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Disentangling the effects of supply and demand shocks: a DSGE model for the Spanish economy

José María Martín Moreno[a*], Rafaela Pérez[b] and Jesús Ruíz[c]

[a]*Universidad de Vigo and Rede, Vigo 36310 España*
[b,c] *Universidad Complutense and ICAE, Madrid, España*

Abstract

In this paper we use a small open economy Dynamic Stochastic General Equilibrium Model (DSGE) for Spanish economy to search for a deeper characterization of the determinants of Spain's macroeconomic fluctuations throughout the period 1970-2008. In order to do this, we distinguish between tradable and non-tradable goods to take into account the fact that the presence of non-tradable goods in this economy is one of the largest in the world. We estimate a DSGE model with supply and demand shocks (sectorial productivity, public spending, international real interest rate and preferences) using Kalman Filter techniques. We find the following results. First of all, our variance decomposition analysis suggests that 1) the preference shock basically accounts for private consumption volatility 2) the idiosyncratic productivity shock accounts for non tradable output volatility; and 3) the sectorial productivity shock along with the international interest rate both greatly account for tradable output. Secondly, the model closely replicates the time path observed in the data for the Spanish economy and finally, the model captures the main cyclical qualitative features of this economy reasonably well.

1. Introduction

The aim of this paper is to extensively study the determinants of Spain's macroeconomic fluctuations. It analyzes the period 1970 – 2008 to avoid the distortions created by the international financial and economic crisis.

In this sense, this paper analyzes the sources of fluctuations and the implications on the behavior of

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* Corresponding author. Tel.: +986 812531; fax: +34 986812401.
E-mail address: jmartin@uvigo.es

the Spanish economy by using a Dynamic Stochastic General Equilibrium Model (DSGE) for a small open economy with tradable and non tradable goods. As a first approach, we have decided to use the simplest possible model, without any rigidity, and with the fewest possible number of elements required to study the determinants of Spanish fluctuations. The advantage of this choice is that it reduces the number of parameters that must be estimated to a minimum. This procedure follows the direction of a broadening trend of academic research philosophy (see Chari et al. 2008) and makes it easier to support/justify with empirical evidence. Moreover, this type of model offers solid economic foundations and the sources of fluctuations have a clear structural interpretation.

The main characteristic of the model proposed is the disaggregation of the economy into tradable and non tradable sectors. This theoretical economy enables us to focus on three basic characteristics. First, it shows that 70% of aggregate Spanish output is non-tradable. Second, it provides a good framework to explain the cyclical evolution of the relative price of tradable goods in terms of non tradable goods. Finally, disaggregation also allows us to analyze the Spanish economy at the sectorial level.

This paper revisits the model and estimates the main parameters that drive its dynamics as well as a wide variety of shocks that have hit the Spanish economy throughout the period under study (sectorial productivity shocks, public spending shocks, international interest rate shocks and preference shocks). The parameters of the model are estimated using Kalman Filter techniques.

Once the model is estimated, we infer the series of historical shocks that have generated the observed series. It is then possible to analyze the determinants of Spain's cyclical performance by assessing the model fit, impulse response functions and variance decomposition of the different shocks.

Our findings may be summarized as follows. First, our variance decomposition analysis suggests that private consumption volatility is mainly explained by the preferences shock; non-tradable output volatility is greatly explained by its sectorial idiosyncratic productivity shock, while tradable output is explained by tradable productivity shock as well as the international interest rate. This latter finding represents a remarkable difference with respect to previous works, such as Mendoza (1991) and Schmitt-Grohé (1998) among others, who conclude that this type of shock (real interest rate) does not seem to be very important in explaining the cyclical behavior of economic variables. Second, the model predictions closely represent the data for the Spanish economy. Finally, the model captures the main cyclical qualitative features of the data reasonably well.

The rest of the paper is organized as follows. Section 2 describes the theoretical model. Section 3 presents the numerical simulation of the model and the results. Finally, Section 4 concludes.

2. The model

The Spanish economy is represented by means of a dynamic stochastic general equilibrium model, under the assumption of rational expectations and with the characteristics of a small open economy.

In each period, there are four goods: a tradable good, a non-tradable good, labor and capital. The country is specialized in the production of a tradable good and also produces a non-tradable good. Each good is used for consumption or investment. Tradable goods can be imported, but non-tradable goods like factories, residences or infrastructures, must be produced in the domestic country.

2.1 The Household

The economy is made up of a representative household, that obtains utility from the consumption of tradable goods (C_T), the consumption of non-tradable goods (C_N) and leisure $(L - N_T - N_N)$, where L is the time endowment of the members of household and N_T and N_N are, respectively, the time devoted to work in the tradable sector and the non-tradable sector. Furthermore, labor is assumed to be perfectly mobile between both sectors.

The representative household maximizes the expected utility defined over the stochastic sequences of consumption (C_T, C_N) and labor (N_T, N_N) subject to the budget constraint: