External Imbalances in the European Union and International Fragmentation of Production: Is There a Link?*

Isabella Cingolani [†] Giulia Felice [‡] Lucia Tajoli [§]

January 2015
Comments most welcome.

Abstract

In this paper we assess whether the expansion of international fragmentation of production (IFP) and the creation of production linkages among European countries contribute to the persistent trade imbalances registered within the European Union (EU) area in the past decade. Exporting intermediate and semi-finished goods and re-importing finished and assembled goods can give rise to a trade deficit (both in gross terms and in value added terms), but such international re-organization of production allows countries to improve

*The authors thank for the useful comments received the participants to seminars and conferences in which previous versions of the paper were presented, among which are the Department of Economics, Univ. Carlos III de Madrid (2014), Department of Economic Theory, Universidad de Barcelona (2014), Department of Applied Economics, Univ. Complutense de Madrid (2015), ETSG (Birmingham, 2013), ITSG (Fiesole, EUI, 2013), XXVI Villa Mondragone International Economic Seminar (Rome, 2014), ERSA (Saint Petersburg, 2014), IAES (Madrid, 2014), 'Explaining Economic Change' workshop (Rome, 2014). The authors wish to thank financial support from FARB Politecnico di Milano 2011. Giulia Felice gratefully acknowledges financial assistance from the Marie Curie IEF project (N. PIEF-GA-2012-329153) funded by the European Commission under the Seventh Framework Programme. The usual disclaimer applies.

[†]Dipartimento di Ingegneria Gestionale, Politecnico di Milano - piazza Leonardo da Vinci 32, Milano 20133, Italy. +390223992752. isabella.cingolani@polimi.it

[‡]Department of Economics, Universidad Carlos III de Madrid and Centro Studi Luca d'Agliano. gfelice@eco.uc3m.es

[§]Dipartimento di Ingegneria Gestionale, Politecnico di Milano - piazza Leonardo da Vinci 32, Milano 20133, Italy. +390223992752. lucia.tajoli@polimi.it.

their efficiency and competitiveness (both in terms of cost reduction and higher quality of goods) and to gain access to new export markets. The net effect on the trade balances is therefore ambiguous. We test empirically the sign of this effect, using the recently released WIOD database on international production linkages. We find that the current account in EU countries worsens the higher the offshoring to low-income partners. By contrast, the current account improves by offshoring to high-income partners. This asymmetry suggests that when countries offshore to high-income partners the gains in competitiveness overcome the potentially negative effect of importing intermediate inputs.

KEYWORDS: Trade balances, offshoring, European Union.

JEL CLASSIFICATION: F14, F15, F62.

1 Introduction

The rapid increase of international trade in intermediate and semi-finished goods in the past twenty years has been studied extensively in the international trade literature in order to understand how the shift from trade in final goods to this "vertical trade" affected trade patterns and specialization of countries (see for example Deardorff, 2001; Hummels et al. 2001; Yi, 2003). Intermediate goods are estimated today to account for over half of total goods' trade and over two thirds of services' trade (Miroudot and Ragousiss, 2009). The growing relevance of trade in intermediate goods is directly related to the expansion of the international fragmentation of production (IFP), or the development of international production chains stretching across different countries, where the various production phases and the creation of value added for a given final good is taking place in different locations. This phenomenon, initially studied especially for the U.S., has become increasingly relevant also for the European Union (EU), affecting both extra-EU and intra-EU trade relations (Egger and Egger, 2005; Baldone et. al, 2007). In particular, both the deep integration process that accompanied the introduction of the single European currency and the enlargement of the EU to the Central and Eastern European Countries (CEECs) fostered the integration of production processes across the EU, giving rise to extensive intra-European production chains.

IFP and the high share of intermediate goods on overall trade flows lead scholars to partially revise the traditional measures of trade flows across countries and the related indexes of comparative advantage (Deardorff, 2005, Baldone et. al, 2007, Stehrer, 2012, Koopman et al., 2014), while generally less attention has been devoted to the implications of this type of trade for countries' trade balances. The macroeconomic effects of IFP started to be discussed only recently in the international economics literature, prompted by the widening trade imbalances and sharp trade fluctuations registered before and during the global crisis (Escaith and Gonguet, 2009, Escaith et al., 2010, Levchenko et al. 2010, Gopinath and Neiman, 2011, Falzoni and Tajoli, 2015). But the extent and form of participation of a country to the global value chain might affect the amount of its exports and imports well beyond the business cycle effects, thereby affecting its trade balance. As awareness of the growing impact of IFP on trade flows, and thereby on trade balances, grew, some international projects (WIOD, OECD-WTO, GTAP, UNCTAD, IDE-JETRO) begun to develop specific measures of trade balances in terms of value added, now available for a subset of countries.

For over a decade, macroeconomic data showed a large and widening increase in the current account imbalances all over the world, as if some

structural global change had occurred. The problem was exacerbated right before the burst of the 2008 crisis when some countries' balances had become a reason of serious concern. The issue might play a role also for the European countries. As the financial tensions affected more seriously the EU countries, it became apparent that one of the dimensions of the EU problems is the persistent difference in its members' trade balances. In fact, while the EU as a whole *vis-a-vis* the rest of the world has a nearly balanced trade, its member states appear quite differentiated in this respect (Guerrieri and Esposito, 2012).

The aim of this paper is to explore the possible relationship between these persistent trade imbalances of the EU countries and the expansion of the phenomenon of IFP within Europe. There is no clear *a priori* effect of IFP on a country trade balance, and casual observation of the EU countries' trade balances confirms that a definite pattern does not emerge. On the one hand, considering a specific country pair in the global value chain, exporting intermediate and semi-finished goods and re-importing finished and assembled goods can give rise to a trade deficit (both in gross terms and in value added terms, but with different magnitudes) for the country in the upstream parts of the international production chain, while it can originate a trade surplus for downstream countries. On the other hand, if this international re-organization of production allows countries to improve their competitiveness and to gain access (even indirectly) to new export markets, the effect on trade balances can be positive.

This competitiveness channel can develop along different lines. Higher competitiveness through IFP can be reached through cost and, therefore, price reduction (Deardorff, 2001; Baldone et al., 2002); it can arise through technological improvements or factors' productivity enhancement (Grossman and Rossi-Hansberg, 2008) and the quality of intermediate inputs and components from abroad incorporated in a country's final product. Several recent contributions have highlighted the link between the quality of inputs and the quality of output and the role of non-price competitiveness in countries' external performance (Verhoogen, 2008; Kugler and Verhoogen, 2012).

A country's involvement and position in the global value chain can be related to its external position also through income effects. IFP can affect both the within and the between countries income distribution depending on a country's position in the global value chain and the tasks offshored (Grossman and Rossi-Hansberg, 2008; Costinot et al., 2012, 2013; Timmer et al., 2013, 2014), with ambiguous consequences on the current account. Moreover, it typically affects the income distribution among different sources of income which may have different saving and consumption behaviour, again with ambiguous implications on the current account.

