The pass-through effect: a twofold analysis

Forte, Antonio

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THE PASS-THROUGH EFFECT: A TWOFOLD ANALYSIS

Antonio Forte[1]

Abstract

In this paper I analyse the pass-through effect in four big areas using different approaches. On the one hand, I inspect this issue comparing the REER (real effective exchange rate) with the WARP (weighted average relative price) in the US, the UK, Japan and the Euro area. On the other hand, I try to support the findings of the first part with a double econometric analysis: I employ single equation and Var approaches in order to provide wide and robust results. The global conclusion is that in the major economies of the world the pass-through effect has been very light from January 1999 onward and that, especially in the Euro area, this result is linked with the firms behaviour.

[1] forteantonio80@gmail.com

Introduction

At the onset of 2008 a new paper by Thomas, Marquez and Fahle shed more light on a problematic issue: the measurement of the traditional multilateral exchange rates (Nominal and Real Effective Exchange Rate) could not be very precise in describing the actual path of the exchange rates. Indeed, they found a marked difference between the WARP (Weighted Average Relative Price) approach, the new exchange rate by Thomas, Marquez and Fahle (2008), and the traditional REERs. This discrepancy lies on the use of different time series to calculate the prices. The WARP uses the price levels, while the REER uses a price index. As a consequence, the WARP gives a more active role to the switch of the import flows from high level cost to low level cost countries. This peculiarity of the WARP has provided very interesting results for the US in their study.

In this paper I reproduce the WARP methodology and gauge the WARP exchange rate for four areas: the US, the Euro Area, the UK and Japan. My methodology is slightly different from the one used by the three American economists and so I calculated again the WARP for the US.

The Warp analysis takes the first part of the paper. After that, I present an econometric analysis on the pass-through effect. The second section is useful to examine the significance of the linkage between the exchange rates and the consumer prices (the global pass-through effect) or between the import prices and the domestic prices (the second stage pass-through). Moreover, these two analyses can be joined together. Indeed, both the WARP and the econometric section deal with prices, exchange rates, pass-through effect and imports. Even if these approaches adopt a very different point of view, my aim is to find common findings. The global results highlight a very light pass-through effect in the countries analysed. And this is probably linked to the behaviour of the firms. The isolation of the domestic inflation from the external shocks is undoubtedly a positive feature but, in this case, this goal has deprived the consumer of the positive impact of the globalization on prices.

The paper is organised as follows: in the following section I describe the methodology and the results obtained through the WARP approach. In the second part I present the econometric results of the pass-through effect with single equation and Var regressions. Global and joined conclusions end the paper.

1 The W.A.R.P. approach - WARP vs REER

In this part I compare the official real effective exchange rates of four big economic areas (the Euro Area, the US, the UK and Japan) with multilateral exchange rates calculated following the WARP methodology. The differences between the two indicators will be useful to draw some conclusions about the impact of the changing trade flows on the relative prices during the last years. Indeed, the analysis by Thomas, Marquez and Fahle (2008) opens a new scenario in this field of study: the positive benefits of globalization, especially as regards the low cost imports, have been probably underestimated by the traditional measurements. That is the reason why I decided to reproduce this new calculation methodology and use it to gauge the WARP of the four biggest World economies: in this way it is possible to understand if the differences that the Thomas, Marquez and Fahle's study has pointed out can only be a feature of the US case or if they can be considered as a valid indicator in a global perspective.

1.1 The methodology

Before showing the results, it is appropriate to shortly explain the basic features of the multilateral exchange rates and the substantial difference between the WARP and the traditional indices published by central banks or by other authorities.

The Real Exchange Rate is a measurement that considers the course of the nominal bilateral exchange rate together with the path of the national prices. As a consequence, it is a measurement of the relative price between two baskets of goods in two different areas. The Real Effective Exchange Rate (REER) is, in general, computed as a geometric average of bilateral real exchange rates.

Shortly: the real exchange rate is computed between one base nation and many trading partners of that nation and then it is possible to calculate the mean of these rates. The most common formula for the bilateral real exchange rate is:

$$\varepsilon_{ij,t} = \frac{p_{i.t}}{e_{ij,t} \cdot p_{j,t}}$$

where $p_{i,t}$ is a price index of the base country, $p_{j,t}$ is a price index of the partner and $e_{ij,t}$ is the bilateral nominal exchange rate. So, the multilateral real exchange rate is only a geometric mean of these bilateral exchange rates. That is, a mean of

the different ε_{in} computed for the *n* trading partners. The weights used to gauge the geometric mean are the percentages of the import-export shares between the base country and the selected trading partners.

The WARP is not conceptually different from the REER, but there is a substantial feature that makes the two measurements fundamentally different: the WARP does not use the price indices, for it uses the price levels. As a consequence, it is possible to calculate in a more precise way the effect of the switch of the trade flows from high level cost countries to low level cost ones on the multilateral real exchange rate. The use of the price indices reduces this kind of effect in the REER formula. Moreover, the comparison of the time series makes it possible to understand the limitations of the calculations made by the central banks (in the following box there is a precise and formal description of the methodology used in this study to calculate the WARP).

In sum, the multilateral exchange rates gauged through the WARP methodology make the relationship between the relative prices of the two baskets more precise (in this case the baskets are represented by the GDPs) because they use the price levels. Indeed, in this way it is more evident the effect of the growing trade flows with emerging countries, that have a lower level of prices, and of the decreasing trading flows with developed countries, that have a higher level of prices. This process is captured in a lower defined way by the REER, because the use of the index prices attenuates the effect of this process on the real exchange rate.

1.1 My WARP methodology

The methodology I use in this study is different from the one proposed by Thomas, Marquez and Fahle (2008). In this paragraph I explain the most fundamental mathematical passages to calculate the index presented in this study. I suggest to read the just mentioned paper in order to compare the two methodologies.

The WARP, as well as the REER, is a geometric mean.

The formula is: WARP = $(q_{1t})^{w_{1t}} \cdot (q_{2t})^{w_{2t}} \cdot \ldots (q_{nt})^{w_{nt}}$

The exponents are the share of the import-export flows between the base country and the *n* chosen trading partners. In the brackets there are the bilateral relative level of prices. The three American economists calculated this value using the data of the Penn World Table of the Pennsylvania University and the appropriate exchange rates. But the data on the PPP (Purchasing Power Parity) published in the Penn

World Table are not so recent. The most recent data go back to 2004. As a consequence, it is necessary a procedure that updates the data. In order to eliminate this problem, I decided to use the data published by the International Monetary Fund. In my study all the "q" are the ratio between the GDP of the trading partners expressed in dollars and the same GDP based on purchasing power parity (the US is the base country): $q_1 = \frac{GDP_1\$}{GDP_1 PPP}$. This is the procedure to gauge the relative price of a basket (in this case the basket is the GDP). Obviously, one must modify these ratios in order to apply them to other geographical areas. For example, in order to calculate the values of the Euro Area one must divide the q obtained for the US by the ratio $\frac{GDP_€\$}{GDP_€ PPP}$. In this way it is possible to obtain the data relating to the Euro Area. I followed this procedure for the four areas of my study. Then, it is sufficient to calculate the geometric mean of these q in order to calculate the desired multilateral exchange rate. The weighting coefficients are the ones published by the Federal Reserve for the US and by the Bank of England for the UK. The Japanese Ministry of Finance published the coefficients I employed for the Japanese case. Indeed, the Bank of Japan used these values, based on the export only, as weighting coefficients for its REER. So, I used the same weighting coefficients in order to make the Japan WARP comparable to the REER. As for the Euro area, I used the weighting coefficients published by the European Commission.

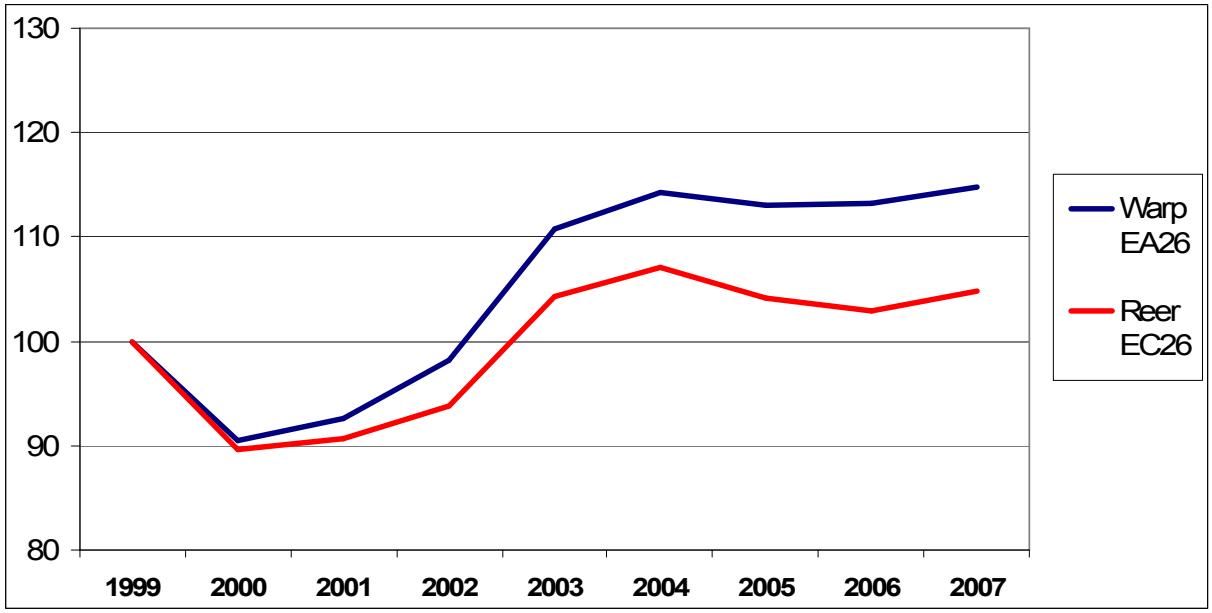
1.2 The results

The Euro Area

Figure 4.1 shows the real effective exchange rate published by the European Commission (REER Ec) and the WARP of the Euro Area. I gauge the WARP using the same twenty-six trading partners chosen by the European Commission for the implementation of the REER and the Euro Area WARP employed the same time-varying weighting coefficients as the REER. So, as I have broadly explained, the two indicators differ just because the REER uses the price indices while the WARP uses the price levels. I compare the WARP with the REER of the European Commission for the REER published by the European Central Bank, differently from the other central banks, is gauged using weighting coefficients that are not time-varying. So, the ECB index does not precisely gauge the trend of the import-export shares of the

trading partners. This fact can mitigate the impact of the changing nature of the trade flows on the exchange rates. So I preferred to use the REER of the European Commission in order to compare the same WARP and the same REER in the four areas.

Figure 4.1: the Euro area, WARP vs REER



The base year is 1999. The two lines show a similar trend but the WARP lays above the REER. The distance between the two lines gradually increases during the course of the sample. Indeed, the difference is slightly below 2 points in 2001 but it is near 10 points in 2007 (the distance reaches the peak in 2006). This difference is just due to the peculiar feature of the WARP. Indeed, during the last years, the import-export shares of the Euro Area highlighted a growing trend of the emerging countries weights and, on the contrary, a decreasing trend of the weights of the developed countries. For example, it is interesting to cite the shares of four trading partners of the Euro Area used in the calculation of the exchange rates. The share of the US decreased from 23,4 percent to 19 percent between 1999 and 2007. The share of the UK also decreased from 20,9 percent to 17,1 percent. On the contrary, the Chinese share increased from 4 percent to 9,3 percent during the same period, and the Russian one was almost doubled, from 3,5 to 6,6 percent. These trends in the international trade pushed the WARP above the REER, and this result highlights a more intense appreciation in comparison with the traditional measurement.

The United States of America

The US are analysed in this study because my methodology is slightly different form the one used in the paper by Thomas, Marquez and Fahle. So, I want to analyse the results obtained in different areas but using the same methodology. In this way I avoid to compare results that should not be totally coherent.

Even in this case I make the WARP similar to the REER published by the Federal Reserve. Indeed, I choose the same twenty six trading partners (included the Euro Area) used by the Federal Reserve to gauge the REER. Besides, I use the same weighting coefficients published by the Federal Reserve (it is important to specify that I refer to the "broad" REER of the FED). As a consequence, the unique difference between my WARP and the REER is the replacement of the price indices of the REER with the price levels of the WARP. Figure 4.2 shows the two exchange rates.

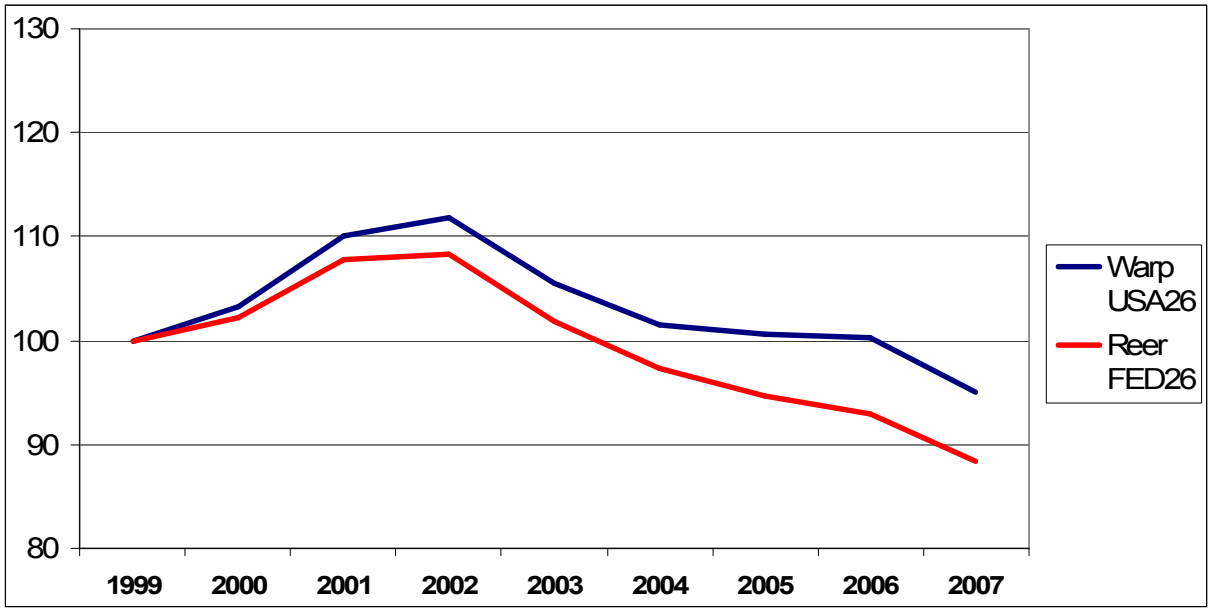
The final result is very similar to the one obtained for the Euro Area. Even in this case, the use of the price levels pushed the WARP above the REER. This result is in line with the one obtained by Thomas, Marquez and Fahle. So, also in this study the WARP for the US is above the REER and shows a more appreciated exchange rate in comparison with the *official* measure.

