Fiscal, Monetary and Exchange Rate Policy in Spain, 1874-1913

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Abstract

This paper is an attempt to draw an overall picture of the transmission mechanism of macroeconomic policy tools (fiscal, exchange rate and monetary policies) in a national economy during the classical gold standard. I present the empirical results based on the SVAR framework. An SVAR analysis reveals that adjustments in exchange rates and monetary and fiscal policy pursued as policy tools played an important role in the recoveries that followed declines in GDP in the period 1874-1913. In the face of dramatic economic shocks, the rigidities of the monetary system inhibited recovery, particularly in countries on the periphery. None of these policy options would have been available under the gold standard and the impact of fluctuations in the economic cycle would have been much greater. My analysis sheds new light on the conduct of macroeconomic policy in Spain during the classical Gold gold standard. The level of the exchange rate was key since it helped to improve the terms of trade, promoted exports and raised prices at a time when the West suffered from the problems of deflation. The results in this paper provide new empirical evidence for the core-periphery debate addressing the period of the classical gold standard.

Key words: Classical Gold Standard, Spain, Exchange Rate, Monetary Policy, Fiscal Policy, SVAR.

JEL codes: E42, E52, E63, N10

Resumen

Este artículo pretende trazar un visión general de los mecanismo de transmisión de los instrumentos de política macroeconómica (política fiscal, cambiaria and monetaria) en una economía nacional durante el patrón oro clásico. Presento los resultados empíricos basados en un modelo SVAR. El análisis SVAR señala que los ajustes del tipo de cambio and la política monetaria and fiscal, entendidas como instrumentos de política, jugaron un papel importante en las recuperaciones que siguieron a las caídas del PIB durante el periodo 1874-1913. Frente a los grandes impactos económicos, las rigideces del sistema monetario imposibilitaban las recuperaciones, particularmente, en los países de la periferia. Ninguna de estas políticas se hubiera podido llevar a cabo dentro del patrón oro habiendo sido el impacto de las fluctuaciones del ciclo mucho mayor. Mi análisis arroja nueva luz sobre el funcionamiento de la política macroeconómica en España durante el patrón oro clásico. El nivel del tipo de cambio fue clave ya que ayudó a mejorar los términos de intercambio, promoviendo exportaciones e incrementando los precios mientras Occidente sufría problemas de deflación. Los resultados del trabajo aportan nueva evidencia en el debate centro-periferia para el periodo conocido como patrón oro clásico.

Palabras clave: Patrón oro clásico, España, Tipo de cambio, Política monetaria, Política fiscal, SVAR.

Códigos JEL: E42, E52, E63, N10

"(...) in no way does the fall of the peseta seem to me synonymous with weakness. The freedom to allow a certain moderate slackening in the exchange rate in times of general depression affecting the rest of the world can be a valuable measure to maintain internal stability, which would otherwise be impossible."

J. M. Keynes, interviewed in *El Sol* by Luís de Olariaga, 10 June 1930

I. Introduction

The study of the gold standard has grown in importance as a consequence of the euro crisis and the issues created by relinquishing monetary sovereignty (Stiglitz, 2016, p. 12). The euro generated the same rigidities in Europe that the gold standard once imposed on the world. The economies on the southern periphery of Europe did not succeed in remaining within the rules of the classical gold standard[1]. These are the same countries that have struggled to overcome the recent economic crisis in the context of the single currency (Eichengreen, 2015, pp. 12, 13 and 93). Fixed exchange rates facilitate trade and investment flows in times of prosperity, but they exacerbate problems in times of crisis (Eichengreen and Temin, 2010, p. 370)[2]. To overcome major crises, there is a need for the stimulus of expansionary monetary and fiscal policy, as well as a flexible exchange rate.

This paper seeks to analyse the rigidities in the gold standard using the Spanish case in order to draw lessons for the present day. One of the successes of the system was to keep exchange rates stable in much of the world (Triffin, 1985, p. 12; Eichengreen, 1992, pp. 4-8). The gold standard created a climate without monetary shocks and this, according to its proponents, contributed to economic growth. Membership in the gold standard was a sign of good conduct and it resulted in benefits such as lower interest rates, a decrease in fiscal deficits, lower inflation,

[1] For the Italian case, see Fratianni and Spinelli (1984), Cipolla (1995), Tattara (1997, 2000 and 2003), Bordo (1999, p. 328) and Frattiani and Spinelli (2012). For the Portuguese case, see Mata (1987), Reis (1996, 2000 and 2007), Valerio (1998) and Bordo (1999, p. 329). For an analysis of the gold standard in Greece, see Lazaretou (1995 and 2005).
[2] Also, Varoufakis (2016), p. 37, highlights the relationship between the rigidities of the euro and those of the gold standard.

better access to capital markets and lower transaction costs (Bordo and Rockoff, 1996, pp. 389-396 and López-Córdoba and Meissner, 2003, p. 344).

The positive effects of stability and growth were generally limited to the advanced economies. A large proportion of the countries on the periphery experienced major exchange rate fluctuations and instability (Triffin, 1985, p. 128). If the economies of the periphery wished to join the gold standard, they were required to enact painful, sometimes untenable adjustments to their national economy[3]. The countries of Europe's southern periphery, such as Italy and Portugal, were unable to remain within the gold standard. The structural problems of their economies prevented them from bringing their money supply under control and keeping their exchange rate stable.

The economies on the periphery were debtors in the global financial system, making them vulnerable to the withdrawal of funds in times of financial constraint (De Cecco, 1974; Temin, 1995, p. 28 and Bordo Flandreau, 2003, p. 420). Countries outside the gold standard used fluctuations in the exchange rate to cushion the impact of economic shocks (Bordo and Rockoff, 1996, p. 416; Bordo and Flandreau, 2003, p. 419)[4]. In addition, speculation was a key problem under the gold standard. A loss of confidence would spark a speculative attack on the currency in question (Eichengreen, 1996, pp. 46-49; Bordo and Jonung, 2001, p. 14, and Bernanke, 2015, p. 26). Credibility varied enormously between the core and the periphery (Hallwood et al., 1996, p. 129ff; Bordo and Flandreau, 2003, p. 446; Bordo and MacDonald, 2005, p. 326 and Mitchener, Shizume and Weidenmier, 2010, p. 54). The interest rate, which served as an adjustment mechanism for the countries at the core, did not work for the periphery (Morys, 2013, p. 205, and Triffin, 1997, p. 128). Banks in the core countries would assist one another (Flandreau, 1998, pp. 737 and 761), whereas they would not help the countries on the periphery[5].

Studying the individual experiences of countries on the periphery under the classical gold standard has enhanced our understanding of the periphery in this period. In short, the gold standard was a constraint on potential monetary and fiscal policy actions in reaction to

[3] Braga de Macedo (1996), p. 243 and Martín Aceña, Reis and Llona (2000), p. 2. For additional information on the main characteristics of the gold standard, see Temin (1995, p. 25).

[4] Cipolla (1995), p. 132, emphasises that, in the Italian case, compulsory legal tender acted as a social and economic cushion. Crafts, N., & Mills, T. C. (2013) find that the abandonment of fixed exchange rates enabled the British economy to overcome the depression of the thirties by gaining control of its monetary and fiscal policy and being able to lower interest rates.

[5] For additional information, see Eichengreen, 1995.

fluctuations in the economic cycle (Bordo and Kydland, 1995, pp. 436-441; Bordo and Jonung, 2001, pp. 12-13, and Bernanke, 1995, pp. 11-12)[6].

The case of the Spanish economy offers an opportunity to analyse the behaviour of macroeconomic variables in the only Western country to remain always outside the gold standard[7]. There is no consensus over whether the non-adoption of the gold standard benefited or harmed Spain's economic growth[8]. The proponents of a fixed exchange rate stress that growth would have been greater under the gold standard. However, keeping a flexible exchange rate and freedom of choice in macroeconomic policy did succeed in dampening the impact of fluctuations in the economic cycle experienced by Spain during the classical gold standard. For this reason, the following study aims to analyse whether the tools of monetary, exchange rate and fiscal policy had a real effect on Spain's economy between 1874 and 1913.

The paper covers the period known as the classical gold standard. Spain had a *de jure* bimetallic standard over the period. Nevertheless, in the late eighteen-eighties, the country is regarded to have had a *de facto* fiduciary system in that the real value of silver was lower than its face value and there were constant outflows of gold. Over the entire period, Spain increased its money supply, maintained constant budget deficits and experienced a major depreciation of its currency.

From 1874, after granting the Banco de España a monopoly on the issue of banknotes, the state could resort to increasing the amount of banknotes in circulation (Figure 1) to solve its treasury problems. The issue limit imposed on the Banco de España was raised various times, enabling the money supply to be increased[9]. The decree of 14 July 1891 raised the limit to 1,500 million pesetas (Sardà, 1987, p. 180). Subsequently, in 1898, the limit was again increased, this time to

[6] See footnote 1.

[7] Sardà (1987), Martín Aceña (1981) p. 267, Martín Aceña (1993) p. 135, Tortella (1994) p. 323, Serrano (2004) p. 155, García Iglesias (2005) p. 62, Sabaté, Gadea and Escario (2006), p. 310, Nogues and Martínez Ruíz (2011) p. 3, Martínez Ruíz and Nogues (2014) pp. 9 and 19.

[8] On one hand, Sardà (1987), Solé Villalonga (1964, 1967) and Tortella (1981, 1994) defended a position contrary to the gold standard. Their argument is based on the impossibility of taking monetary and fiscal policy actions under the gold standard. More recently, this stance has been defended by Cubel et al (1998); Catalan, Sudrià and Tirado (2001); Cubel (2001); Llona (2001); Ródenas, Brú and Almenar (2001); and Sabaté, Gadea and Serrano (2001), Carreras and Tafunell (2004, pp. 219-20), Serrano (2004) and Bru and Ródenas (2006). This school of thought is called the "classical thesis" and is associated with Professor Joan Sardà. On the other hand, Martín Aceña (1981, 1993, 1997 and 2000) defends the critical thesis, viewing it as a mistake not to have adopted the gold standard. Aceña, a professor at the University of Alcalá, holds that Spanish growth would have been greater under the gold standard. See Martín Aceña, Martínez Ruiz and Nogues (2011) and Martínez Ruiz and Nogues (2014), among others. In an intermediate position in the debate, we can find García Iglesias (2005) and Prados de la Escosura (2003). For additional information on the issue, see Roldan (2016).

[9] Sardà (1987), p. 176, the situation in 1883 could only be resisted through an increase in the money stock.

2,500 million pesetas[10]. Finally, in a last attempt to improve the price of the peseta on the international market and reduce public debt, the limit was lowered to 2,000 million pesetas because of a tighter monetary policy than in the preceding years[11]. The increase in banknotes in circulation was tied to the state's budgetary policy[12].

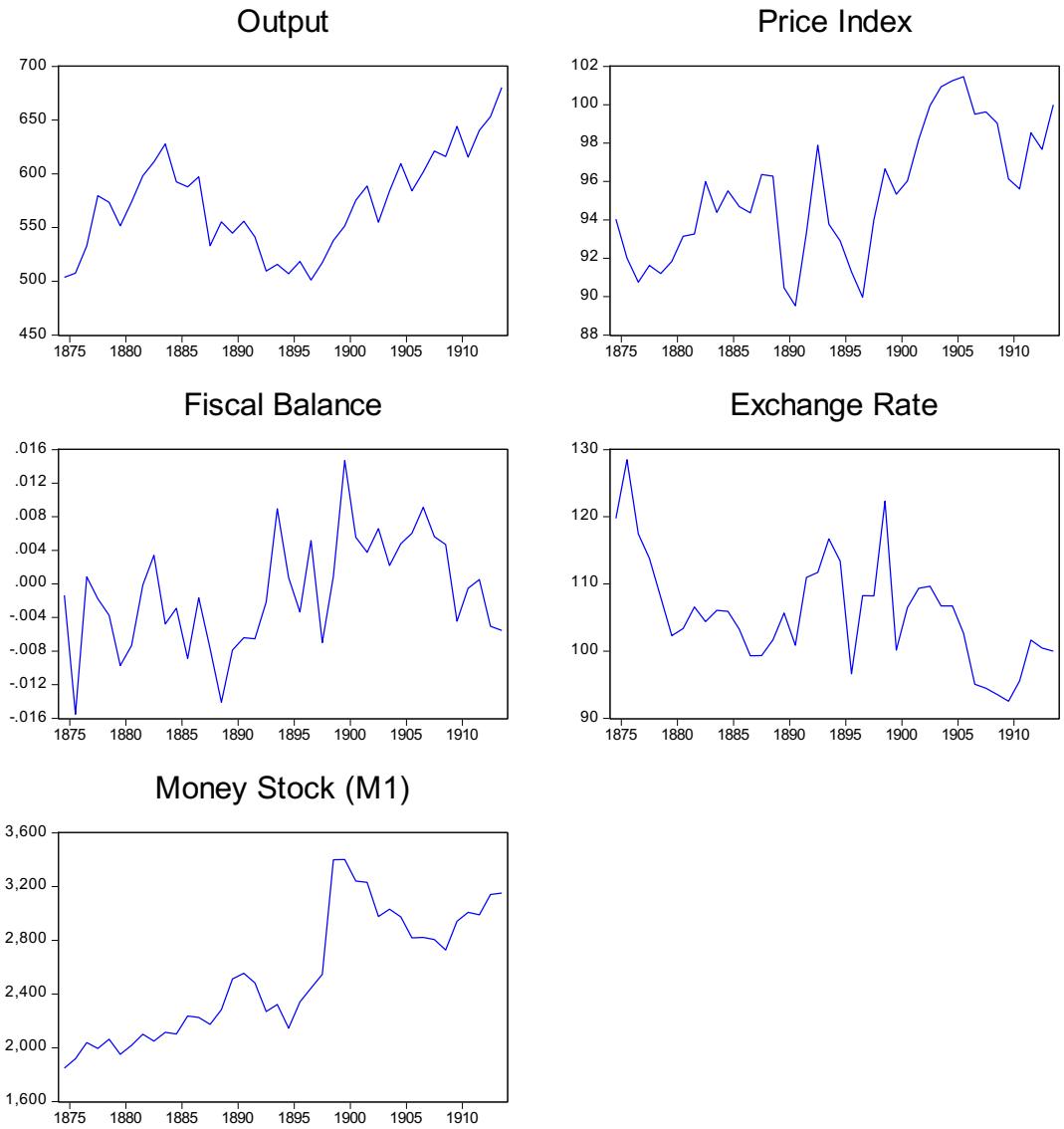

Figure 1: Evolution of output (real pc GDP in million pesetas), price index, fiscal balance (in percentage of real GDP), exchange rate (real effective exchange rate) and money stock (real M1 in million pesetas). Everything is in 1913 pesetas.
Source: see text.

[10] The Cuban uprising forced the Ministry of Overseas Territories to resort to the issue of banknotes, Sardà (1987, p. 190).
[11] These types of tighter policies are associated with Villaverde. Raimundo Fernández Villaverde was Chancellor of the Exchequer in 1899-1900 and 1902-1903. Later, he was prime minister in 1903 and 1905. His policies involved carrying out a financial restructuring to put the system on a sound footing again and halting the depreciation of the currency. In 1908 these policies were abandoned when signs of domestic slump appeared (Sardà, 1982, p. 202).
[12] Escario et al (2011) observe a strong causality between the budget and changes in the monetary base between 1875 and 1998.

From 1874 to 1899, deficits were recurring (Figure 1). The exchange rate was flexible from the late eighteen-eighties, losing value particularly between 1888 and 1900. The exchange rate depreciated by 26.6% between 1883 and 1891. By contrast, between 1893 and 1898 the depreciation was 36%, the highest in the period (Figure 1). Could any of these policies have encouraged growth in the Spanish economy? Did these policies have an impact on the real economy? If they did, was the impact negative or positive?

The aim of this paper is to determine whether the benefits of being outside the gold standard had an impact on Spain's real economy between 1874 and 1913 and, if so, what the impact was. In other words, the focus is to investigate, at a quantitative level, the role played by economic policy tools on the cycle's fluctuations. The Spanish economy during the gold standard offers an interesting case study because Spain was the only country to remain always outside the gold standard. The paper analyses the dynamic relationship between macroeconomic variables and seeks to estimate the magnitude of their effects. To this end, an SVAR (structural vector autoregression) model is constructed using two variables relating to the state of the real economy and three economic policy variables[13]. The SVAR analysis treats the variables symmetrically, adjusting a regression of each variable over a constant, with a certain number of lags for each variable and the same number of lags for the other variables in the SVAR model[14]. The main advantage of using an SVAR model is that, with relatively few assumptions, it can give consistent and asymptotically efficient estimations that make it possible to observe causality.

For the Spanish case, this type of study has no precedents for the period spanning the late nineteenth and early twentieth centuries. However, the methodology has been used by Cha (2003) and by Shibamoto and Shizume (2014) to capture the magnitudes of the effects of macroeconomic policies in Japan, by Gordon and Krenn (2010) to measure the same effects in the US, and by Mattesini and Quintieri (1997) in the Italian case, among others[15]. Shibamoto and Shizume (2014) have studied the impact of monetary, fiscal and exchange rate policy in Japan during the inter-war period. This paper follows the analyses carried out by the authors mentioned above.

[13] A formal explanation of structural vector autoregressions can be found in Bernanke (1986) and Sims (1986).
[14] Christiano et al. (1999) use SVAR to study the transmission mechanism of monetary policy. Blanchard and Quah (1989) popularised the use of SVAR models in the analysis of fluctuations in the economic cycle. Blanchard and Perotti (2002) obtain the dynamic effects produced by shocks in fiscal spending and taxes.
[15] For the English case, see an analysis of monetary policy in Jeanne (1995).

The sample is small. Nevertheless, there are examples of similar studies with comparable sample sizes[16]. The most important limitation is that the results from a small sample can be more imprecise. This paper confirms how expansionary monetary and fiscal policy and adjustments in the exchange rate played a prominent role in Spain's economic development. Expansionary monetary policy was an effective way to foster economic growth in the period. It was adapted in response to the country's economic conditions and treasury problems. The effects of fiscal policy were not as great, but they did exist. Having a flexible exchange rate proved crucial to sustaining Spanish economic growth and being able to overcome fluctuations in the cycle, promoting exports and raising domestic prices, while avoiding deflation abroad.

The paper is organised as follows: section 2 describes the methodology and the data; section 3 presents the empirical results; section 4 discusses the results in relation to the historical evidence and previous literature; and lastly section 5 puts forward a conclusion.

II. Methodology and data

This section describes the econometric tools and data used to estimate the effects of monetary, fiscal and exchange rate policy on real GDP. To achieve this aim and analyse the dynamic relationship between macroeconomic variables, the following VAR model is constructed using the variables of output (y_t), price index (p_t), fiscal balance (f_t), exchange rate (e_t) and money stock (m_t):

$$B(L)X_t = b_0 + \varepsilon_t$$

where $X_t = (y_t, p_t, f_t, e_t, m_t)$, $b_0$is the vector of the constant, $B(L) = B_0 - B_1L_1 - \cdots - B_pL^p$ is a *p*-th order lag that forms a matrix $B_j = (j = 1, \dots, p)$ such that the diagonal elements of b_0 are equivalent to 1 and $\varepsilon_t = (\varepsilon_{yt}, \varepsilon_{pt}, \varepsilon_{ft}, \varepsilon_{et}, \varepsilon_{mt})$ is a five-by-one vector of serially uncorrelated structural disturbances with a mean zero and a covariance matrix Σ_ε. Following the order of Shibamoto and Shizume (2014), the macroeconomic variables are put first (real GDP and price index) and then the policy tool variables are added (fiscal balance, real effective exchange rate and money stock). This order assumes that politicians first observe their macroeconomic variables and then apply different policy tools[17]. Fiscal policy appears first

[16] Boiciuc (2014) uses 48 observations and Ćorić, T., Šimović, H., & Deskar-Škrbić, M. (2013) use 52 observations.
[17] The order is the same one used in Christiano et al. (1999). Changes in the order of the variables do not qualitatively alter the result of the regression, see Appendix 2.

because it was determined independently of the other available policies[18]. Then comes the exchange rate, which being flexible could act freely as a cushion or shock absorber for the economy, and monetary policy comes last[19].

The structural model is as follows:

$$A(L)X_t = a_0 + u_t$$

where b_0 is the vector of the constant, $A(L) = I - A_1L - \cdots - A_pL^p$ is a *p*-th order lag of matrix A_j $(j = 1, 2, \dots, p)$ and $u_t = u_{yt}, u_{pt}, u_{ft}, u_{et}, u_{mt}$ is the a five-by-one vector of serially uncorrelated structural disturbances with a mean zero and a covariance matrix Σ_u.

Five macroeconomic variables have been used. The y_t is real pc GDP measured using GDP from Prados (2003) and population from Nicolau (2005), p_t is the price index from Maluquer (2013), f_t is the real fiscal balance as percentage of GDP obtained by Comín and Díaz (2005), e_t is the real effective exchange rate, whose calculation is explained below, and m_t is the money stock measured through M1 (Martín Aceña and Pons, 2005)[20]. All the data have been calculated in real terms, deflating with the price index provided by Maluquer (2013)[21].

The real effective exchange rate takes account of the average weight of the exchange rate against the pound sterling, the French franc and the US dollar. The calculation of the exchange rate makes use of the whosale price index obtained by Sardà (1948), pp. 302-305, for Spain, the whosale price index obtained by Mitchell (2007) for the other three countries, and the peseta exchange rate from Martín Aceña and Pons (2005). The weight of foreign trade to the respective countries is obtained from Prados de la Escosura (1982), p. 42, using fixed weightings updated every five years. The weightings account for more than 60% of total foreign trade over the entire period.

The frequency of the data is annual. The sample runs from 1874, the year in which the Banco de España was granted a monopoly in the issue of banknotes because of the state's treasury

[18] The problems of Spain's treasury, which were the result of the many wars in which the country was involved in the period, meant the remaining policies were determined by state spending (Escario, Gadea and Sabaté, 2006)

[19] In this analysis, it is not possible to use expected inflation (as used in Shibamoto and Shizume, 2014) because of the absence of futures markets in Spain in the cited period. Instead of six variables, therefore, the above SVAR model has only five.