The sign and magnitude of the effects of IFP on current accounts are therefore open to empirical investigation. Using two indicators of a country's participation to the global value chain, the Feenstra and Hanson (2006) offshoring indicator, and the share of foreign value added in a country's gross export recently proposed by Koopman et al. (2014), computed from the World Input-Output Database (WIOD), we employ an empirical model of medium-term current account determinants along the line of Lane and Milesi-Ferretti (2012) in order to explore the relationship between participation in the global value chains and current account position for the EU countries. Our results show that the involvement of a country in IFP can indeed affect its trade balances, also through the presence of a pro-competitiveness effect. But the sign of this relationship crucially depends on the type and source of offshoring. In particular, we find that offshoring to low-income/low-product (high-income/high-product) quality partners is negatively (positively) related with a country's current account. We also show that this result is especially relevant for the EU new member countries, suggesting that both the quality of the domestic demand and the segment of competition (low vs. high quality) in the foreign market matter.

This paper is related to three main streams of literature. It contributes to the literature investigating medium term determinants of current account imbalances within the EU (see Section 2), by investigating the role of a country's participation in the IFP as a potential determinant of its external position. It contributes to the stream of literature recently emerged on indexes of countries' involvement in the global value chain by looking at its implications on the aggregate external position. The contributions belonging to this already large stream of literature provide new sophisticated indicators, new data and conceptual categories on the IFP showing several stylized facts on trade specialization patterns highlighting the difference in gross and net terms, factor income flows' dynamics and patterns across countries, patterns of foreign and domestic value added content in gross export and production (Antras et al., 2012; Daudin et al., 2011; Johnson-Noguera, 2012; Timmer et al., 2013, 2014; Stehrer, 2012; Koopman et al., 2014). Recently, Johnson (2014) underlines the relevance of the value-added view of trade with respect to adjustment of trade imbalances, by changing the size of the required real exchange rate change; along the same line, Bems (2014) shows that traditional multi-sector macro model generate different predictions regarding the relative price response to external rebalancing when calibrated by using gross-flow trade data instead of value added trade data. Last but not least our paper contributes to the fast growing literature on non-price competitiveness and the role of quality in international trade (among the others, Flam and Helpman, 1987; Falvey and Kierzkowski, 1987; Hallak, 2006; Verhoogen,

2008; Feenstra and Romalis, 2012), explicitly considering the role of inputs quality in assessing the effects of a country's participation in IFP. To the best of our knowledge, our contribution represents an original attempt to investigate the relationship between different indicators of IFP and the current account, in particular by focusing on EU countries and differentiating by partners in the offshoring relationship.

The structure of the paper is as follows. The next section illustrates some descriptive evidence of trade balances and offshoring in the EU. Section 3 reports our empirical estimation of the relationship between offshoring and current account balances. Section 4 concludes.

2 Trade balances and offshoring in the EU

As mentioned, in the years before the global financial crisis, the EU as a whole has remained relatively close to external balance, while the current account (CA) balances and the competitive positions of individual member countries have widely diverged. After the introduction of the Euro (2002-2007) and before the crisis, Figures 1 and 2 show a clear divide in the Euro area between surplus-Northern countries and deficit-Southern/Eastern countries. In particular, it is worth noting that the scale and persistence of the imbalances was increasing and greater than in earlier decades (see Fig. 2). With the slowdown of the EU economies following the international financial crisis, some signs of rebalancing are appearing (see Fig. 3).

This pattern of imbalances within the euro area and its persistence have been explained by "traditional" macroeconomic factors (Guillemette and Turner, 2013). But these explanations are only part of the story, and also some other components might play a role. As discussed by Chen et al. (2012), the two main explanations refer to the rising financial integration among euro area countries that increased financial flows toward the area debtor countries, and to wage and price rigidities of this same group of countries. Both effects brought about a significant real effective exchange rate appreciation in many Southern countries (even if to a different extent). Therefore, the external divergence is directly related to a steady widening of differences in the competitive positions of the two groups of countries (see also Coudert et. al., 2013, Belke and Dreger, 2013). However, Chen et al. (2012) show that trade and financial flows between the euro area countries and the rest of the world also played an important role in explaining the different external imbalances, as the impact of trade developments with countries outside the euro area has been highly asymmetric. For example, the effects of Chinese competition or of integration with Central and Easter Europe have been quite different,

because of the different models of specialization of the European countries (see also Dieppe et al., 2012).[1]

Our analysis moves precisely from these considerations, looking at one specific asymmetry in the international trade linkages of European countries, their involvement in the international fragmentation of production and in global value chains, which impacts directly on countries' international position and competitiveness. Here we first measure each country's level of IFP using a variation of the index that has become standard in the literature, the 'narrow offshoring' index.[2] The aggregate offshoring index is given by the following expression:

$$OFFIND_{it} = \frac{\sum_j \sum_s import^i_{js}}{\sum_j input^i_j} \tag{1}$$

where i is the reporting country (in our case, a member state of the EU), t is time, s is the partner from which a country imports intermediate goods, j is a country's intermediate goods sector.

The data used to build our measure of IFP (or intermediate goods trade) come from the WIOD recently released within a project founded by the Seventh Framework Programme of the European Commission. The database is built on national accounts statistics, national Input-Output tables and national Supply-Use tables for 40 countries (among which the EU27 countries), for the period 1995-2011. In particular, it provides domestic and international input-output flows at two digit-industries.[3] Even if imperfect, this measure is considered a good starting point to assess a country's involvement in the global value chain.[4]

[1] Even less traditional analysis of CA imbalances in the euro area consider the issue of the relative competitiveness of countries as a crucial one. See Collignon, 2013. Another explanation of within EU current account imbalances which is worth mentioning is the allocation of resources toward non-tradable sectors (housing boom) highlighted by Giavazzi and Spaventa, 2010.

[2] This index is based on the so called 'narrow offshoring', commonly used in the literature to measure the weight of imported intermediate inputs belonging to sector j and employed for production in the same sector, originally introduced by Feenstra and Hanson (1996), and subsequently improved thanks to the use of input-output tables for imports. We take the aggregate measure by summing up by sectors and by partners, so that our numerator is the sum of the value of all intermediate goods imported by all intermediate goods' sectors of country i from all sectors of all partners' country s (including the Rest of the World aggregate), while at the denominator we have the total value of all intermediate inputs used in production in all sectors of country i.

[3] For a detailed description of the dataset, see Stehrer, 2012.

[4] One aspect that this index does not allow to capture is the upstream or downstream position of a country in the production chain, which might be relevant in affecting its overall international position. See Antras et al., 2012.

