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Local responses to a global monetary policy:
The regional structure of financial systems

by

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Abstract

This paper contrasts the different regional effects of an homogeneous monetary policy and studies the local characteristics that underlie these differential responses. To this purpose, we use Spanish regional data and estimate a structural vector autoregression model using SUR techniques to characterise regional responses. Results provide evidence of statistically different regional responses of real variables to monetary policy shocks. We use these estimated responses to analyse if they depend on regional characteristics. Results show that manufacturing sectors, international openness, small firms, a negative financial position as well as the degree of nominal wage indexation enhance the effect of monetary policy.

Keywords: VAR, monetary policy shocks, regional responses.
JEL Codes: E5, R5.

1.- Introduction

On January 1999, a European Central Bank (ECB) was created. This institution is already driving a single monetary policy for all European Monetary Union (EMU) members. By July 2002, it will establish a single currency in a wide area of Europe. Although there is a debate on the benefits and costs of this process and a lot of work has been done on this topic, much less effort has been put into knowing the differential country effects of a common monetary policy. The single currency is already under way and there is a necessity to know how many degrees of freedom we still have to manage regional effects of monetary policy shocks.

To understand what the different regions of the European Monetary Union can do is not a trivial question and due to the lack of studies on this respect, it seems to be a taboo one. There is evidence from the United States that shows different regional effects of a single monetary policy (Carlino and DeFina, 1999) but surprisingly this question has been avoided in the European Union countries. Two reasons can explain this lack, first, the difficulty to establish country comparisons and, second, political pressures that restrict economic analysis on the inequalities deriving from an integration process. Due to the new paradigm for the national central banks in Europe and the availability of regional data sets to perform this kind of study, we consider that the moment has come to study the differential effects of a common monetary policy at the regional level. Thus, it will allow regional governments to face the single monetary policy more efficiently and will also provide the ECB with a better understanding of the effects of its decisions.

Lately, researchers have perceived the importance of this kind of studies and there is an increasing number of studies trying to define the differences across country responses. Dornbush, Favero y Giavazzi (1997) made the effort to review the literature and concluded that wage setting and financial structure lead to unequal cost among countries with inflation reduction episodes.

This paper quantifies the reaction of the Spanish regions to a common monetary shock and tries to provide an explanation for the intensity of the responses. The evidence presented suggests the existence of regional specific responses depending on the balance sheet composition of the different agents, the sectoral structure and other regional characteristics.

The paper is organised as follows. Section 2 addresses the theoretical features underlying the estimations. In Section 3, we present the data and the empirical methodology; in section 4 and using Vector Autoregresion techniques (VAR) and our methodological proposal, we obtain the responses of the different Spanish regions to monetary policy shocks while in section 5, we try to explain where these differences across regions come from. Finally, section 6 presents some concluding comments.

2.- Why do regions react asymmetrically to monetary shock? A theoretical view.

There are many arguments explaining why we can observe differences in the monetary policy transmission mechanism across regions and, consequently, idiosyncratic responses to a common monetary shock. The theoretical and empirical literature has presented several reasons explaining why a single monetary policy can lead to different regional effects. The sectoral composition of the economy, the structure of the financial sector, the wage determination process, etc. can affect the transmission mechanism of monetary shocks.

Let us consider two different stages in the monetary policy transmission mechanism and, consequently, two links that can affect the response to a monetary shock. We will consider a first stage related to the financial characteristics of the territory and a second one associated with the real economy. Figure 1 tries to represent the two stages of the mechanism we are studying.

Figure 1: Monetary policy transmission mechanism

Monetary Authority	_____	Financial Structure	_____	Real Sector

Starting from the end of this chain, we consider that real sectors have imperfections in the monetary policy absorption due to differences across regions on both microstructure and macrostructure.

Concerning regional microstructures, we observe that an expansive monetary policy increases equity and physical assets' prices. It also varies the marginal value of wealth and has income effects, resulting in increasing the income of borrowers and decreasing the rent of lenders (Barran, Coudert and

Mojon, 1997). All these effects will affect households' consumption decisions. Decreases in consumption will both be associated with net creditor financial positions and expansive monetary policies and, in this case, we will observe a less positive response of real variables. On the contrary, increases in consumption will be associated with net debtor financial positions and expansive monetary policies and, consequently, we will observe a greater response of real variables.