[20] I have choosen pc GDP because it is a better measure of economic growth since it takes into account the population. Appendix 1 shows autocorrelation tests and normality test. The results would not vary qualitatively if M2 were used in place of M1 or if the nominal exchange rate replaced the real exchange rate. Nor are there significant variations if total GDP is used instead of pc GDP. For more information, see Appendix 2. Nor do the conclusions change if the entire analysis is done in nominal terms.

[21] The price index of Maluquer (2013, pp. 59-60) is used because its construction makes it most appropriate for the analysis of a relatively short period of time. CPIs show less intense highs and lows than wholesale prices. Differences between the two estimations appear primarily in the short run. In the long run, they are consistent and plausible.

hardships, to 1913[22]. All the variables have been converted into logarithms with the exception of the fiscal balance[23]. The available criteria for selecting the number of VAR lags point to one lag as the optimal number to carry out the SVAR estimation. The SVAR is estimated on levels because the performance of the estimation is consistent even if each variable is not stationary (Hamilton, 1994, pp. 651-653)[24].

The paper uses the Cholesky decomposition to orthogonalise the reduced form innovations. The Cholesky decomposition imposes a specific form of structural model (the first variable by order is considered the most exogenous).

III. Empirical results

Structural shocks

This section sets out the results obtained using the SVAR estimation. Three different results are offered: the structural shocks of the times series, the impulse response function, and the historical decomposition of the macroeconomic variables.

[22] It is not possible to start the analysis earlier because of the lack of historical series of monetary circulation prior to 1874.

[23] This is the same procedure followed by Shibamoto and Shizume (2014). Because the fiscal balance has negative values, it cannot be converted into logarithms. As a result, the variable is used without conversion.

[24] A Johansen test has been used to check for the existence of a cointegration vector for the variables that are not stationary, integrated of order 1. See Appendix 1.

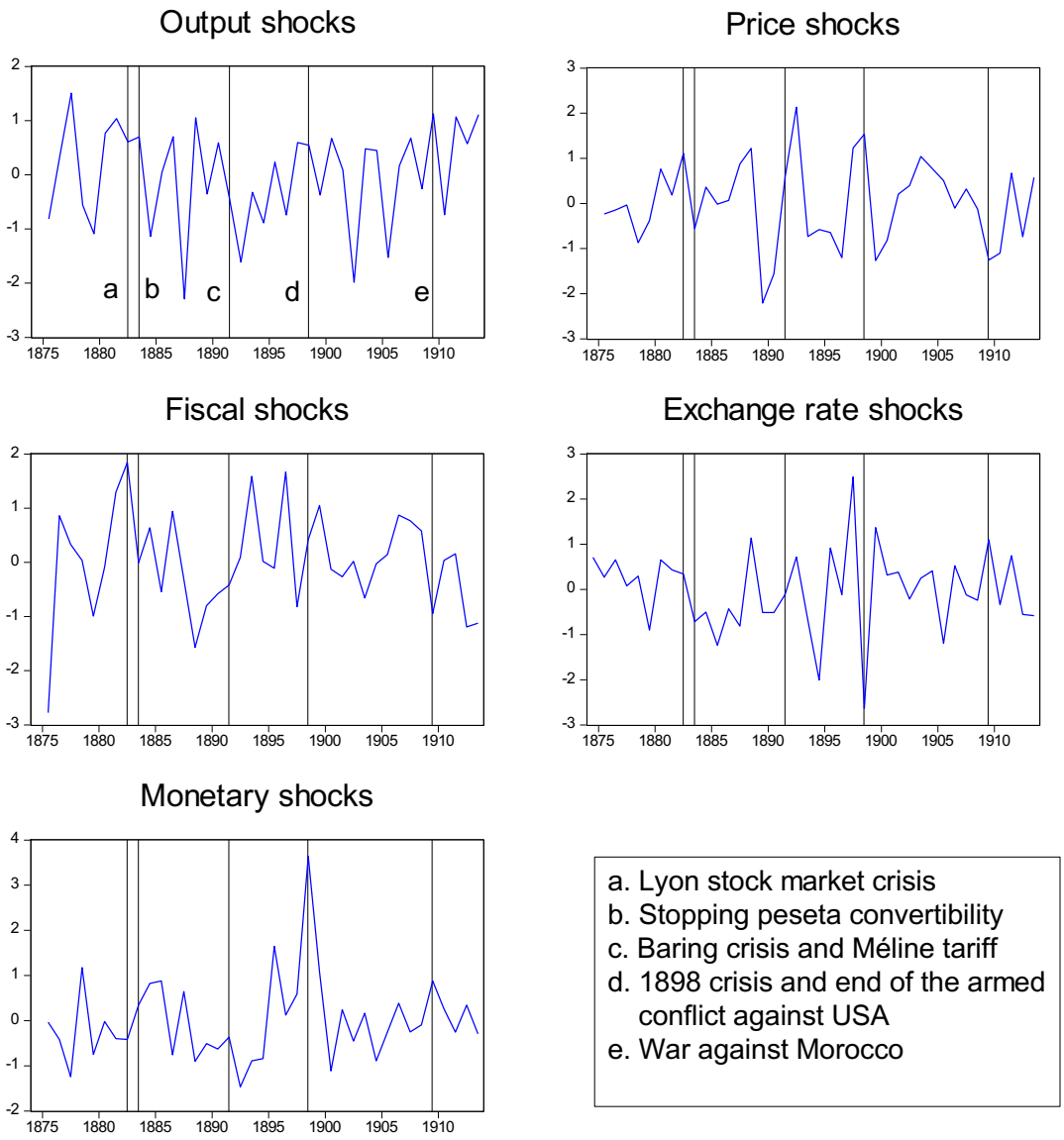

Figure 2. Structural shocks

Figure 2 shows the structural shocks in the five time series. Because of the method of their construction, the structural shocks are not correlated. The following events must be taken into account: the Banco de España is granted a monopoly on the issue of banknotes (1874), the Lyon stock market crisis occurs (1882), the peseta's convertibility into gold is suspended (1883), the Baring crisis and the Méline tariff[25] occur (1891), the phylloxera outbreak spreads across the Iberian Peninsula in the eighteen-nineties, the armed conflict against the US comes to an end (1898) and the conflict with Morocco begins (1909). The shocks obtained from the VAR analysis

[25] The tariff was a major tightening of the entry conditions for Spanish wine, which was the country's leading export, when coming into France (Serrano, 2011).

are independent of the structural shocks on other variables. For example, the structural shocks in fiscal policy are not induced as responses to fluctuations in the other variables.

The shocks shown in Figure 2 are consistent with the historical evidence. The first graph shows the different falls in GDP that correspond to distinct economic impacts. First, a recovery in GDP can be observed. This can be associated with the euphoria of the Bourbon Restoration. Later, between 1878 and 1879, there is a negative, but short impact[26].

From 1882, GDP again began to fall. In that same year, the *Banque de Lyon et de la Loira* collapsed and the shockwaves spread first to Paris and later to Spain. After the fall of financial institutions in Lyon, the Spanish banks experienced cash withdrawals, bank failures and dwindling gold reserves. In addition, the possibility of importing cheap grain sparked a major agricultural depression that compounded the financial slump and turned the crisis into the longest of the period. Large outflows of gold from Spain precluded the conversion of Spanish banknotes into gold (Sardà, 1987, p. 179; Martín Aceña, 1993, pp. 135, 137 and 189; Tortella, 1994, pp. 139, 177 and 480-481; Bordo and Schwartz, 1999, p. 32; Martín Aceña, Nogués and Martínez Ruíz, 2011, p. 3 and Catalan and Sánchez, 2012, p. 96). From this time, a negative trend continued until 1889, when GDP began to recover.

In 1892, with the previous crisis still not entirely overcome, a new international financial crisis escalated, turning particularly severe in the United Kingdom. The solvency problems of the Banco Nacional de Buenos Aires had forced Argentina to suspend payments and pushed Barings Brothers to the brink of ruin by 1890. Initially, GDP appeared to recover modestly, but it again fell between 1895 and 1897. This was an economic crisis of great breadth (Sardà, 1987, p. 223). In addition, the Méline tariff levied by the French made the entry conditions insurmountable for alcoholic beverages from the Iberian Peninsula, preventing wine exports (Serrano, 2011, p. 641). The loss of the French market intensified the slump and the outbreak of phylloxera throughout the Iberian Peninsula further exacerbated the situation.

Between 1902 and 1906, another period of crisis took hold. At this time, GDP fell twice as a consequence of swingeing budget adjustments and the Melilla War. Lastly, the years 1910 and 1912 point to two slight declines in GDP coinciding with the conflict with Morocco.

The price shocks followed an upward trend, with fluctuations, until 1883, just after the financial bubble burst in Lyon. Then prices fell until a recovery began in 1885. At that point, they trended upwards, but continued to fluctuate until 1892. Even so, Spanish prices remained higher than

[26] Vicens and Nadal (1967) reproduced in Vicens and Nadal (1987), p. 674.

the prices in the remaining Western countries, thereby avoiding the deflation abroad. From 1893, prices followed a slightly negative overall trend. In 1904, a sharp fall occurred, probably as a result of Villaverde's restrictive policies to balance the Spanish budget and halt monetary expansion by means of domestic devaluation[27].

In the late eighteen-seventies, shocks in the fiscal balance showed a downward trend. From 1882, the fiscal balance improved because of the debt reorganisation carried out by Camacho[28]. The structural shocks of fiscal policy suffered a negative impact between 1884 and 1889 coinciding with falls in GDP. The war against the US pushed public spending higher and boosted aggregate demand. As a result, there was a very intense negative impact on the budget between 1894 and 1898. In 1900, stability was regained, but then another downward trend took hold until 1903. The moments of greatest public spending correspond to armed conflicts. As an outgrowth of Villaverde's restrictive policies, the fiscal balance remained balanced and in surplus with the sole exception of 1909, the year in which the armed conflict against Morocco began. In that year, a negative impact can be observed.

The exchange rate fluctuated mildly into the eighteen-eighties. From the second half of the decade, however, there were more severe impacts on the value of the currency. Going forward, the peseta tended to depreciate until 1898. In 1887-1890, a depreciation helped to overcome the crisis mentioned above (Sardà, 1987). Later, in 1892, a small rise in the exchange rate (depreciation) can be seen. Similarly, between 1893 and 1894, the peseta lost value. Then, in response to the debacle in Cuba, the currency entered a very intense process of depreciation, particularly in 1896-1897, reaching its historical high mark in 1898. This loss of value contributed to overcoming the economic crisis that hit Spain in the eighteen-nineties (Maluquer, 1999). Subsequently, the exchange rate appreciated as a result of Villaverde's contractionary policies. In 1910, the value of the currency fell as a consequence of the conflict with Morocco.

The money stock rose sharply in 1878 and then again in 1880. Later, during the crisis of the Lyon stock exchange, the money stock was further increased. In 1895, another sharp rise took place. In 1898, a major shock in the money stock coincided with a sharp depreciation of the national currency as highlighted in the previous paragraph and the war against the US. Subsequently,

[27] The projects of Villaverde that were carried out in this period were based on a simple version of the quantity theory of money without taking into consideration the negative effects of sudden deflation on finances or industry (Olariaga, 1933, pp. 108-112 and Maluquer, 1999, pp. 184-185).