As shown in Table 1, the offshoring index presents relevant variations across EU members. The different values of the index can be the result of a combination of factors: the extent of international fragmentation of production used by local firms and the involvement of a country in international production chains, the position of a country within such international production chains, and the dependence of its manufacturing system on imported inputs. Therefore these indexes should be interpreted with caution. In any case, the level of IFP measured through this index appears to be sizeable for all the EU countries, being on average about 30% and with a slight increasing trend over the past decade for most countries. Table 1 also reports the offshoring index computed using intermediate inputs imported only from high income countries (most of them European), and only from low income countries.[5] It appears that for the EU countries in our sample, intermediate inputs are imported mainly from high income countries, but the relative importance of the two groups also varies.

This general observation on the relevance of IFP for the European countries is substantiated by the second indicator we used to assess this phenomenon. The availability of input-output tables allowing to separate the use of domestic and imported intermediate inputs in production makes possible to compute the domestic and foreign contribution to value added in final goods (see Koopman et al., 2014). According to Johnson (2014) and Bems (2014) trade flows measured in gross and value added terms could be differently related to the external position of a country. Following this intuition, by using the WIOD database and following Koopman's methodology, we decomposed domestic and foreign value added in EU countries' gross exports.[6] The results of this decomposition are reported in Table 2. Confirming what is already apparent in the offshoring indexes, also the foreign value added content of gross exports (FVA) shows high variations across countries, and the change over time did not follow the same trend for each country: Italy and Germany experienced a strong growth in the foreign content of exports, while countries like Greece and Portugal experienced a reduction. The share of foreign value added in export is unsurprisingly very high especially for the smaller EU countries, but it is close to one fourth or one fifth also for the largest EU members. Overall the foreign value added content of the Euro area exports was above 20% in the last years. This indicator is correlated with the offshoring index, but it should convey more precise information on the involvement in global value chains, being computed specifically on

[5]The sum of the offshoring index from the two groups does not coincide with the total index of offshoring, as in the WIOD database a share of imported inputs does not have a defined geographical origin and it comes from the "rest of the world". See the Appendix.

[6]see Appendix 5.2.

exports and taking into account re-imports.

Recent analyses using similar decomposition techniques show that the involvement of European countries in international production chains remains quite strong at the European regional level (Amador et al., 2013). On average, well over 10% of the value added in exports of a euro area country is originated in another euro area country, and the share increases to over 15% considering value added coming from all EU members. For euro area countries, in the past decade supply linkages within the euro area maintained their relative importance, with little geographic re-orientation toward other parts of the world.

These strong intra- and extra-EU production linkages have certainly affected import and export flows of EU countries and their trade balance. Countries' international competitiveness, in addition to macroeconomic factors, is in fact strictly related to countries' specialization and to the organization of production. IFP, by affecting the organization of production (Grossman and Rossi-Hansberg, 2008; Timmer et al., 2013), can certainly affect competitiveness, both through direct cost effects (Baldone et al., 2002), or through productivity effects (Olsen, 2006). This is why we proceed to analyze the relationship between CA balance and IFP.

3 Estimating the relationship between offshoring and trade balances

3.1 The empirical framework

We use two sources of data. As mentioned, our measures of international fragmentation of production are based on the WIOD Database recently released, and they are the indexes described in the previous section. In the first set of regressions, we have considered an aggregate index of offshoring for each EU27 reporting country, so the index is given by the ratio of the total value of intermediate goods imported by all sectors of country i from all partners s, i.e. the total value of intermediate goods imported by country i, over the total use of intermediate goods by country i at time t. Since we are interested in the relationship between a country's involvement in the global value chain — proxied by the offshoring index — and a country's current account balance, we also need data on macroeconomic variables for the EU countries to estimate a standard model of current account determination, and we use national accounting data provided by Eurostat. We focus on the EU27 countries for the period 1999–2011.

As a first step, we consider a standard empirical model of current account determination (see, for instance, Lane and Milesi-Ferretti, 2012). The following empirical specification is considered

$$\mathsf{CA_{it}} = a_0 + a_2 \mathsf{X_{it}} + u_{it} \tag{2}$$

where the dependent variable is the country i current account balance in goods and services[7] at time t expressed as the ratio to GDP and X_{it} is a vector of explanatory variables. We follow the literature on current account determination (Lane and Milesi-Ferretti, 2012, Ca' Zorzi, Chudik, Dieppe, 2012) in considering the following potential determinants of current accounts:

- as for demographic variables, we consider the total population and the population growth rate, which is expected to have a negative sign as a positive demographic trend tends to increase aggregate consumption in the short run; we also include the old-age dependency ratio as the ratio of people older than 65 years over the population aged between 15 and 64, the sign of which is also expected to be negative since a country with a relatively high share of economically dependent population is expected to have a lower level of national saving, and therefore a lower CA balance;

- fiscal balance, as a percentage of GDP; several recent models show potential mechanisms through which a departure from the Ricardian equivalence is possible and predict a positive relationship between government budget balances and current account in the medium term, e.g. the 'twin deficits' idea;[8]

- real GDP's growth rate, capturing catching up factors, is usually expected to have a negative sign, since the higher the real GDP growth, the higher the income expected in the future, and the higher the current consumption;

- income per capita, measured as GDP in Purchasing Power Standard (PPS) per inhabitant, again capturing catching up factors. This variable is expected to have a positive relationship with the CA balance

[7] In our sample, the current account balance in goods and services is highly correlated with the total current account, but for our purposes, considering trade in goods and services only provides a better indicator of a country's external position. In the rest of the paper, by current account we mean the current account in goods and services. Nevertheless, the results for the total current account including income flows and transfers are very similar to the ones presented and they are available from the authors upon request.

[8] See also Florio and Ghiani (2015) on this point.

since the lower the income per capita the larger the current account deficits expected in the catching up process;

- investment, i.e., gross capital formation as a share of GDP, is usually expected to be negatively associated with the CA balance since the higher the current investment the higher the growth rate expected in the future, on the one hand, and the higher the current demand, on the other hand, both factors worsening the CA balance;

- real effective exchange rate (lagged) as a measure of a country's competitiveness is expected to have a positive relationship with the CA balance (the sign of the coefficient should be negative in our case, given the adopted definition of the exchange rate);

- net foreign assets (expressed as a share of the GDP, lagged), which according to the literature should have a negative sign: the higher the foreign debt (the lower the NFA) the better should be the current account in the following period;

- energy products balance (values of net export of energy products [9] as a share of GDP) is usually expected to have a positive relationship with the CA balance.

