilon_t \quad (1)$$

In equation (1) g_t is composed by a yt vector (size wx1) of observable variables including a policy rate and a vector f_t (size kx1) of latent factors, such as $g_t = \begin{bmatrix} y_t \\ f_t \end{bmatrix}$; c is an rx1 vector of coefficients that multiplies constant terms, b_i (i=1,...,p) are the elements of the lag polynomial matrix which size is rxr where r=w+k and $\varepsilon_t \sim N(0, \Omega)$ where Ω is an rxr covariance matrix.

Since the model proposed in this paper needs to be time varying both in the coefficients and in the variance-covariance matrix of the shocks, we follow the specification outlined in Korobilis (2009), which, in turn, is inspired to the framework proposed by Primiceri (2005), who introduced such a framework in a VAR specification, without any Factor component. By introducing such a component, our TVP-FAVAR assumes the following analytical form:

$$g_t = c_t + b_{1t} g_{t-1} + .. + b_{pt} g_{t-p} + \varepsilon_t \quad (2)$$

where all the elements have the same features as in the equation (1), with the exception of ct and b_{it} that in a time varying framework become respectively a rx1 vector of time varying coefficients that multiply constant terms and a rxr coefficient matrix for i=1,…,p and t=1,….T. Moreover, in

equation (2) $\varepsilon_t \sim N(0, \Omega_t)$ is a vector of idiosyncratic heteroskedastic shocks with a variance covariance matrix Ω_t being a *r*x*r* full matrix for each *t*=1,….,*T*. As is common in literature, see for example Smith and Kohn (2002), Cogley and Sargent (2005), Canova and Gambetti (2009) it can be parametrized using a decomposition of the FAVAR covariance matrix of the form:

$$A_t \Omega_t A_t' = \Sigma t \, \Sigma_t' \tag{3}$$

where A_t is a unit lower triangular matrix with ones on the main diagonal

$$A_t = \begin{bmatrix} 1 & .. & .. & 0 \\ a_{21,t} & 1 & .. & : \\ : & .. & 1 & 0 \\ a_{m1,t} & .. & a_{m(m-1),t} & 1 \end{bmatrix} \tag{4}$$

and

$$\Sigma_t = \begin{bmatrix} \sigma_{1,t} & .. & .. & 0 \\ 0 & \sigma_{2,t} & .. & : \\ : & .. & .. & 0 \\ 0 & .. & 0 & \sigma_{n,t} \end{bmatrix} \tag{5}$$

On the basis of equations (3) to (5) it can be derived that:

$$g_t = c_t + b_{1t} g_{t-1} + .. + b_{pt} g_{t-p} + A^{-1} \Sigma_t \varepsilon_t \tag{6}$$

Let now place the time varying coefficients in a vector B_t = (vec(b_{1t})',….,vec(b_{pt})')', the elements in the lower triangle of matrix A_t (stacked by rows) in a vector α_t and the diagonal elements of Σ_t in a vector σ_t. Let assume that this set of drifting parameters follows random walk processes augmented with a mixture of innovations that is the result of the combination of two normal components as in Korobilis (2009). The specification of the dynamics of the drifting parameters results as follows:

$$\begin{aligned} B_t &= B_{t-1} + \eta_t^B \\ \alpha_t &= \alpha_{t-1} + \eta_t^\alpha \\ \ln(\sigma_t) &= \ln(\sigma_{t-1} + \eta_t^\sigma) \end{aligned} \tag{7}$$

where $\eta_t^B \sim N(0, Q_B)$, $\eta_t^\alpha \sim N(0, Q_\alpha)$, $\eta_t^\sigma \sim N(0, Q_\sigma)$ are independent innovation vectors, while Q_B, Q_α and Q_σ are the errors covariance matrices associated with each one of the parameters vectors. The assumption adopted is that all the error terms are mutually uncorrelated.

2.2 Estimation

In their 2005 paper, BBE described and compared the two most common ways to estimate latent factors to be included in a VAR analysis.

The first method consists in a two-step approach, in which the factors are obtained from the observation equation adopting a standard principal component technique and identification is performed by restricting either loadings or the factor themselves, as proposed by Stock and Watson (2005). After this stage the FAVAR model is estimated replacing F_t with $\widehat{F_t}$. This approach has the advantage to be theoretically simple and to identify the factors against any rotation.

The other way to estimate dynamic factors is a single step procedure adopting a likelihood based

Gibbs Sampling technique that jointly estimates the unobservable factors and the VAR equation. This approach brings identification issues, as there is the need to restrict the channels by which the vector of observed variables *Y*t contemporaneously affects X_t. This is done employing a triangular identification scheme in the upper *K*x*K* block of the loadings matrix, leading to the fact that the ordering of the variables in the *X*t has a predominant role in shaping the likelihood function, as the specific choice restricts the contemporaneous effect of *Y*t on the first *K* variables.

In addition to that, in the context of a time varying FAVAR, a Gibbs Sampling technique that employs a Monte Carlo Markov Chain (MCMC) algorithm risks to become computationally too burdensome as another MCMC simulation has to be implemented in order to estimate the dynamic evolution of the parameters.

The approach adopted in this paper follows the two-step procedure by Stock and Watson (2005) in which the model parameters are obtained conditionally on the previously estimated factors. The equation that links the observed series x_t, the fundamental economic variables $y_t$and the factors is the following:

$$x_{it} = \check{\lambda}_{i_t}^{f} f_t + \check{\lambda}_{i_t}^{y} y_t + u_{it} \tag{8a}$$

$$u_{it} = \rho_{i1} u_{it-1} + .. + \rho_{iq} u_{it-q} + v_{it} \tag{8b}$$

Where $\check{\lambda}^{f}$ is nxk, $\check{\lambda}^{y}$is nxl, $v_{it} \sim N(0, \exp(h_{it}))$, E($v_{it}\ f_t$) = 0 and E($v_{it}\ v_{js}$) = 0 for all *i,j* = 1, …, *n* with i≠j and *t* =1,…*T* with *t*≠*s*. Since we need to work with uncorrelated errors, model 8(a) must be transformed into:

$$x_t = \lambda^{f} f_t + \lambda^{y} y_t + \Gamma(L) x_t + v_t \tag{9}$$

Where $\gamma(L)$= diag($\rho^1(L),..,\rho^n(L)$), $\rho^i(L)$=$\rho_{i1}(L)$+..+$\rho_{iq}(L^q)$, λ^j = (In - $\gamma(L)$) $\tilde{\lambda}^j$ for j=*f,y* and $v_t \sim N(0, H_t)$ with H = diag(exp(h_{1t}),…, exp(h_{nt})) where each lag volatility evolves as a random walk of the form

$$h_{it} = h_{it-1} + \eta_t^h \quad (10)$$

with $\eta_t^h \sim N(0, \sigma_h)$). Equation (9) jointly with equation (2) constitutes the TVP-FAVAR model in accordance to the two steps estimation approach prescribed by Stock and Watson (2005), being the first the factor and the second the FAVAR equation. The parameters of the state equation have conditionally normal errors, hence a standard Kalman filter technique can be applied in order to estimate the time variant parameters.

For what concerns the factor equation the parameters are sampled using standard linear regression model arguments, with the exception of the log-volatilities, for which Kim et al. (1999) algorithm was employed.

2.3 Bayesian framework

There are two different orders of reasons why in this analysis we adopt a Bayesian framework.

Firstly, Bayesian analysis is useful to avoid the main shortfalls of the classical maximum likelihood technique when dealing with large dimension, non-linear models as in this case.

An alternative way of describing the profligate parametrization problem is to underline that in the present analysis a too much large number of variables are employed with respect to the limited number of available observations; Bayesian techniques are required in order to solve degrees of freedom problems.

Secondly given that the hypothesis that the time evolution scheme of both FAVAR autoregressive parameters and parameters of the variance covariance matrix is described by a random walk

can lead to explosive draws, the setting of an adequate priors' scheme is required in order to avoid the spark of diverging dynamics.

The prior setting used here resembles the one in Korobilis (2009) which, rather than employing informative priors which values were computed using a training sample (as in Primiceri 2005), adopts a standard Minnesota prior, which assigns a Hierarchical ordering to the influence exerted on a variable's dynamics by its own lags and the other variables' ones.

The priors for the initial states of the time varying coefficients and their simultaneous relations are assumed to be normal, while the priors of the hyperparameters determining the time varying

evolution of the variance of the innovations impact on the parameters and their second moments are modelled as independent inverse-Wishart.

2.4 VAR representation and impulse response functions

The VAR representation of the TVP-BFAVAR model can be written down in a reduced form as follows:

$$g_t = B_t(L)g_t + A^{-1}\Sigma_t\zeta_t \tag{11}$$

Where $g_t = \begin{bmatrix} y_t \\ f_t \end{bmatrix}$, B_t is the polynomial of coefficients in the lag operator and $\zeta_t$is drawn from a normal distribution $N\sim(0,1)$.

The identification retraces the block-triangular scheme proposed by BBE (2005), dividing in three groups the economic indicators considered. In the first, upper, group are placed the variables that do not react simultaneously to the monetary innovation (real economic drivers and future expectations), then is set the instrument rate, and in the lowest part is placed the fast-moving variables group, which includes financial indicators, that are supposed to react immediately to the shock.

For what concerns the simulation of the impulse response function, as a proxy of the policy instrument the choice falls on the short term interbank rate. As our sample spans both pre and post EMU periods, until the currency union has been established we take as reference the German three months' interbank rate (as in Lund, 1999, and Favero et al., 2000), while since the inception of the Eurozone, the three month Euribor becomes the selected proxy. There is to be noted that, joining the two series does not introduce neither distortions nor breaks, as even before the start of the currency union, the European reference rate was the German one.

2.5 Data, country selection and variable construction

VAR analysis, as performed in the literature about EMU's transmission mechanism symmetry, presents two main shortcomings.