[28] In 1879, Spain's public debt represented over 200% of GDP. Spain was in need of a reformer. Juan Francisco Camacho de Alcorta arrived at the Ministry of Finance in 1881. There he enacted a reform in December 1881 to extricate the nation from insolvency. Debt was reorganized, government bonds were consolidated and financial burdens were reduced. This was a voluntary, mutually agreed restructuring (Comín and Martorell, 2006).

greater stability in the money stock coincided with Villaverde's policies and an improved balance in the state's accounts. Lastly, in 1909, an increase in the money stock took place, possibly as a funding measure for the war against Morocco.

Effects of the structural shocks

A shock to the *i*-th variable not only affects the *i*-th variable directly, but also all the other endogenous variables by means of the VAR's dynamic structure (lag). The impulse response function traces the effect of one standard deviation shock on the current and future values of the endogenous variables, causing them to increase or decrease[29].

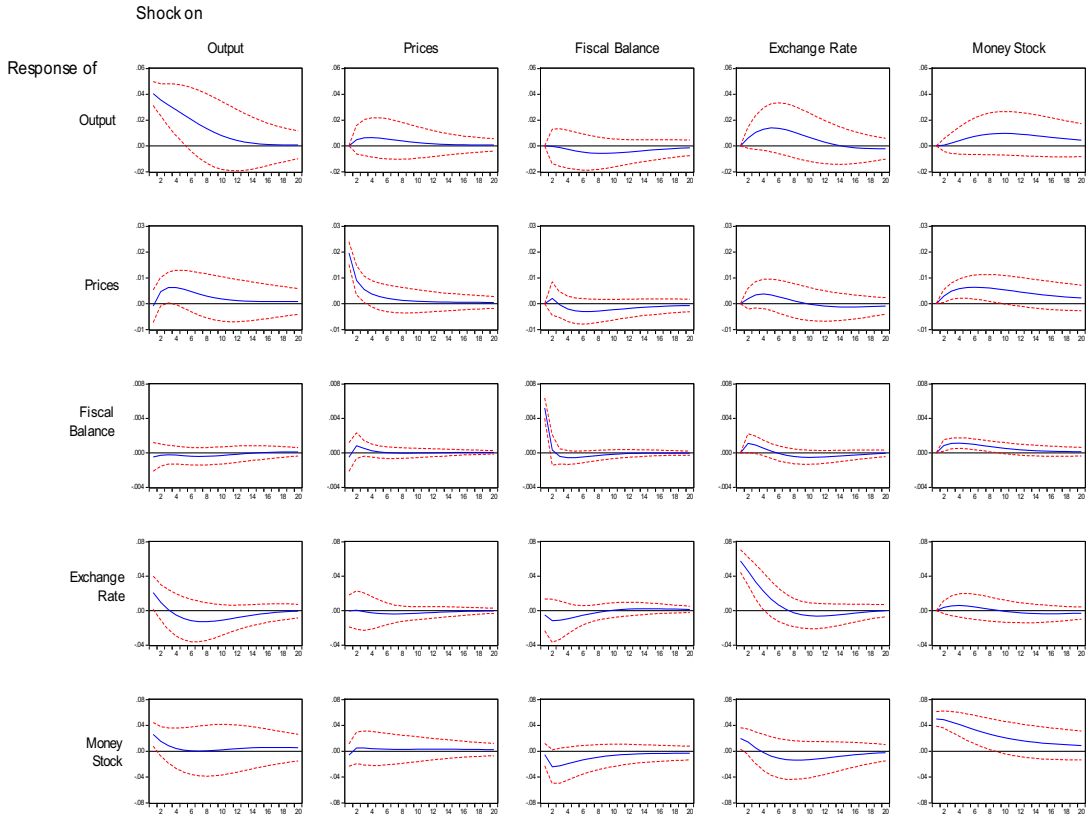

Figure 3. Impulse response function

Figure 3 sets out the impulse response functions for each variable. The rows show each variable's response to five different shocks. The columns show the response of all the variables to one type of shock. For instance, the first row shows the responses of GDP to shocks on each variable, while the first column shows how shocks on output affect each variable. The red bands

[29] A shock is considered a positive impact.

show a standard deviation of 1.96 with a confidence interval of 90%[30]. The main aim is to observe whether monetary policy, fiscal policy or a flexible exchange rate had an impact on the real economy and whether this promoted the development of the Spanish economy. Did a flexible exchange rate, increases in the money supply and recurring deficits help to overcome the fluctuations of the economic cycle?

According to the impulse response functions, expansionary fiscal policy had a positive impact on GDP. Both monetary policy and the exchange rate also affected GDP positively. With an increase in M1 or the exchange rate (depreciation), GDP rose[31]. In short, expansionary monetary and fiscal policy and the depreciation of the peseta were useful macroeconomic policy tools for Spain's economy during the classical gold standard.

The fourth column shows the responses to shocks on the exchange rate. In the top chart, GDP increased after a shock on the exchange rate (depreciation). Prices also responded positively to a shock on the exchange rate. The results suggest that shocks to the value of the currency had a major influence on the real economy during the period of the classical gold standard. A shock on the exchange rate also had a positive impact on the exchange rate itself. In addition, the currency's loss of value was followed by an increase in the money stock. Depreciation produced an excess of demand for money. To compensate, the money supply had to increase, thus increasing the price level. Similarly, there was a positive trend in the fiscal balance in response to a depreciation of the exchange rate. In the face of a shock on the exchange rate, the state's accounts improved. Lastly, given the positive impact of depreciations on GDP, the exchange rate can be said to have acted as an automatic stabiliser of the economy[32].

The fifth column represents the impulse response functions to a monetary shock (an increase in the amount of money). An increase of money supply had a positive impact on output. This was followed by a fall in interest rate, which augmented exchange rate (depreciation). Hence, a shock on the money stock was followed by a depreciation of the peseta. The creation of liquidity by the monetary authorities caused the value of the peseta to fall. The impulse response function confirms that a shock on the money stock brought about a statistically significant increase in real GDP and prices. Thus, an expansionary monetary policy had effects on the real economy through the stimulation of aggregate demand.

[30] Standard deviations are preferred because they offer the responses in the correct order of magnitude.
[31] Peripheral countries used depreciation in order to overcome crises recurrently. Matthias Morys (2013), p. 221, shows that these countries paid little attention to variations in the exchange rate and a great deal of attention to the bank coverage ratio.
[32] If M2 is used, it also shows a positive effect, but the error bands are wider.

As can be observed in the third column, shocks on fiscal policy also had an impact on the real economy. If the symmetry of the functions is taken into account, a negative shock on the fiscal balance initially caused an increase in GDP. The increase in public spending ultimately had a multiplier effect that led to a rise in GDP. By contrast, budgetary tightening produced an economic contraction. The application of expansionary fiscal policy, therefore, had a positive impact on Spain's real economy. In turn, an increase in deficits caused an increase in the money supply, providing evidence of the relationship between the two policies[33].

GDP shocks had significant effects on real GDP, but limited effects on prices. In this period an increase of GDP was followed by currency depreciation. The money stock rose when GDP rose. Higher GDP spurred increased demand for money to be used in transactions, so an increase in the money stock became necessary. A rise in money supply also caused an increase in exchange rate (depreciation) until price level was high enough to equal supply and demand.

Price shocks had a positive impact on GDP and on prices themselves. However, their effect on the exchange rate was virtually negligible. A shock on domestic prices caused an increase in the fiscal balance. In addition, an increase in prices generated a rise in the money stock. Being outside the gold standard maintained freedom of action in monetary, fiscal and exchange rate policy and this had a positive impact on the Spanish economy.

Historical decomposition of the variables

In this section, an historical decomposition analysis shows how the model describes and interprets history. The historical decompositions measure the cumulative contribution of each structural shock on the evolution of each variable over time. They are essential, for instance, to understand the origin of the declines or increases of a given variable. The figures show the decompositions for the fluctuations in each variable that can be explained by the five structural shocks in the model.

[33] This relationship is addressed in detail in section 5.

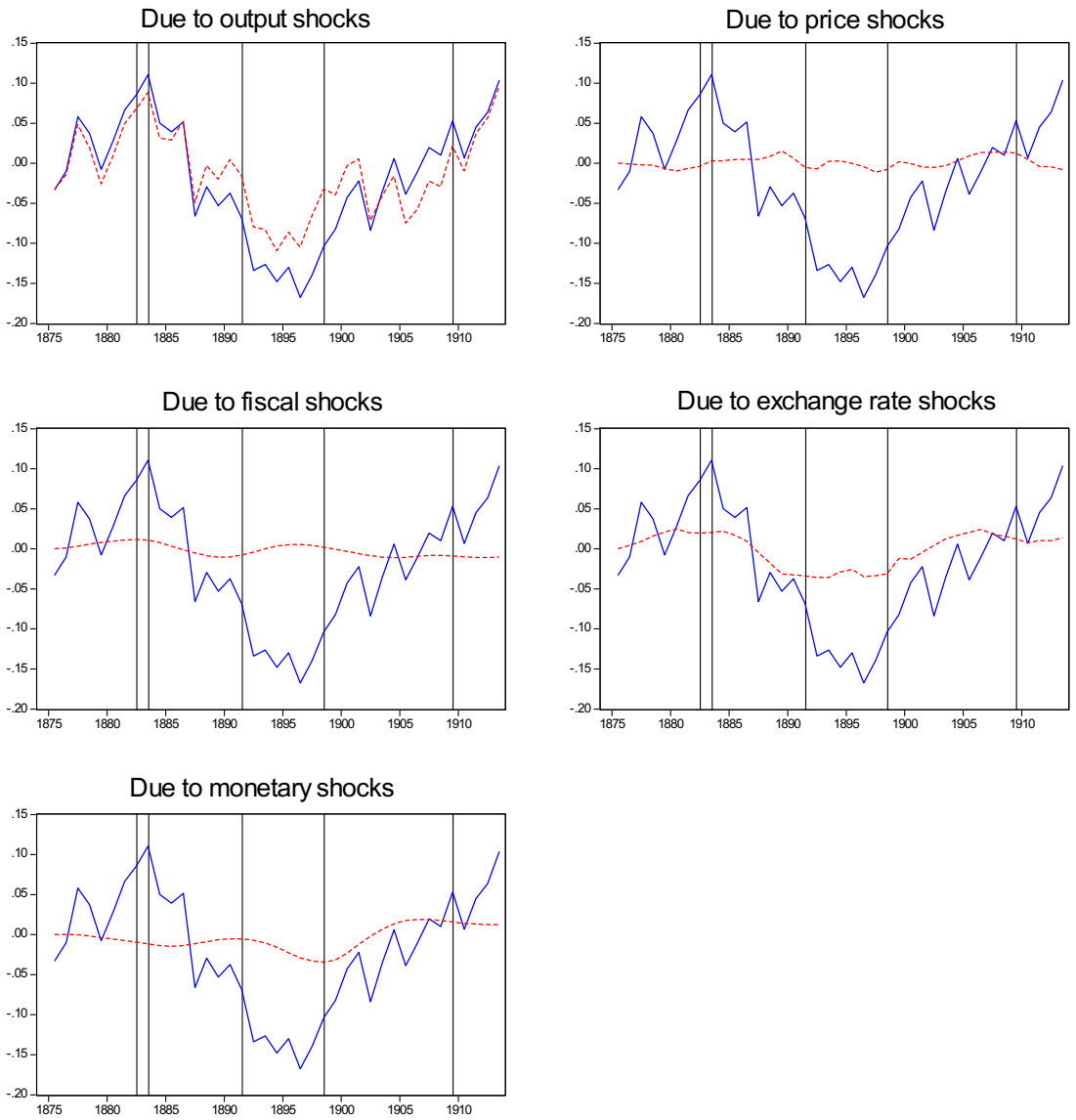

Figure 4. Historical decomposition of GDP

Figure 4 decomposes the series of real GDP into five components that are explained by the five types of structural shocks, respectively: GDP, prices, fiscal balance, exchange rate and money stock. It explains the contributions of shocks on the different variables to fluctuations in GDP. The continuous line shows the fluctuations in GDP and the broken line shows the decomposition into the different structural shocks. The shocks on GDP account for the largest part of the fluctuations in output between 1874 and 1884. By contrast, during the second half of the eighteen-eighties, the nineties and the early years of the twentieth century, a portion of these fluctuations was due to other factors.