In the second step, we include in the model the offshoring index as computed in equation (1) or the FVA measure to check the relationship between a country's current account over GDP and its involvement in the global value chain, and if such a relationship is robust to the inclusion of all the regressors usually considered as the main determinants of current account balances, i.e., the regressors considered in equation (2) listed above. We then run the following regression

$$\mathsf{CA}_{\mathsf{it}} = a_0 + a_1 \mathsf{OFFIND}_{\mathsf{it}} + a_2 \mathsf{X}_{\mathsf{it}} + u_{it} \tag{3}$$

where the dependent variable is, as in equation (2), the country i's CA balance at time t expressed as a ratio to GDP, X_{it} is the vector of explanatory variables as in equation (2) and $OFFIND_{it}$ is our measure of international fragmentation of production. As anticipated in the introduction, there is no a priori expected sign for the offshoring variable, as a country's participation in the global value chain could have different effects on the current account,

[9] We use the aggregated group G27 — Mineral Fuels, Mineral Oils and Products of their distillation; Bituminous substances; mineral waxes.

namely a re-importing effect, potentially negatively related with the current account, and a competitiveness-enhancing effect, potentially positively related with the current account.

Going a step further, should a competitive effect be at work, then the characteristics of the partner where offshoring takes place should also matter. To investigate this aspect, in the third step, we split the partners of a country in its international vertical relationships according to their product quality. The higher is the partners' product quality, the higher should be the quality of imported intermediate inputs, and therefore the higher the quality of final goods produced by a country (Kugler-Verhoogen, 2012; Crinó and Colantone, 2013), which will in turn positively affect its competitiveness.

The first measure that we use to proxy the product quality of the partners is an indirect one, i.e., the income per capita, following previous contributions according to which income per capita is positively related with the quality of goods produced, consumed and exported by a country (Verhoogen, 2008, Epifani and Crinó, 2012). We split the partners according to the GDP per capita in PPP in 1998 (Source: IMF). Still, buying intermediate goods from a low-income partner may not always necessarily mean buying low-quality intermediate goods; for instance, within a specific set up of the global value chain, upstream countries could find convenient to buy intermediate goods in low-income countries, by providing knowledge, information and materials in order upgrade the quality of intermediate goods. More generally, there might always be sectoral niches and/or skills, also in low-income countries which enable them to produce high-quality goods. Therefore, we also consider an alternative 'direct' measure of a country's product quality recently provided by Hallak and Shott (2010), the 'normalized quality index', and we rank the partners according to this index in 1998, to reduce potential endogeneity issues. As underlined by Hallak and Shott (2010), the overlapping in the countries' rankings based on their normalized quality index' and on the income per capita is only partial, and therefore it makes sense to use both indicators.[10]

We build two groups of countries, low- and high-, taking median value of the GDP per capita and the normalized quality index in 1998.[11] This way we build six new variables on the basis of the type of partners in offshoring. Offind-LI, i.e., offshoring to low-income partners, Offind-LQ, i.e.,

[10]Another reason why we choose to rely on both the rankings is that in both cases some countries are excluded from the partners splitting, and enter a residual group, because non-overlapping with the WIOD data (see Appendix 5.1). By using two indicators we are more comfortable in claiming that results do not depend on the residual group.

[11]For robustness, we have carried out our analysis also considering 2003, and results do not change.

offshoring to low 'product quality' partners, Offind-HI, i.e., offshoring to high-income partners, Offind-HQ, i.e., offshoring to high 'product quality' partners, Offind-res, i.e., which represent the offshoring to a group of partners which is residual, not classified, in the two rankings. We report in the Appendix (5.1) the list of countries belonging to each group. In order to check the robustness of our results, we carry out the analysis above by using the index resulting from our decomposition of value added in export, specifically the share of foreign value added in export, both aggregate and split according to the origin of the imported intermediate inputs (Appendix 5.2).

Finally, if a competitiveness effect is at work, the quality of the domestic market and the segment where a country competes in the foreign market should also matter. Therefore, we carry out the above analysis on two subsamples of countries: EU13 (mature economies) and New EU Member States. The results are presented in the next section.

3.2 Results

In Column 1 of Table 3, we analyse the main macroeconomic determinants of the CA balances in goods and services for the EU27 countries over the period 1999-2011, by carrying out the estimation of the model in equation (2), with country and time fixed effects included.[12] Our results show that investment, population (both stock and growth), and net foreign assets are significantly and negatively related to EU countries' current accounts as expected, while fiscal balance and income per capita are positively related to the CA.[13] These results are in line with what is expected according to the previous literature, as reported in the Section 3.1, and in general they fit well a catching up explanation of external imbalances (Obstefeld and Rogoff, 2007).

In Column 2 we show the estimates of model (3), where we also include among the current account determinants our main variable of interest, i.e. the offshoring index in equation (1). The main results reported for the estimation of the previous model still hold. The relationship of the offshoring index with the current account balances observed in model (3) is not significant. This is still the case in Column 3, reporting the results of our preferred specification, where we estimate model (3) by accounting for both time and spatial correlation in the error terms, by correcting standard errors following

[12]Hausman's specification test has been run rejecting the null hypothesis; therefore we rely on the FE specification.

[13]Our analysis, by including country fixed effects, is exploiting within-country (over time) variability, which is likely to be low for the group of EU27 countries in the period considered, especially compared to larger sample cross-country analyses. This may explain why some of the determinants of current account are not significant in our results.

Driscoll and Kraay (1998).[14] This is particularly relevant since we are considering EU27 countries which in the decade considered have been involved in a process of economic and policy integration. As for our main variable of interest, i.e. the offshoring index, is still insignificant.

This result changes when we include the offshoring indexes split according to the type of partners. As mentioned in the section above we split the partners according to their product quality level proxied by two different indexes: the GDP per capita and a more sophisticated measure of a country's product quality, the 'normalized quality index' recently introduced by Hallak and Shott (2010). In both cases we rank countries with respect to the median value in 1998, which allows the countries' ranking to be exogenous with respect to our analysis, starting in 1999.

In Column 1 of Table 4, countries are split according to the first index of quality, i.e., GDP per capita. Our variables of interest are offind-LI and offind-HI, their coefficients capturing the different effect on the current account of offshoring to low-income partners / high-income partners with respect to using input produced domestically. In Column 2 of Table 4, countries are split according to the Hallak and Shott (2010) index of quality. In this case our variables of interest are offind-LQ and offind-HQ, their coefficients capturing the different effect on the current account of offshoring to low-product quality partners / high-product quality partners with respect to using input produced domestically.

In both cases the indexes turn out to be significant, at the 1% level, with a negative sign and a positive sign when offshoring to low-income/low-product quality partners and offshoring to high-income/high-product quality partners, respectively, are taken into account. In terms of magnitudes, the coefficient if much larger in the negative relationship than in the positive one. The relationship is robust to the inclusion of all the medium-term determinants of CA considered in the literature, comprising income effects (controlled for by per capita GDP) and price competitiveness (captured by lagged REER). This suggests that offshoring is producing some significant additional effects.