The two results, the Thomas, Marquez and Fahle result and mine, are very similar, but they are not totally comparable because the base years are different (in my study the base year is 1999, while the three American economists used the 1971-1991 mean as base period). Notwithstanding this fact, it is important to underline that even in the US case the globalization had a relevant impact on the multilateral exchange rate. Indeed, there is a difference of about 2-3 points until 2002, but then this difference grows above 7 points in 2006. In sum, even using a different methodology, the WARP I gauge in this study makes me draw the same conclusions as the WARP calculated in the study by Thomas, Marquez and Fahle.

I specify the share of some trading partners of the US in order to examine the phenomenon of the gradual switch of the trade flows. The UK, China, Japan and the Euro Area had respectively a share equal to 5,8 percent, 7,2 percent, 12,9 percent and 18,2 percent in 1999. In 2007 these shares were completely different: China more than doubled the share (16,2 percent); the Euro Area share slightly decreased (17,1 percent); the UK share decreased to 4,5 percent; the Japanese share decreased by more then 3 points (9,2 percent). It is plain that even in this case there

is a substantial change in the trade flows from developed countries to China and other *low cost* countries.

Figure 4.2: the US, WARP vs REER



The United Kingdom

I repeated the same analysis with the UK data and the final result is similar. In this case the Bank of England publishes the time series of the REER against forty trading partners. Besides, the Bank of England publishes the weighting coefficients used to gauge this multilateral exchange rate. And so, also in this case, the difference between the WARP and the REER of the UK lays in the use of the price levels (the WARP), instead of the price indices (the REER).

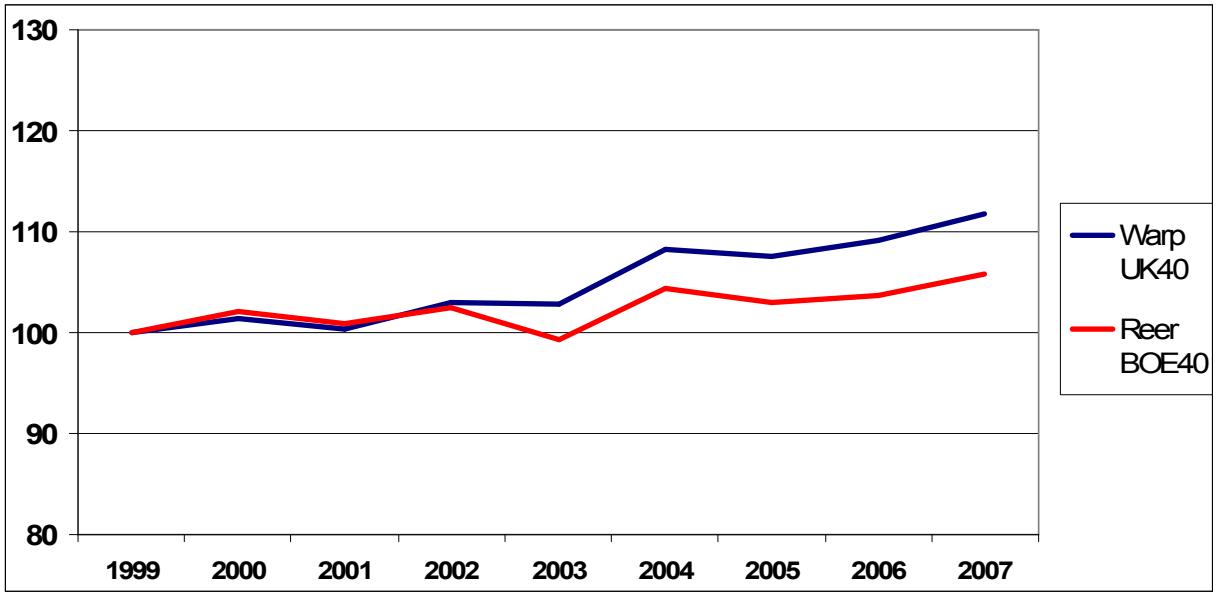
Form 1999 (the base year) to 2002 the course of the two lines is very similar, they are substantially superposed one upon the other (see figure 4.3). From 2003 ahead there is a discrepancy: the WARP is above the REER. The course of the two lines is similar, but the WARP highlights that the real exchange rate gauged through the price levels is more appreciated in comparison with the official measure published by the Bank of England. The difference between the two exchange rates grows during the sample from 3,5 points in 2003 to about 6 points in 2007.

Even in this case the same specification of the previous paragraphs is valid. That is, the change in the trade flows is a feature of the UK too. One can notice a growing trend of the import-export shares of the emerging countries and a decreasing importance of the developed countries. This phenomenon implies a stronger relative

appreciation of the real exchange rate if one uses the price levels instead of the price indices.

Some data can be useful in order to better comprehend the development of this phenomenon (I refer to the weights used by the Bank of England): the Chinese share increased from 1,9 percent in 1999 to 5,4 percent in 2006 (the last available data are the ones of 2006); during the same period, the share of the US decreased from 18,3 percent to 15,5 percent; the Japanese share decreased by about 1 point (from 5,3 to 4,4 percent); the Euro Area share (Euro Area with 13 members) decreased from 51,2 percent in 1999 to 49,3 percent in 2006. These are the data for the most relevant trading partners, but there are cases in which the shares are doubled (for example Russia and Poland). In general, as I pointed out for the US and the Euro Area cases, the share of the low cost nations is gradually growing while, on the other hand, the import-export share with the industrialized nations is diminishing. This trend is caught in a more precise way by the WARP and this fact makes the two exchange rates diverge when this phenomenon amplifies.

Figure 4.3: the UK, WARP vs REER



Japan

The last nation I analyse is Japan. I show the comparison between the official measurement and the WARP. The peculiarity of the REER published by the Bank of Japan is that the weighting coefficients are based on the Japanese export only. For this reason, I used the same weights for calculating the WARP in order to make comparable the two measurements. The effective exchange rate calculated by the

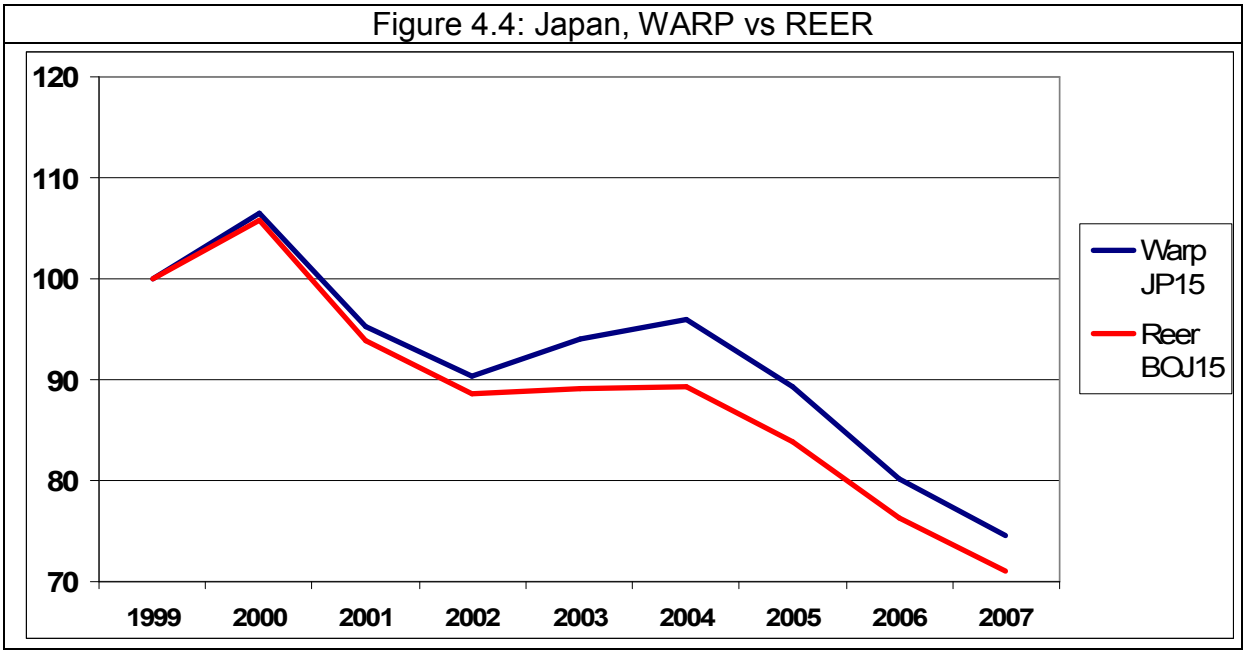
Bank of Japan is based on fifteen trading partners (including the Euro Area, that includes thirteen countries in this case). Even in this case 1999 is the base year.

Figure 4.4 shows the comparison between the official REER and the WARP. The two lines are substantially superposed one upon the other during the first three years. But, from 2002 the WARP starts to lay above the REER. This difference, that is initially very limited, minus than two points in 2002, rapidly grows until 2004. In this year the two exchange rates are divergent by more than 6,5 points. This difference gradually diminished until 3,5 points in 2007.

This analysis, as the three previous ones, highlights a difference between the two measures. The WARP is above the REER in the Japanese case too.

As in the preceding paragraphs, it is useful to show some data of the Japanese trade flows. In order to give more detailed data I show both the data used for the WARP and the REER, based on the export flows only, and the global import-export shares (these shares are useful to understand the trends of the trade flows in a more complete way). All the shares are obviously referred to the fifteen countries selected for the calculation of these exchange rates.

Figure 4.4: Japan, WARP vs REER



The share of the Japanese exports towards the Euro Area 13 (inside the brackets there are the import-export shares) diminished from 15,6 percent (14,7) in 1999 to 12.9 percent (12.5) in 2007; the share towards the US decreased from 34,8 percent (31,8) in the base year to 23,9 percent (20,8) in 2007. On the contrary, the share of the exports towards the Chinese market grew from 6,3 percent in 1999 (the import-

export share was equal to 10,8 percent) until 18,1 percent (23) in 2007. The other partners showed a stable course of their own shares. But, the interpretation of the data is plain: the industrialized trading partners are gradually loosing their importance in the bilateral trade especially in favour of China.

1.3 Warp - Conclusions

- The results of the preceding pages highlight a high degree of homogeneity. All the WARP exchange rates are above the corresponding REER. These results are in line with the one obtained by the three American economists. So, the WARP seems to catch in a more appropriate way the effect of the globalization on the real exchange rates. Indeed, the use of the price levels aims at making the growing international role of the emerging countries more evident. Indeed, the REER, employing the price indices, catches the trend of the inflation rate and this can mislead the final result because the emerging countries are converging. This implies that they still have a lower level of prices in comparison with the developed economies but that they also have a faster growth of prices, and so a more elevated inflation rate in comparison with the industrialized economies. As a consequence, the growing weight of these countries leads to opposite results: the REER amplifies the role of the high inflation countries, and this causes the depreciation of the exchange rate, while the WARP amplifies the role of the low price nations and this makes the exchange rate more appreciated. It is plain that the two measurements treat the same nations in a different way and the WARP methodology seems to be more coherent with the actual view of the global economy. The delocalizations and the growing role of the emerging countries in the world trade are mainly linked to their low costs. So, a measure like the WARP, that employs the price levels, is obviously more in line with the present scenario.
- My elaborations have another common feature. The divergence between the WARP and the REER amplifies in 2002 and 2003. Probably this result is closely linked to the role of China in the international trade. Indeed, China joins the WTO (World Trade Organization) on 11 December 2001. Since then its share in the international trade has markedly grown. Indeed, the data I have showed highlight the constant growth of China as a trading partner for all the four developed economies I examined. As a consequence, it is obvious to assert that the role of China is crucial to determine the difference between the two indicators. Its growing interaction with

the developed economies allows to import low cost goods in a bigger percentage in comparison with the previous decades. This fact makes the WARP lay above the REER. There are obviously other *low cost* nations that are increasing their shares in the world trade and that are contributing to amplify this phenomenon. But the special coincidence between the increase of the WARP-REER gap and the entrance of China into the WTO increases the importance of this nation as a key factor for explaining the course of the two indicators.

- The results obtained in this study can be also useful in order to draw some other implications for the economic policies. It is clear that during the last years the opportunity to import goods from the emerging countries made the real exchange rate more appreciated in comparison with the official measurements usually emphasized. But the analysis also leads to further findings.

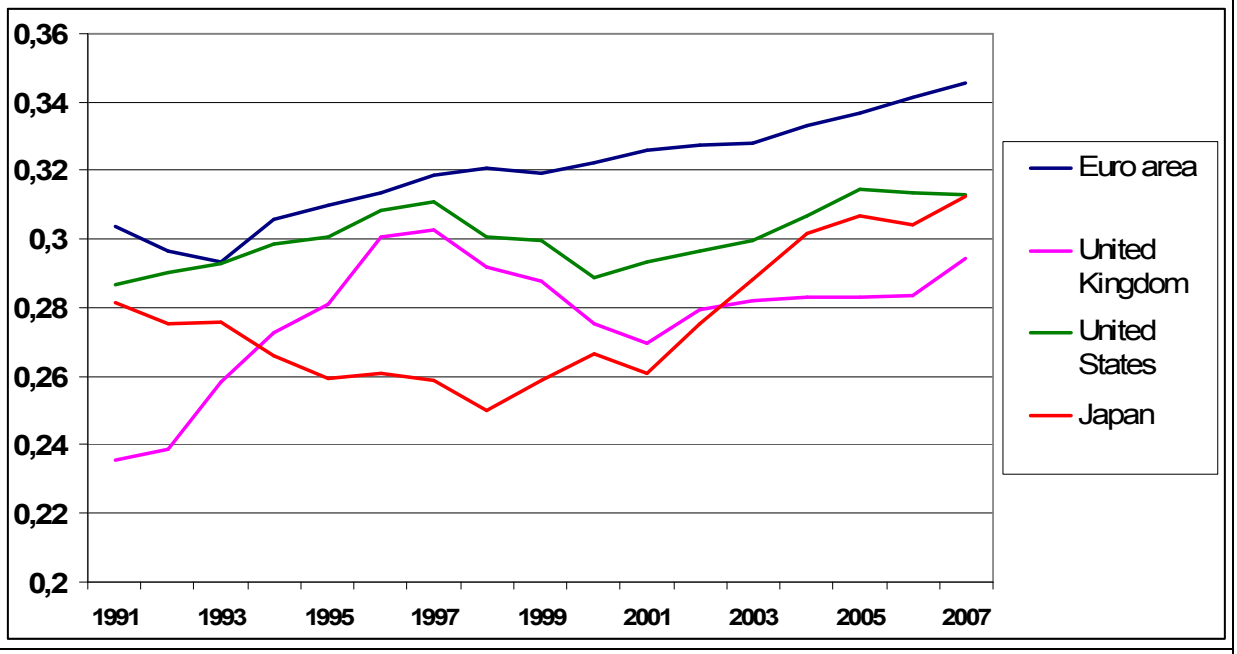
In particular it is possible to indicate two further implications:

  - First of all, in the recent past we probably underestimated the positive impact of globalization over the prices. If the real exchange rate measured through the WARP methodology lies above the REER, this means that the impact over the prices is considerable. And this process certainly had an important role in dampening the inflations of the developed world. In other words, the industrialized countries imported disinflation.
  - In the same way, the inflation moderation of the last decades in the developed economies is unquestionably linked to this phenomenon. In this way one should reduce the presumed increased ability of the Central Banks in moderating and controlling the inflation course. We probably lived in a particularly fortunate period, in which the opportunity to freely trade with nations that exported low cost goods extremely favoured the price moderation even in presence of a strong economic growth.