Concerning macrostructure, we observe that the distribution of real sectors is correlated with the intensity of the monetary policy effects. Different shares of monetary policy sensitive sectors across regions will provoke different regional responses to a homogeneous monetary policy (Carlino and DeFina, 1997). The response will be more intense in those regions with a higher percentage of manufacturing and construction sectors, which seem to be more interest-sensitive than, for instance, agricultural or public sectors. Another factor to mention is the size of the companies, since it is an indication of the ability to reach wider credit channels, in most of the cases not linked to regional fund sources. In contrast to small companies that directly depend on narrower credit opportunities, large companies can appeal to different options like stock or international markets. Similarly, the transmission of monetary shocks depends on the region's internal structure and size of its financial sector. As large banks have better access to international funding options than small ones (see Kashyap and Stein, 1994), the effects of a monetary policy will be lower in those regions where large banks are more numerous. Besides, a low number of financial institutions and small financial sectors are highly correlated with a lack of competition (Oline and Rudebusch, 1995). This lack of competition will lead the banking industry to try and keep its monopoly benefits, by, for instance, slowing the transmission process of an interest decrease to credits. Empirical evidence on the rigidities of bank interest rate, when modifying the official interest rate, and on the different effects that monetary policy can have on firms and households can be found, for the Spanish case, in Sastre (1991) and Escrivá and Haldane (1994).

In addition, the kind of wage bargaining affects the macroeconomic performance, not only because firm and national bargaining seem to be correlated with lower wage increases than industry bargaining (Calmfors and Driffill, 1988) but also because nominal wage contracts allow for persistent effects on output of monetary shocks (Gottfries and Westermark, 1998). Finally, the degree of openness determines the effects of a thigh monetary policy since an appreciation increases real income but damages exports and, therefore, output and employment (Dornbush, Favero and Giavazzi, 1997).

Financial structure is the other link of the transmission channel. Monetary

policy affects the balance sheet of banks, both changing the lending rate, and consequently moving the efficient short and long rate composition of the balance sheet, and modifying the ability of funding. The distribution of contracts between short and long term loans and the frequency of interest rate adjustments do also make differences when the central bank alters this structure (BIS, 1995). A restrictive monetary policy will affect the bond-loans ratio of the banks, as they are imperfect substitutes, firms will have a higher external finance premium, and supply of loans will be reduced (Bernanke and Gertler, 1995 and Bernanke and Blinder, 1992). As a result, we will observe a shift in firms' external financing.

On the other hand, a restrictive monetary policy reduces the market value of collateral (Kiyotaki and Moore, 1997) being thus more difficult for companies to obtain loans. Finally, Hanson and Waller (1996) find a significant correlation between the policy of regional banks and regional growth rate. Amos, Kermani and Wingender (1986) argue that regional growth is slowed down when regional credit is constrained. Moore and Hill (1982) mention that it is cheaper for local banks to monitor local investment than banks in other regions and some studies suggest that the informal lending channel (non-bank forms) are basically local (OECD, 1995). If regions differ on any of these characteristics, we might observe different regional responses to monetary policy. Local banks would act as regional stabilisers of monetary policy.

Table 1 summarises the relationship between monetary policy effects and regional characteristics. Note that we are only able to check the symmetric effects. With VARs approach, we can not identify asymmetric effects depending on the kind of monetary policy (expansive or restrictive). In this kind of models, we do not allow for asymmetric effects of monetary policy.

Table 1 - Regional characteristics and MP effects			
		Expansive	
		Less effect	More effect
Restrictive	Less effect	Family net lending position Less interest sensitive sectors Big companies Real wage bargaining Close economies International financial markets Internal finance	Local banks Competition in financial sector
	More effect	National banks No competition in financial sector	Family net borrowing position More interest sensitive sectors Small companies Nominal wage bargaining Open economies National financial markets External financing (collateral, stocks)

According to the previous survey, we have selected some variables that can affect regional effects of monetary policy. Due to the fact that some elements remain constant throughout regions belonging to the same nation, not all of the presented characteristics can be analysed using regional data. However, far from being a shortcoming of the data, these characteristics allow us to obtain deeper insights on the other elements.

Table 2 - Explanatory variables

	Max	Region	Min	Region	Mean	Std
Net lending-borrowing	0.33	Cantabria	-2.75	Navarra	-1.05	0.70
Public debt (% GDP)	7.90	Navarra	2.31	C-Mancha	4.71	1.74
Deposits/credits	2.06	C. Leon	0.96	Baleares	1.35	0.32
Large/small companies	0.08	Madrid	0.02	Murcia	0.04	0.02
>50 employees (% firms)	2.70	Madrid	1.00	Extremadura	1.54	0.50
Construction (% GDP)	0.14	Murcia	0.05	Navarra	0.10	0.03
Manufacturing (% GDP)	0.44	Navarra	0.06	Extremadura	0.24	0.12
Other services (% GDP)	0.22	Madrid	0.10	Rioja	0.14	0.03
Financial sector (%GDP)	0.08	Madrid	0.05	Murcia	0.06	0.01
Public employment (% L)	0.27	Madrid	0.14	Cataluña	0.19	0.03
Wage earners (% L)	0.86	Madrid	0.57	Galicia	0.72	0.07
Collective bargaining (%)	0.77	Baleares	0.44	Galicia	0.57	0.11
Savings rate	0.16	Rioja	0.07	Andalucia	0.12	0.03
National/regional banks	3.04	Asturias	0.69	Rioja	1.31	0.58
Exports/Imports	1.79	Extremadura	0.20	Canarias	1.01	0.43
Openness	0.73	Navarra	0.07	Extremadura	0.33	0.18

Firstly, we want to test whether regions more affected by credit constrains (measured here by net lending-borrowing position and the rate of deposits over credits) are more sensible to monetary shocks. Secondly, we study the effects of the presence of larger firms (large over small firms ratio and percentage of firms with more than 50 employees) and thirdly, we contrast theories suggesting that manufacturing and construction sectors (percentage of these sectors in GDP) are more sensitive to monetary shocks and that, as a result, monetary shock response does depend on industrial composition. Here, we can also see if regions with different percentages of other services (we have included in this case tourism-related activities), public employment or financial sectors are unequally affected by monetary policy.

Finally, we are interested in the effects of other variables, presented in the literature, such as those related to labour market, coverage of collective bargaining and percentage of wage earners, household saving rate, presence of regional banks and trade openness. The corresponding descriptive statistics are presented in Table 2 and show that these variables are far from remaining constant across regions. In principle, we can therefore expect that these differences will be translated into different regional responses to a common monetary policy.

3.- How to measure a regions' reaction to monetary shocks? An empirical approach.

Although studies concerning the regional effect of a single monetary policy are no too many, we can identify two different approaches that allow us to shed some light on the question, that is to say extremely large national macroeconomic models using over 100 equations, on one hand, and small models, mainly using Vector Autoregressive techniques, on the other. However, other approaches have also been used.

The Bank for International Settlements (1995) has compared the effect of a monetary policy using large national econometric models. These models are not meant to do this kind of exercise as they use different assumptions but they provide a good starting point. This study presents some evidence on differential national effects of monetary policy.

Concerning the second type of models, it is considered that VARs models perform relatively well. Gerlach and Smets (1995), Barran, Couydert and Mojon (1997) and Britton and Whitley (1997) have implemented VARs models to evaluate the impact of monetary policy shocks across countries. These papers provide evidence on across-country differences in monetary shock responses among European countries. Although these documents differ in the identification of restrictions, they can be used to analyse similarities and differences. Although VARs models show that monetary policy is endogenous, in the sense that it moves to accommodate macroeconomic unbalances, and monetary policy shocks explain less than 20% of output variations (Bernanke Gertler and Watson, 1997), it seems that these shocks have significant and persistent real effects that differ across countries.

Dornbusch, Favero and Giavazzi (1997) use another kind of ad hoc models. They prefer central banks reaction functions in order to address statistical differences among six countries, when measuring the effect of monetary policy on output. They find significant asymmetries across European countries.

However, the above-described models present the following flaw: they identify asymmetries in monetary policy effects across countries that could partially be explained because these policies are somewhat different. Studies carried out at a regional level can avoid this problem, although, at this level, much less has been done. Using VARs techniques, Garrison and Chang (1979) and Carlino and DeFina (1999) find regional differences in the effects of monetary

policy for the United States. Although these techniques are frequent when analysing national data, they are much less common with regional information. VAR techniques will be increasingly used in regional analysis as they are parsimonious in the use of data, provide a flexible adjustment of economic theory and perform relatively well (1999).