The negative sign of offshoring to low-income/low-product quality countries may be capturing the fact that when countries offshore to low-income/low-product quality partners the accounting effect overcomes the competitiveness effect, the latter being weakened by a lower quality of final goods incorporating lower quality inputs (Kugler-Verhoogen, 2012, Crinó and Colantone, 2013).

The opposite happens when countries offshore to high-income/high-product

[14] Driscoll and Kraay standard errors are also robust to heteroschedasticity.

quality partners. In this case the competitiveness effect prevails.

Instead, the overall offshoring index computed aggregating all the partners to which a country offshores, was not significant owing to offshoring having opposite effects according to the 'quality' of the country of destination.

In Table 5 we present the results when the analysis is carried out considering as the main variable of interest the foreign value added content of a country's export, for all partners (Column 1), and split by type of partner (Column 2 and 3).[15] The results are aligned with the ones obtained considering the offshoring index (Table 4,): the overall measure of foreign value added in a country's export is not significant (Column 1) while if foreign value added origins from a low income/low-product quality partner it significantly and negatively affects the CA (Table 5, Column 2 and Column 3, respectively). Differently from the results obtained with the offshoring index, in this case the relationship between foreign value added from a high income/high-product quality partner with the current account is positive but not significant.

In order to further test the 'competitiveness effect' related to IFP, we estimate the same model over the sub-sample of Central and Eastern EU countries and EU 'advanced' countries, by considering both the offshoring index (Table 6, and the foreign value added index, Table 7). We expect the effect to be larger in countries where the domestic market is more likely to absorb lower quality goods and in countries trading mostly in the low quality segment of the foreign markets.

When considering the sub-samples NMSs and EU13 the results for offshoring (Table 6) and foreign valued added (Table 7) are still aligned. Interestingly enough, among the NMSs, both offshoring and incorporating foreign valued added from low-income/low-product quality partners significantly and negatively affect the CA. On the other side, among the EU13 the relationship is not significant. By contrast, among the EU13, both offshoring and incorporating foreign valued added from high-income/high-product quality partners significantly and positively affect the CA, while among the NMSs the relationship is not significant. These results suggest that the quality of domestic demand and production matter as well. Since NMSs buy and sell more than the EU-13 in the low-quality segment of the foreign markets, the negative effect of producing low-quality goods is more relevant in NMSs than in EU13.

[15] The estimation method of model (3) with this new specification is the same as in Column 3 of Table 3 and in Column 1 and 2 of Table 4.

4 Conclusion

In this paper we make a first attempt to explore the potential relationship between the current account imbalances of the EU countries and the expansion of the phenomenon of the international fragmentation of production within Europe. We build two indicators of countries' involvement in IFP and in global value chains: an offshoring index, and the share of foreign value added in gross exports, both obtained from the WIOD database. We use these indicators to test empirically this relationship for the EU countries in the period 1999-2011.

Our results show that indeed IFP is a relevant component of EU countries' CA. The CA in EU countries worsens the higher the offshoring to low-income/low-product quality countries, i.e. the lower the production using high quality inputs. This evidence suggests that the potentially negative effect of importing intermediate inputs on the current account is not compensated by the potentially positive effect of gaining competitiveness by offshoring when countries import low-quality inputs. On the other side, the CA improves the higher the offshoring to high-income/high-product quality countries, suggesting that incorporating in production high quality imported inputs allows the competitiveness channel to prevail.

Our results are robust to the inclusion of standard medium term CA determinants, to different indicators of IFP, to different rankings based on different countries' product quality indexes, and are not driven by outliers (countries, years, partners).

In particular, results are not symmetric for EU-NMSs and EU-13. The negative relationship between CA and offshoring to low-income/low-product quality countries holds for EU-NMSs, but not for EU-13, suggesting that both domestic demand's quality and the segment of competition (low vs. high quality)in the foreign markets matter. By contrast, the positive relationship between CA and offshoring to high-income/high-product quality countries holds for EU-13, but not for EU-NMSs.

As a general conclusion our results suggest that a country's involvement in the global value chain negatively affects its external position only if the country buys from 'low-product quality' partners. Otherwise the net effect is positive.

From a policy perspective we could conclude that what is relevant is the ability of a country to enhance its competitiveness through offshoring by 'selecting' the right type of partners, which probably is also driven by the determinants of offshoring, i.e. learning from partners, importing technology and knowledge versus pure cost saving. It is worth noting nevertheless that additional considerations are needed to evaluate the overall welfare effects of

offshoring, as the effects on a country's external position are only a part of the consequences of this phenomenon.

References

[1] Amador, J., Stehrer, R., R. Cappariello, (2013). "Global Value Chains: A View from the Euro Area". Mimeo.

[2] Antras, P., Chor, D., Fally, T., R. Hillberry, (2012). "Measuring Upstreamness of Production in Trade Flows", American Economic Review Paper and Proceedings, 102 (3), 412-416.

[3] Baldone, S., Sdogati, F., L. Tajoli, (2002). "Moving to Central-Eastern Europe: Fragmentation of Production and Competitiveness of the European Textile and Apparel Industry", Rivista di Politica Economica, 92(1), 209-282.

[4] Baldone, S., Sdogati, F., L. Tajoli, (2007). "On Some Effects of International Fragmentation of Production on Comparative Advantages, Trade Flows and Income of Countries", The World Economy, 30 (11), 1726-1779.

[5] Belke, A. and C. Dreger, (2013). "Current Account Imbalances in the Euro Area: Does Catching up Explain the Development?", Review of International Economics, 21(1), 617.

[6] Beltramello, A., De Backer K., Moussiegt L., (2012). "The export performance of countries within Global Value Chains (GVCs)", OECD Science, Technology and Industry Working Papers, 2012/02, OECD Publishing.

[7] Bems, R., (2014). "Intermediate Inputs, External Rebalancing and Relative Price Adjustment", Journal of International Economics, forthcoming.

[8] Ca' Zorzi, M., Chudik, A., and A. Dieppe, (2012). "Thousands of Models, one story. Current account imbalances in the global economy", ECB Working Paper Series, N 1441.

[9] Chen, R., Milesi-Ferretti G.-M., and T. Tressel, (2012). "External imbalances in the Euro Area", IMF Working Paper WP/12/236.

[10] Colantone, I. and R. Crinó, (2014). "New Imported Inputs, New Domestic Products", Journal of International Economics, 92(1), pp. 147-165.

[11] Collignon, S., (2013). "Macroeconomic imbalances and competitiveness in the Euro Area", Transfer: European Review of Labour and Research, 19 (1), 63-87.

[12] Costinot, A., Vogel, J. and S. Wang, (2013). "An Elementary Theory of Global Supply Chain", Review of Economic Studies, 80, 109144.