The first is linked to a statistical problem occurring in comparing the impulse responses to policy innovations. Given the high uncertainty around estimated IRFs in classical models, when comparing the reaction of the same variable for two countries there is a high probability of incurring in a second type error, i.e. accepting the null hypothesis of homogeneity in the policy innovation effects even if the median responses seem to differ remarkably (Favero et al. (1999) and Ehrmann et al. (2003)).

To fix this concern, we follow the track set by Clarida and Galì (1994) and Amisano et al. (2009), constructing our variables as the ratio between observations for country *i* and the German ones. This allows to obtain time series that describe the relative performance of the studied economy with respect to Germany, the leading economy of the union. All the series have been indexed, taking as reference quarter 1999q1 (set = 100), id est the moment in which the currency union effectively started. In this way, it is easier and unambiguous make inference about dynamics of the evolution of each variable for each country in the timespan considered.

Once an index for the variables of each country has been built up the vector x of the input variables of the model is specified as follows

$$x = \frac{x_i^j}{x_i^G} \tag{12}$$

Where *i*=1,….,*n j*=Italy, France, Netherlands and G stands for Germany.

This permits work with variables that describe the relative evolution of each country-specific economic indicator relative to the German one, and to appreciate how the policy stimulus as influenced such evolution, that is the main purpose of this paper.

The policy rate is the only variable that has not been constructed as a ratio, because we are not interested in the relative shock that hits a country but we want to assess how a common shock affects the transmission mechanism in each of the analysed members of the union.

The second problem encountered in this strand of literature, is that VARs employed are mainly based on pre-EMU data, which exposes results to a sort of Lucas Critique, as it is possible that the transition to the common currency has changed agents' behaviour and expectations, making invalid the insights gained with pre-union based data (Bean, 1998, Mihov, 2001).

To address this issue, we have built a dataset including 82 economic series that broadly describe the structure of the countries analysed (see Table 1 for a detailed list). The series starts in 1995q1 and ends in 2014 q4, including 80 observations, 20 before the inception of the currency union and 60 afterwards. As previously anticipated, given the short dimension of the sample, Bayesian inference is required to obtain robust estimates (Jaroczinski, 2010). The countries considered are Italy, France and the Netherlands. The first because, since the very beginning of the talks of instituting the common European currency, its economic soundness was put into question and its admission in the union itself was in doubt until the eleventh hour (Amisano et al. (2009)). Hence, it can be considered to be representative of the so-called peripheral countries. It is of interest also because of its peculiarities in the banking and industrial systems, as it is characterized by a productive base founded on small and medium enterprises which rely heavily on bank credit. As the dimension of the firms and their dependence on the bank credit are deemed

to be key factors in the credit channel of the transmission mechanism, Italy surely represents an optimal case to study possible asymmetries of such channel. The inclusion of France is motivated by the fact that its economy has always been considered to belong to the core of the EMU union. However, after the sovereign debt crisis, some have started to argue that maybe it is no more so, as for example the study of the sovereign bond yields may bring to claim (see Basse, 2013). Through the proposed Time Varying framework, we want to observe whether also the monetary policy effects have changed since the 2012 crisis, adding evidence to the claim that wants France exiting the EMU core group.

Lastly, Netherlands is included in the analysis as it allows to assess whether or not, inside the core group of EMU countries, the transmission mechanism works evenly. In the latter case this would bring us to claim that Germany stands alone as the leading and reference economy of the area and, hence, that some re-equilibrating policies must be implemented to recalibrate the balance of power between the union economies.

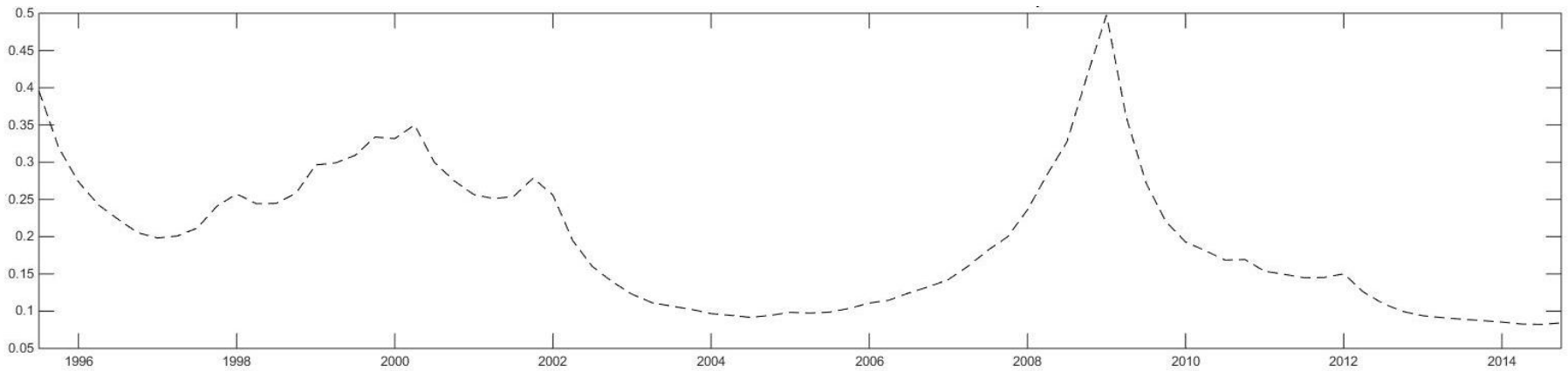
3. Results

3.1 Monetary policy variability and labour market turbulences: what role for asymmetric shocks?

In order to understand the dynamics that since its inception have driven the behaviour of the ECB, it is useful to start with the analysis of the non-systematic monetary policy interventions.

The non-systematic part of the central bank conduct encompasses both policy errors and reactions to exogenous shocks and it is measured with the identified monetary policy innovations. Following the hint offered by Primiceri (2005) we exploit the time varying standard deviation of the posterior distribution of the interest rate equation as a measure of the magnitude and variability of the non-systematic interventions. As can be seen from figure 1[1], between 2008 and 2009 we report a higher variance of those manoeuvres, surely associable to the attempt by the authorities to counteract the exogenous shocks brought by the financial crisis.

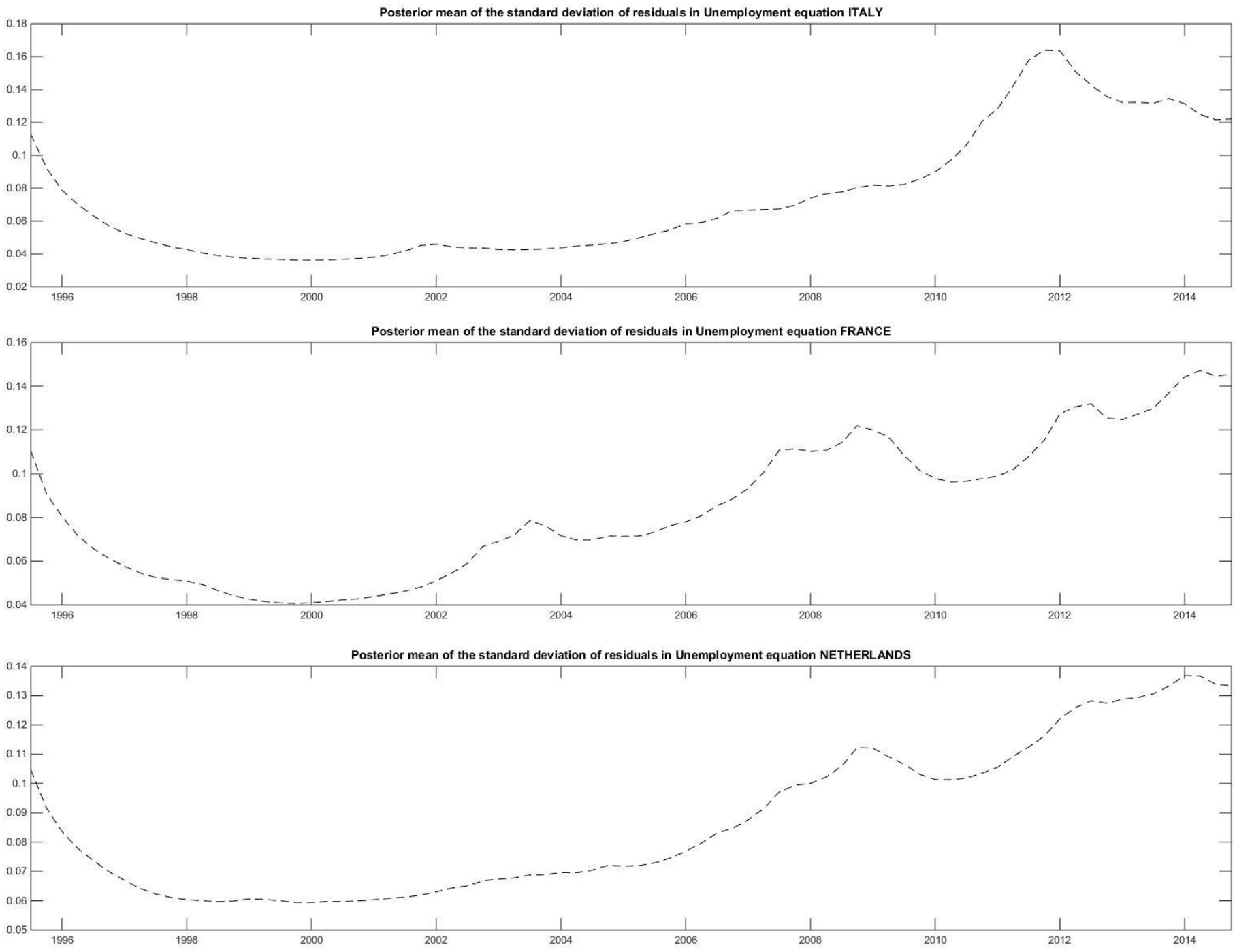
1 Posterior mean of the standard deviation of residuals in interest rate equation for Italy/Germany spread



Another significant insight that can be drawn from this analysis is that after an initial higher uncertainty around policy actions, after 2002 the variance of the policy innovations settles to very low levels. This means that the central bank took a while to calibrate its policy action and choose a stable track, but that as soon as the transaction was complete (with the adoption of the unified currency, occurred on January first, 2002) it acquired sufficient confidence with the new economic ensemble and was able to adopt a coherent policy strategy.