Our first methodological approach is simply to estimate a VAR model for each Spanish region and to then study the effects of a monetary shock in this region. This will identify the effect of a common monetary policy shock which could have differential effects across regions, due to the regional characteristics described in the previous section. In this model, we have included a real variable, namely employment, (chosen as our real variable instead of GDP, firstly, because it offers quarterly data and, secondly, because labour information is available for a larger period). Note that output responses are more sensitive than employment ones due to the presence of adjustment cost in the labour market. In addition to employment, we have introduced two more variables in the model: consumer price index and a monetary policy indicator. The results presented here are calculated using ALP (Liquid Assets Held by the Public) as monetary indicator. However, we have tested our results with other measurements of the amount of money (M3) and, for instance, a previous version of this paper also included interest rate in the model. We have not found significant differences in the results.

Employment series come from the Spanish Labour Force Survey (EPA). As price indicator, we use regional consumer price indexes from the National Statistics Office (INE) while the monetary policy variable comes from the Bank of Spain. Obviously, this variable is the only one included in the model at national level. The variables are quarterly from 1978:1 to 1998:1. We use four lags of each variable with quarterly time dummies in the estimation.

A second, but very related, approach is to use Seemingly Unrelated Regression (SUR) techniques to jointly estimate regional equations for the different variables. In the first model, we estimate, through OLS, three equations for each region (employment, price and money equation) but we do not take into account that the error terms of the equations are likely to be correlated between regions. As a result, if we use OLS techniques (first approach), we could obtain inefficient estimations because we would be ignoring the information contained in the contemporaneous covariance of the regional error terms. On the contrary, SUR techniques jointly estimate these regional equations, including contemporaneous correlations, and make our estimations more accurate by reducing their standard deviation.

Besides, with this technique, as we are jointly estimating the regional equations, we can test (and impose) some restrictions on the parameters of the model, thus increasing the degrees of freedom. Basically, we are thinking of testing if some parameters in the price equation, for instance, are constant across regions. As previously mentioned, we estimate, using SUR techniques, a system of seventeen Spanish regions imposing restrictions across the accepted regions (see Table 5) and do so for all three variables.

Finally, we check the possibilities of a third technique. In our previous methodologies, we identify slightly different regional shocks because we estimate different equations for each territory. However, these identified regional shocks generally show a correlation coefficient of more than 0.95. Our aim is now to identify a monetary shock in a national model and then to use this shock (equal to all regions) in each regional VAR in order to obtain the responses to this identified national monetary shock. In this specification, we do not include a national monetary indicator in each regional model. Instead, we include the national monetary shock identified previously.

After estimating the reduced form of both models, denoted VAR and SUR, we need to impose some restrictions to define structural shocks and to analyse impulse response functions (IRF) to these shocks. We only consider short term restrictions and organise the variables so that these restrictions can be written in a lower triangular matrix, thus enabling us to use the Cholesky decomposition of the variance-covariance matrix of residuals to define structural shocks. We can sum up our short term restrictions in the following equation:

$$\begin{pmatrix} \mu_L \\ \mu_P \\ \mu_M \end{pmatrix} = \begin{pmatrix} 1 & 0 & 0 \\ x_{L,P} & 1 & 0 \\ x_{L,M} & x_{P,M} & 1 \end{pmatrix} \begin{pmatrix} e_L \\ e_P \\ e_M \end{pmatrix}$$

Where L corresponds to employment, P stands for prices and M for the amount of money. μ are the residuals from the reduced form of the model while e represents the structural uncorrelated shocks.

In line with similar assumptions made for the Spanish economy, we consider that no other variable in the model has a contemporaneous effect on employment. We are assuming price stickiness in the short term and that monetary variables can react contemporaneously to the rest of variables, as a result of an accommodating monetary policy. We have used some similar specifications, including long term restrictions, in the model and the results do not significantly change but we obtain worse short term dynamics for some regions.

4.- Empirical Results

Having decided to use the VAR methodology, in line with the literature analysing the effects of the monetary policy on national variables, we consider that our first approach should follow the mainstream research methodology and that we should study the effects on regional variables, by just using a VAR for each region.

In these models, we use variables in levels. As Bernanke and Mihov (1997) mention, this procedure generates consistent estimations even when the variables are not stationary. However, variables in differences will provoke inconsistent estimations if they are cointegrated. As shown in Table 3 and Table 4, our variables are I(1) and are cointegrated. Therefore, we follow a recent trend in the literature using a specification in levels. Previous versions of this document used first differenced variables and, again, results remain roughly the same.