[13] V. Coudert, Couharde, C. and V. Mignon, (2013). "On Currency Misalignments within the Euro Area", Review of International Economics, 21(1), 3548.

[14] Crinó, R. and P. Epifani, (2012). "Productivity, Quality and Export Behavior", Economic Journal, 122(565), pp. 1206-1243

[15] Daudin, G., Rifflart, C., D. Schweisguth, (2011). "Who Produces for Whom in the World Economy?", Canadian Journal of Economics, 44 (4), 1403-1437.

[16] Deardorff, A.V. (2001), 'Fragmentation in Simple Trade Models', North American Journal of Economics and Finance, 12, 121-37.

[17] Deardorff, A.V. (2001), 'Fragmentation across Cones', in S.W. Arndt and H. Kierzkowski (eds.) Fragmentation. New Production Patterns in the World Economy, Oxford University Press, 35-51.

[18] Deardorff, A.V. (2005), 'Ricardian Comparative Advantage with Intermediate Inputs', North American Journal of Economics and Finance, 16, 11-34.

[19] Dieppe, A. et al. (2012), 'Competitiveness and External Imbalances within the Euro Area', European Central Bank Occasional Paper Series no. 139.

[20] Driscoll J.C. and Kraay A.C. (1998) Consistent covariance matrix estimation with spatially dependent panel data, The Review of Economics and Statistics, 80, 4, 549-560.

[21] Egger, H. and P. Egger (2005), 'The Determinants of EU Processing Trade', The World Economy, 28, 2, 147-68.

[22] Escaith, H. and F. Gonguet (2009). "International Trade and Real Transmission Channels of Financial Shocks in Globalized Production Networks", MPRA, 15558.

[23] Escaith, H., Lindenberg, N. and S. Miroudot (2010). "International Supply Chains and Trade Elasticity in Times of Global Crisis", Staff W.P. ERSD-2010-08.

[24] Falzoni, A. and L. Tajoli, (2015). "International Fragmentation of Production and Trade Volatility: an Analysis for the European Countries". Modern Economy, forthcoming.

[25] Falvey, R. and H. Kierzkowski, (1987). "Product Quality, Intra-Industry Trade and (im)perfect competition", in (H. Kierzkowski, ed.), Protection and Competition in International Trade, pp. 495-511, Oxford: Basil Blackwell.

[26] Flam, H. and E. Helpman, (1987). "Vertical Product Differentiation and and North-South Trade", American Economic Review, vol. 77(5), pp. 810-822.

[27] Hallak, J. C., (2006). "Product Quality and the Direction of Trade", Journal of International Economics, vol. 68(1), pp. 238-265.

[28] Feenstra, R. and G. Hanson, (1996). "Globalization, outsourcing and wage inequality", American Economic Review, vol.86, no.2, 240-245.

[29] Feenstra, R.C. and J. Romalis, (2014). "International Prices and Endogenous Quality", Quarterly Journal of Economics, 129(2), 477-527.

[30] Florio, A. and G. Ghiani, (2015). "The twin deficit behavior across booms and busts: a Markov-switching analysis ", FARB Working Paper, mimeo.

[31] Giavazzi, F. and L. Spaventa, (2010). "Why the Current Account May Matter in a Monetary Union: Lessons from the Financial Crisis in the Euro Area", CEPR Discussion Paper No. 8008.

[32] Gopinath, G. and B. Neiman, (2011). "Trade Adjustment and Productivity in Large Crises", NBER N. 16958.

[33] Grossman, G. and E. Rossi-Hansberg, (2008). "Trading Tasks: A Simple Theory of Offshoring", American Economic Review, 98:5, 1978-1997.

[34] Guerrieri, P. and P. Esposito, (2012). "Intra-European Imbalances, Adjustment, and Growth in the Eurozone", Oxford Review of Economic Policy, 28, 3, 532-550.

[35] Guillemette, Y. and D. Turner, (2013). "Policy Options to Durably Resolve Euro Area Imbalances", OECD Economics Department Working Paper no. 1035, OECD Publishing.

[36] Hummels, D., J. Ishii, and K. Yi. (2001). "The Nature and Growth of Vertical Specialization in World Trade." Journal of International Economics 54:75-96.

[37] Johnson, R. and G. Noguera (2012). "Accounting for Intermediates: Production Sharing and Trade in Value Added", Journal of International Economics, 86 (2), 224-236.

[38] Johnson, R. (2014). "Five Facts about Value Added Exports and Implications for Macroeconomics and Trade Research", Journal of Economic Perspectives, 28 (2), 119-142.

[39] Lane, P.R. and G.M. Milesi-Ferretti (2012). "External adjustment and the global crisis", Journal of International Economics, 88, 252-265.

[40] Levchenko, A. A., Lewis, L.T., and L. L. Tesar (2010). "The Collapse of International Trade during the 2008-2009 Crisis: in Search of the Smoking Gun", IMF Economic Review, 58:2, 214-253.

[41] Koopman, R., Wang, Z. and Wei, S.J. (2014). "Tracing Value-Added and Double Counting in Gross Exports", American Economic Review, 2014, 104 (2), 459-94.

[42] Kugler, M. and E. Verhoogen, (2012). "Prices, Plant size and Product Quality", Review of Economic Studies, 79, 307339.

[43] Miroudot, S. and A. Ragoussis (2009), "Vertical Trade, Trade Costs and FDI", OECD Trade Policy W.P. N. 89.

[44] Obstefeld, M. and K. Rogoff (2007), "The Unsustainable U. S. Current Account Position Revisited". In R. Clarida ed., G7 Current Account Imbalances: Sustainability and Adjustment, NBER Chapters, NBER Inc, 339-376.

[45] Olsen, K. B. (2006), "Productivity Impacts of Offshoring and Outsourcing: a Review", OECD STI Working Paper 2006/1.

[46] Stehrer, R. (2012), "Trade in Value Added and the Value Added in Trade", WIOD W.P. N. 8.

[47] Timmer, M. P., B. Los, R. Stehrer and G. J. de Vries (2013), Fragmentation, Incomes and Jobs. An analysis of European competitiveness, Economic Policy, vol. 28(76), 613-61.

[48] Timmer, M. P., A. A. Erumban, B. Los, R. Stehrer and G. J. de Vries (2014), Slicing Up Global Value Chain, Journal of Economic Perspectives, vol. 28(2), 99-118.

[49] Unctad (2013), "Global Value Chain and Development".

Verhoogen, E. (2008). "Trade, Quality Upgrading and Wage Inequality in the Mexican Manufacturing Sector", The Quarterly Journal of Economics, vol. 123(2), 489-530.

[50] Yi, K.-M. (2003), "Can Vertical Specialization Explain the Growth of World Trade?," Journal of Political Economy, vol. 111(1), 52-102.