- The analysis of the results makes it possible to give another interpretation. The WARP can provide some information on the pass-through effect. It is well-known that a prolonged deflation took place during the first globalization. The increased production capacity together with the remarkable improvement and rise of the trade flows, made it possible to spread goods with lower prices. This fact had a positive impact over the prices and for a long period of time the levels of prices went down. During the last years, the period of the second globalization, we experienced a low and stable inflation rate in the developed economies but we did not observe a global

reduction of prices. These facts support the idea of a reduction of the pass-through effect from import prices to consumer prices. Indeed, if the positive effect of the import of low cost goods had caused a strong impact on the domestic prices of the industrialised countries, we would have observed a rebalancing of the relative prices. In other words, we should have gauged a WARP closer to the REER in comparison with the results I have obtained: the reduction of price levels in the developed economies would have reduced the difference between the two measures. But, analysing the data, it is possible to recognize that we did not experienced a global reduction of prices. This situation can be explained analysing some data about the financial condition of the firms. Indeed, it is possible that the firms kept the positive features of the globalization for themselves, increasing their profits. Figure 4.5 shows an evidence that could support this idea. The ratio between gross operating surplus and gross value added grew in the four areas I examined. The trends are not totally coincident but, since 2001, all the indicators have shown a stable and clearly positive course. This means that during the last years the firms benefited from the international scenario. They fully exploited the benefits of the growing trade flows with the emerging countries. Firms increased their profits and kept for themselves a large part of the pass-through effect. The deflationary forces coming from the global economy did not have a strong impact on consumer prices. We did not experience a deflationary period thanks to, or in consequence of the firms' behaviour.

Figure 4.5: Ratio between gross operating surplus and gross value added



Source: European Commission web site, personal elaboration

2 *The econometric analysis*

2.1 Introduction

During the last years, a large strand of literature has pointed out the decreasing and/or limited role of the pass-through effect from exchange rate and import prices to domestic inflation. This phenomenon has been studied both in developed and in developing countries, obtaining the same result. The degree of the exchange rate pass-through is the highest on import prices, it is moderate on producer prices and is the lowest on consumer prices, so, it decreases along the distribution chain. Indeed, McCarthy (1999-2000-2007), using a Var approach, shows that in several industrialized countries the pass-through from the exchange rate and import prices to domestic prices is modest. Hahn (2003), following a very similar approach, finds a similar result focusing on the Euro area. Amato, Filardo, Galati, Von Peter, and Zhu (2005), summing up a part of the literature, highlight that the reduction of the pass-through effect is a common result in the recent studies on this phenomenon. Sekine (2006), using a single equation approach, shows that in the six major economies of the world the pass-through has declined during the last three decades. Gagnon and Ihrig (2004), examining the pass-through effect in 20 industrialized economies, find the same result: the pass-through effect has declined during the time and it has been very light during the last years. Moreover, Campa and Goldberg (2002) show that in the OECD countries there is evidence of a partial pass-through effect. But, as I said, other studies find a similar result even in developing countries: Ito and Sato (2006) and Sek and Kapsalyamova (2008) focus on Asian countries and find a light pass-through from exchange rate to consumer prices. Leigh and Rossi (2002) find the same result for Turkey (the pass-through to wholesale prices is more pronounced compared to the pass-through to consumer prices) and Billmeier and Bonato (2002) focus on Croatia and find that the exchange rate pass-through effect has been low after the stabilization in this country. Furthermore, there are other studies that focus on the Euro area. For example, Anderton (2003) estimates a pass-through around 50-70% from Euro effective exchange rate to price of extra Euro-area imports of manufactured, while Hüfner and Schröder (2002) find a very limited pass-through from NEER to HICP. At the end, Mishkin (2008) sums up the most recent findings of the pass-through literature and underlines that a very low pass-through effect is a common feature for a broad number of countries that pursued a stable and predictable monetary policy. Finally,

many studies underlined the same feature: the pass-through is no more a big concern of the policy makers. It is possible to make the exchange rate freely fluctuate without having a deep impact on the domestic prices. This is a very important finding because in this way the Governments can be less alert towards the exchange rate and they can let it rise or go down. This conclusion can create a significant fracture between the external imbalances and the domestic prices. The isolation of the national prices from the external factors, such as the exchange rate and the import prices, creates a larger space for the policy makers to use their tools without affecting the domestic economic situation. This result can be linked with Krugman (1986). In his study he argues that "pricing to market" by foreign suppliers can explain why U.S. import prices do not fully reflect movements in the exchange rate. So, the so called, “local currency pricing” can help explain the reduction of the pass-through effect during the last years.

In my study, in order to examine the state of the pass-through in the Euro Area, I focus on the four biggest economies of the area: Germany, France, Italy and Spain[2]. Furthermore, at the same time I present an analysis on the US, Japan and the UK in order to compare the econometric results of this section with the ones obtained through the WARP approach used in the previous pages. I employ both a single equation and a VAR approach. In the first case I follow the study of Sekine (2006) and estimate the two stages of the pass-through effect. In the first stage one can gauge the relationship between the import price and the exchange rate while the second stage aims at estimating the relationship between the import prices and the domestic inflation. However, a single-equation pass-through regression ignores the fact that domestic inflation may affect the exchange rate and other possible interrelation among the variables. And so, a VAR approach is useful to extend and complete the analysis. In this case I follow the McCarthy (1999-2000-2007) and Hahn (2003) studies.

In this strand of the literature, my study is innovative for three reasons: first, I analyse the Euro era, from January 1999 to June 2008. So, I focus on this period and compare the results obtained for Germany, France, Italy and Spain with the ones of other industrialised economies (the US, the UK and Japan). To my knowledge, this is the first attempt to estimate the pass-through for some European countries during the Euro age; second, I join a twofold econometric approach (single equation and Var)

[2] I focus on these nations, instead of the Euro area as a whole, for the lack of the import price time series for the Euro area

with the results and findings obtained comparing the WARP and the REER. This ample approach widen the robustness of the results; third, I introduce some differences in comparison with the studies I quoted with respect to the data I employ in the regressions.

2.2 The single equation approach and the data

The equations I employ in my study mimic the ones of the paper by Sekine (2006) but, as I said, I divide the second stage in two steps.

So, I regress three equations for each nation.

$$\Delta p_t^m = \beta_0 + \beta_1 \Delta p_t^{comm} + \beta_2 \Delta p_{t-1}^{comm} + \beta_3 \Delta E_t + \beta_4 \Delta E_{t-1} + \beta_5 \Delta E_{t-2} + \beta_6 \Delta p_t^{OECDpp} + \beta_7 \Delta p_{t-1}^{OECDpp} + \beta_8 \Delta p_{t-1}^m + \varepsilon \quad (1)$$

$$\Delta p_t^c = \beta_0 + \beta_1 \Delta p_{t-1}^m + \beta_2 \Delta p_{t-2}^m + \beta_3 \Delta indprod_{t-1} + \beta_3 \Delta indprod_{t-2} + \beta_5 \Delta p_{t-1}^c + \varepsilon \quad (2)$$

$$\Delta p_t^{pr} = \beta_0 + \beta_1 \Delta p_t^m + \beta_2 \Delta p_{t-1}^m + \beta_3 \Delta indprod_{t-1} + \beta_4 \Delta indprod_{t-2} + \beta_5 \Delta p_{t-1}^{pr} + \varepsilon \quad (3)$$

The equation (1) represents the first stage of the pass-through effect. The dependent variable is the import price. The regressors are the lagged dependent variable, p^m , a commodities price indicator, p^{comm} , a global producer prices indicator, p^{OECDpp}, and a time series of the nominal effective exchange rate, E . The aim of this first regression is to analyse the strength of the linkage between the exchange rate and the import prices. In so doing, it is possible to understand if the fluctuations of the exchange rate have a significant impact on the value of the imports. The other regressors can add further information. For example, the commodity prices can be useful to show the sensitivity of the value of the imports with respect to the trend of the commodity prices. Δ denotes series in first difference. The series are in log levels.

The theory suggests a value of the coefficient of the exchange rate near 1. That is, one should observe a perfect pass-through from exchange rate to import prices. In the following pages, I show the results of this regression and, observing the results, one can see that the relationship between the exchange rates and the import prices is weaker than the one expected.

Equations (2) and (3) are very similar. They reproduce the second stage of the pass-through effect. Equation (2) is the ordinary second stage: it resembles a Phillips

Curve. The dependent variable, p_t^c , is a consumer price index. The regressors are the import price, p^m , the industrial production, $indprod$, and a lagged dependent variable. The main goal of this equation is to measure the strengthen of the relationship between import prices and consumer prices. According to different authors (some of them have been previously cited), this link is weaker today than it was some years ago. As a consequence, we are living a period in which the fluctuations of the exchange rates have a very limited impact on the domestic inflation rates. But, one could question where this linkage has gone. So, I use another equation, the equation (3), in order to analyse the link between the import prices and the producer prices, p_t^{pr} . In so doing, I can show where the second stage of the pass-through effect has gone: if the relationship between the import prices and the producer prices is significant while the relationship between the import prices and the consumer prices is not, then the retailing sector has probably absorbed the pass-through. Otherwise, if the relationship between the import prices and the producer prices is not significant then one can suppose that the industrial sector has broken the transmission of the pass-through effect.

So, the principal feature of this study is the possibility to understand where the pass-through weaken. In this way we can join this econometric analysis to the results showed by the WARP exchange rates.

The equations (2) and (3) differ from each other for another characteristic: in the equation (2) the *import prices* are lagged (lags 1 and 2) while in the equation (3) this regressor is both contemporaneous and lagged (lag 1). I assume that the import prices have a simultaneous and lagged impact on the producer prices while they have only lagged impacts on the consumer prices. I think that this is a plausible scenario.

But, before showing and analysing the results of the regressions it is useful to describe the data.

All the data are on a monthly basis. The time series start in January 1999 and end in June 2008. I examine the seven nations of my study during the same period of time. In this way, through a synchronized analysis, it is possible to directly compare the results. Moreover, I try to use the same data sources for all the nations in order to reduce the possible discrepancies among the time series.

The nominal effective exchange rates are published by EUROSTAT. I use the NEER against 41 trading partners and gauge the monthly variation of these indices.

The producer price, p_{t-1}^{OECDpp}, is an index published by OECD and it represents a mean of the producer prices among the OECD countries. I use the monthly variation of this time series in my study (that is, the log-level first difference).

The commodity price index, p_{t-1}^{comm}, is published by IMF and I gauged the monthly variation. Obviously, I use the nominal bilateral exchange rates in order to transform this series and I use it in the equations of the different nations (this series is based on the commodity prices expressed in dollar terms and so it has been necessary to adapt it to the other six nations).

The import price, p_t^m, is published by OECD. I employ the unit value of imports. I have used this measure for all the nations, even if the OECD publishes more than one import prices index for some of the nations of my sample. So, I have gauged the monthly variation of the unit value of imports and then I have employed it in the equations.

The industrial production, $indprod$, I employ is published by EUROSTAT for Italy, Germany, France, Spain and the UK and by OECD for Japan and the US. As shown in the equations, this index is used in first difference.

The producer prices indices, p_t^{pr}, are published by OECD (domestic producer price) and I use the monthly variation of the time series.

The consumer prices indices are taken from OECD: I use the HICP for France, Germany, Italy, Spain and the UK. And I use the CPI for Japan and the US. Even in this case I have used the monthly variation of the indices.

As shown in Table 4.13, these time series are stationary.

2.3 The results of the single equation approach

Tables 4.1, 4.2 and 4.3 show the value of the coefficients, their level of significance, the adjusted R^2, the sample period, the Durbin Watson tests, the White tests and the Variance Inflation Factors obtained with the three regressions.

- The first stage of the pass-through effect

The regressions do not show problems of heteroskedasticity, collinearity and clear problem of autocorrelation in the residuals. So, the value of coefficients and their significance are fully acceptable. The value of the adjusted R^2 statistic is somewhat satisfactory. The results show that France is the unique nation in which

there are not exchange rate significant coefficients. In the other nations there is at least one significant coefficient. This means that a linkage still exist between the exchange rate and the import price. In the UK, the US and Japan the relationship is *faster* than in Italy, Germany and Spain. That is, in the Euro area nations the significant coefficients are lagged (lag 2 in Germany, lag 1 in Italy, lags 1 and 2 in Spain) while in the UK, the US and Japan the contemporaneous coefficient on the exchange rate shows a high level of significance (in these three nation lag 0 and lag 1 are significant). An important feature is the not so high value of these significant coefficients. Spain is the unique nation showing a rather high value (lag 1: 0.837). As a consequence, it is clear that only a limited first stage pass-through effect exists in these six nations (in France there is no evidence of pass-through from exchange rate to import price).

The linkage between the commodity price and the import price is significant in all the nations except Spain but in the US this relationship has the *wrong* sign. But also in this case the value of the coefficients are quite small. Another important aspect is that the lagged dependent variable is significant is six nations. So, there is a certain degree of persistence.

In sum, the first stage pass-through is still alive but it is not so strong. In the UK, the US and Japan the relationship between exchange rate and import price is faster then in Germany, Italy and Spain. In France I find no evidence of pass-through effect in the short run.