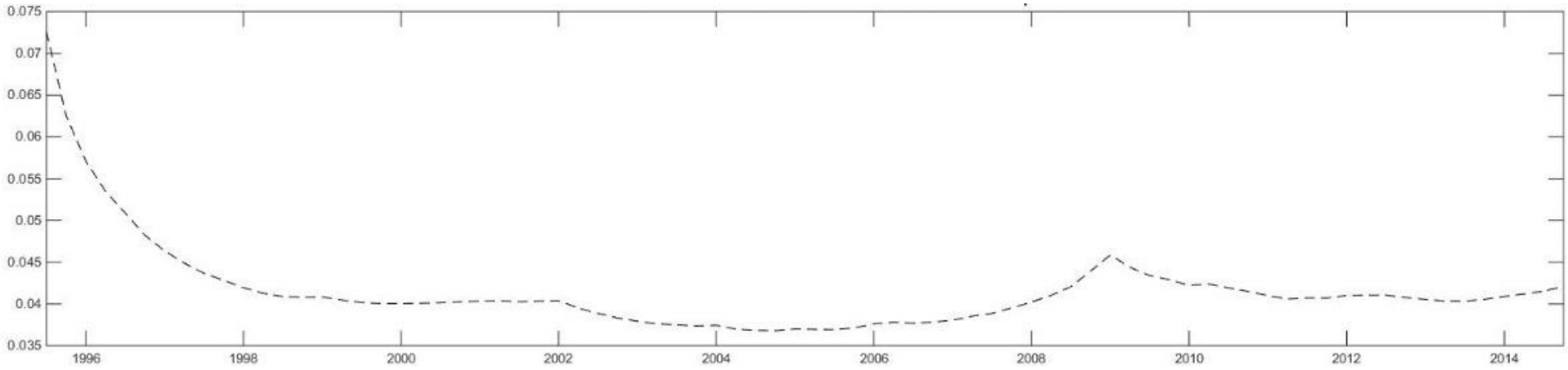
The same analysis just employed to evaluate the non-systematic monetary policy actions, can be performed also to check whether asymmetric exogenous shocks have hit the labour market and the price dynamics[2].

2 Posterior mean of the standard deviation of residuals in unemployment equation for Italy, France and the Netherlands



For what concerns shocks on labour market, it results evident that after the financial crisis the variability and intensity of the asymmetric exogenous shocks, that have hit this sector of the economy, experience a sharp rise, especially in Italy, where they reach a more considerable magnitude than the ones of France and the Netherlands. It is also worth to be noted that, even of smaller entity, asymmetric shocks had hit the labour market in France and the Netherlands well before the financial crisis, signalling that uneven pressures were already acting before the financial turmoil unleashed. This contributes an evidence to the fact that asymmetric shocks have hit the Eurozone and that, especially peripheral countries, which experienced also the sovereign distress, have suffered labour market turbulences that core economies and particularly the German economy have not. For what concerns inflation evolution, it does not seem that any asymmetry in the exogenous shock has influenced its dynamics in the timespan considered[3].

3 Posterior mean of the standard deviation of residuals in inflation equation



This makes sense since the deflationary pressures manifested in the last years stem from the structural evolution of the economic conditions rather than directly from exogenous shocks and they characterized the whole European economic environment.

3.2 The functioning of the transmission mechanism: where do the asymmetries lie?

Most of the VAR analyses presented in literature employed small dimensional models not to incur in degrees of freedom issues in the parameters estimation, thus neglecting the examination of how monetary impulses influence intermediate variables.

This caused the absence, in most of the previous works, of an assessment of the heterogeneity of transmission dynamics, limiting the analysis to the study of the symmetry of the impact on the main economic indicators.

Employing a TVP-BFAVAR model we are able to estimate the repercussion of policy innovations both on fundamental variables as GDP, inflation and unemployment and on variables that are bound to determine the functioning of the transmission channels of monetary innovations to the real economy.

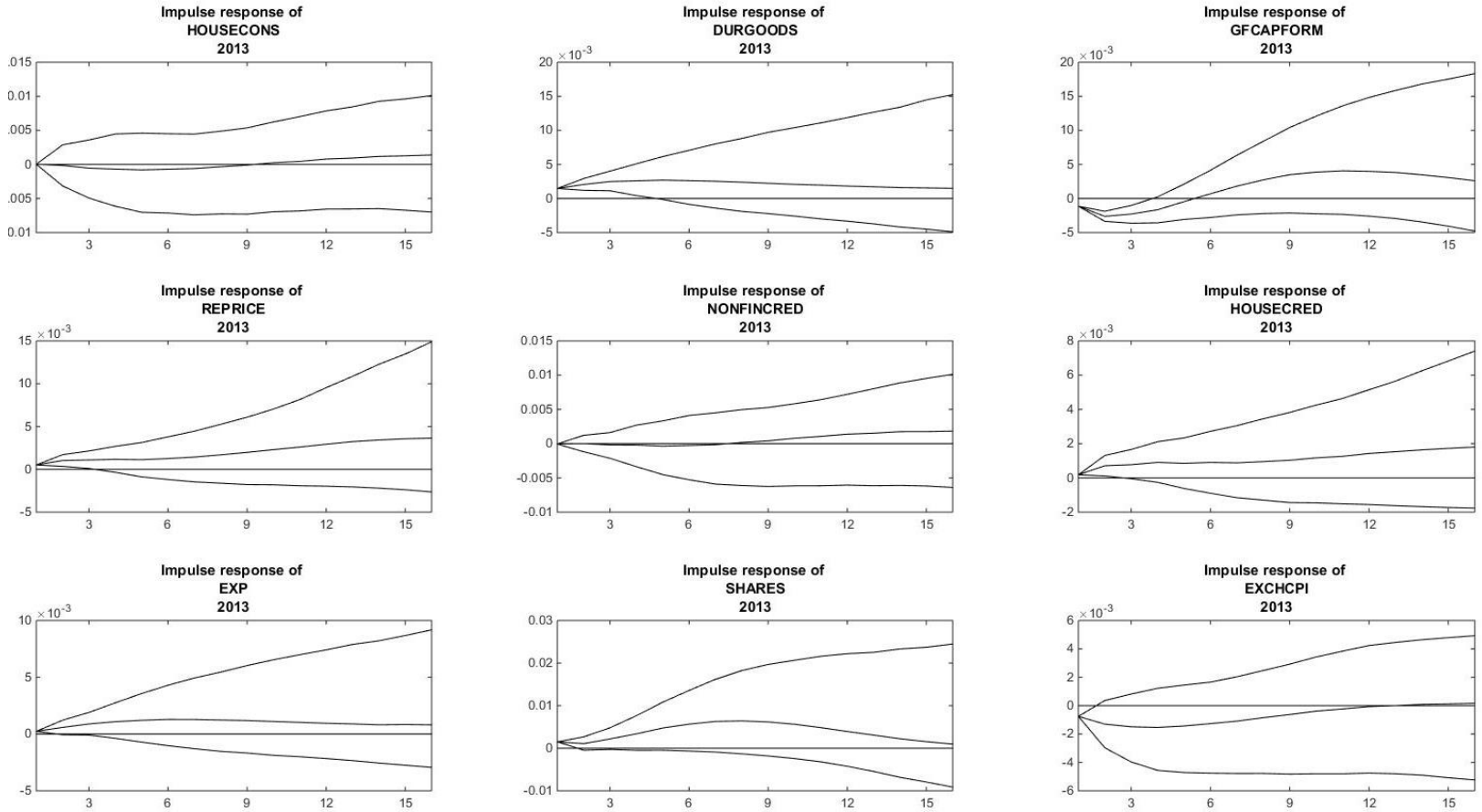
According to Mishkin (1996), which provides a concise but complete literature review of the topic, there are three main channels of monetary policy transmission: the Keynesian interest rate channel, the credit channel and the so-called "monetarist" channel which emphasizes the role of other asset prices as exchange rates and equity prices.