Table 1: Offshoring in EU countries (average index for 1999-2011)

Country	Offshoring index (total)	Offshoring index to high-income partners	Offshoring index to low-income partners
Luxembourg	60.58	55.82	2.87
Malta	46.56	34.13	4.75
Ireland	45.83	37.87	3.79
Hungary	41.42	26.49	7.91
Lithuania	39.32	13.60	7.45
Belgium	36.97	28.85	3.92
Slovakia	36.24	16.30	10.48
Cyprus	34.68	18.50	7.35
Netherlands	33.84	20.90	4.31
Estonia	33.78	17.52	6.38
Slovenia	32.79	22.25	4.94
Bulgaria	31.23	13.44	8.77
Austria	30.39	19.29	5.96
Czech Rep.	30.00	18.98	6.59
Denmark	29.83	21.67	4.22
Greece	27.66	16.48	3.59
Sweden	26.70	18.15	3.46
Latvia	26.17	12.25	7.47
Romania	25.50	13.85	5.89
Finland	23.50	13.84	3.85
Poland	22.75	14.52	3.67
Portugal	22.32	16.02	2.00
Germany	21.58	12.56	4.87
Spain	17.78	10.88	2.69
France	17.04	11.42	1.98
United Kingdom	16.73	11.51	2.16
Italy	15.82	8.39	2.26

Notes. The offshoring index is computed for each year as in (1) and we computed the simple average for the years 2007-2011. High-income countries include Austria, Belgium, Luxemburg, Netherlands, Sweden, Denmark, Spain, Finland, France, UK, Italy, Germany, Ireland, Japan, Australia, USA, Canada, Cyprus, Taiwan. Low-income countries include Bulgaria, Czech Rep., Hungary, Estonia, Lithuania, Latvia, Poland, Portugal, Greece, Romania, Slovakia, Slovenia, Turkey, Brazil, Mexico, India, China, Korea, Indonesia. Countries are split according to their per-capita GDP in PPP in 1998 with respect to the median (Source: IMF). The residual group of countries includes the 'Rest of the World' and Russia.
Source: Our elaborations on WIOD database.

Table 2: Foreign Value Added in Export in EU countries (average index for 1999-2011)

Country	Foreign Value Added (total)	Foreign Value Added (High-income partners)	Foreign Value Added (Low-income partners)
Luxembourg	59.27	53.41	3.36
Hungary	45.63	30.10	8.44
Malta	44.66	31.88	5.11
Slovakia	44.52	23.40	10.29
Ireland	42.46	34.60	3.76
Czech Rep.	42.02	27.16	8.25
Belgium	41.62	30.44	4.83
Estonia	39.98	22.08	7.20
Slovenia	37.98	25.57	5.70
Bulgaria	37.16	16.00	8.64
Netherlands	34.40	20.27	4.52
Lithuania	34.39	11.86	5.03
Denmark	32.88	22.88	4.95
Austria	30.74	19.86	5.47
Sweden	30.30	20.08	4.02
Portugal	29.60	20.79	3.22
Poland	29.44	18.90	4.55
Finland	29.21	16.68	4.77
Cyprus	28.13	19.94	5.40
Greece	27.55	17.77	2.68
Latvia	27.49	13.80	6.04
Romania	27.19	15.74	5.36
Spain	26.55	15.78	3.98
France	24.93	16.50	3.31
Germany	23.87	13.95	5.13
Italy	22.29	12.34	3.46
United Kingdom	18.60	12.34	2.58

Notes. The Foreign Value Added in a country's export is computed as in Koopmans et al. (2012) for each year and we computed the simple average for the years 2007-2011. High-income countries include Austria, Belgium, Luxemburg, Netherlands, Sweden, Denmark, Spain, Finland, France, UK, Italy, Germany, Ireland, Japan, Australia, USA, Canada, Cyprus, Taiwan. Low-income countries include Bulgaria, Czech Rep., Hungary, Estonia, Lithuania, Latvia, Poland, Portugal, Greece, Romania, Slovakia, Slovenia, Turkey, Brazil, Mexico, India, China, Korea, Indonesia. Countries are split according to their per-capita GDP in PPP in 1998 with respect to the median (Source: IMF). The residual group of countries includes the 'Rest of the World' and Russia.

Source: Our elaborations on WIOD database.

Table 3: Models of Current Account Balance determinants

	(1)	(2)	(3)
dependency ratio	0.005	0.005	0.005
	(0.283)	(0.290)	(0.154)
fiscal balance	0.240***	0.239***	0.239***
	(0.053)	(0.052)	(0.026)
gdp growth	0.039	0.058	0.058
	(0.092)	(0.101)	(0.045)
gdp per capita	0.870***	0.847***	0.847***
	(0.187)	(0.195)	(0.112)
investment	-0.925***	-0.934***	-0.934***
	(0.095)	(0.096)	(0.055)
lagged reer	0.008	0.004	0.004
	(0.039)	(0.039)	(0.014)
total population	-0.430*	-0.430*	-0.430***
	(0.211)	(0.211)	(0.069)
population growth	-0.258*	-0.223	-0.223***
	(0.133)	(0.143)	(0.067)
lagged NFA	-0.034***	-0.034***	-0.034***
	(0.008)	(0.007)	(0.005)
energy balance	-0.101	-0.119	-0.119
	(0.244)	(0.263)	(0.094)
offind		-0.062	-0.062
		(0.118)	(0.056)
R-squared	0.7705	0.7716	0.7716
N	314	314	314

* p<0.10, ** p<0.05, *** p<0.01

Notes. Dependent variable: Current Account (goods and services) balance as a ratio to GDP. All models include year and country fixed effects. Standard errors in models (1), (2) are clustered by country. In column (3) Driscoll-Kraay standard errors, which are robust to general forms of spatial correlation, are reported. (a): within R-squared.

Table 4: Models of Current Account Balance determinants: Offshoring by type of partners

	(1)	(2)
dependency ratio	-0.063	-0.055
	(0.141)	(0.132)
fiscal balance	0.265***	0.254***
	(0.031)	(0.029)
gdp growth	0.040	0.041
	(0.047)	(0.044)
gdp per capita	0.872***	0.884***
	(0.114)	(0.118)
investment	-0.906***	-0.939***
	(0.047)	(0.047)
lagged reer	0.022	0.009
	(0.013)	(0.013)
total population	-0.654***	-0.550***
	(0.082)	(0.074)
population growth	-0.199***	-0.212**
	(0.065)	(0.083)
lagged NFA	-0.032***	-0.031***
	(0.005)	(0.005)
energy balance	-0.120	-0.140
	(0.079)	(0.095)
offind-LI part.	-0.728***	
	(0.127)	
offind-HI part.	0.180***	
	(0.063)	
offind-res part.	0.011	
	(0.070)	
offind-LQ part.		-0.756***
		(0.062)
offind-HQ part.		0.199***
		(0.061)
offind-res part.		0.012
		(0.068)
R-squared (a)	0.7935	0.7959
N	314	314

* p<0.10, ** p<0.05, *** p<0.01

Notes. Dependent variable: Current Account (goods and services) balance as a ratio to GDP. All models include year and country fixed effects. Driscoll-Kraay standard errors, which are robust to general forms of spatial correlation, are reported. (a): within R-squared.