TABLE 4.1: FIRST STAGE PASS-THROUGH

OLS, robust standard errors. Dependent variable: National Import Prices. January 1999 - June 2008.							
	Germany	France	Italy	Spain	US	UK	Japan
β_0	-0.002	-0.001	0.002*	0.002	-0.000	-0.002**	0.000
β_1 commodity prices	0.141**	0.165***	0.112***	0.016	-0.020*	0.101***	0.087*
β_2 commodity prices (-1)	0.011	0.102**	0.143***	0.069	0.004	-0.018	0.192***
β_3 NEER	0.059	0.306	0.191	-0.238	-0.105***	-0.352***	-0.466***
β_4 NEER (-1)	0.049	-0.081	-0.388***	-0.837***	-0.084***	-0.149**	-0.215**
β_5 NEER (-2)	-0.625***	-0.002	-0.175	-0.714*	0.021	-0.031	-0.056
β_6 OECD producer prices	-0.041	-0.613	0.037	0.753	0.450***	0.115	-0.313
β_7 OECD producer prices (-1)	0.880	-0.003	0.361	-0.249	0.033	0.829***	0.772
β_8 National Import price (-1)	-0.345***	-0.189*	-0.303***	-0.503***	0.289***	-0.304***	-0.119
Adj R^2	0.20	0.19	0.49	0.29	0.44	0.40	0.45
D.W. test	2.06	2.00	2.00	2.33	2.03	2.04	2.19
White test	29.74	42.13	54.62	54.46	42.59	43.25	43.24
V.I.F.	<3.22	<3.21	<3.22	<3.25	<3.02	<2.68	<2.94
*Significant at one percent level, ** Significant at five percent level, ***Significant at ten percent level.							

TABLE 4.2: SECOND STAGE PASS-THROUGH, PART A

OLS, robust standard errors. Dependent variable: National Producer Price. January 1999 – June 2008							
	Germany	France	Italy	Spain	US	UK	Japan
β_0	0.001***	0.001***	0.001***	0.001***	0.002***	0.001***	-0.000
β_1 National Import Price	0.030***	0.107***	0.115***	0.025*	0.908***	0.145***	0.022**
β_2 National Import Price (-1)	0.023**	-0.004	-0.020	0.015	-0.315	0.104***	-0,000
β_3 Industrial Production (-1)	0.000	-0.001	-0.001	-0.012***	-0.239*	0.003	-0,002
β_4 Industrial Production (-2)	-0.005*	-0.005**	-0.002***	-0.009**	0.239	-0.007	0.023
β_5 National Producer Price (-1)	0.119	0.290***	0.319***	0.458***	0.095	0.426***	0.527***
Adj R^2	0.08	0.19	0.36	0.32	0.25	0.43	0.34
D.W. test	2.09	2.05	2.12	1.89	1.98	2.09	2.16
White test	12.36	18.95	17.43	13.02	27.45	21.08	37.01**
V.I.F.	<1.20	<1.19	<1.52	<1.28	<1.40	<1.28	<1.27
*Significant at one percent level, ** Significant at five percent level, ***Significant at ten percent level.							

TABLE 4.3: SECOND STAGE PASS-THROUGH, PART B

OLS, robust standard errors. Dependent variable: National Consumer Price. January 1999 – June 2008							
	Germany	France	Italy	Spain	US	UK	Japan
β_0	0.001***	0.001***	0.001***	0.001***	0.001***	0.001***	-0.000
β_1 National Import Price (-1)	0.004	0.021	-0.000	0.040***	-0.072	0.121***	0.016
β_2 National Import Price (-2)	0.000	-0.021	0.009	0.004	0.007	0.016	0.022**
β_3 Industrial Production (-1)	0.003	-0.002*	0.000	0.007***	0.030	0.010	0.019
β_4 Industrial Production (-2)	-0.003	-0.000	0.000	-0.009***	0.102	0.005	0.027
β_5 National Consumer Price (-1)	-0.315***	0.103	0.149	0.296***	0.426***	-0.068	0.016
Adj R^2	0.11	0.02	0.00	0.18	0.13	0.13	0.01
D.W. test	2.00	2.01	1.97	1.82	1.76	2.02	1.99
White test	22.34	20.83	20.83	24.22	38.07***	18.41	12.02
V.I.F.	<1.28	<1.23	<1.31	<1.32	<1.35	<1.22	<1.13
*Significant at one percent level, ** Significant at five percent level, ***Significant at ten percent level.							

- The second stage of the pass-through effect, part A

This paragraph deals with the analysis of the first part of the second stage pass-through effect, that is, the linkage between import prices and producer prices (equation 3). I used this equation, together with the equation (2) (the traditional second stage pass-through), because in this way it is possible to study the chain from import prices to consumer prices more in detail. The results are shown in Table 4.2.

The regressions do not show problems of collinearity and autocorrelation in the residuals. As regards the homoskedasticity, there is a problem of heteroskedasticity only in the Japanese case. The value of the adjusted R^2 statistic is very low only in the German case. So, bearing in mind the Japanese lack of homoskedasticity, it is possible to interpret the data in the correct way.

The relationship between the import price (regressor) and the producer price (dependent variable) is significant in all the seven nations analysed. In all the cases the lag 0 coefficient is significant. In Germany and the UK the lag 1 coefficient is significant too. The value of these coefficients are very small except for the US lag 0 coefficient. In this case the value is near 1 (0.908). The UK shows two significant coefficients with a discrete value. In six nations there is a trend (a significant constant) and in five nations there is persistence (a significant dependent lagged variable). The other coefficients, although significant in same cases, are not important because their value is extremely small.

So, in sum, the relationship between the import price and the producer price is globally evident even if it is very light. The value of the coefficients highlights a higher pass-through in the US than in the other areas. This result is important: in the US the firms have shown a higher propensity to change the price of their production in response to the fluctuations of the import prices. But in the other cases the coefficients in this second step are smaller then in the first stage. So, another piece of the pass-through effect has gone away.

- The second stage of the pass-through effect, part B

In this third section I study the traditional second stage pass-through effect (see table 4.3 for the results). The aim is to gauge the linkage between the import prices and the consumer prices. The results of this step, together with the previous ones, can shed more light on the pass-through chain. The regressions do not show problems of collinearity and clear presence of autocorrelation in the residuals. As regards the homoskedasticity, there are problem of heteroskedasticity only in the US case. The value of the adjusted R^2

statistic is very low in France, Italy and Japan. Also in this case, bearing in mind the US lack of homoskedasticity, it is possible to interpret the data in the correct way.
It is straightforward to observe that the relationship between the import prices and the consumer prices is lighter than the one between the import and the producer prices. There are only three statistically significant coefficients: one in the Spanish regression, one in the UK case and the last in the Japanese equation. The higher value is in the UK regression. But, a global vision highlights this reduced linkage between the regressor (import price) and the dependent variable. So, it is clear that the pass-through effect is very limited or absent in this case. Only in the UK it is possible to observe a linkage with a discrete value.
One can also notice that there is a significant trend in six nations and that in three nations there is persistence (a significant dependent lagged variable). The other coefficients are not significant or they are very small.
In conclusion, in this paragraph I have examined the results of the traditional second stage pass-through effect. The main feature is that both in the Euro Area and in the US this link is not active. The import prices did not affect the consumer prices during the sample. On the contrary, I have found a significant relationship between import and consumer prices in the UK (lag 0) and in Japan (lag 1). In the Japanese case the value of the coefficient is extremely small. So, the UK seems to be the unique nation in which this ring of the pass-through chain has proved its effectiveness.

2.4 The VAR approach and the data

In this section I present the VAR and the data. My VAR model is very similar to the one presented by McCarthy in his seminal paper of 1999 and then extended in 2000 and 2007. Moreover, in order to test the robustness of the results, I also use a different shocks transmission chain, following the ideas in Hahn (2003). The difference between the two authors lies in the ordering of the variables: McCarthy inserts the interest rate at the end of the chain (in my VAR I do not use a monetary aggregate and so the interest rate is the last variable) while Hahn decides to insert the interest rate in the second position of the chain.
The seven variables included in the model are: the first difference of the log of commodity price, p^{comm} (by IMF, gauged in national currency); the Hodrick-Prescott filter on industrial production, $HPindprod$ (by EUROSTAT for Italy, Germany, France, Spain and the UK and by OECD for Japan and the US); the monthly variation (that is, the log-level first difference) of the nominal effective exchange rate against 41 trading partners, E (published by EUROSTAT); the import price, p^m, is the monthly variation of

the unit value of imports published by OECD; the producer price, p^{pr}, is the monthly variation of the domestic producer price index published by OECD; the consumer price, p^{c}, is the monthly variation of the index published by OECD (HICP for France, Germany, Italy, Spain, the UK and CPI for Japan and the US); the interest rate, dtd, is the monthly variation of the day-to-day rate (published by OECD, I employ the same rate for Germany, France, Italy and Spain). In this last case, differently from other studies, I employ the monthly variation, instead of the level, because of problems of stationary of the dtd rate time series.

Different orderings of these variables seem reasonable. In the baseline model I decided in favour of the McCarthy's ordering: x_t = (p_t^{comm} , $HPindprod_t$, E_t , p_t^m , p_t^{pr} , p_t^c , dtd_t)'. Then, for robustness purpose, I estimate the VAR using the ordering suggested by Hahn: x_t = (p_t^{comm} , dtd_t , $HPindprod_t$, E_t , p_t^m , p_t^{pr} , p_t^c)'. The day-to-day rate is in a different position along the transmission chain. In the first case, the position of the interest rate at the end of the chain implies that the monetary policy reacts to all shocks in the model and affects all variables with a lag, in my case after a month. The second ordering implies that the monetary policy reacts to a contemporaneous commodity shock but, in this case, the monetary policy shock impacts on the other variables. Moreover, this ordering implies that monetary policy does not react to actual inflation but to the expectations. But, as I show in the following pages, the results obtained with the two orderings are substantially the same.

As usual in this case, I apply the Cholesky decomposition in order to identify the structure of the shocks. As a consequence, the variance-covariance matrix of the reduced form residuals is written in a lower triangular matrix and n*(n-1)/2 restrictions are imposed on the matrix to identify the structural shocks. Some of the structural shocks do not have contemporaneous impacts on some of the other variables. The reduced form VAR residuals e is correlated with the structural disturbances ε in the following way:

$$\begin{pmatrix} e^{COMM} \\ e^{Y} \\ e^{NEER} \\ e^{IMP} \\ e^{PPI} \\ e^{CPI} \\ e^{DTD} \end{pmatrix} = \begin{pmatrix} s_{11} & 0 & 0 & 0 & 0 & 0 & 0 \\ s_{21} & s_{22} & 0 & 0 & 0 & 0 & 0 \\ s_{31} & s_{32} & s_{33} & 0 & 0 & 0 & 0 \\ s_{41} & s_{42} & s_{43} & s_{44} & 0 & 0 & 0 \\ s_{51} & s_{52} & s_{53} & s_{54} & s_{55} & 0 & 0 \\ s_{61} & s_{62} & s_{63} & s_{64} & s_{65} & s_{66} & 0 \\ s_{71} & s_{72} & s_{73} & s_{74} & s_{75} & s_{76} & s_{77} \end{pmatrix} * \begin{pmatrix} \varepsilon^{COMM} \\ \varepsilon^{Y} \\ \varepsilon^{NEER} \\ \varepsilon^{IMP} \\ \varepsilon^{PPI} \\ \varepsilon^{CPI} \\ \varepsilon^{DTD} \end{pmatrix}$$

This is the structure that mimics the McCarthy studies and it is my baseline model, while the following structure is the one that reproduces the shocks transmission chain by Hahn:

$$\begin{pmatrix} e^{COMM} \\ e^{DTD} \\ e^{NEER} \\ e^{Y} \\ e^{IMP} \\ e^{PPI} \\ e^{CPI} \end{pmatrix} = \begin{pmatrix} s_{11} & 0 & 0 & 0 & 0 & 0 & 0 \\ s_{21} & s_{22} & 0 & 0 & 0 & 0 & 0 \\ s_{31} & s_{32} & s_{33} & 0 & 0 & 0 & 0 \\ s_{41} & s_{42} & s_{43} & s_{44} & 0 & 0 & 0 \\ s_{51} & s_{52} & s_{53} & s_{54} & s_{55} & 0 & 0 \\ s_{61} & s_{62} & s_{63} & s_{64} & s_{65} & s_{66} & 0 \\ s_{71} & s_{72} & s_{73} & s_{74} & s_{75} & s_{76} & s_{77} \end{pmatrix} * \begin{pmatrix} \varepsilon^{COMM} \\ \varepsilon^{DTD} \\ \varepsilon^{NEER} \\ \varepsilon^{Y} \\ \varepsilon^{IMP} \\ \varepsilon^{PPI} \\ \varepsilon^{CPI} \end{pmatrix}$$

In both cases the commodity prices shocks affect the reduced form residuals of all the equations while the change in the commodity prices are not affected contemporaneously by any of the other shocks. Moreover, in both cases the price variables (import price, producer price, consumer price) are ordered according to the distribution chain. The other features are straightforward to understand analysing the matrices.

Then, in order to estimate the VAR, the time series employed are assumed to be stationary. The stationary of the time series has been examined by a Phillips Perron test[3] (see table 4.13). The results show that the series used in the VAR are stationary. The VAR model therefore is estimated with a constant and six lags for the seven nations (to determine the lag order of the VAR model I performed the LR test).

Moreover, once the recursive model has been estimated, a number of exercises can be accomplished: variance decompositions show for each variable the ratio of the forecast error variance that is attributable to its own shocks and to shocks stemming from other variables; impulse response functions show the estimated response of each variable to an impulse in one of the innovations.

2.5 The VAR results

In this section I show the impulse-response functions and the variance decomposition. The time series sample starts in January 1999 and ends in June 2008.

[3] The PP test, based on Phillips and Perron (1988), applies a non-parametric correction to the t-statistic of the coefficient in the estimated AR(1) process.

Impulse-response function

Figure 4.6 shows the impulse-response functions obtained with the baseline model. The first figures show the relationship between commodity price and import price, the second ones the relationship between exchange rate and import price and the last figures plot the impulse-response function between import price and producer price and between import price and consumer price. Then, figure 4.7 shows the impulse-response functions obtained with the Hahn ordering. The differences between the models are very limited and so I decide to comment only the baseline model. The cumulated orthogonalized impulse-response function and the confidence intervals (95%) are shown in the figures. For example, the first seven graphs show the cumulative response of import prices to a 1% increase in commodity prices during the fifteen months after the shock. The other graphs show the relationship that I have previously mentioned.