Table 3
Phillips-Perron unit root test (Four lags)

Variable	I(1) vs. I(0)	I(2) vs. I(1)
Employment	-2.167	-34.270**
Prices	-1.811	-27.080**
Amount of money	-1.082	-42.508**

** Indicates significance at 1% level

Table 4
Johansen cointegration test (Four lags)

Equation	Statistics
Employment	-102.09**
Prices	-81.06**
Amount of money	-72.80**

** Indicates significance at 1% level

As can be seen in Table 5, using SUR approach we can accept that employment and money parameters are equal across regions in the price equation. We also observe that we can not impose any restriction across regions in money and employment equation.

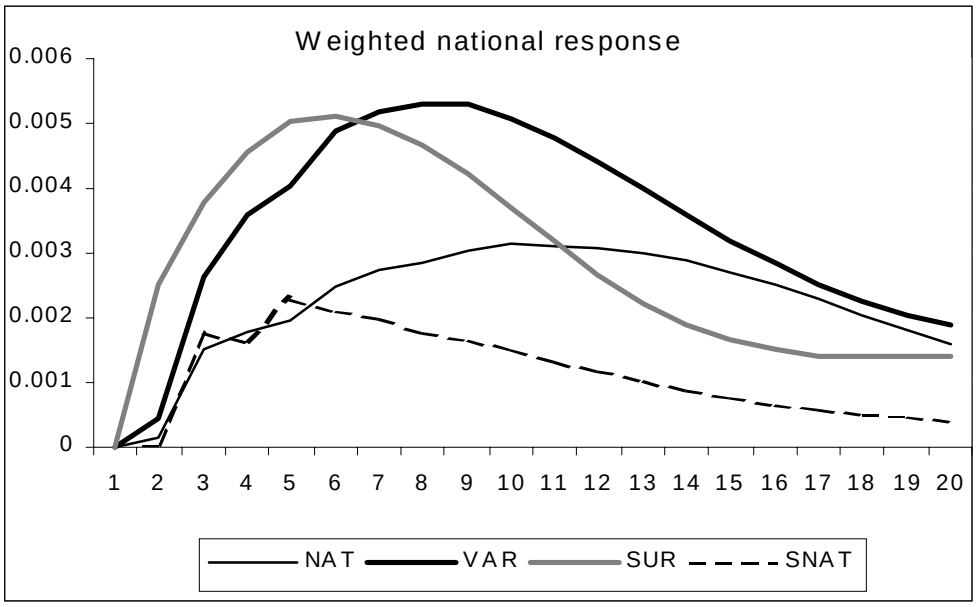
Table 5
SUR equation restrictions (P-value)

Parameter→ Equation ↓	Employment	Price	Money
Employment	0.007	0.000	0.000
Price	0.970	0.000	0.370
Money	0.000	0.000	0.000

Summing up, we have the traditional VAR using OLS techniques, the generalised least square estimations in SUR models and the identified national shock (SNAT). After estimating the three reduced forms of the models, we decompose the residuals into structural shocks, using the previous matrix of restrictions described above, and calculate the impulse response functions of real variables to a standard deviation shock in the monetary indicator.

We observe that an expansive monetary shock increases employment in almost every region. Weighting regional responses, we build the national response showed in Figure 2 for the three specifications considered, in addition to a fourth one which is simply a VAR for national data (NAT) with the same variables and characteristics as the ones explained for regional VAR. Generally speaking, the responses are quite similar across models and behave as predicted by monetary theory. An expansive monetary shock increases employment in the short term but, in the long run, this policy does not have any real effect.

Figure 2: Weighted national responses to monetary shock



Taking into account the different models, results suggest that Spanish regions do not react in the same way to monetary policy. Table 6 presents the employment response to a monetary shock after two years and "average lag" (as a summary of the curve shape). Statistics on average lag contain information on the timing of the response and avoid the ad hoc choice of the lag, when analysing the results. This table also includes some statistics on mean regional responses and their dispersion.