The real exchange rate affected movements in GDP, especially the upward trend from 1896 to 1906. Between 1897 and 1899, the value of the currency stimulated the recovery of real GDP. Indeed, the peseta's greatest loss of value occurred in 1898. Nonetheless, the exchange rate promoted the recovery of the Spanish economy and it helped to explain the fluctuations in real GDP. Changes in the amount of money also explain, though to a lesser extent than the exchange rate, the declines and increases in GDP, especially in the periods 1890 and 1906. The money stock helps to explain the negative trend and especially the recovery of GDP from 1897 to 1900. The impacts of prices had a very limited effect during most of the overall period. Fiscal shocks had practically no effect on fluctuations in real GDP.

In line with this analysis, politicians formulated some of their policies in response to the country's economic conditions and to changes in other policies. To analyse this, Figures 5, 6 and 7 have been constructed to show each historical decomposition of fluctuations in the fiscal balance, the exchange rate and the money stock and the components attributed to structural shocks (GDP, prices, fiscal balance, exchange rate and money stock) into which each of them is decomposed.

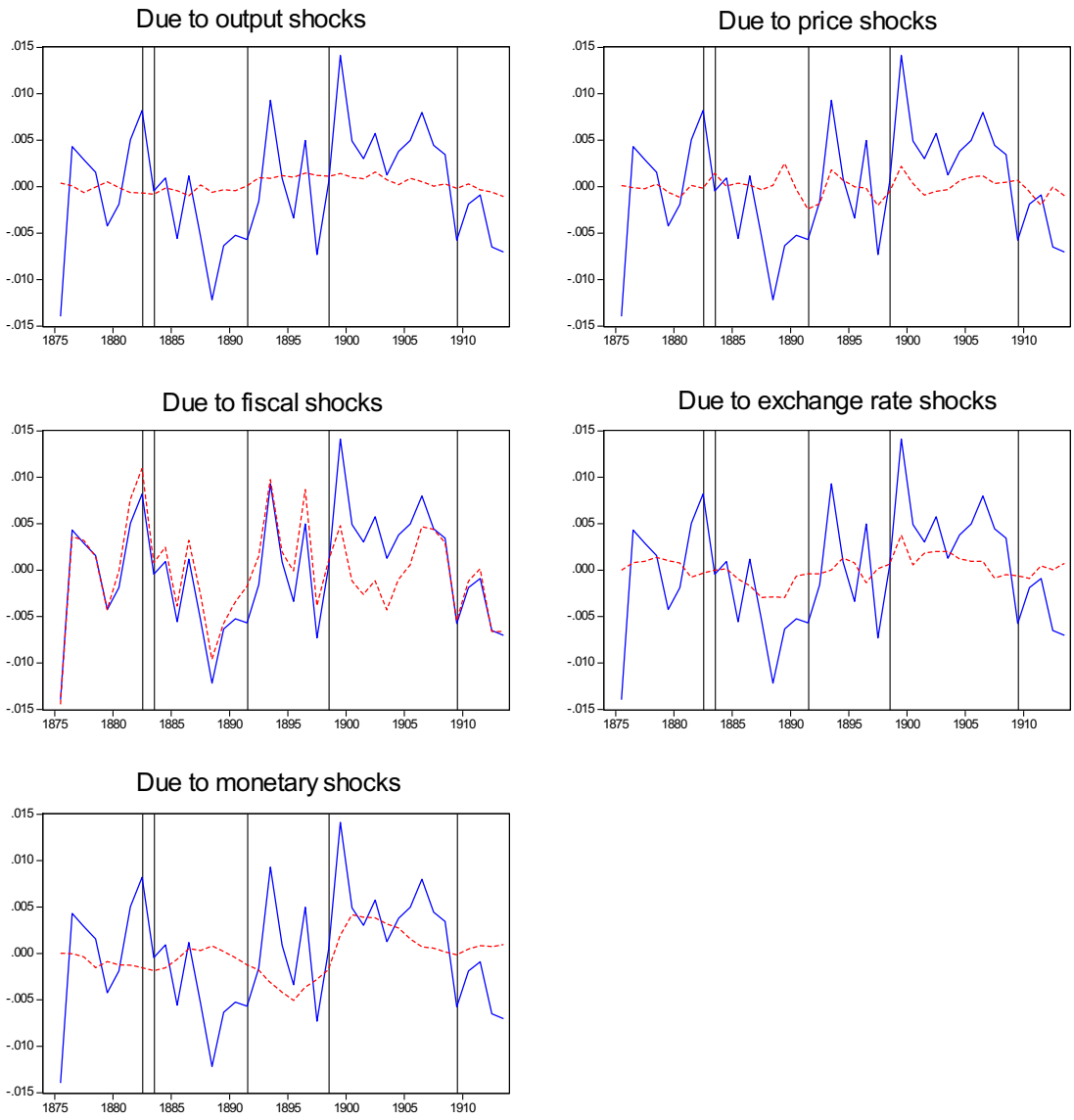

Figure 5. Historical decomposition of the fiscal balance

Figure 5 shows the historical decomposition of fluctuations in the fiscal balance. Shocks due to fiscal policy explain most of the movements in the fiscal balance over the entirety of the period. However, occasional variations can be observed. In the period 1885-1905, the variations are largely explained by shocks in the exchange rate. In the period 1890-1906, shocks in the money stock have influence on movements in the fiscal balance. Level of prices, though to a lesser extent than the exchange rate and money stock, also explained fluctuations in the fiscal policy. Shocks due to GDP do not help to explain the fluctuations in fiscal policy throughout the period.

Figure 6 shows the historical decomposition of fluctuations in the exchange rate. Shocks to the exchange rate explained major part of movements in the exchange rate. Shocks to the money stock and GDP are the shocks that to the largest extent explain movements in the value of the

currency. Real GDP influenced fluctuations in the exchange rate, particularly between 1875 and 1890. Thus, the exchange rate responded to the state of the Spanish economy by acting as an automatic stabiliser of the economy. Fiscal policy contributed to the evolution of the exchange rate between 1883 and 1890. The exchange rate policy was endogenous.

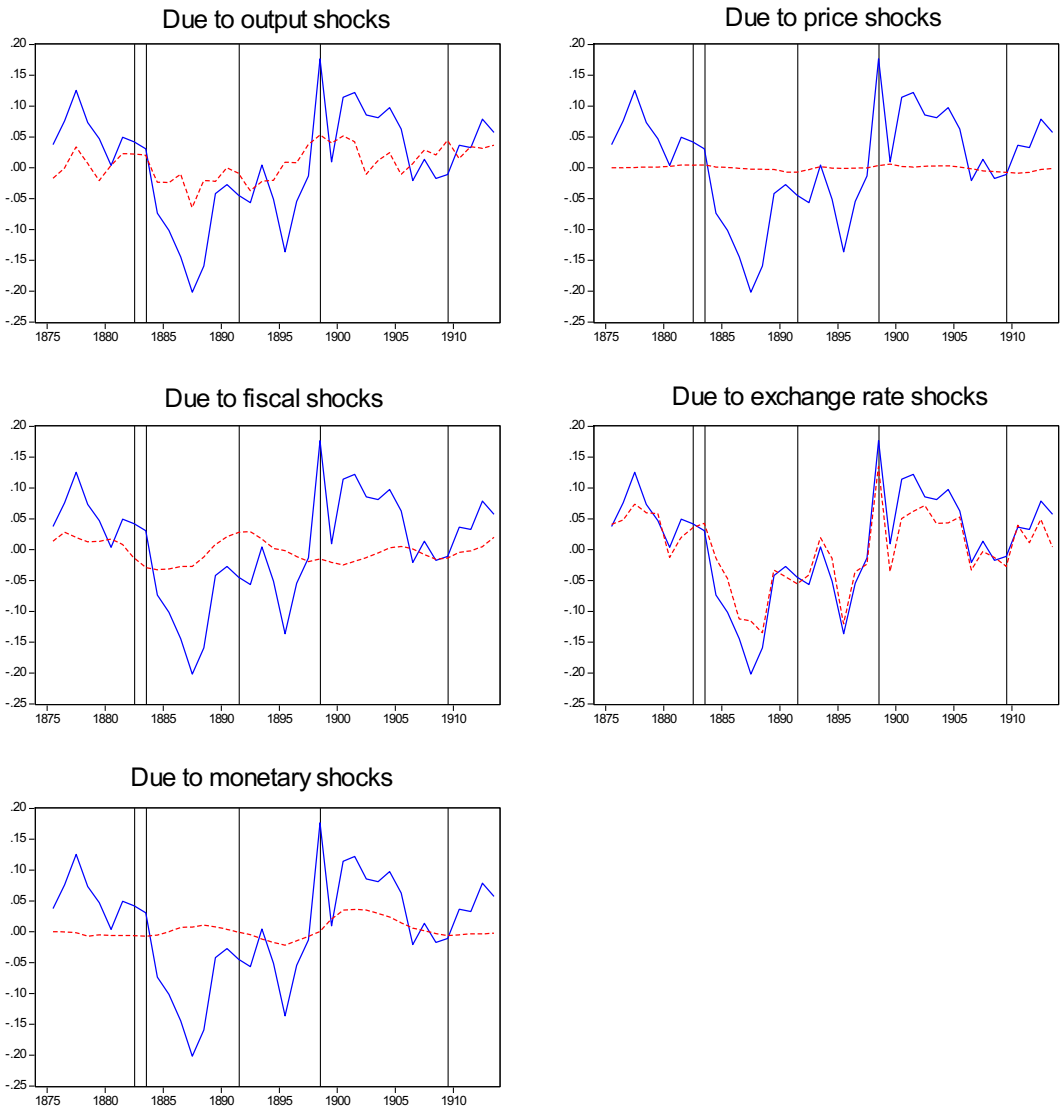

Figure 6. Historical decomposition of the exchange rate

Figure 7 represents the historical decomposition of the money stock. Monetary shocks explained a large part of the fluctuations in the money stock. Shocks to the fiscal balance and the exchange rate had an effect on fluctuations in the money stock over the entire period. Shocks to GDP also helped to explain fluctuations in the money stock, particularly between 1881 and 1890, coinciding with a fall in GDP. Monetary policy responded to the economic cycle and it was endogenous.