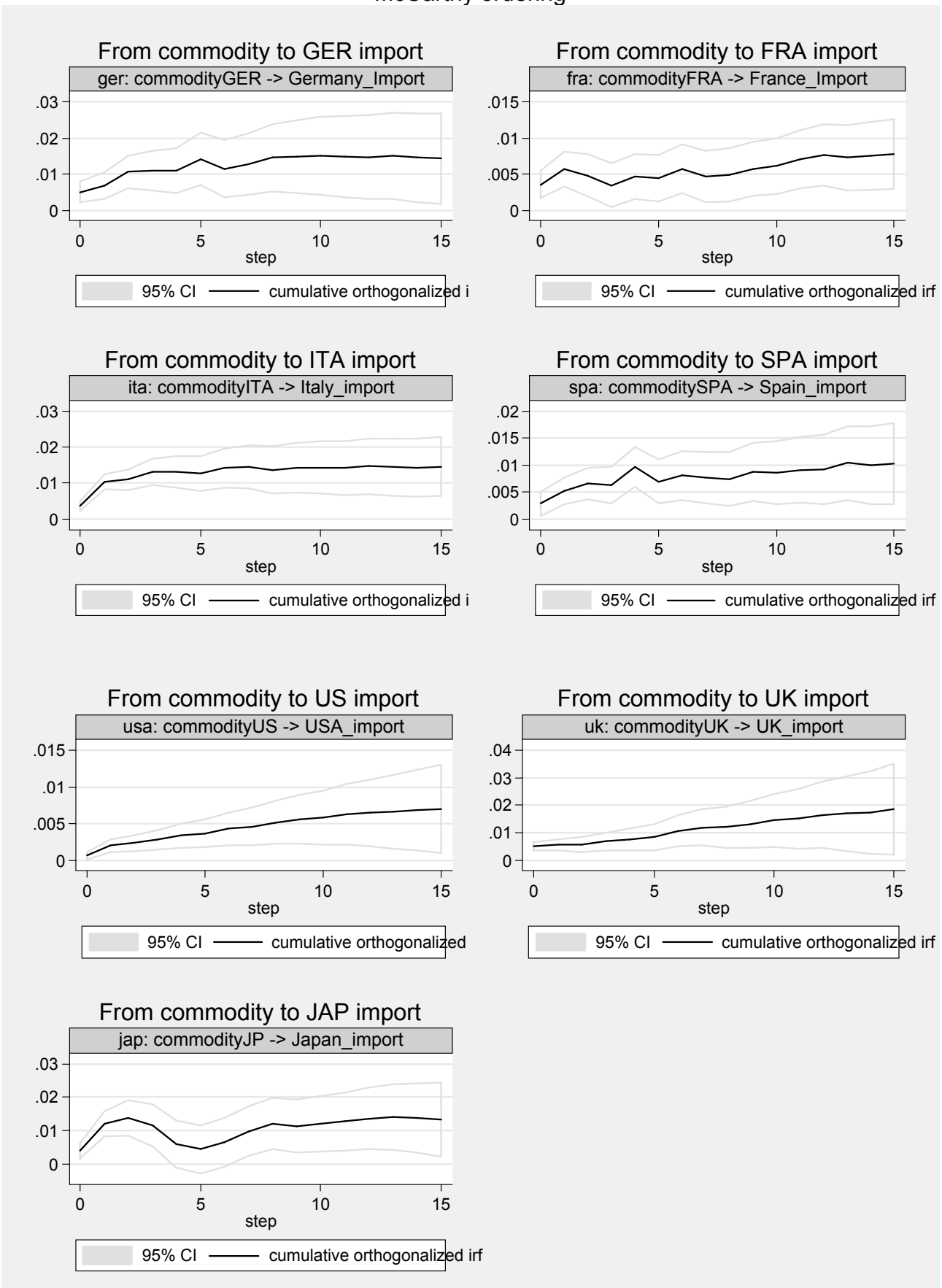
Summing up the results, the response of the import prices to a shock in commodity price is significant in all the seven nations, even if the response is not so ample. The largest responses are in Italy, Germany, Japan and the UK. Japan also has the largest response after the first months.

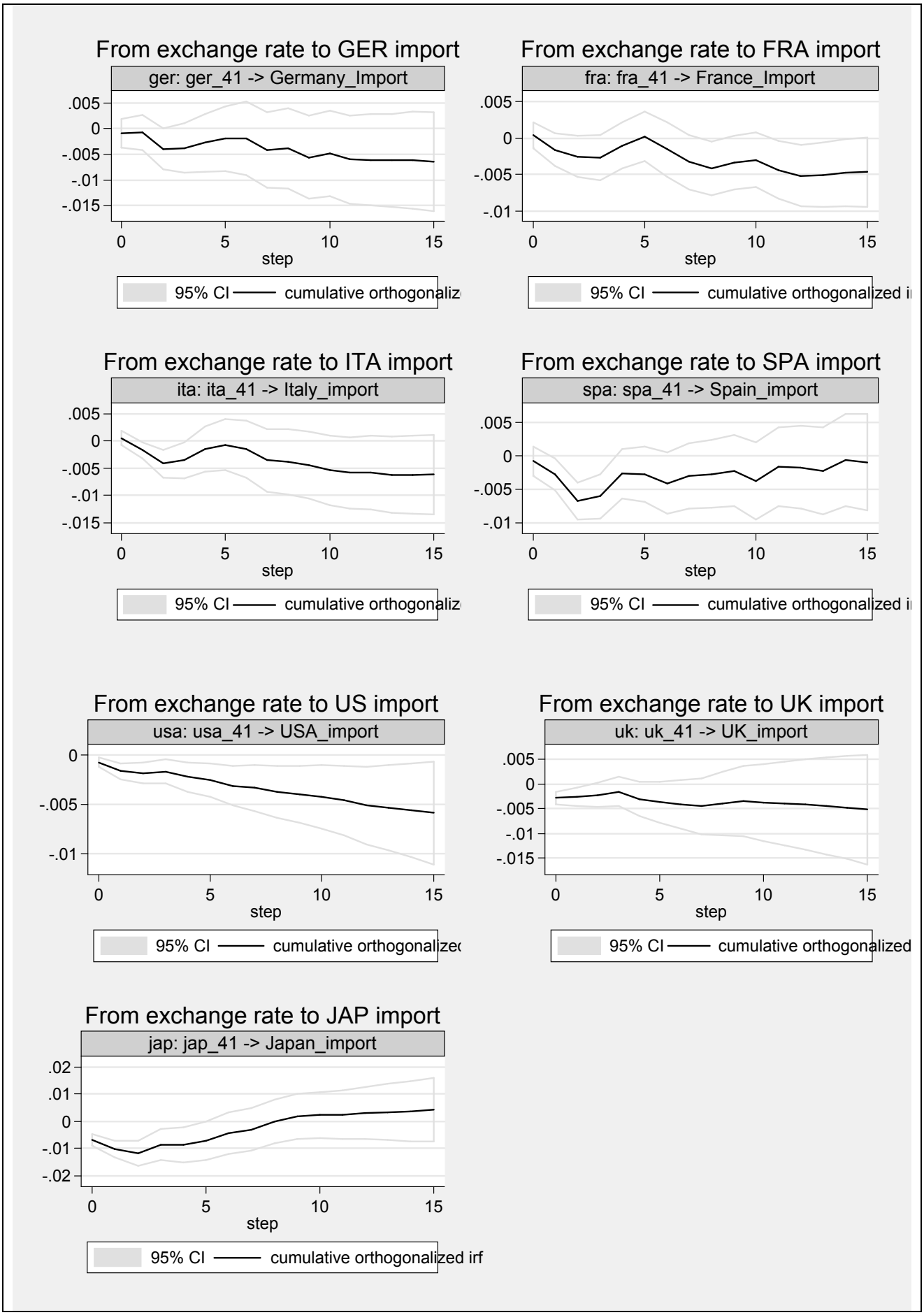
The response of import prices to a shock of exchange rate is significant in the US along all the fifteen months and during the first months in Japan. In the other nations the exchange rate shock does not have a significant impact on the import price course. Even if the responses are not significant they are of the *right* sign.

The import price shock does not have a significant impact on producer and consumer prices. Indeed, analysing the graphs one can observe that the response of the producer prices and consumer prices to a 1% increase in import prices is not significant in the nations I analysed. Moreover, in France, Italy, Spain and Japan the response of the producer prices has the *wrong direction*. The same thing happens for Spanish, French and Japanese consumer prices. So, the last segments of the pass-through do not work at all.

This first inspection of the VAR results highlighted the role of the commodity prices on the one hand, but it also shows the quite absent relationship between import prices and producer-consumer prices. It seems that during the last years the role of the external factors in influencing and determining the path of the domestic inflation rates has dramatically diminished. As a consequence, the VAR results support the hypothesis stemming from the Warp and the single equation analyses: the pass-through effect during the last year has been very light in all these nations.

Figure 4.6: Cumulative orthogonalized impulse-response function and confidence intervals
-McCarthy ordering-