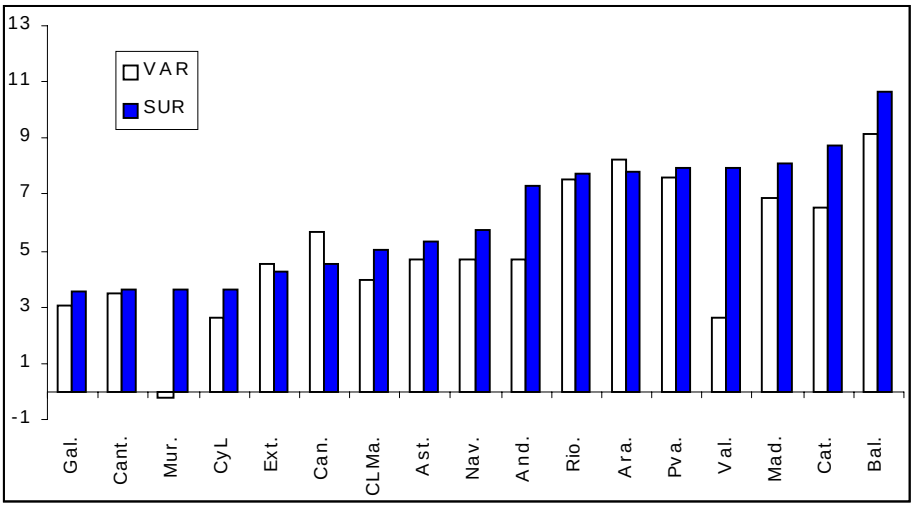
Table 6
Regional responses to a monetary shock*

	Response after 2 years (x1000)			Average lag		
	VAR	NAC	SUR	VAR	NAC	SUR
And.	4.70	2.54	7.31	9.93	9.39	10.60
Ara.	8.26	4.02	7.84	9.74	7.94	9.87
Ast.	4.70	2.84	5.31	8.55	9.14	9.31
Bal.	9.16	5.49	10.65	9.67	8.22	10.00
Can.	5.71	4.24	4.53	10.49	8.90	10.56
Cant.	3.46	-1.28	3.59	13.21	4.49	13.92
CyL	2.63	-1.54	3.62	7.97	9.46	8.83
CLMa.	3.98	3.37	5.04	10.15	10.39	10.37
Cat.	6.51	0.62	8.76	11.79	10.91	11.55
Val.	2.62	-0.36	7.93	10.58	1.29	10.48
Ext.	4.53	3.31	4.26	7.63	8.64	8.14
Gal.	3.07	1.94	3.54	3.07	7.83	2.58
Mad.	6.88	3.33	8.10	9.42	9.19	9.95
Mur.	-0.20	-5.18	3.60	12.64	10.13	11.34
Nav.	4.70	3.75	5.78	11.90	10.21	12.13
Pva.	7.60	2.09	7.92	9.93	8.75	10.16
Rio.	7.52	2.55	7.74	9.60	8.10	9.62
Statistics						
Max	9.16	5.49	10.65	13.21	10.91	13.92
Min	-0.20	-5.18	3.54	3.07	1.29	2.58
Average	5.05	1.87	6.21	9.78	8.41	9.96
Tip Dev	2.41	2.66	2.21	2.30	2.33	2.31

As shown in Table 6, there are differences across regions: some territories have an more intense employment response after an expansive monetary shock than others. Figure 3 presents the responses of VAR and SUR models two years after a monetary shock. These seem to have a similar pattern from one model to another and show differences across regions. For instance, employment response in Balearic Islands or Catalonia is twice the response of other regions like Galicia or Cantabria.

We can better appreciate these differences in the figures included in appendix 1. These present regional impulse responses to one standard deviation shock in amount of money. In order to calculate the confidence interval in the SUR model, we use the simulate command in RATS to generate 1,000 draws of the estimations. Figures present the average response and one standard deviation confidence interval. One of the advantages offered by this model is that it increases the significance of the estimations. We can therefore assure that monetary policy is not neutral in the short term and that there are significant differences across some of the regions (see Figure 3).

Figure 3: Regional VAR and SUR responses



5. Explaining regional responses

As we have shown, the different models estimated in previous sections provide similar results but SUR methodology offers some advantages. From now on, we will therefore focus on SUR specifications to present results; although if we compare them with those obtained from other methods, our conclusions do not vary.

Our interest is now to identify some possible sources, according to the theories mentioned in section 2, that could explain these different reactions across regions to a common monetary policy shock. A first approach is provided in Figure 4 where we present correlation across regions for each variable and employment response in SUR specification.

Figure 4 Correlation of regional responses and variables

In this figure, we present two measures of regional responses. The first one is simply the regional response two years after the monetary shock while the second one is the average lag. In both cases, results are quite similar and we get expected sign in the correlation between regional response and these characteristics.