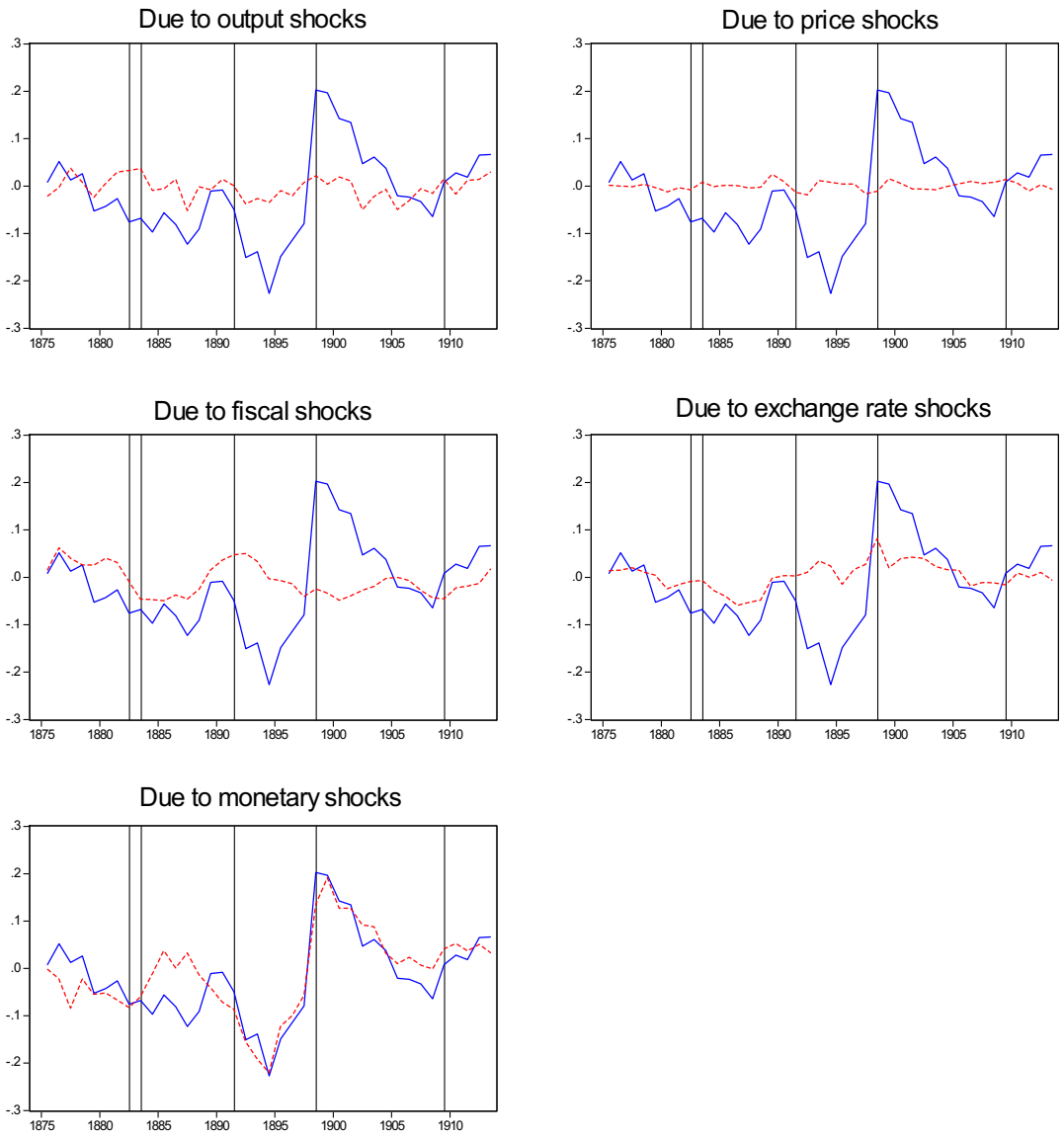

Figure 7. Historical decomposition of the money stock

Both the exchange rate and monetary policy responded to the current state of GDP. The results show how the policies were not exogenous, but endogenous. That is, some policies affected other policies and they varied as a function of the economic conditions and the policies applied. It can be confirmed that the increase in money in circulation and the depreciation of the peseta had positive effects on the real economy during the classical gold standard in a Spain that was outside the international monetary system. Within the gold standard, there would have been no option to depreciate the currency and the difficulties of maintaining a fixed exchange rate would have grown. Staying in the gold standard would have led to internal devaluations through prices and wages. These kinds of policies in undiversified economies like Spain's would have inhibited recovery at times of fluctuation in the economic cycle. The Spanish economy made use

of the exchange rate and monetary expansion to overcome such economic impacts. Without these policy tools, the adjustments would have been much more prolonged and painful.

IV. Benefits of being outside the gold standard

In the period under study, the maintenance of the gold standard was an essential requirement for prosperity. This led to the use of restrictive policies when the need was for expansionary ones (Temin, 1995). When fluctuations in the cycle are intense and unexpected, a rapid reaction is necessary to preserve equilibrium. The classical gold standard did not permit this type of response and it undercut a country's options to control its own economy through the setting of exchange rates (Keynes, 1932/1988, pp. 173 and 180)[34]. It was a system, therefore, that was hard to apply in countries on the southern periphery of Europe like Spain. Floating exchange rates were and are a fast way to correct for shocks that affect the equilibrium between domestic price levels and price levels abroad[35]. The main cause of internal instability experienced up to 1914 with the classical gold standard was a result of the subordination of economic policy to external objectives.

Policies in the late nineteenth century and early twentieth century were not devised strategically, but rather were adjusted in accordance with circumstances[36]. None of these policy options could have been pursued under the gold standard, which required restrictive policies to be maintained over time. Without the freedom to choose macroeconomic policy and a flexible exchange rate, the impact of fluctuations in the economic cycle would have been much greater. Based on the results, the depreciation of the peseta was crucial to increasing output and prices during the various crises that hit the Spanish economy in the period under study[37].

Over the period, monetary policy played a fundamental role as a consequence of Spain being outside the gold standard. According to Sardà (1987, 218), the fiduciary expansion brought about by pressure from the Spanish treasury was able to sustain the country's economic progress. In the short term, monetary policy was one of the most powerful tools to change the real economy. As the impulse response function and the historical decomposition of the

[34] Keynes (1932) reproduced in Keynes (1988).
[35] "The classical gold standard is not appropriate in practice to overcome [such difficulties], simply because it cannot produce a readjustment of domestic prices quickly enough" (Keynes, 1932/1988, p. 180).
[36] Olariaga, 1977, p. 137, takes the view that Spain's policy was ad hoc rather than a control aimed consciously at regulating the economic cycle.
[37] For literature on the Spanish case, see Olariaga, (1933), Tortella (1974), Sardà (1987), Martín Aceña (1981, 1993, 1997, 2000), Catalan, Sudrià and Tirado (2001) and Catalan and Sánchez (2012). For other cases, see Temin (1995), Bernanke (1995), Eichengreen and Temin (2010), Bordo and Rockoff (1996), Shibamoto and Shizume (2014), Eichengreen and Sachs (1986).

variables show, this policy accommodated the state's fiscal needs (Escario, Gadea and Sabaté, 2011, pp. 271-272 and Sabaté, Gadea and Escario, 2006, pp. 310, 321 and 328). These scholars stress that seigniorage was essential to safeguarding the state's long-term solvency[38]. The Spanish treasury was in need of money, which it obtained by monetising public debt (Sardà, 1987, pp. 186, 190 and 199). The impossibility of using monetary policy because of a commitment to the gold standard would have ruled out action to counter the economic impacts (Bordo, Choudri and Schwartz, 2002, p. 2). In the Spanish case, the application of expansionary economic policies prevented more intense fluctuations in the economic cycle and avoided external deflation[39].

Figure 8. Growth rates for the components of GDP, 1893-1899.

C	G	I	V E	X	M	GDP	Year
-9.07%	-0.88%	-0.62%	0.08%	-1.98%	1.04%	-11.437%	1893
-0.61%	-0.32%	-0.08%	0.11%	0.24%	-0.32%	-0.984%	1894
-4.69%	-0.15%	0.17%	0.12%	-0.48%	1.77%	-3.259%	1895
-5.09%	0.42%	0.00%	0.14%	4.34%	-1.93%	-2.131%	1896
10.85%	1.47%	0.68%	0.16%	2.23%	-1.61%	13.776%	1897
8.33%	0.79%	0.42%	0.10%	-0.17%	-0.02%	9.459%	1898
2.31%	-0.85%	2.93%	0.05%	-2.28%	-1.74%	0.409%	1899
11.25%	1.18%	5.15%	-26.68%	9.07%	-4.26%	-4.278%	1893-1899

Source: Own elaboration based on Prados de la Escosura (2003).

As the impulse response functions show, deficits made it possible to avoid the further stifling of an economy that was already sluggish. Between 1883 and 1892, the deficits were constant and the needs of the Spanish treasury meant that fiscal and monetary policy were dependent on one another (see impulse response function). Lastly, there was no application of fiscal austerity measures, which would have been detrimental to the Spanish economy.

In the specific case of the economic crisis at the end of the eighteen-nineties, the statistics on gross domestic product point to the great importance of exports in the economic recovery

[38] They stress the importance of preserving monetary sovereignty.

[39] Dornbursch (1987). The coordination of monetary policies to keep a stable exchange rate would be unable to offset the relinquishing of deficit financing through the issue of banknotes.

(Figure 8)[40]. Spain's economy shrank by 4.28% during the crisis of the nineties. Exports helped to bolster GDP by 9.1%, while consumer spending pushed up GDP by 11.2%. Investment, ranked third behind exports and consumption, contributed 5.15% and government spending aided in a 1.2% growth in GDP. In the short run, thanks to a flexible exchange rate, Spain was barely affected by the cyclical downturn that affected the international economy between 1890 and 1896 (Sardà, 1987, p. 197).

The results obtained by Cha (2003) and by Shibamoto and Shizume (2014) vary depending on whether or not the dynamics of prices are included in the SVAR model. For this reason, the same analysis has been repeated without the prices variable to observe whether any changes occur. Leaving out prices, the results do not vary qualitatively. The money stock retains its importance as the variable that explains GDP fluctuations to the greatest extent. Fiduciary expansion was the key factor in sustaining the economic progress of the country. The exchange rate retained its importance in the impulse response function and in the historical decomposition (Figure 9). Depreciation had a greater countercyclical effect in the crisis of the eighteen-nineties than was shown by the SVAR model including prices. Lastly, the impact of the fiscal balance on GDP diminished in the impulse response function and remained a non-explanatory factor of fluctuations in GDP.

[40] Only the crisis of the late eighteen-nineties is examined because it was the longest crisis in the period. The study could be extended to the entire period.