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usa: usa_41 -> USA_import
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From exchange rate to UK import
uk: uk_41 -> UK_import
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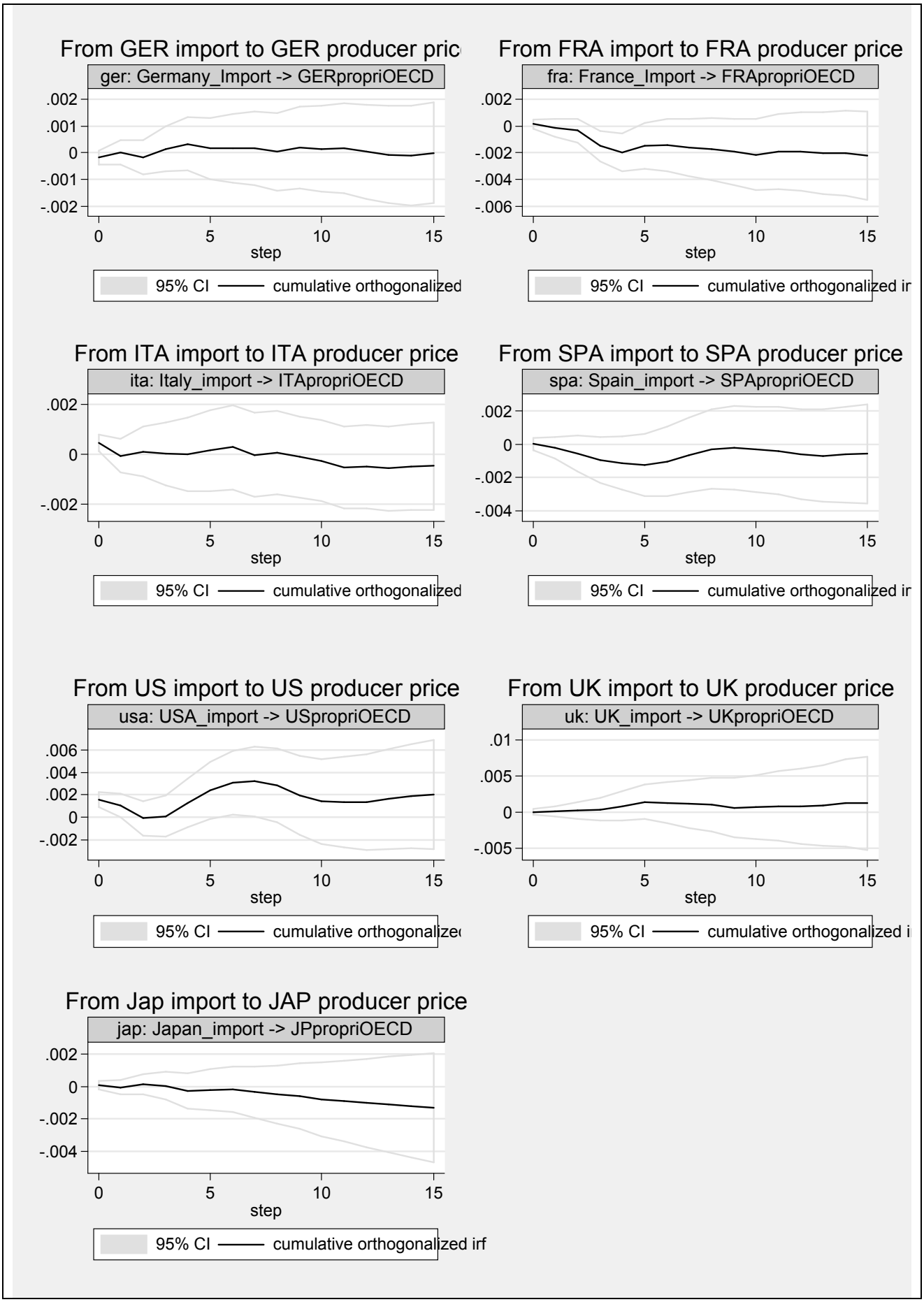
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spa: Spain_import -> SPApropriOECD
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From US import to US producer price
usa: USA_import -> USpropriOECD
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uk: UK_import -> UKpropriOECD
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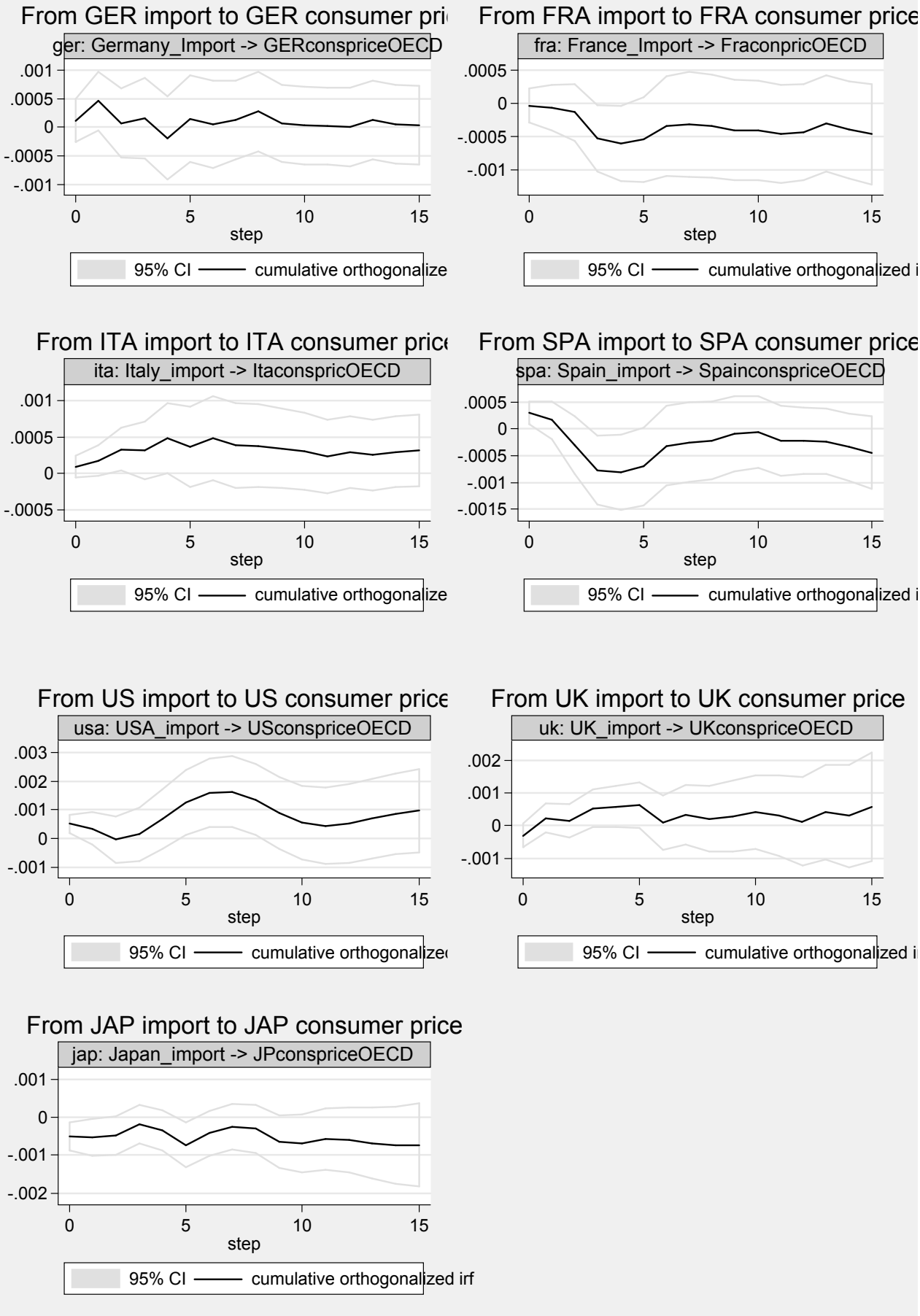
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spa: Spain_import -> SpainconspriceOECD
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cumulative orthogonalized i
From US import to US consumer price
usa: USA_import -> USconspriceOECD
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-.001
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15
step
95% CI
cumulative orthogonalize
From UK import to UK consumer price
uk: UK_import -> UKconspriceOECD
.002
.001
0
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5
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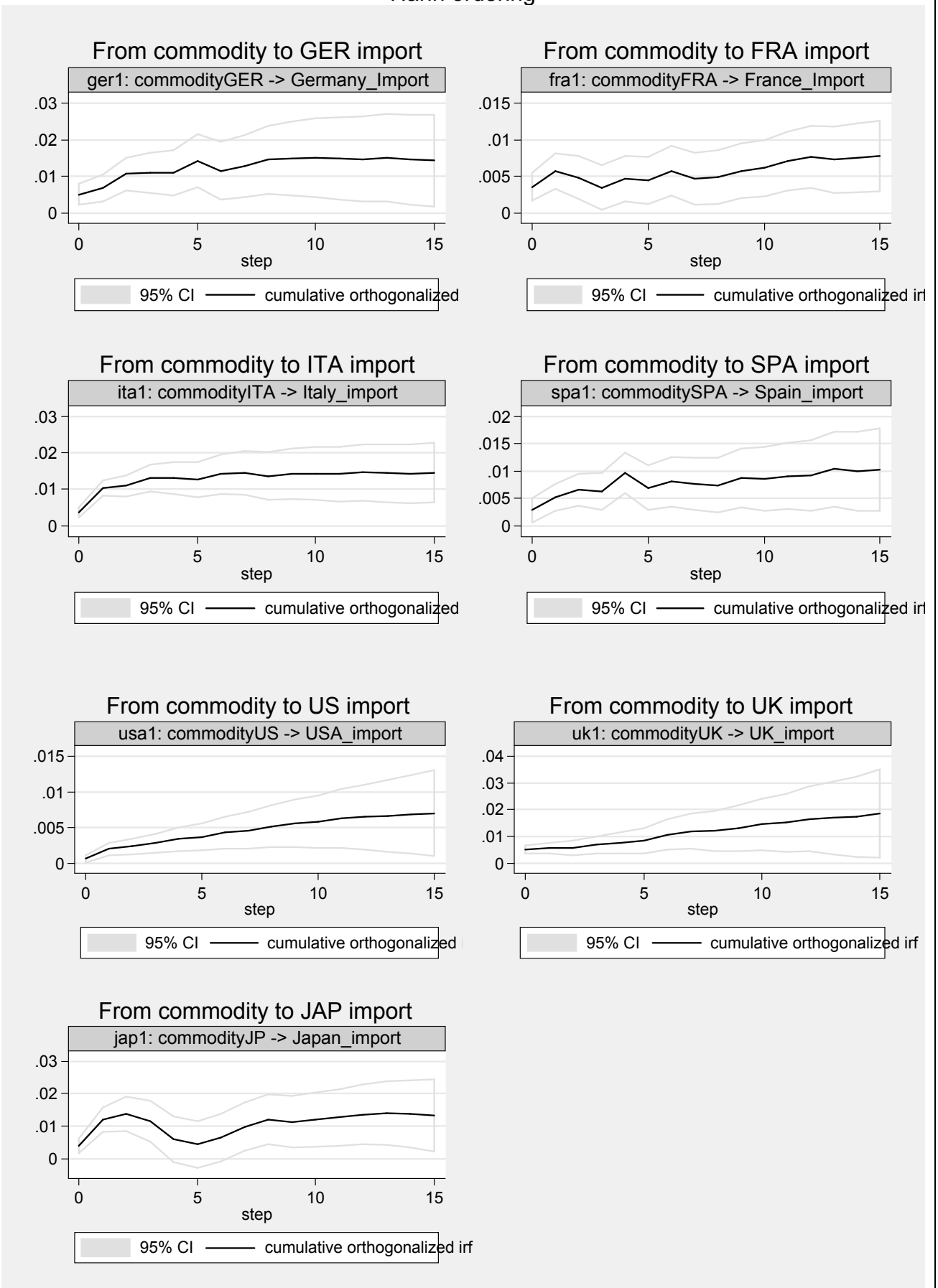
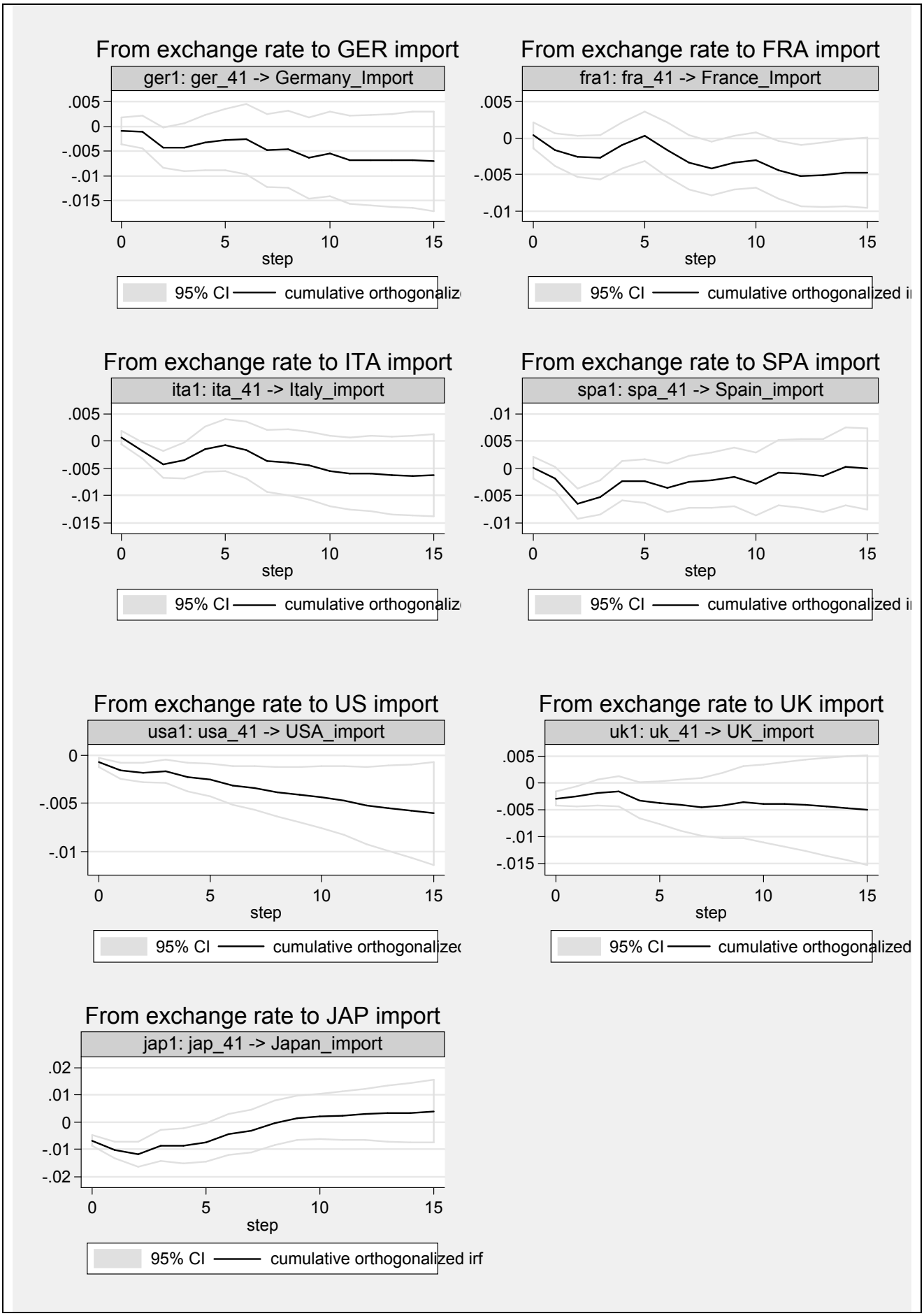
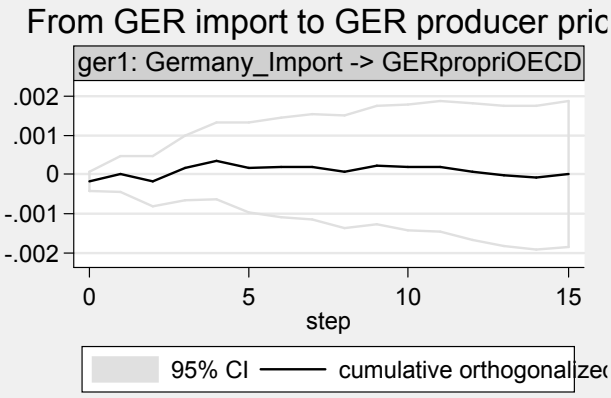
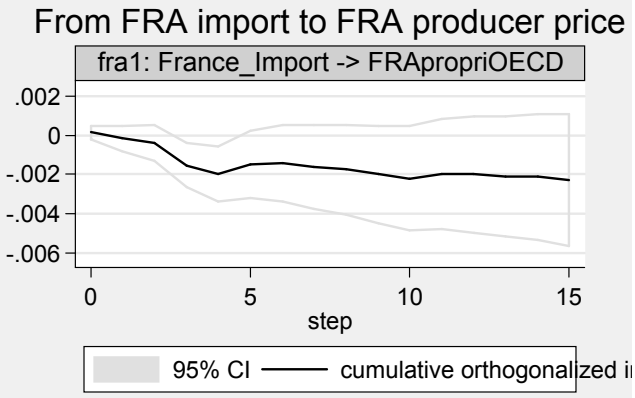
95% CI
cumulative orthogonalized i
From JAP import to JAP consumer price
jap: Japan_import -> JPconspriceOECD
.001
0
-.001
-.002
0
5
10
15
step
95% CI
cumulative orthogonalized irf

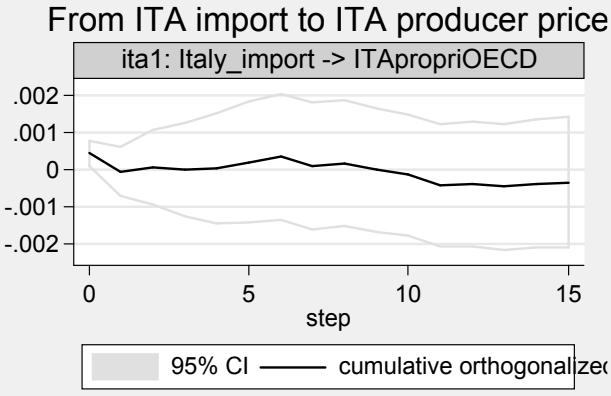
Figure 4.7: Cumulative orthogonalized impulse-response function and confidence intervals
-Hahn ordering-

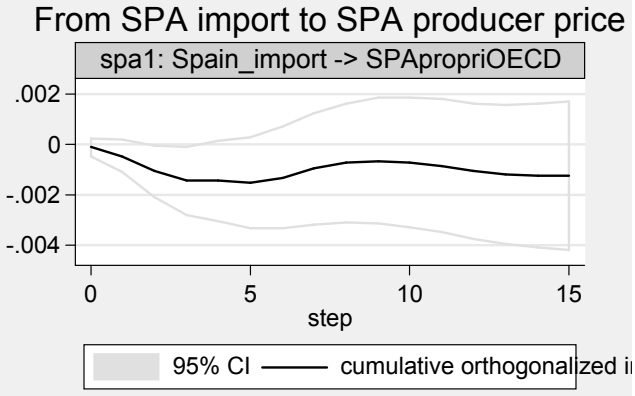


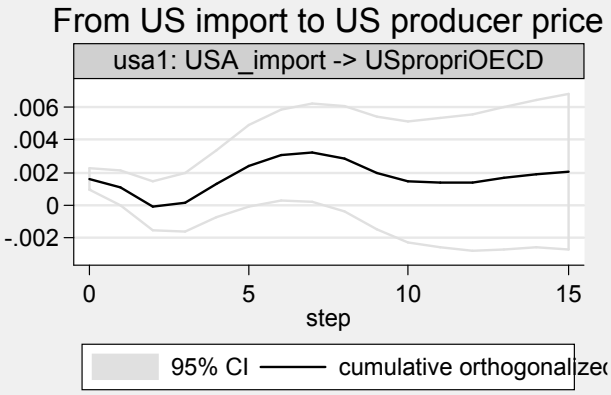

From exchange rate to GER import
ger1: ger_41 -> Germany_Import
.005
0
-.005
-.01
-.015
0
5
10
15
step
95% CI
cumulative orthogonaliz
From exchange rate to FRA import
fra1: fra_41 -> France_Import
.005
0
-.005
-.01
0
5
10
15
step
95% CI
cumulative orthogonalized i
From exchange rate to ITA import
ita1: ita_41 -> Italy_import
.005
0
-.005
-.01
-.015
0
5
10
15
step
95% CI
cumulative orthogonaliz
From exchange rate to SPA import
spa1: spa_41 -> Spain_import
.01
.005
0
-.005
-.01
0
5
10
15
step
95% CI
cumulative orthogonalized i
From exchange rate to US import
usa1: usa_41 -> USA_import
0
-.005
-.01
0
5
10
15
step
95% CI
cumulative orthogonalize
From exchange rate to UK import
uk1: uk_41 -> UK_import
.005
0
-.005
-.01
-.015
0
5
10
15
step
95% CI
cumulative orthogonalized
From exchange rate to JAP import
jap1: jap_41 -> Japan_import
.02
.01
0
-.01
-.02
0
5
10
15
step
95% CI
cumulative orthogonalized irf