Table 7
Explaining responses – SUR model
Dependent Variable: Employment response 2 years after a shock in M

	Coef.	Coef.	Coef.
Constant	0.002 (0.522)	-0.013 (2.526)	-0.013 (1.882)
Collective bargaining	0.011 (2.735)	0.011 (2.493)	
Manufacturing sector	0.011 (2.893)	0.008 (1.992)	0.007 (1.416)
Deposits /credits	-0.003 (-2.678)		
Wage earners		0.015 (2.392)	0.028 (2.538)
> 50 employees			-0.002 (1.256)
R^2	0.480	0.450	0.260

Another way of illustrating where these differences come from is to

calculate some regressions of regional responses against the variables identified in section 2, as elements that could explain these responses. These regressions can not be interpreted as structural ones but we think that they are quiet useful to illustrate the sources of heterogeneity across regions sharing a common monetary policy.

Table 8
Explaining responses – SUR model
Dependent Variable: Employment response average lag to a shock in M

	Coef.	Coef.	Coef.
Constant	7.85 (1.66)	-7.73 (1.32)	-13.44 (2.19)
Collective bargaining	5.38 (0.94)	4.10 (0.82)	
Manufacturing sector	9.53 (1.77)	6.60 (1.44)	9.88 (2.22)
Deposits /credits	-2.39 (1.33)		
Wage earners		19.04 (2.61)	35.34 (3.51)
> 50 employees			-2.95 (-1.99)
R^2	0.07	0.31	0.44

In these tables (Table 7 using a two year response and Table 8 using average lag as dependent variables), we observe some of the effects predicted by theory and, as can be seen on the last row of the tables, we explain nearly fifty per cent of regional response variance. In these regressions we observe that the intensity of a regional response to a monetary shock is positively related with: a larger percentage of activity concentrated in manufacturing sector, a greater ratio of employees affected by collective bargaining, the percentage of wages earners and the degree of openness.

In those territories where manufacturing activity is more relevant, positive monetary shocks will, to a greater extent, affect employment because these sectors are highly interest rate sensitive. Movements in interest rate will lead to more investments and production decisions in these sectors than in others, like services or public sectors, since they are less dependent on external finance or less opened to international trade. We initially expected the construction sector to be at least as important as the manufacturing one in regressions. However, the former does not have a significant effect on employment response.

When wages are bargained in nominal terms, economic agents can not counteract movements in monetary policy and this, in turn, will have an important effect. Economies with more employees affected by collective bargaining or with

more wage earners will be in this situation. Finally, exchange rate is affected by monetary policy and expansionary policies will be accompanied by an exchange rate depreciation. Therefore, regions more opened to international trade will be more affected by monetary policy.

In addition, we see that regional response is negatively related with variables that measure the regional capacity of enterprises to have access to international financial and stock markets. Regions presenting a higher percentage of firms with more than 50 employees are less affected by monetary policy. For these firms, the relevant interest rate is, in many cases, the international one; being more independent from domestic monetary policy.

Furthermore, a negative sign in the deposit over credit variable indicates that regions with shorter credit constrains are again less affected by monetary shocks. Firstly, lending (or borrowing) regions are more (or less) positively affected by monetary expansions and, secondly, credit constrained regions (the borrowing ones) will be highly affected by a monetary expansion as a result of their increased decision set and a greater value of their collateral.

6.- Concluding comments

This paper uses quarterly data from 1978:1 to 1998:1 for Spanish regions to study the different regional effects of a common monetary policy. We propose a joint estimation across regions (SUR) of a VAR model that includes real and monetary variables to identify the responses of employment to monetary policy. This technique is more suitable since it includes the residual cross correlation, gives better estimations and allows us to introduce some inter-regional constrains. You should have more information here to make an assumption more suitable.

All the regional responses show the expected shape, in the long term there are no real effects but there are interesting short term dynamics. However, we can observe differences in these short term responses across regions, some of them being statistically significant. The intensity of these responses can be explained according to some regional characteristics identified in the literature.

The importance of interest sensitive sectors, the degree of nominal indexation and of international openness are factors that enhance the effects of monetary policy. On the other hand, regions characterised by a more important presence of larger or less credit constrained firms are less sensitive to monetary shocks. These results are similar to those obtained for the USA by Carlino and

DeFina (1999).

These results are robust to a variety of specifications. We have checked our results changing the estimation method, modifying the identification procedure of the national monetary shock, using first differenced variables and imposing long term restrictions on residual covariance matrix (de Lucio and Izquierdo, 1998). Main results do not vary although we think SUR specification offers some advantages and provides the most satisfactory results.

Finally, EMU countries are now facing up a common monetary policy and structural differences among them are even more profound than the ones existing between regions within a given country. Although the results obtained here can not be directly transferred to the EURO area, we consider that some of these differential effects will be observed and that further studies concerning this topic are needed.