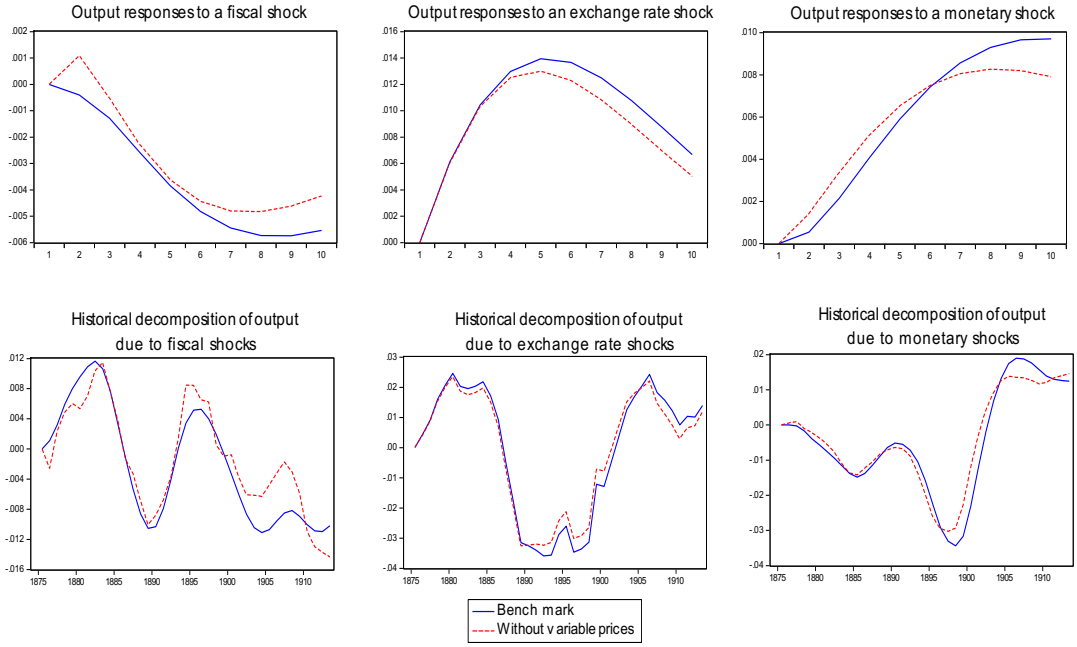

Figure 9. Original model vs. VAR model without the prices variable

As Spain was affected by recurring armed conflicts in the period, the same model has also been estimated with the addition of an exogenous dummy variable that takes a value of 1 for years in which Spain was engaged in armed conflict and 0 for years in which it was not (Figure 10)[41]. The analysis does not change significantly. The impulse response function shows results of identical sign. However, the response of GDP to fiscal policy was greater when armed conflicts are taken into account. On the one hand, the response of Spain's economy to monetary policy diminished. On the other hand, the output response to exchange rate increased. Anyway, both have a positive impact. The historical decomposition of output, when taking wars into account, shows a slight decreased importance of shocks on fiscal policy in the explanation of GDP fluctuations. Monetary shocks see a decrease in their power to explain GDP fluctuations, although they continue to be important to an understanding of the ups and downs of the Spanish economy[42]. Finally, exchange rate shocks increased their capacity of explain output fluctuations, concretely, between 1895 and 1900.

[41] Spain was engaged in the following armed conflicts: Third Carlist War (1872-1876), Ten Years' War (1868-1878), Little War (Cuba) (1879-1880), Cuban War of Independence (1895-1898), Spanish-American War (1898), Philippine Revolution (1896-1898), Margallo War (1893-1894), Melilla War (1909-1913), and Rif War, or Second Moroccan War (1911-1927).

[42] The results of the impulse response function are even more in keeping with economic theory than the original results were.

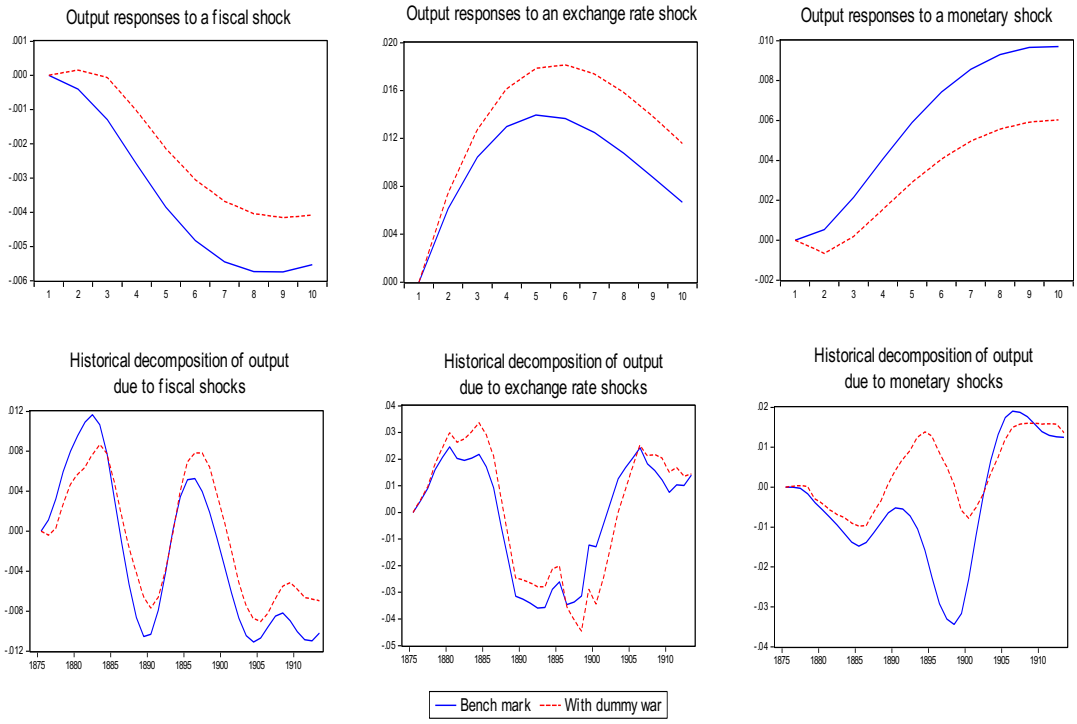

Figure 10. Original model vs. VAR model with "War" dummy.

Conclusion

This paper has presented an overall picture of macroeconomic policy tools and their effects on Spain's economy between 1874 and 1913. The Spanish case is significant because it was the only Western country not to enter the classical gold standard. The main finding is that the depreciation of the exchange rate had salient effects on the Spanish economy outside the gold standard during the period 1874-1913.

The SVAR analysis reveals that adjustments in exchange rates and monetary and fiscal policy undertaken as policy tools played an important role in the recoveries that followed declines in GDP. Expansionary monetary policy needed to sustain state spending helped to smooth out fluctuations in GDP. While this policy was effective, it was not carried out as an independent policy. Rather, it was a response to economic conditions. Indeed, it can be confirmed that the policies were endogenous and depended ultimately on fiscal policy, that is, on the needs of the Spanish treasury. The effects of fiscal policy were less significant. The exchange rate level was crucial because it helped to improve the terms of trade, promoted exports and raised prices at a time when the Western world was suffering from the problems of deflation. The three variables had a positive effect on the real economy. On balance, having a flexible exchange rate

and an expansionary monetary policy was crucial to sustaining growth amid the fluctuations of the economic cycle.

Some studies emphasise that Spain should have entered the monetary system of the gold standard and that this would have improved its economy in the long run (Martín Aceña, 1981, 1993, 1997 and 2000; Martínez-Ruíz and Nogues, 2014). Nonetheless, this paper shows how the policies adopted by Spain outside the gold standard had a positive effect on its economy. Being inside the gold standard would have made it impossible to apply economic stimulus measures. The paper confirms the hypothesis of Sardà (1987), pp. 169-196, and the assertions of Martín Aceña (1981), p. 275 and (1993), pp. 145 and 154; Tortella (1994), pp. 177-178; Herranz and Tirado (1996), p. 32; Serrano (2004), p. 164 and Catalan and Sánchez (2012), pp. 110-111.

In the face of dramatic economic shocks, the rigidities of the monetary system inhibited recovery, particularly in countries on the periphery. The results in this paper provide new empirical evidence for the core-periphery debate addressing the period of the classical gold standard.

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Annex 1

I. Unit root test

Null Hypothesis: LYPC has a unit root
Exogenous: Constant
Lag Length: 5 (Automatic - based on t-statistic, lagpval=0.1, maxlag=9)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-1.067000	0.7173
Test critical values:	1% level	-3.639407	
	5% level	-2.951125	
	10% level	-2.614300	

*MacKinnon (1996) one-sided p-values.

Null Hypothesis: LP has a unit root
Exogenous: Constant
Lag Length: 0 (Automatic - based on t-statistic, lagpval=0.1, maxlag=9)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-1.871934	0.3416
Test critical values:	1% level	-3.610453	
	5% level	-2.938987	
	10% level	-2.607932	

*MacKinnon (1996) one-sided p-values.

Null Hypothesis: F has a unit root
Exogenous: Constant
Lag Length: 2 (Automatic - based on t-statistic, lagpval=0.1, maxlag=9)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-1.804435	0.3726
Test critical values:	1% level	-3.621023	
	5% level	-2.943427	
	10% level	-2.610263	

*MacKinnon (1996) one-sided p-values.

Null Hypothesis: LE3 has a unit root
Exogenous: Constant
Lag Length: 0 (Automatic - based on t-statistic, lagpval=0.1, maxlag=9)

		t-Statistic	Prob.*

Augmented Dickey-Fuller test statistic		-2.554924	0.1109
Test critical values:	1% level	-3.610453	
	5% level	-2.938987	
	10% level	-2.607932	

*MacKinnon (1996) one-sided p-values.

Null Hypothesis: LM1 has a unit root
Exogenous: Constant
Lag Length: 4 (Automatic - based on t-statistic, lagpval=0.1, maxlag=9)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-0.970472	0.7529
Test critical values:	1% level	-3.632900	
	5% level	-2.948404	
	10% level	-2.612874	

*MacKinnon (1996) one-sided p-values.