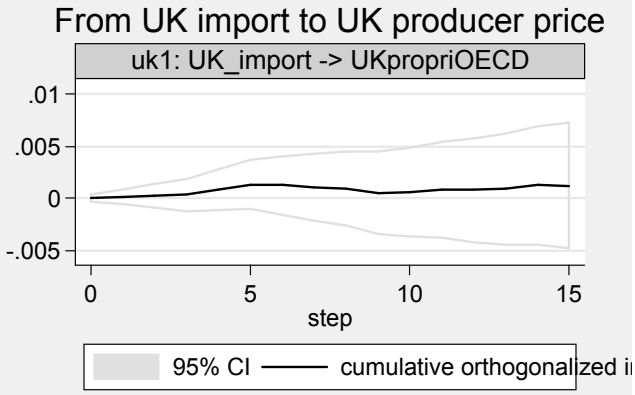

From GER import to GER producer pric
ger1: Germany_Import -> GERpropriOECD
.002
.001
0
-.001
-.002
0
5
10
15
step
95% CI
cumulative orthogonalized

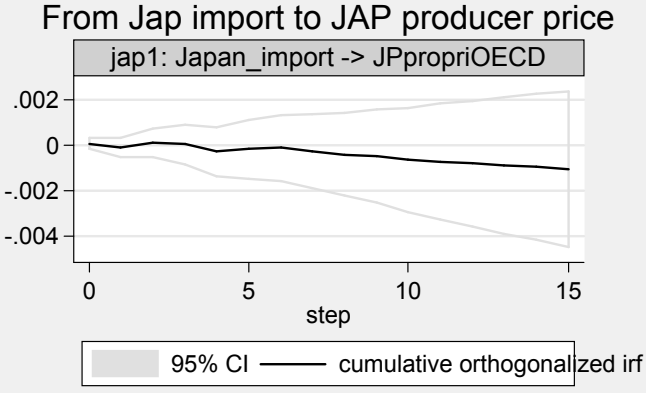

From FRA import to FRA producer price
fra1: France_Import -> FRApropriOECD
.002
0
-.002
-.004
-.006
0
5
10
15
step
95% CI
cumulative orthogonalized i

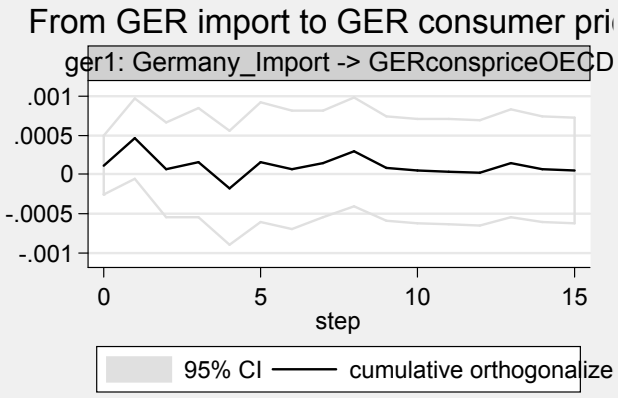

From ITA import to ITA producer price
ita1: Italy_import -> ITApropriOECD
.002
.001
0
-.001
-.002
0
5
10
15
step
95% CI
cumulative orthogonalized

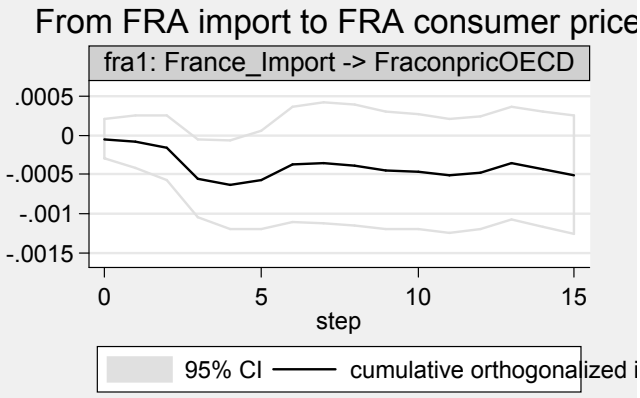

From SPA import to SPA producer price
spa1: Spain_import -> SPApropriOECD
.002
0
-.002
-.004
0
5
10
15
step
95% CI
cumulative orthogonalized i

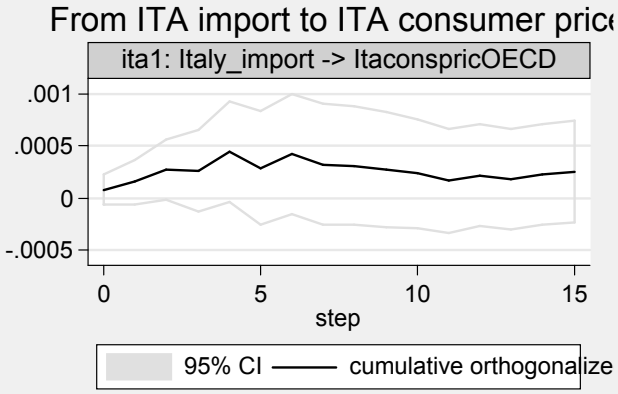

From US import to US producer price
usa1: USA_import -> USpropriOECD
.006
.004
.002
0
-.002
0
5
10
15
step
95% CI
cumulative orthogonalized

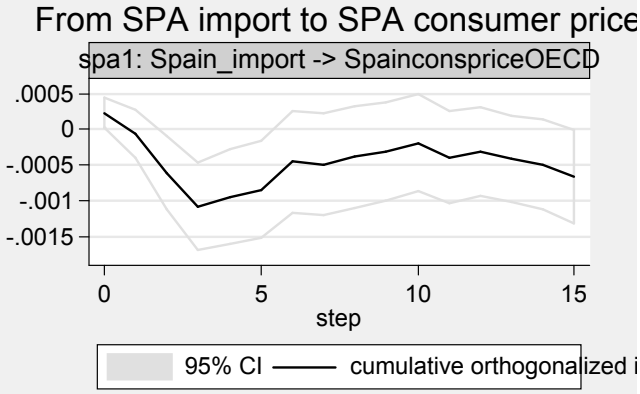

From UK import to UK producer price
uk1: UK_import -> UKpropriOECD
.01
.005
0
-.005
0
5
10
15
step
95% CI
cumulative orthogonalized i

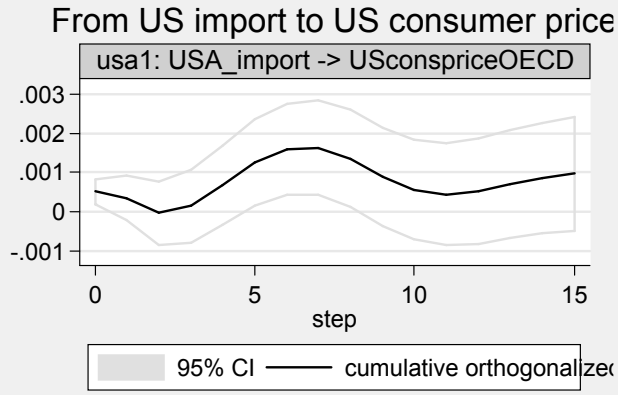

From Jap import to JAP producer price
jap1: Japan_import -> JPpropriOECD
.002
0
-.002
-.004
0
5
10
15
step
95% CI
cumulative orthogonalized irf

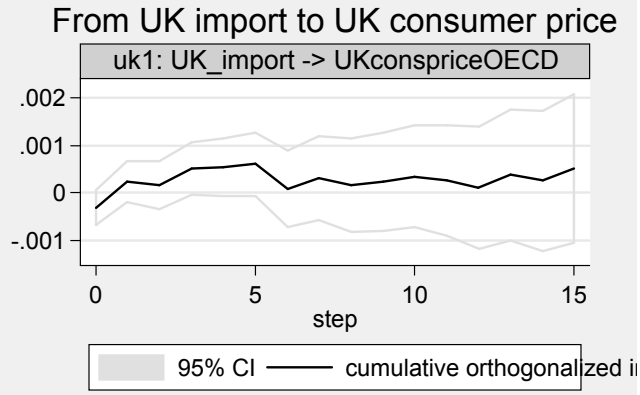

From GER import to GER consumer pri
ger1: Germany_Import -> GERconspriceOECD
.001
.0005
0
-.0005
-.001
0
5
10
15
step
95% CI
cumulative orthogonalize

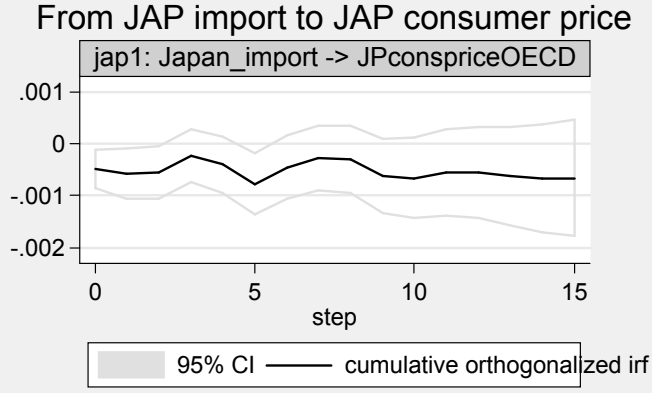

From FRA import to FRA consumer price
fra1: France_Import -> FraconpricOECD
.0005
0
-.0005
-.001
-.0015
0
5
10
15
step
95% CI
cumulative orthogonalized i


From ITA import to ITA consumer price
ita1: Italy_import -> ItaconspricOECD
.001
.0005
0
-.0005
0
5
10
15
step
95% CI
cumulative orthogonalize


From SPA import to SPA consumer price
spa1: Spain_import -> SpainconspriceOECD
.0005
0
-.0005
-.001
-.0015
0
5
10
15
step
95% CI
cumulative orthogonalized i


From US import to US consumer price
usa1: USA_import -> USconspriceOECD
.003
.002
.001
0
-.001
0
5
10
15
step
95% CI
cumulative orthogonalize


From UK import to UK consumer price
uk1: UK_import -> UKconspriceOECD
.002
.001
0
-.001
0
5
10
15
step
95% CI
cumulative orthogonalized i


From JAP import to JAP consumer price
jap1: Japan_import -> JPconspriceOECD
.001
0
-.001
-.002
0
5
10
15
step
95% CI
cumulative orthogonalized irf

Variance decomposition

In this section I show a part of the variance decomposition. Indeed, I select only some of the data obtained estimating the Var. The following tables compare the impact of the shock of one variable to another variable in the seven nations of my study. In this way it is simpler to observe the differences among the nations. I show the variance decomposition of the baseline model. The variance decomposition is useful in order to understand how important the various shocks have been in determining the fluctuations of the prices (import, producer and consumer prices). This is another way to examine the influence of the external factors on the domestic inflation. See tables 4.4 - 4.12 for the results.

As regards import prices, commodity price shocks are more important than exchange rate shocks for all the seven nations. Indeed, commodity prices explain from 4.8 to 41.6 percent of the import price forecast variance, with an average of 20.3%, while the range for the exchange rate goes from 0.1 to 29.5 percent, with an average of 9.4%. In both cases the percentages are higher during the last months analysed. This is a first interesting result: in all the seven nations, the commodity price shocks have a higher influence than the exchange rate shocks in influencing the import price fluctuations.

For producer prices, the percentage of variance explained by commodity price is very large, from 23 to 69.6 percent, with an average value of 42.07%. In this case, the values decrease during the twelve months analysed. On the contrary, a modest percentage of variance is explained by exchange rate (average value 5.33%) and by import price (average value 4.87%), but in this case the percentages are bigger at the end of the period. So, even in this case I find a very large impact of the commodity price shocks on the fluctuations of the producer prices while the other factors, exchange rate and import price, seem to have a very limited role.

As regards consumer prices, commodity price shocks explain a quite large percentage of the consumer price forecast variance: from 0.4 to 41 percent, with an average value of 15.58%. But there is not a clear pattern: in some nations the percentage grows during the time, in other countries the trend is decreasing. Producer price, import price and exchange rate shocks have a modest role. The first explains from 0.1 to 20.6 percent of the forecast variance of the consumer prices, with an average value of 9.16%. The second explains from 0 to 12.6 percent (with an average value of 6.65%) and in this case the values increase during the time. The exchange rate shows the lowest values: it explains

from 0.7 to 13.8 percent of the consumer price forecast variance, but the average value of 6.14% is the lowest among the various factors examined.

The most important conclusion that emerges from the variance decomposition analysis is that the commodity prices have a prominent role in explaining the variance of the import, producer and consumer prices. While, on the contrary, the exchange rate shocks explain a modest proportion of the variance of all the prices analysed. Another important feature is that the combined influence of exchange rate and commodity price on consumer prices is less than it is for producer prices. This is probably linked to the fact that the consumer price index includes a higher percentage of non tradable goods in comparison with the producer price index. Notwithstanding this, the difference remains very large.