3.2.1 Interest rate channel

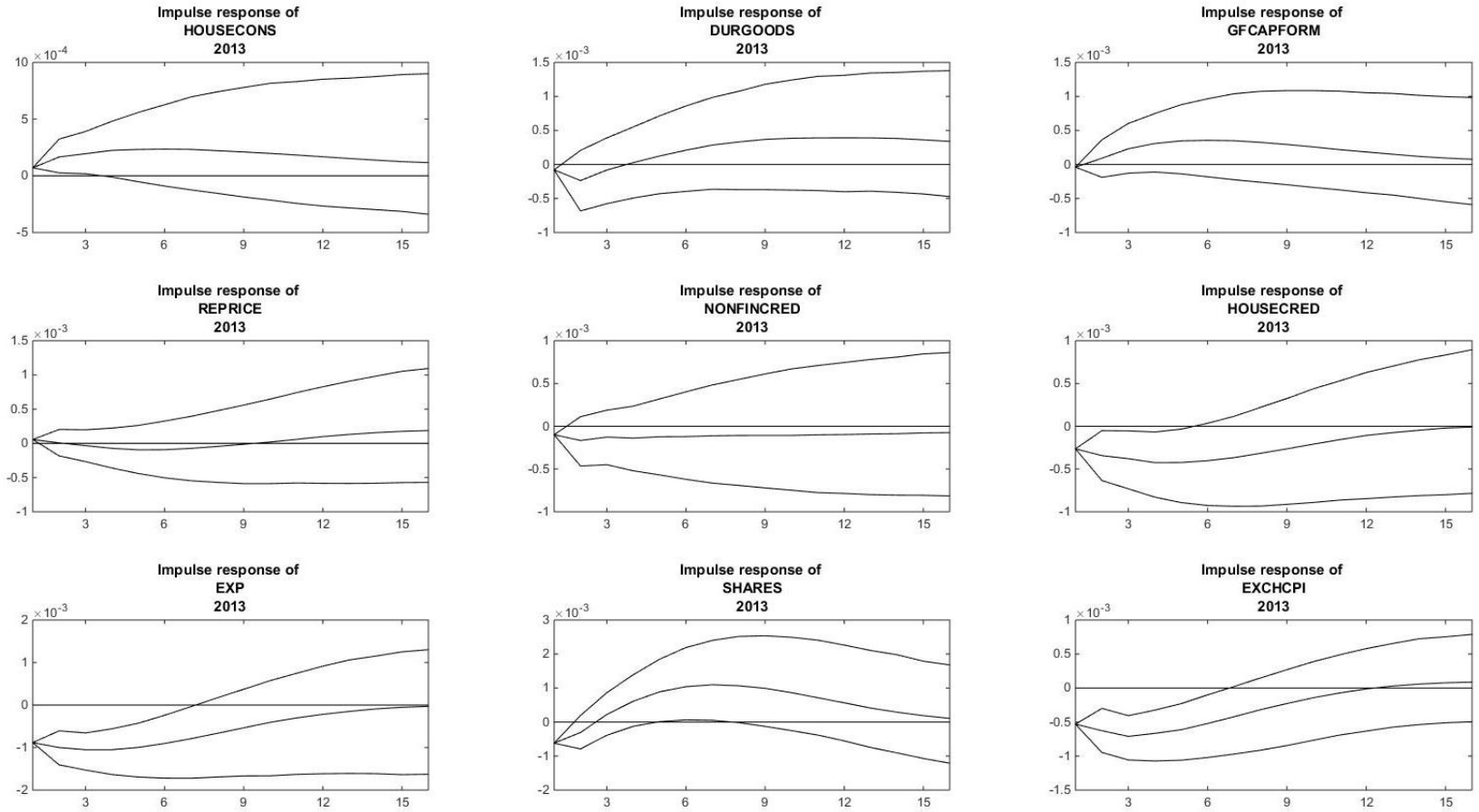
In line with theory, the interest rate channel functioning is determined by the interest rate sensitivity of the aggregate demand, because of cost-of-capital reasons. It works in the following way: after a policy intervention, let's say a monetary contraction, short term interest rate rise and, given price stickiness, also real rates do. Then, being long term rates an average of future expected short term rates, according to the term structure scheme, higher real short term rates lead to higher long term ones. A contractionary policy, thus, causes higher real long term interest rates that induce a decline in interest-sensitive activities (such as business investment, household consumption in durable goods and housing investment), finally leading to a contraction of the aggregate output. Is straightforward to understand that different interest rate sensitivities of the aggregate demand are bound to generate asymmetries in the shock's propagation between two economies.

Asymmetries in this transmission channel seem to be present in full fledge in Italy. As figure 4 shows, gross fixed capital formation (used as a proxy of business investment), consumption in durable goods and real estate prices display a response to the monetary policy impulse that is significantly different from the German one.

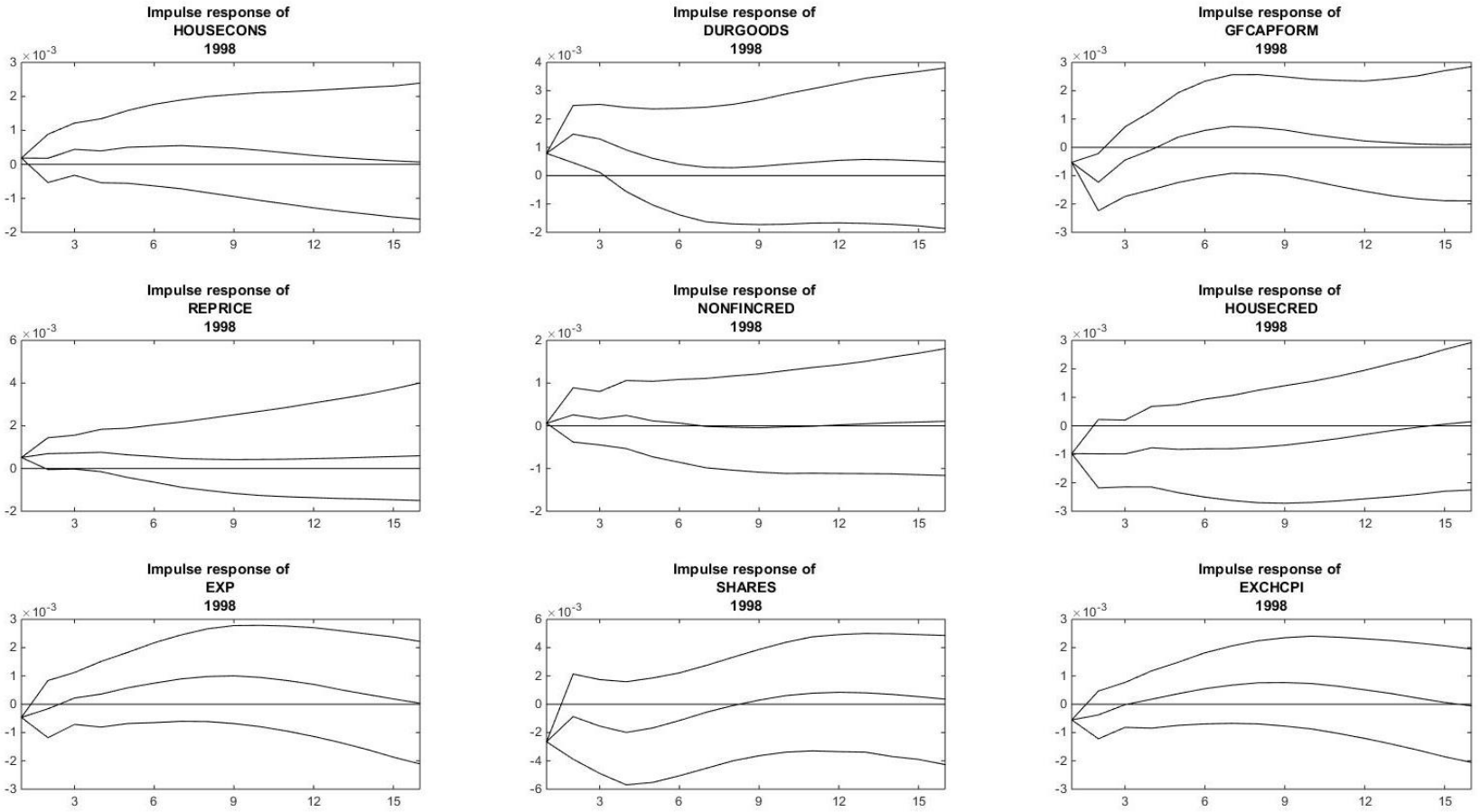
4 Medians, 10th and 90th percentiles of impulse responses for selected indicators which represent measures of the variables that constitute the diverse channels of transmission of the monetary policy (Italy)



5 Medians, 10th and 90th percentiles of impulse responses for selected indicators which represent measures of the variables that constitute the diverse channels of transmission of the monetary policy (France)



6 Medians, 10th and 90th percentiles of impulse responses for selected indicators which represent measures of the variables that constitute the diverse channels of transmission of the monetary policy (Netherlands)



A possible explanation is a high degree of heterogeneity in the industrial structures of the two countries, with Italian industrial sector composed by small firms which are more sensitive to interest rate modifications, and characterized by a different sensitivity of aggregate demand. The Netherlands (Figure 6) also display a response of spending in durable goods statistically different to Germany, even if this difference is lower in magnitude and persists for a shorter time than in the Italian case.

For what concerns France (Figure 5), it seems that the functioning of this channel is aligned with the one registered in Germany. This finding shows a first evident source of heterogeneity in the economies analysed, calling for some structural reforms bound to promote some convergence of industrial systems' structure, that would curb the discrepancies in the economies' interest rate sensitivity enhancing the even transmission of ECB actions.

3.2.2 Credit channel

Since the mid-nineties, literature started to emphasize the role of credit market imperfections in the propagation of monetary impulses (Bernanke and Gertler, 1995, Kashyap and Stein, 2000 and Mihov, 2001). The credit channel explanation focuses the attention on how monetary policy impacts on banks' lending activity. A policy innovation modifies the access to bank credit, either through the so-called bank-lending channel or through the balance-sheet channel. The first mechanism sees a policy intervention modify the interest rate and, through it, bank deposits and bank loans. The balance-sheet channel, instead, alters the creditworthiness of economic agents. A contractionary intervention deteriorates firms balance sheet, resulting in the decrease of their equity value and net worth, and hence also the value of the collateral they can offer when asking for credit. Banks see the risk of adverse selection and moral hazard augment and raise accordingly the interest rate on loans. An inhomogeneous functioning of the credit channel is noticeable in the French case, where, as is evident from figure 5, credit provision to households reacts with a significant difference with respect to Germany. This indicates that, as a result of a contractionary policy shock, banks modify lending attitude towards households in a different way in the two countries. This can signal either a different banking system structure or solidity of the financial system, or a different households' creditworthiness status, as the discrepancies might have been induced by both of the sub-channels presented. For what concerns Italy (Figure 4) and the Netherlands (Figure 6) their credit channel reaction to monetary innovations seem to be in line with the German ones, and even the crisis does not seem to have altered them.

This evidence seems to support the idea that, even if, as shown in the literature, crisis have determined asymmetries in the lending conditions across Eurozone, those divergences do not reflect in a inhomogeneous change in the reaction to monetary manoeuvres of credit provisions

to the real sector. Also in France, where an asymmetry has been detected in the reaction of credit to households, this divergent response was pre-existent and not induced by the crises occurred in the 2008-2011 period.

3.2.3 Asset prices channel

The last channel works through the influence of monetary decisions on other asset prices such as exchange rates and equity prices.

For what concerns the former, nominal exchange rates are affected by interest rate modifications induced by policy determinations. Usually, to a change in nominal exchange rates normally corresponds an according modification of the real exchange rate, that leads to a change in the net exports which reflects on output evolution. In a currency union, although, it may be that national price dynamics respond heterogeneously to a monetary stimulus, hence bringing to diverse evolutions of the real exchange rate across countries. This can lead to heterogeneous effects on international trade and, finally, domestic production.