II. Cointegration test

Sample (adjusted): 1876 1913
Included observations: 38 after adjustments
Trend assumption: No deterministic trend (restricted constant)
Series: LYPC LPM F2 LE3 LM1
Lags interval (in first differences): 1 to 1

Unrestricted Cointegration Rank Test (Trace)

Hypothesized No. of CE(s)	Eigenvalue	Trace Statistic	0.05 Critical Value	Prob.**
None *	0.634790	103.1567	76.97277	0.0001
At most 1 *	0.592181	64.87992	54.07904	0.0041
At most 2	0.367951	30.79652	35.19275	0.1381
At most 3	0.238931	13.36257	20.26184	0.3356
At most 4	0.075605	2.987392	9.164546	0.5830

Trace test indicates 2 cointegrating eqn(s) at the 0.05 level
* denotes rejection of the hypothesis at the 0.05 level
**MacKinnon-Haug-Michelis (1999) p-values

Unrestricted Cointegration Rank Test (Maximum Eigenvalue)

Hypothesized No. of CE(s)	Eigenvalue	Max-Eigen Statistic	0.05 Critical Value	Prob.**
None *	0.634790	38.27678	34.80587	0.0185
At most 1 *	0.592181	34.08340	28.58808	0.0089
At most 2	0.367951	17.43395	22.29962	0.2083
At most 3	0.238931	10.37518	15.89210	0.3014
At most 4	0.075605	2.987392	9.164546	0.5830

Max-eigenvalue test indicates 2 cointegrating eqn(s) at the 0.05 level
* denotes rejection of the hypothesis at the 0.05 level
**MacKinnon-Haug-Michelis (1999) p-values

III. Lag lenght criteria

VAR Lag Order Selection Criteria
Endogenous variables: LYPC LPM F2 LE3 LM1
Exogenous variables: C
Date: 03/15/17 Time: 11:24
Sample: 1874 1913
Included observations: 37

Lag	LogL	LR	FPE	AIC	SC	HQ
0	323.6573	NA	2.28e-14	-17.22472	-17.00703	-17.14797
1	431.6676	180.9903	2.60e-16	-21.71176	-20.40561*	-21.25128*
2	462.5042	43.33790*	2.05e-16*	-22.02725*	-19.63265	-21.18304
3	486.8008	27.57996	2.63e-16	-21.98923	-18.50617	-20.76129

* indicates lag order selected by the criterion
LR: sequential modified LR test statistic (each test at 5% level)
FPE: Final prediction error
AIC: Akaike information criterion
SC: Schwarz information criterion
HQ: Hannan-Quinn information criterion

IV. Autocorrelation test

VAR Residual Serial Correlation LM Tests
Null Hypothesis: no serial correlation at lag order h
Date: 03/15/17 Time: 11:25
Sample: 1874 1913
Included observations: 39

Lags	LM-Stat	Prob
1	40.88144	0.0236
2	28.85128	0.2702
3	17.52672	0.8618
4	19.22348	0.7863

Probs from chi-square with 25 df.

V. Normality test

VAR Residual Normality Tests
Orthogonalization: Cholesky (Lutkepohl)
Null Hypothesis: residuals are multivariate normal
Date: 03/15/17 Time: 11:25
Sample: 1874 1913
Included observations: 39

Component	Skewness	Chi-sq	df	Prob.

1	-0.659647	2.828375	1	0.0926
2	-0.072753	0.034404	1	0.8528
3	-0.347734	0.785975	1	0.3753
4	-0.289008	0.542916	1	0.4612
5	1.556623	15.74999	1	0.0001
Joint		19.94166	5	0.0013

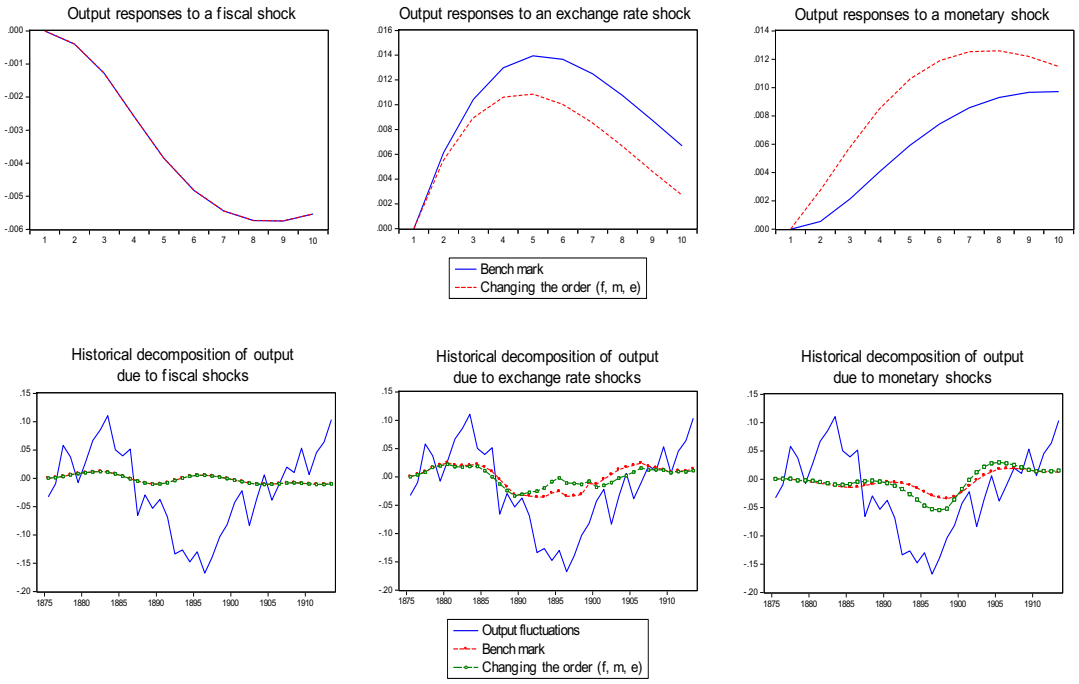
Component	Kurtosis	Chi-sq	df	Prob.
1	2.646348	0.203238	1	0.6521
2	2.709267	0.137355	1	0.7109
3	3.730252	0.866562	1	0.3519
4	4.223788	2.433692	1	0.1188
5	7.162635	28.15724	1	0.0000
Joint		31.79808	5	0.0000

Component	Jarque-Bera	df	Prob.
1	3.031614	2	0.2196
2	0.171759	2	0.9177
3	1.652537	2	0.4377
4	2.976608	2	0.2258
5	43.90723	2	0.0000
Joint	51.73974	10	0.0000

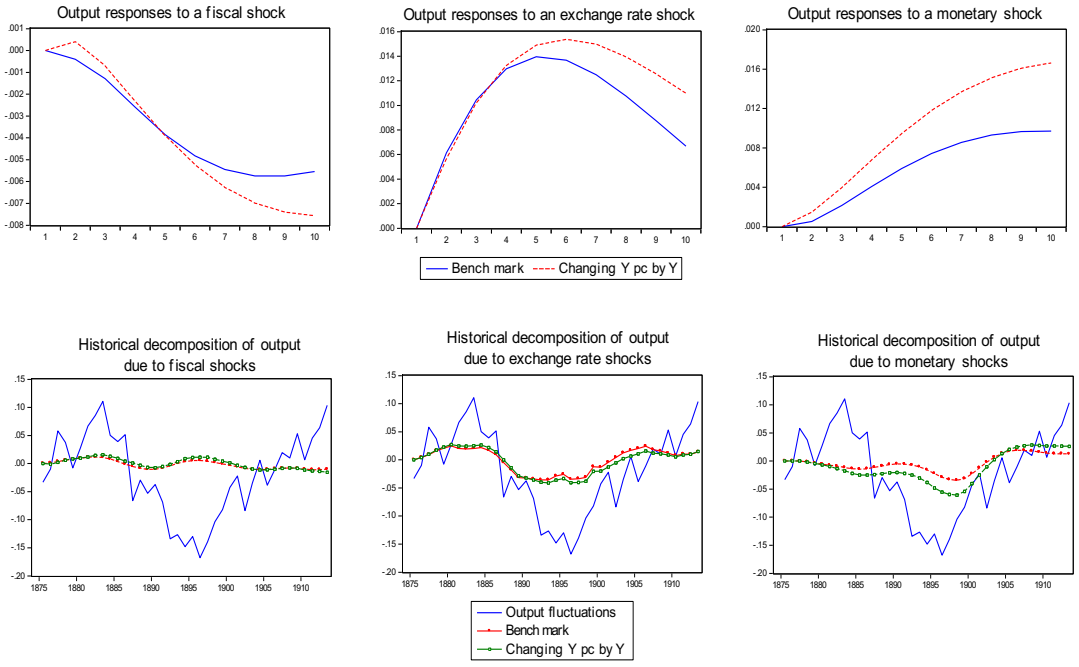
Annex 2

I. Changing the order of variables (f, m, e)

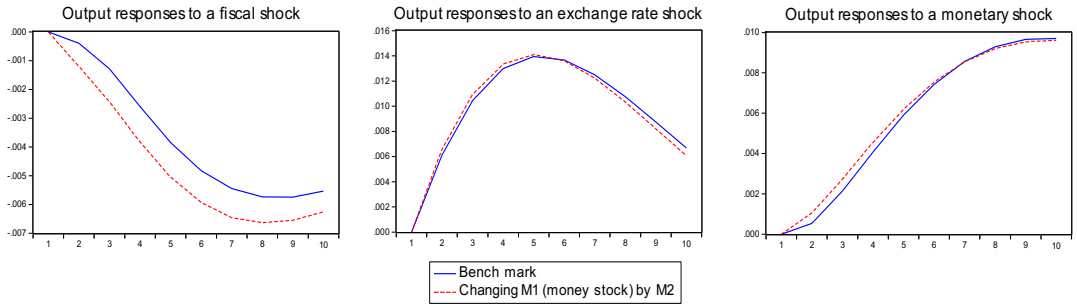
As one can see in footnote 17 the order of variables can alter the result. Taking into account the fiscal dominance (Escario, Gadea and Sabaté, 2011, pp. 271-272 and Sabaté, Gadea and Escario, 2006, pp. 310, 321 and 328), one can think that the order for Spain could be output, price index, fiscal balance, money stock and exchange rate. Fiscal balance determined the debt monetization and, consequently, the quantity of banknotes affected the level of exchange rate. If we change the order of the variables, the result of the regression do not qualitatively change.

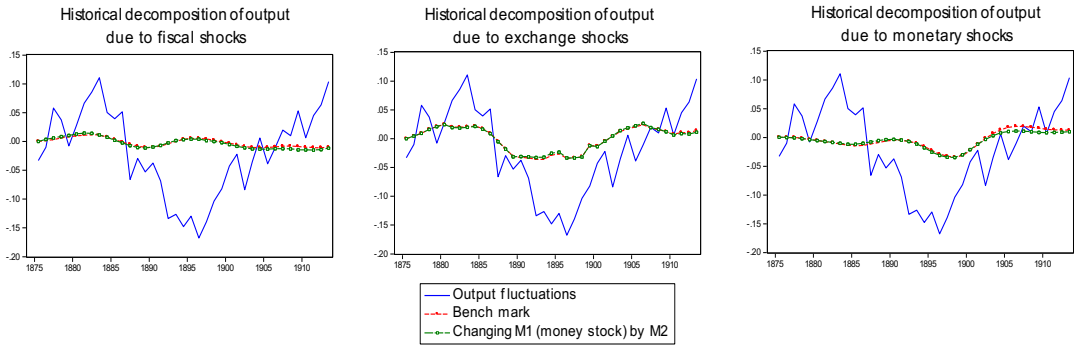


II. Changing pc Y by Y



III. Changing M1 (money stock) by M2


Output responses to a fiscal shock
Output responses to an exchange rate shock
Output responses to a monetary shock
Bench mark
Changing M1 (money stock) by M2


Historical decomposition of output due to fiscal shocks
Historical decomposition of output due to exchange shocks
Historical decomposition of output due to monetary shocks
Output fluctuations
Bench mark
Changing M1 (money stock) by M2