Table 4.4: Percentage of Import Price Forecast Variance Attributed to Commodity Prices

Country	Forecast Horizon											
	1	2	3	4	5	6	7	8	9	10	11	12
US	0.048	0.208	0.195	0.187	0.195	0.192	0.197	0.198	0.205	0.210	0.211	0.219
UK	*0.323*	*0.300*	*0.283*	*0.261*	*0.249*	*0.243*	*0.266*	*0.270*	*0.266*	*0.267*	*0.271*	*0.267*
JAP	*0.097*	*0.271*	*0.250*	*0.243*	*0.294*	*0.290*	*0.287*	*0.288*	*0.287*	*0.281*	*0.279*	*0.278*
GER	0.107	0.093	0.132	0.130	0.126	0.148	0.158	0.155	0.158	0.156	0.155	0.154
FRA	0.118	0.139	0.139	0.140	0.135	0.132	0.131	0.132	0.129	0.132	0.131	0.134
ITA	*0.214*	*0.416*	*0.370*	*0.371*	*0.354*	*0.348*	*0.347*	*0.337*	*0.335*	*0.331*	*0.326*	*0.323*
SPA	0.056	0.060	0.059	0.058	0.091	0.103	0.104	0.103	0.101	0.105	0.104	0.103

Table 4.5: Percentage of Import Price Forecast Variance Attributed to Exchange Rate

Country	Forecast Horizon											
	1	2	3	4	5	6	7	8	9	10	11	12
US	*0.068*	*0.120*	*0.111*	*0.100*	*0.113*	*0.115*	*0.123*	*0.124*	*0.128*	*0.128*	*0.130*	*0.133*
UK	0.097	0.088	0.086	0.080	0.096	0.095	0.089	0.088	0.088	0.088	0.086	0.084
JAP	*0.295*	*0.193*	*0.179*	*0.189*	*0.171*	*0.170*	*0.181*	*0.171*	*0.182*	*0.184*	*0.182*	*0.181*
GER	0.004	0.003	0.034	0.033	0.035	0.035	0.033	0.044	0.043	0.050	0.050	0.053
FRA	0.001	0.032	0.038	0.034	0.048	0.057	0.071	0.084	0.087	0.090	0.089	0.097
ITA	0.004	0.039	0.073	0.070	0.091	0.093	0.093	0.111	0.109	0.109	0.112	0.112
SPA	0.004	0.020	0.079	0.078	0.109	0.098	0.100	0.102	0.100	0.099	0.104	0.114

Table 4.6: Percentage of Producer Price Forecast Variance Attributed to Commodity Price

Country	Forecast Horizon											
	1	2	3	4	5	6	7	8	9	10	11	12
US	0.528	0.499	0.449	0.415	0.360	0.331	0.325	0.322	0.323	0.319	0.315	0.316
UK	0.505	0.696	0.685	0.640	0.580	0.513	0.494	0.488	0.479	0.470	0.463	0.459
JAP	0.233	0.442	0.407	0.346	0.298	0.293	0.280	0.271	0.254	0.240	0.234	0.230
GER	0.559	0.552	0.520	0.488	0.467	0.441	0.434	0.424	0.422	0.421	0.421	0.420
FRA	0.662	0.656	0.603	0.518	0.452	0.443	0.435	0.425	0.408	0.398	0.395	0.394
ITA	0.449	0.455	0.429	0.403	0.398	0.372	0.372	0.360	0.359	0.351	0.345	0.343
SPA	0.487	0.569	0.513	0.437	0.392	0.379	0.363	0.353	0.340	0.337	0.338	0.338

Table 4.7: Percentage of Producer Price Forecast Variance Attributed to Exchange Rate												
Country	Forecast Horizon											
	1	2	3	4	5	6	7	8	9	10	11	12
US	0.007	0.008	0.013	0.012	0.048	0.049	0.047	0.049	0.057	0.056	0.058	0.061
UK	0.014	0.017	0.015	0.014	0.013	0.019	0.021	0.019	0.019	0.020	0.020	0.022
JAP	*0.004*	*0.024*	*0.067*	*0.063*	*0.110*	*0.110*	*0.126*	*0.135*	*0.174*	*0.174*	*0.178*	*0.187*
GER	0.026	0.033	0.032	0.036	0.037	0.032	0.037	0.043	0.043	0.042	0.042	0.043
FRA	0.033	0.031	0.028	0.027	0.034	0.037	0.053	0.069	0.075	0.084	0.084	0.084
ITA	0.087	0.074	0.069	0.069	0.070	0.073	0.071	0.079	0.078	0.085	0.084	0.087
SPA	0.024	0.039	0.035	0.030	0.027	0.032	0.030	0.030	0.046	0.049	0.048	0.049

Table 4.8: Percentage of Producer Price Forecast Variance Attributed to Import Price												
Country	Forecast Horizon											
	1	2	3	4	5	6	7	8	9	10	11	12
US	*0.085*	*0.077*	*0.100*	*0.093*	*0.106*	*0.119*	*0.121*	*0.119*	*0.119*	*0.127*	*0.129*	*0.128*
UK	0.000	0.001	0.001	0.002	0.014	0.025	0.023	0.022	0.021	0.025	0.024	0.023
JAP	0.004	0.008	0.017	0.016	0.032	0.033	0.031	0.032	0.033	0.031	0.034	0.033
GER	0.007	0.013	0.018	0.033	0.036	0.038	0.037	0.036	0.038	0.041	0.041	0.041
FRA	*0.002*	*0.009*	*0.012*	*0.106*	*0.107*	*0.120*	*0.168*	*0.112*	*0.109*	*0.107*	*0.108*	*0.110*
ITA	0.027	0.047	0.045	0.042	0.042	0.041	0.041	0.047	0.047	0.048	0.049	0.054
SPA	0.000	0.005	0.014	0.025	0.024	0.024	0.025	0.033	0.039	0.039	0.039	0.039

Table 4.9: Percentage of Consumer Price Forecast Variance Attributed to Commodity Price												
Country	Forecast Horizon											
	1	2	3	4	5	6	7	8	9	10	11	12
US	0.295	0.410	0.375	0.324	0.290	0.280	0.273	0.270	0.270	0.265	0.261	0.260
UK	0.028	0.069	0.067	0.067	0.074	0.068	0.058	0.093	0.099	0.098	0.100	0.099
JAP	0.004	0.044	0.054	0.088	0.096	0.088	0.084	0.083	0.082	0.082	0.082	0.085
GER	0.113	0.096	0.091	0.111	0.101	0.099	0.101	0.110	0.113	0.113	0.116	0.117
FRA	0.127	0.195	0.188	0.179	0.176	0.202	0.192	0.180	0.174	0.174	0.173	0.170
ITA	0.035	0.139	0.140	0.122	0.108	0.106	0.107	0.107	0.110	0.108	0.108	0.107
SPA	0.252	0.371	0.336	0.285	0.274	0.241	0.227	0.220	0.212	0.204	0.201	0.197

Table 4.10: Percentage of Consumer Price Forecast Variance Attributed to Exchange Rate												
Country	Forecast Horizon											
	1	2	3	4	5	6	7	8	9	10	11	12
US	0.008	0.019	0.026	0.022	0.051	0.057	0.055	0.054	0.057	0.059	0.060	0.060
UK	0.013	0.039	0.046	0.053	0.053	0.059	0.047	0.044	0.044	0.043	0.042	0.045
JAP	0.007	0.008	0.008	0.010	0.012	0.026	0.037	0.046	0.051	0.065	0.063	0.071
GER	0.012	0.020	0.036	0.041	0.047	0.059	0.059	0.058	0.059	0.058	0.058	0.058
FRA	*0.073*	*0.100*	*0.090*	*0.084*	*0.084*	*0.114*	*0.110*	*0.102*	*0.129*	*0.130*	*0.133*	*0.138*
ITA	0.039	0.040	0.041	0.058	0.083	0.080	0.077	0.075	0.080	0.084	0.085	0.088
SPA	0.067	0.106	0.106	0.089	0.090	0.080	0.084	0.082	0.079	0.078	0.077	0.076

Table 4.11: Percentage of Consumer Price Forecast Variance Attributed to Import Price												
Country	Forecast Horizon											
	1	2	3	4	5	6	7	8	9	10	11	12
US	0.045	0.040	0.056	0.052	0.074	0.098	0.103	0.100	0.105	0.120	0.126	0.126
UK	0.022	0.071	0.070	0.092	0.090	0.081	0.100	0.097	0.098	0.097	0.096	0.094
JAP	0.064	0.056	0.051	0.059	0.060	0.076	0.087	0.089	0.087	0.099	0.097	0.097
GER	0.002	0.018	0.038	0.035	0.045	0.055	0.054	0.053	0.055	0.059	0.058	0.058

FRA	0.000	0.001	0.002	0.045	0.046	0.040	0.047	0.042	0.040	0.039	0.039	0.039
ITA	0.013	0.018	0.038	0.033	0.051	0.059	0.067	0.072	0.071	0.071	0.071	0.074
SPA	0.036	0.030	0.078	0.110	0.102	0.092	0.109	0.106	0.101	0.099	0.098	0.099

Table 4.12: Percentage of Consumer Price Forecast Variance Attributed to Producer Price												
Country	Forecast Horizon											
	1	2	3	4	5	6	7	8	9	10	11	12
US	0.206	0.165	0.160	0.152	0.142	0.133	0.129	0.144	0.144	0.140	0.138	0.139
UK	0.082	0.064	0.065	0.062	0.063	0.079	0.072	0.084	0.086	0.084	0.082	0.099
JAP	0.076	0.089	0.087	0.076	0.074	0.100	0.097	0.096	0.100	0.100	0.103	0.102
GER	0.078	0.113	0.110	0.110	0.111	0.106	0.106	0.104	0.107	0.106	0.109	0.108
FRA	0.079	0.065	0.097	0.087	0.088	0.075	0.071	0.066	0.063	0.063	0.062	0.063
ITA	0.001	0.065	0.118	0.102	0.133	0.138	0.133	0.132	0.132	0.130	0.130	0.129
SPA	0.015	0.010	0.019	0.036	0.033	0.042	0.040	0.039	0.037	0.039	0.039	0.038

The examination of the Var results has pointed out the same scenario of the single equation approach. There is a clear evidence of a very limited linkage between domestic inflations and external factors in the countries I studied. Moreover, the linkage weakens step by step along the distribution chain. Summing up, the econometric analysis is in line with the findings I drew with the Warp approach.

3 Global conclusions

This twofold analysis has pointed out some important features.

- The first part of this paper (*the WARP approach*) highlights the difference between the traditional measures of the multilateral real exchange rate and the measures elaborated through the WARP methodology. This difference is present in all the four areas I have analysed (the Euro Area, the UK, the US and Japan) and it means that the domestic prices of these zones have been more appreciated than the standard measures indicate. This result is linked with the growth of the trade flows from/to the developing countries. But the WARP approach is useful to observe another phenomenon: the domestic prices of the four areas I have analysed did not decrease in consequence of the deflationary forces. The result is that the exchange rate using price levels is situated above the exchange rate that employs price indices. This difference is due to the fact that the positive effects of cheap imports did not have a relevant impact on the domestic prices. There has not been a rebalancing of the relative prices. This situation is different from the one we observed during the first globalization: in that period the domestic prices of the developed countries, such as the US and the UK, went down. So, the WARP approach leads us to conclude that during the last years the pass-through effect has been very light or absent.

- In order to support this finding with some econometric results I studied the pass-through effect in seven nations with both a single equation and a VAR approach. In this way it is possible to gauge the strength of the linkage between the exchange rate fluctuations, the import prices trend and the consumer prices. The results analysed in the second part of the paper confirm the WARP scenario. That is, the consumer prices have not been influenced by the exchange rate movements and by the import prices course. So the traditional pass-through effect reveals a situation in line with the WARP-REER comparison. The pass-through is very light or totally absent. This means that the domestic prices are somewhat isolated from external turbulences. This is a positive feature when the policy makers are obliged to make the exchange rate freely fluctuate, but during the last years this characteristic has not been so positive for the consumers purchasing power. Indeed, if the pass-through had been stronger, the domestic prices would have been affected in a deeper way and the final effects would have been a lower level of the consumer prices and an improved purchasing power. There is an econometric result that is interesting: the UK is the unique country in which the pass-through effect is significant in all the stages of the single equation approach with a somewhat remarkable amplitude and, at the same time, the difference between the WARP and the REER is the lowest in the UK among the four analysed areas. So, as one could expect, the WARP is more similar to the REER where the pass-through is still alive. This means that the domestic prices experienced the positive impact of globalization and, at the end, that this process favoured the consumers. In this framework, the role of the firms is fundamental. And the suspect that emerges from this analysis is that the pass-through effect has been strongly influenced by the firms' behaviour. The econometric and the Warp results together with the data showed in figure 4.5 support the hypothesis of a prominent role of the firms in dampening the relationship between external factors and domestic inflations. But, in so doing, the firms kept for themselves a large part of the positive aspects of the globalization. That is, during the last years we observe a redistribution of the wealth from consumers to firms.

Table 4.13 Test Phillips Perron (with constant, no trend). January 1999 - June 2008. H0: unit root			
Time series	Test PP	Time series	Test PP
US commodity price	-9.541***	US import price	-7.718***
Ger commodity price	-8.789***	Ger import price	-13.258***
Fra commodity price	-8.789***	Fra import price	-12.481***
Ita commodity price	-8.789***	Ita import price	-10.187***
Spa commodity price	-8.789***	Spa import price	-16.623***
UK commodity price	-9.663***	Uk import price	-10.881***
Jp commodity price	-9.758***	Jap import price	-10.089***
Indprod US	-10.846***	US producer price	-8.786***
H.P. indprod US	-2.895**	Ger producer price	-9.047***
Indprod GER	-27.939***	FRA producer price	-7.955***
H.P. indprod GER	-10.842***	ITA producer price	-6.866***
Indprod Fra	-36.404***	SPA producer price	-5.978***
H.P. indprod FRA	-16.219***	UK producer price	-5.533***
Indprod ITA	-40.029***	JAP producer price	-6.151***
H.P. indprod ITA	-18.947***	US consumer price	-6.091***
Indprod SPA	-38.411***	GER consumer price	-17.050***
H.P. indprod SPA	-14.818***	FRA consumer price	-10.099***
Indprod UK	-32.791	ITA consumer price	-9.244***
H.P. indprod UK	-10.342***	SPA consumer price	-8.603***
Indprod JAP	-13.982***	UK consumer price	-11.773***
H.P. indprod JAP	-2.946**	JAP consumer price	-10.203***
NEER US 41	-8.267***	OECD producer price	-6.906***
NEER GER 41	-7.577***	US dtd rate	-5.080***
NEER FRA 41	-7.596***	Ger-Fra-Ita-Spa dtd rate	-9.058***
NEER ITA 41	-7.599***	Uk dtd rate	-16.536***
NEER SPA 41	-7.591***	Jap dtd rate	-11.592***
NEER UK 41	-10.121***		
NEER JAP 41	-9.683***		

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