Focusing on the latter, interest rate changes due to policy intervention alter the discount rate of future cash flows and hence modify equity prices. A modification of equity prices causes a change in the net worth of stakeholders, hence affecting investment decisions, and also produces a wealth effect, since it determines a shift in the financial wealth of consumers, influencing their spending choices.

The exchange rate channel appears to work homogeneously for the Italian and Dutch case, while, for France, it shows a strong asymmetry which emerges both in the response to shock of real exchange rate and exports.

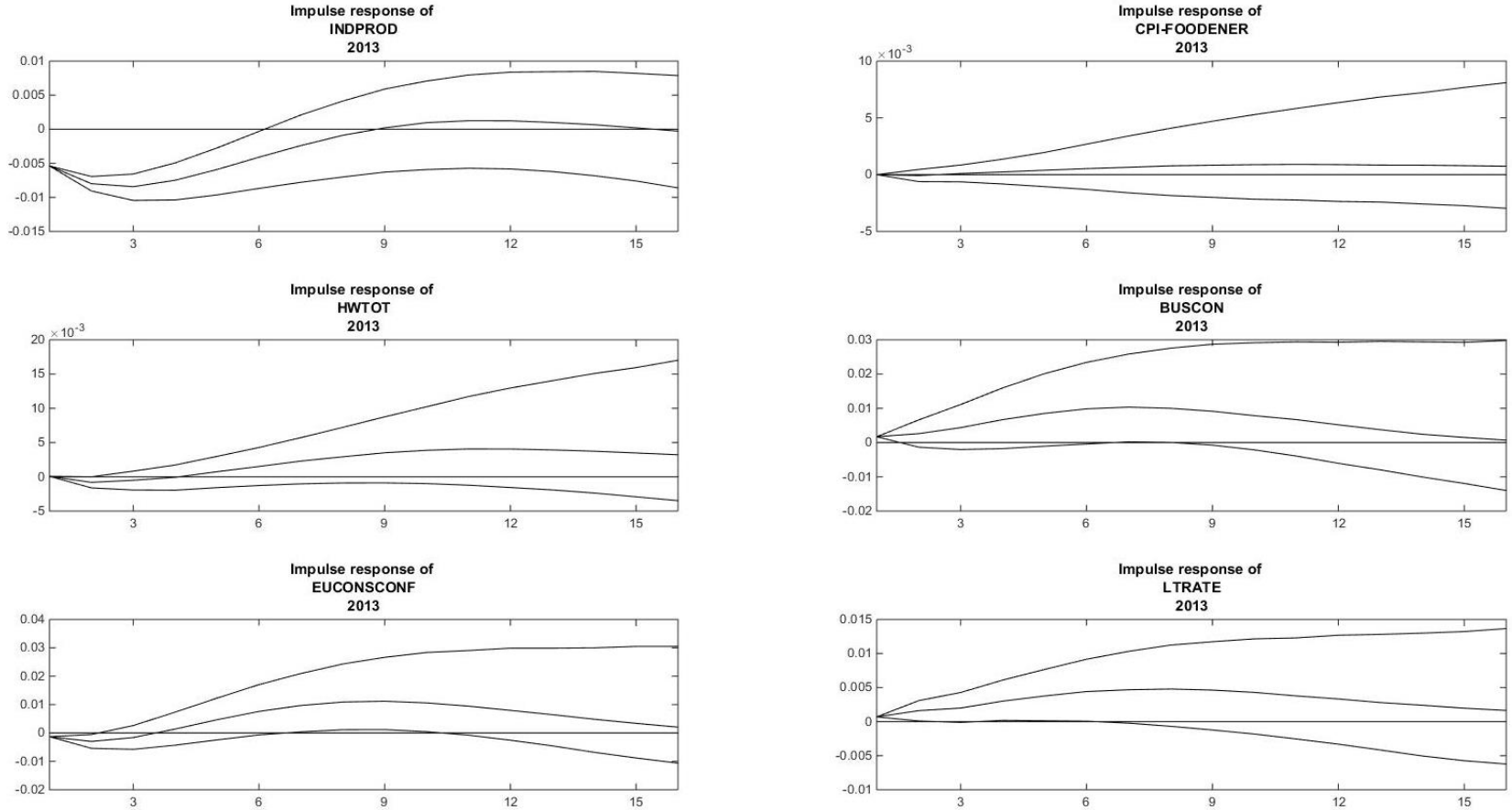
3.3 The impact of asymmetries in the transmission mechanism: inhomogeneity in the reaction of the target variables

Having uncovered which are the channels where heterogeneity is generated, lets focus on whether this diverse functioning of the transmission mechanism influences the homogeneous evolution of the target variables.

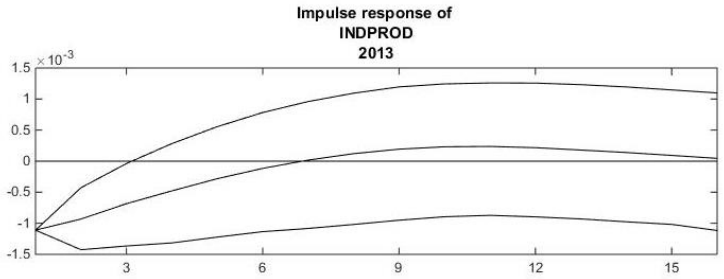
Starting the analysis from Italy (Figure 7), we find that GDP experiences an inhomogeneous reaction to a monetary impulse compared to the German one, witnessing that the diverse dynamics of the transmission mechanism trigger a misalignment of the output evolution. In line with that, consumer confidence also exhibits a significantly different response to the shock than in Germany, as households have become aware of the different perspectives that a monetary innovation involves for the country's business cycle.

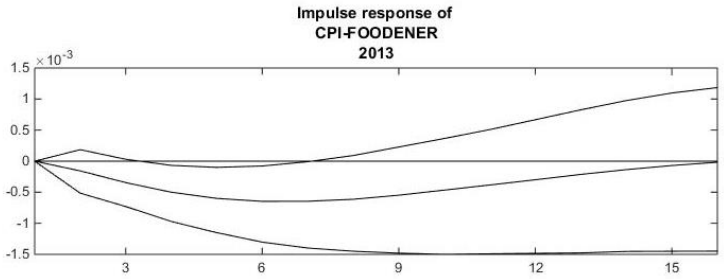
All other variables, from labour market to price indicators, seem to react evenly in the two economies. As expected, though, ten years government bond yield (LTRATE) displays a significant divergent pattern of response, which magnitude amplifies in the post crisis period.

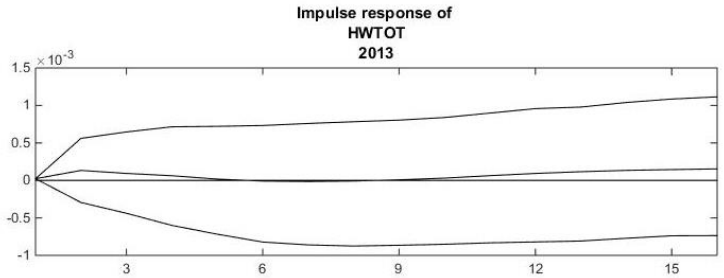
7 Medians, 10th and 90th percentiles of impulse responses for selected indicators which represent measures of the variables targeted by the ECB (Italy)

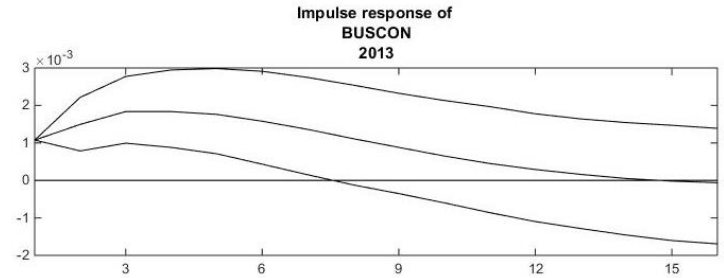


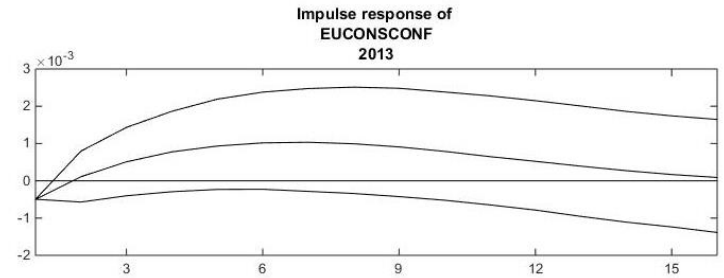
8 Medians, 10th and 90th percentiles of impulse responses for selected indicators which represent measures of the variables targeted by the ECB (France)