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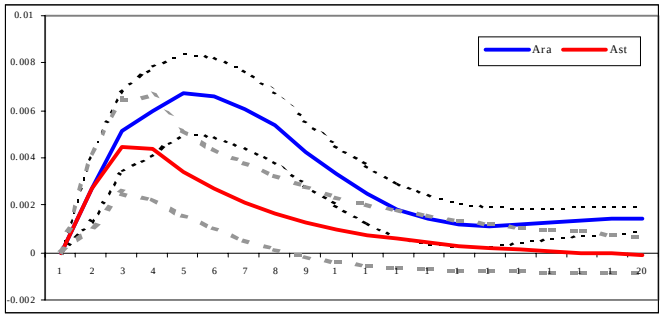
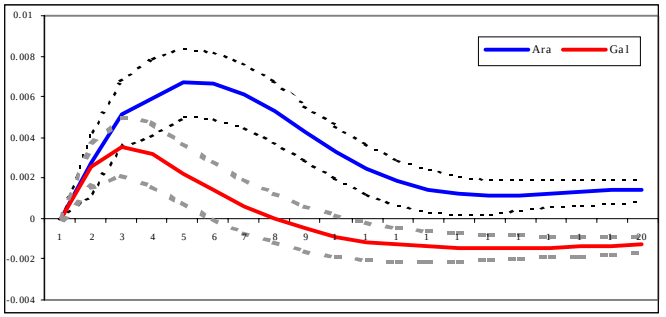
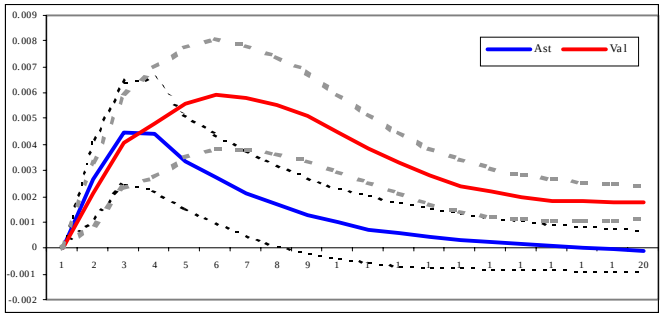
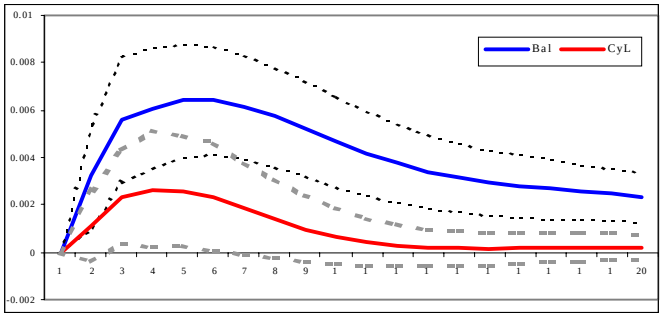
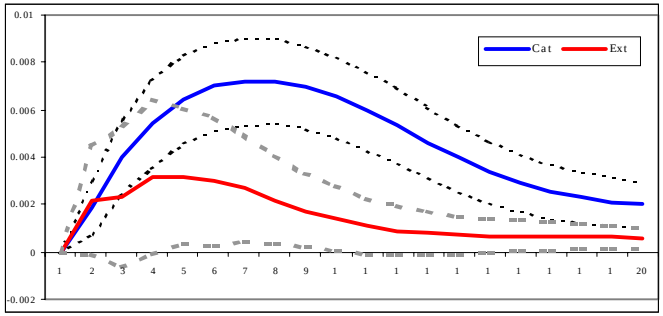
Appendix 1: Confidence Intervals

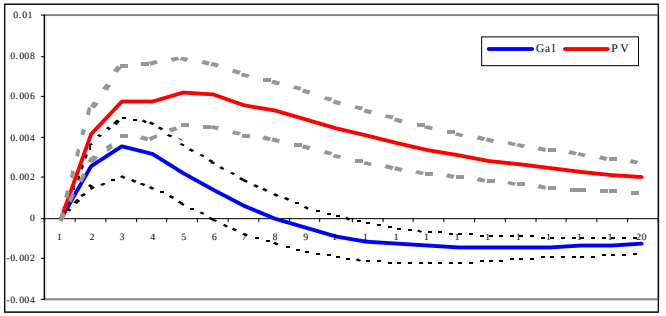












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