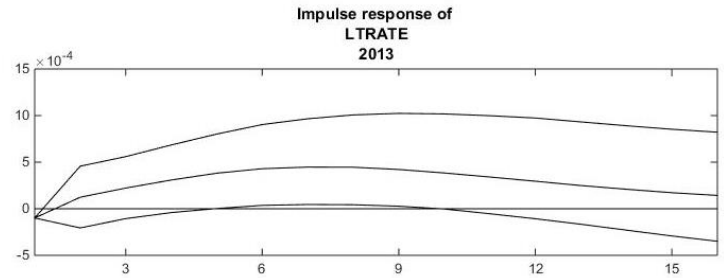




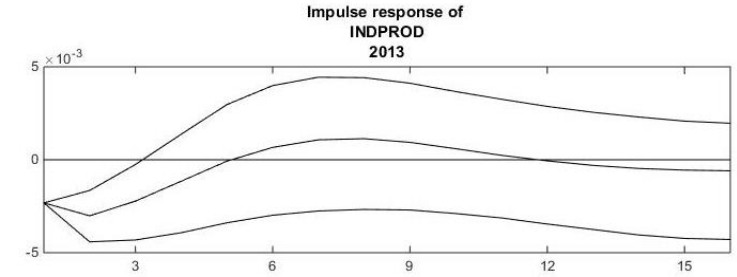


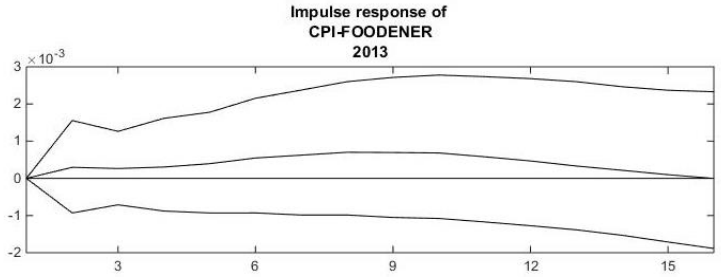


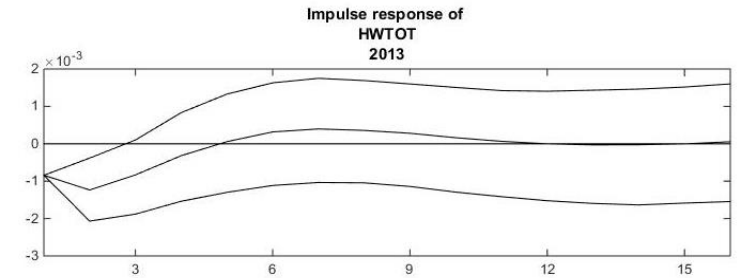


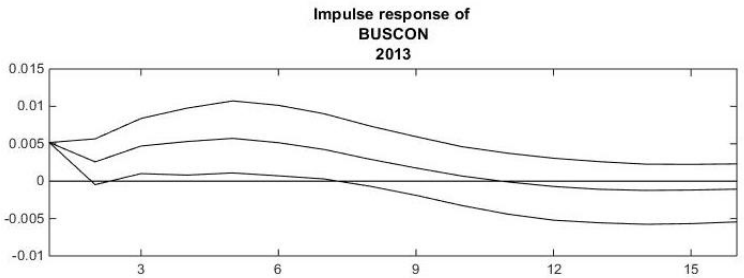


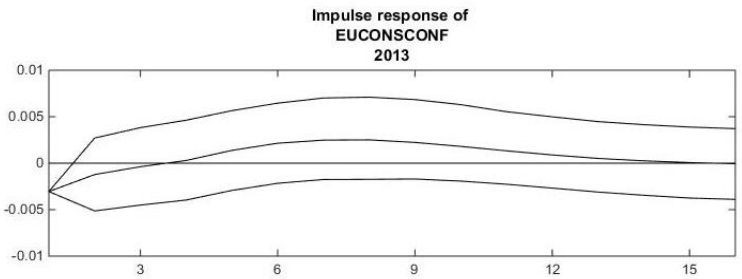
9 Medians, 10th and 90th percentiles of impulse responses for selected indicators which represent measures of the variables targeted by the ECB (Netherlands)

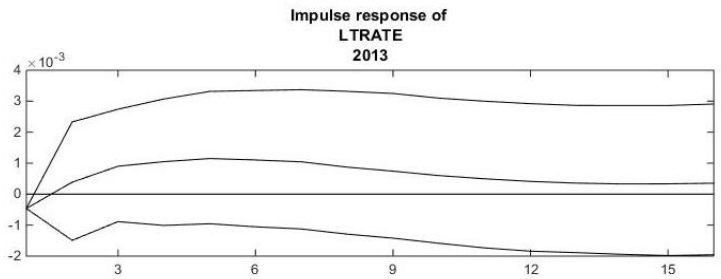












For what concerns France (figure 8) and the Netherlands (figure 9) reaction of output, in each of the economies analysed it is again not aligned with the German one, as in all cases industrial production's gap, used as a proxy, shows a significant response to the monetary impulse. The persistency of such asymmetry is less pronounced than in Italy, where it lasts for six lags, enduring in either cases only for three quarters.

Focusing on France, an asymmetric reaction is noticeable also in the business confidence's rejoinder, that is significantly different for a prolonged time period (more than six quarters), as it is plausible that business agents have learnt how output reacts to monetary stimuli so they adapt their expectations accordingly each time there is a shift in the policy stance. Such an inconsistency between the German and French output reaction might be due to misalignments in the international trade dynamics, given that, as above reported, prices present asymmetric reactions to shocks, which reflect on real exchange rates and then on international trade evolution.

Lastly, also for the Netherlands an inhomogeneous output response is associated with an asymmetric business confidence indicator reaction, witnessing that, differently from the Italian case, the business sector aligns better than households its expectations to policy changes. This time the output heterogeneous behaviour is associated to a diverging evolution of the labour market conditions, as hours worked weekly display a significantly different reply to the monetary variation.

The evidences gathered, suggest to claim that country specific structural reforms are needed to coordinate business cycles and reaction to monetary stances, as the sources of asymmetries are multifarious across all the pairs of countries considered, hinting that an excessively high degree of heterogeneity is still affecting the coordinated functioning of the EMU.

3.4 The evolution of the monetary policy impact on member countries' economies

The last question that has to be faced concerns the time evolution of the transmission dynamics, in order to understand whether the mechanism had always worked asymmetrically or these inconsistencies have manifested in due course, either at the inception of the new monetary union or in the subsequent years. A hypothesis is that in 1999 the effective start of the monetary union area was bound to generate a structural break, altering the interrelations between the member economies and hence affecting the propagation of the monetary actions. The evidences that can be found in literature are mixed (see Boivin et al., 2008, Clausen and Hayo, 2006), leaving doubts on the true impact of such an important political step.

Additionally, also the two crises that have occurred at the end of the last decade were marked as possible sources of alterations in the interaction between the business cycles of the Eurozone

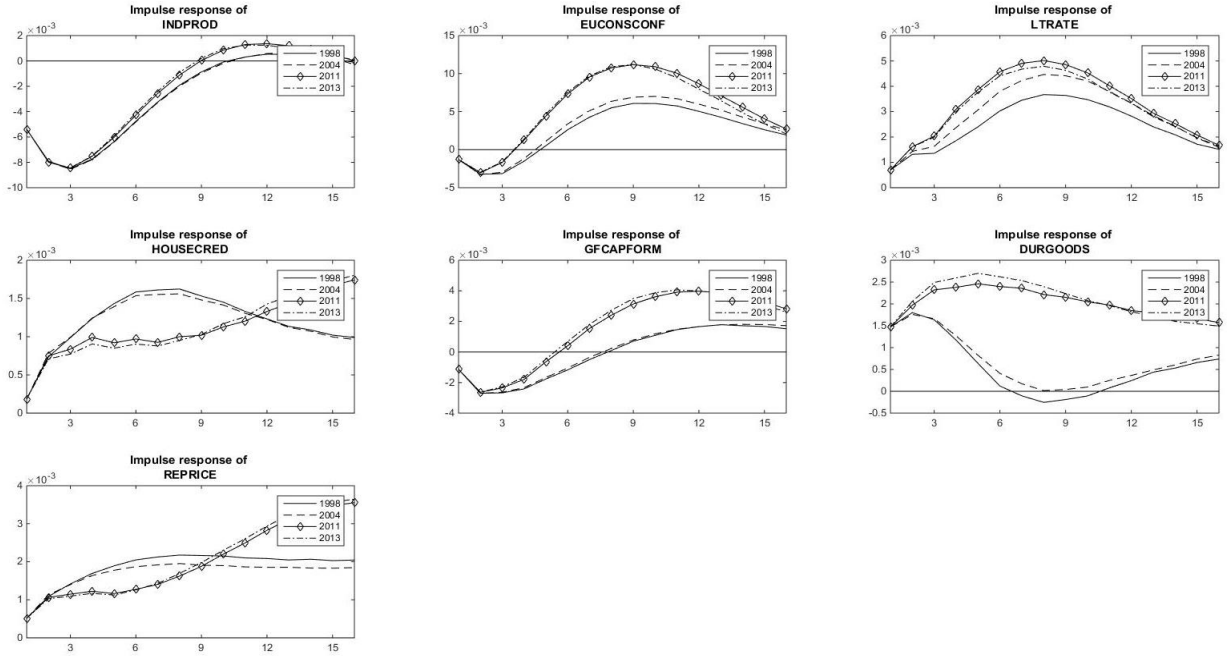
economies, as they both represented exogenous asymmetric shocks, bound to exacerbate already existing divergences.

Through the analysis of the median of the impulse response function of our model in four different time periods (1998,2004, 2011, 2014) we are going to analyse the evolution of the relative reaction of the variables taken into consideration, in order to appreciate their progression through time and, particularly, after the events cited, with the aim to answer two simple questions: was there a structural break at the inception of the currency union? What was the impact of the two crises on the homogeneity of monetary policy effects across EMU?

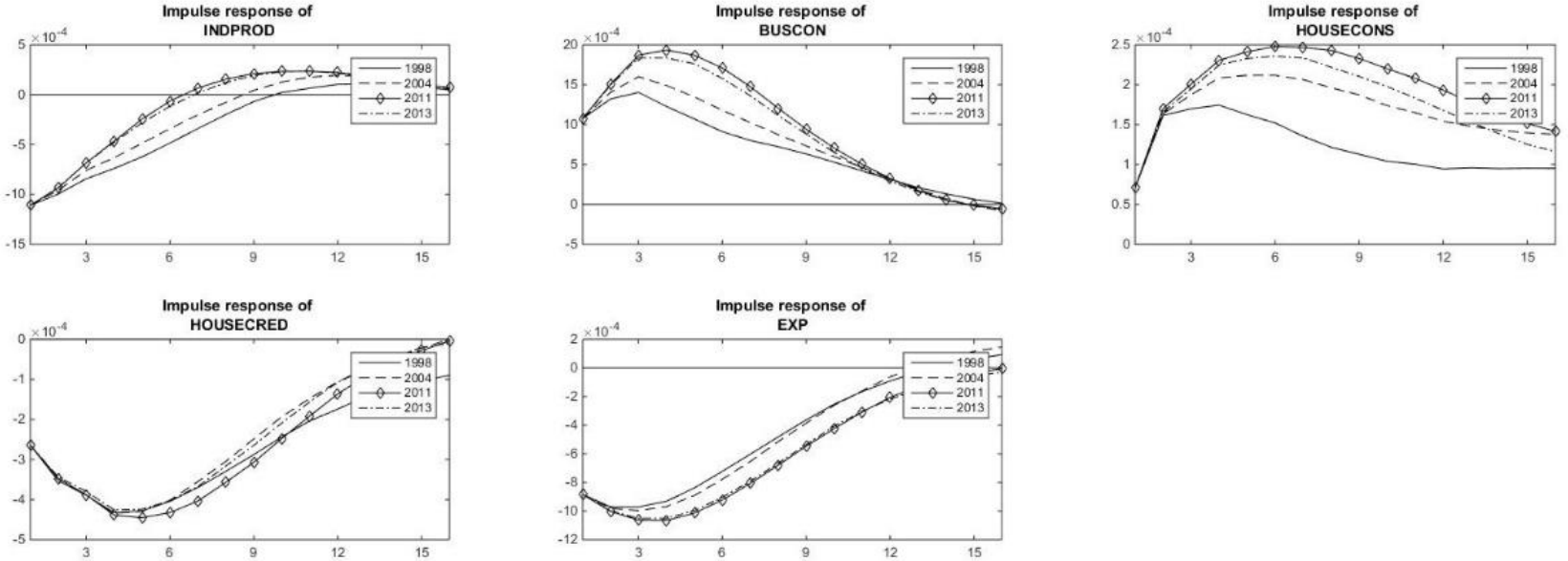
3.4.1 Was there a structural break at the inception of the currency union?

To assess this question let's consider the median impulse response function in 1998 and 2004. The choice of these very time periods is due to the necessity to compare the economies' reaction before and after EMU's inception avoiding any possible bias. While the choice of 1998 seems straightforward, being it the last year of independent central bank activity, 2004 was selected because, as appears from the analyses conduct in the previous chapters, is the first year in which the variability of the policy shocks settles to low levels, indicating that finally the transition process was over and the ECB had achieved some experience on the Eurozone economic environment. Considering it, hence, allows to appreciate whether changes occurred in the transmission mechanism between the pre and post EMU periods, when the economies had fully adapted to the new regime.[4] From the graphs reported in figure 10, 11, 12 it appears that, for most of the variables considered, no appreciable variation has occurred for the dynamics that involve Italy and Germany between the two periods. For all the countries analysed, it turns out that the economic indicators' response to a monetary policy innovation remains similar, and hence the institution of the currency area did not affect significantly the mutual interaction of the European economies hereby examined, leading us to claim that such a political exogenous shock, if adequately announced and gradually achieved, as it was the case for the constitution of the Eurozone, does not lead to structural breaks.

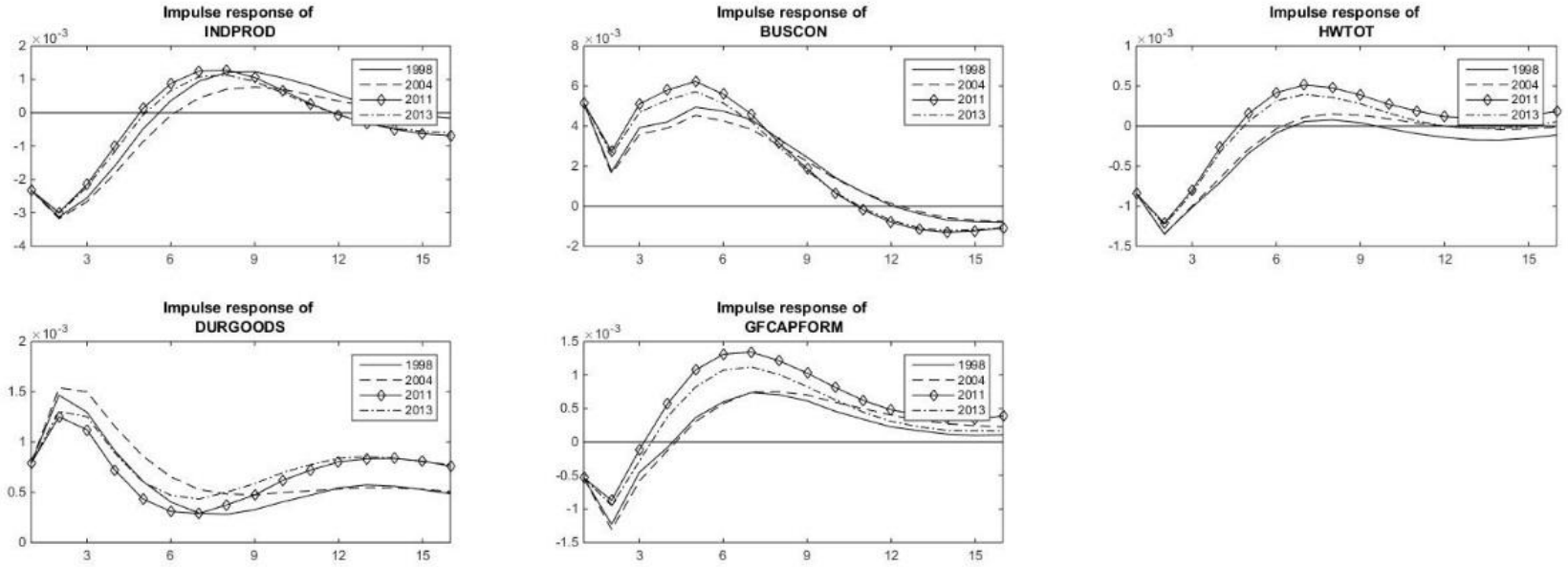
10 Medians of impulse responses for variables which registered significant reactions to monetary impulses for periods 1998:Q1, 2004:Q1, 2011:Q1, 2013:Q1 (Italy)



11 Medians of impulse responses for variables which registered significant reactions to monetary impulses for periods 1998:Q1, 2004:Q1, 2011:Q1, 2013:Q1 (France)



12 Medians of impulse responses for variables which registered significant reactions to monetary impulses for periods 1998:Q1, 2004:Q1, 2011:Q1, 2013:Q1 (Netherlands)



3.4.2 The impact of the two crises on the homogeneity of monetary policy effects across EMU

Now is time to turn the attention to the events that have characterized the economic environment in the last years, and especially the financial crisis, that started to spread in the Eurozone after the first quarter of 2008, and the subsequent 2011 sovereign debt crisis.

Ciccarelli et al. (2013), Gambacorta and Marques-Ibanez (2011) and Acharya et al. (2015) find that the financial crisis has brought a substantial alteration of the economic relationship between countries, as they observe that significant turbulences have hit the credit sector. In addition to that, the debt crisis has surely worsened the economic context of already distressed countries and contributed to add to the asymmetric pressures already acting in the Eurozone.

For this reason, is important to assess whether after these two shocks, the dynamics of monetary policy propagation have suffered an asymmetric shift.

Differently from the case of the institution of the EMU, here is evident that, in 2011, so after the financial crisis, the relation between the reaction of the considered countries suffered a modification. This change in the symmetry of the transmission mechanism is more marked in the Italian case, while for France it remains evident but not as sharp. In the Netherlands, even if some change occurred, it is nearly negligible, given the feeble variation.

Focusing on the Italian case, the financial turmoil seems to have hit particularly long-term consumption habits, investment, share prices and exports, along with government bond yields and confidence indicators, exacerbating their already asymmetric reactions, while it seems to have soothed the discrepancies in the credit market responses. This suggests that the crisis have stressed the difference in agents' confidence in the national economy more than the credit sector, sharpening divergences in the demand side of the economic structure.

For what concerns France, again is noticeable a worsening of the inhomogeneity of confidence indicators reactions, along with exports and household consumptions, that - even if of smaller magnitude as the one displayed in the previous case - signals that the crisis has modified agents confidence in the economic environment and, hence, brought to a sharper deterioration of demand conditions in these two countries rather than in Germany.

In the Netherlands, the 2008 crisis seem to have increased heterogeneity in the credit market reaction to monetary stimuli, but such an asymmetry seems to have been rapidly absorbed, as in 2013, after the sovereign debt crisis, the median impulse response returns in line with the 2004 one. This happens also for real estate price reaction, while there are no traces of confidence and demand dynamics that we have highlighted in the Italian and French cases.

These findings align with the view that the financial crisis have contributed to add significant heterogeneity among Eurozone economies and business cycles, creating a more marked

separation between core countries and peripheral ones. What this analysis adds, is that even France, which usually joins Germany and Netherlands in the core group, cannot belong to it but has to be located somewhere in the middle, and probably displays dynamics more similar to the Italian ones than to Germans' and Dutchs'. Another hint that our results provide concerns the impact of the sovereign debt crisis on policy propagation dynamics, as it seems that it did not add to the asymmetric pressure already brought by the 2008 crisis.

4. Conclusions

Understanding how structural differences affect members' responses to monetary policy is particularly relevant in the context of currency unions (Jaroczinski, 2009). Even more so, within the EMU, where authorities have to understand how to act in order to promote a widespread recovery, it is of absolute relevance nowadays exiting the crisis with a reasonable degree of homogeneity in the economic structures of the participating countries. The eclectic model we proposed, combining ad-hoc different approaches found in literature, helps us to assess the dynamics of the transmission mechanism in many ways, allowing to perform a thorough exam of its dynamic evolution and, of its present state of the art and to assess how the economic shocks have affected it.

The picture that emerges tells that no structural break was registered at the inception of the EMU, witnessing that economic structures across Eurozone had adapted homogeneously to the new environment. Nevertheless, the equilibrium registered in the first years of the union operativity after some time has revealed to be illusive, given that as soon as the first asymmetric shocks occurred, the structural incoherencies between the different member economies immediately appeared.

In this context, Germany appears to have a slightly different role than the one usually hypothesized, as the analysis seems to support the idea that the European Union is not so much divided into two blocs as often pointed out, but rather that there exist a country (Germany) that exhibits an "outlier" behaviour with respect to all the other member economies, in terms of reaction to monetary policy.

Another important evidence is that credit market differences across countries certainly exist and were amplified by the crises occurred, but they do not affect, as much as it is commonly believed, the symmetry of the transmission mechanism across Eurozone economies. Contrarily, the main asynchronous disturbances seem to come from the classical interest rate channel, which affects long term spending and investing behaviour.

This evidence marks the way for future policy actions that have to be undertaken on the basis of a Eurozone-wide approach: the high degree of heterogeneity found in the functioning of the

transmission mechanism (particularly the interest rate channel) within the countries analysed calls for the need of country specific reforms, which has to aim at the harmonization of the economic structure, that, after the crisis hit, have become too inhomogeneous to allow an efficient and even effect of the ECB monetary activity on a Eurozone scale. Furthermore, it evidences that, at the present stage, the EMU does not constitute an Optimal Currency Area and that monetary policy does not provide a significant contribution towards integration and convergence of Eurozone countries. As Blanchard et al. (2010) point out, it is probably time to include in the standard monetary policy activity, new instruments~~,~~ as the ones employed extraordinarily to exit the crises, along with a thorough renewal of the fiscal stance and, in particular, of automatic stabilizers, that might be redesigned in order to promote not only the internal stability of ~~a~~ each member country, but also to maintain a reasonable degree of co-movement of ~~the~~ its business cycle with the other member countries. Further research is, hence, needed to understand how to employ unconventional monetary policy tools in the routinely execution of the central banks activity and, in the context of currency area literature, how fiscal automatic stabilizers may be designed to favour economic integration.

6. LIST OF VARIABLES EMPLOYED IN THE FACTOR ANALYSIS

The time series for the variables employed have been downloaded from OECD, St.Louis' FRED and Eurostat databases and they extend from the first quarter of 1995 to the last quarter of 2014.

	VARIABLE NAME	LABEL	SLOW/FAST CODE (0:slow, 1:Fast)
1	Real Gdp	RealGDP	0
2	Consumer Prices - All Items	CPIALL	0
3	Consumer Prices - Food	CPIFOOD	0
4	Consumer Prices - Energy	CPIENER	0
5	Consumer Prices - All Items Non-Food, Non-Energy	CPI-FOODENER	0
6	Hours Worked, Seasonally Adjusted (TOTAL ECONOMY)	HWTOT	0
7	Hours Worked, Seasonally Adjusted (Agriculture)	HWAGRI	0
8	Hours Worked, Seasonally Adjusted (Industry W Energy)	HWIND	0
9	Hours Worked, Seasonally Adjusted (Manufacturing)	HWMANIF	0
10	Hours Worked, Seasonally Adjusted (Construction)	HWCONSTR	0
11	Hours Worked, Seasonally Adjusted (ETOVG_I)	HWETOVG	0
12	Hours Worked, Seasonally Adjusted (INFO & COMMUNICATION)	HWINFO	0
13	Hours Worked, Seasonally Adjusted (FINANCIAL AND INSURANCE ACTIVITY)	HWFIN	0
14	Hours Worked, Seasonally Adjusted (RE)	HWRE	0
15	Hours Worked, Seasonally Adjusted (SCI_TECH)	HWSCI	0
16	Hours Worked, Seasonally Adjusted (PUBLIC ADM)	HWADM	0
17	Hours Worked, Seasonally Adjusted (OTHER SERVICE ACTIVITIES)	HWOTH	0
18	Hours Worked, Seasonally Adjusted (SELF EMPLOYMENT)	HWSE	0
19	Compensation Of Employees, Total	COMPTOT	0
20	Compensation Of Employees: Agriculture, Forestry And Fishing	COMPAGRI	0
21	Compensation Of Employees: Industry, Including Energy (ISIC Rev.4)	COMPINDU	0
22	Compensation Of Employees: Manufacturing (ISIC Rev.4)	COMPMANUF	0
23	Compensation Of Employees: Construction (ISIC Rev.4)	COMPCONSTR	0
24	Compensation Of Employees: Distrib. Trade, Repairs; Transp.; Accommod., Food Serv. Activ. (ISIC Rev.4)	COMPTRADE	0
25	Compensation Of Employees: Information And Communication (ISIC Rev.4)	COMPINFO	0
26	Compensation Of Employees: Financial And Insurance Activities (ISIC Rev.4)	COMPFIN	0
27	Compensation Of Employees: Real Estate Activities (ISIC Rev.4)	COMPRE	0
28	Compensation Of Employees: Prof., Scientif., Techn. Activ.; Admin., Support Service Activ.(ISIC Rev.4)	COMPSCI	0
29	Compensation Of Employees: Public Admin.; Compulsory S.S.; Education; Human Health (ISIC Rev.4)	COMPADM	0
30	Compensation Of Employees: Other Service Activities (ISIC Rev.4)	COMPOTH	0
31	Wages And Salaries	WAGES	0
32	Total Construction	CONSTRUCTIONTOT	0
33	Total Retail Trade - Volume	SALESTRADE	0
34	Car Registration - Passenger Cars	CARREG	0
35	Industrial Production	INDPROD	0
36	Capacity Utilization	CAPUTIL	0
37	Business Confidence	BUSCON	1
38	Bilancia Commerciale (Goods)	BILCOM	0
39	Unit Labour Costs	ULCOST	0
40	Gdp Per Person Employed	GDPPPE	0
41	Total Production Industry - Construction	TOTPRODCONSTR	0
42	Labour Productivity (Fino'14)	LABPROD	0
43	Value Added	VA	0
44	Value Added Arts	VAARTS	0
45	Value Added Public Sector	VAPS	0
46	Value Added Professional, Scientific And Technical Activities; Administrative And Support Service Activities	VASCI	0
47	Value Added Re Activities	VARE	0
48	Value Added Fin And Insurance Activities	VAFIN	0
49	Value Added Info And Communication	VAINFO	0
50	Value Added Wholesale And Retail Trade, Transport, Accomodation And Food Service Activities	VAWHOLE	0
51	Value Added Agriculture, Forestry And Fishing	VAAGRI	0
52	Value Added Manufacturing	VAMANUF	0
53	Value Added Construction	VACONSTR	0
54	VALUE ADDED Industry (Except Construction)	VAIND	0
55	Subsidies	SUBS	0
56	Gross Fixed Capital Formation	GFCAPFORM	0
57	Actual Individual Consumption	INDIVCONS	0
58	Final Consumption Expenditure Of NPISH	NPISHCONS	0
59	Final Consumption Expenditure Of Households	HOUSECONS	0
60	Collective Consumption Expenditure Of General Government	GENGOVEXP	0
61	Individual Consumption Expenditure Of General Government	GENGOVINDIVEXP	0
62	Economic Sentiment	ECOSENT	1
63	Durable Goods	DURGOODS	0
64	Other Goods	OTHERGOODS	0
65	Real Estate Prices	REPRICE	1
66	European Commission Consumer Confidence Index	EUCONSCONF	1
67	Gvt Bond Yield 5y	GVT5Y	1
68	Gvt Bond Yields 10y	GVT10Y	1
69	Italy (EXPORTS)	EXP	1
70	Italy (IMPORTS) Growth Rate Same Period Previous Year	IMP	1
71	Long-Term Interest Rate	LTRATE	1
72	Share Prices > All Shares/Broad > Total > Total	SHARES	1
73	Currency Conversions > Real Effective Exchange Rates > Overall Economy > CPI	EXCHCPI	1
74	Currency Conversions > Real Effective Exchange Rates > Overall Economy > ULC	EXCHULC	1
75	Amount Of Bonds Outstanding	BONDOUT	1
76	Credit To Non Fin Corp	NONFINCRED	1
77	Credit To Households	HOUSECRED	1

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Notes

[1] For sake of space we report only the posterior mean of the standard deviation of residuals yielded by the analysis of the Italian case, as for the French and Dutch case the results are qualitatively similar. Those graphs remain available upon request.

[2] It is important to emphasize that in these two cases, the analyses of the posterior distribution of the standard deviations will tell us whether heterogeneous asymmetric shocks have occurred, altering the homogeneous evolution of these two variables in the considered country and Germany, as both are inserted in the model as ratios

[3] Again, as in the case of the posterior mean of the standard deviation of residuals in interest rate equation, we report only the one for the Italian case, leaving available upon request the others, that are qualitatively similar.

[4] Anyways, considering different years in the post-EMU era does not qualitatively change the outcome of the analysis

Sommario

Fin dalla sua istituzione, è stata messa in dubbio l'adeguatezza dell'Unione Monetaria Europea come area valutaria ottimale, e, con essa, la trasmissione omogenea degli impulsi monetari a tutti i Paesi della zona euro. Tramite l'adozione di un modello FAVAR a parametri variabili stimato con tecniche bayesiane, correggiamo i difetti presenti nella letteratura esistente e, sfruttando un insieme di dati sufficientemente esteso, forniamo una valutazione aggiornata del funzionamento del meccanismo di trasmissione e della sua simmetria in questi primi anni di attività della BCE. L'analisi empirica mostra che le due crisi occorse nel 2008 e 2011 hanno alterato in modo significativo la trasmissione della politica monetaria, colpendo soprattutto il funzionamento del canale dei tassi di interesse. I nostri risultati suggeriscono, quindi, che le autorità debbano mettere in atto un mix di politiche economiche, soprattutto fiscali, innovativo per riportare un sufficiente grado di simmetria nella propagazione degli stimoli monetari.

Abstract

Since its inception, EMU adequacy to be an Optimal Currency Area was questioned, and, along with it, the homogeneous transmission of the monetary impulses across the Eurozone. Adopting a Bayesian Time-Varying parameter FAVAR model that fixes the flaws present in the existing literature and exploits a sufficiently extended dataset, we provide an updated assessment of the transmission mechanism's functioning and of its symmetry along these first years of ECB operations. The empirical analysis shows that the occurrence of the two crises significantly altered the policy transmission, with the interest rate channel being the most affected. Policy-wise, our findings suggest that authorities must push towards a consistent innovation both on fiscal and monetary sides.

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