Table 5: Models of Current Account Balance: Foreign Value Added

	(1)	(2)	(3)
dependency ratio	-0.011	-0.024	-0.033
	(0.159)	(0.146)	(0.145)
fiscal balance	0.240***	0.270***	0.263***
	(0.025)	(0.029)	(0.027)
gdp growth	0.059	0.060	0.064*
	(0.040)	(0.040)	(0.036)
gdp per capita	0.854***	0.844***	0.861***
	(0.110)	(0.117)	(0.115)
investment	-0.927***	-0.929***	-0.944***
	(0.058)	(0.050)	(0.053)
lagged reer	0.003	0.025	0.020
	(0.012)	(0.017)	(0.015)
total population	-0.412***	-0.515***	-0.463***
	(0.064)	(0.079)	(0.073)
population growth	-0.228***	-0.167**	-0.176***
	(0.061)	(0.062)	(0.061)
lagged NFA	-0.032***	-0.031***	-0.030***
	(0.005)	(0.005)	(0.005)
energy balance	-0.146	-0.091	-0.106
	(0.110)	(0.096)	(0.107)
FVS	-0.069		
	(0.075)		
FVS-LI part.		-0.539**	
		(0.201)	
FVS-HI part.		0.054	
		(0.068)	
FVA-res. part.		0.039	
		(0.061)	
FVS-LQ part.			-0.506***
			(0.165)
FVS-HQ part.			0.082
			(0.079)
FVA-res. part.			0.030
			(0.060)
R-squared (a)	0.7719	0.7827	0.7820
N	314	314	314

* p<0.10, ** p<0.05, *** p<0.01

Note: Dependent variable: Current Account balance in goods and services as a ratio to GDP. All models include year and country fixed effects. Driscoll-Kraay standard errors, robust to general forms of spatial correlation, are reported. (a): within R-squared

Table 6: CA determinants in EU-New Member States and EU-13. Offshoring index.

	EU-NMS	EU13	EU-NMS	EU13
offind-LI part.	-0.852***	0.202		
	(0.098)	(0.449)		
offind-HI part.	0.201	0.330***		
	(0.115)	(0.043)		
offind-res part.	0.007	0.197*		
	(0.083)	(0.101)		
offind-LQ part.			-0.860***	0.170
			(0.178)	(0.265)
offind-HQ part.			0.183	0.427***
			(0.152)	(0.058)
offind-res part.			-0.072	0.246***
			(0.088)	(0.058)
R-squared (a)	0.8924	0.8427	0.8899	0.8454
N	120	150	120	150

* p<0.10, ** p<0.05, *** p<0.01

Note: Dependent variable: Current Account balance in goods and services as a ratio to GDP. All models include year and country fixed effects. Driscoll-Kraay standard errors, robust to general forms of spatial correlation, are reported. All the set of variables of the previous specification are included. (a): within R-squared

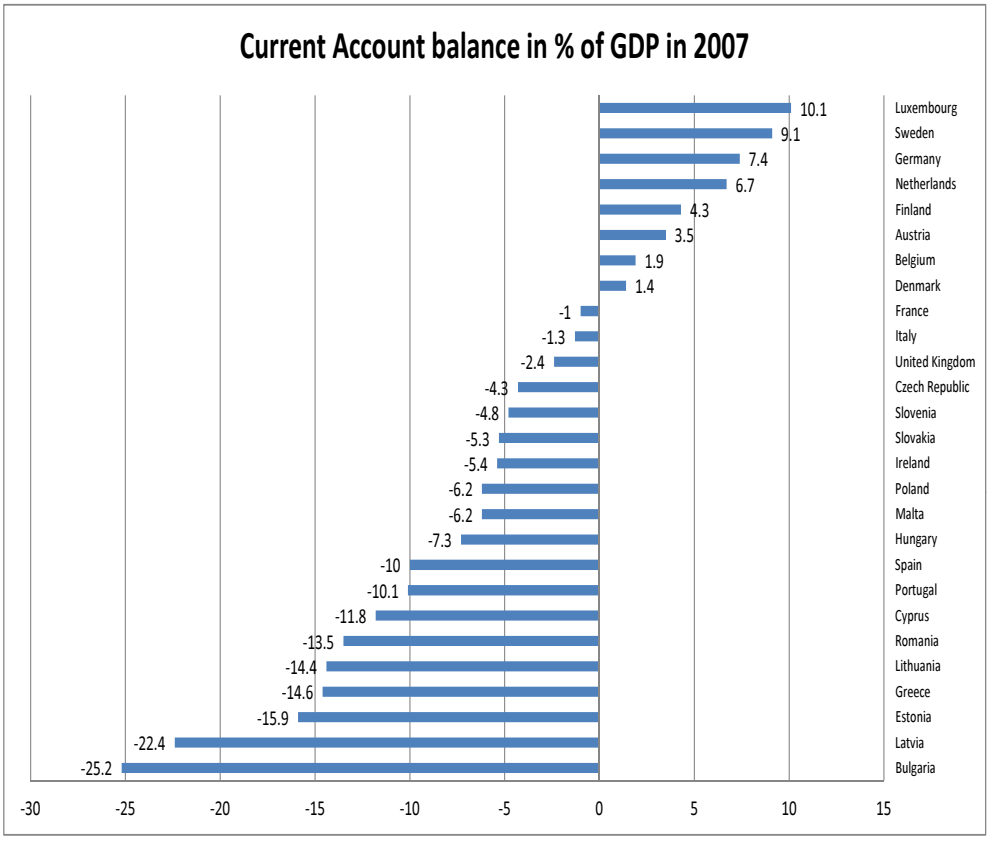
Table 7: CA determinants in EU-NMS and EU13. FVA.

	EU-NMS	EU13	EU-NMS	EU13
FVS-LI part.	-0.710***	-0.250		
	(0.207)	(0.372)		
FVS-HI part.	0.249*	0.203**		
	(0.117)	(0.093)		
FVS-res. part.	0.069	0.071		
	(0.062)	(0.109)		
FVS-LQ part.			-0.591**	0.058
			(0.235)	(0.222)
FVS-HQ part.			0.278	0.212**
			(0.159)	(0.079)
FVS-res. part.			0.048	0.092
			(0.066)	(0.068)
R-squared (a)	0.8870	0.8334	0.8842	0.8323
N	120	150	120	150

* p<0.10, ** p<0.05, *** p<0.01

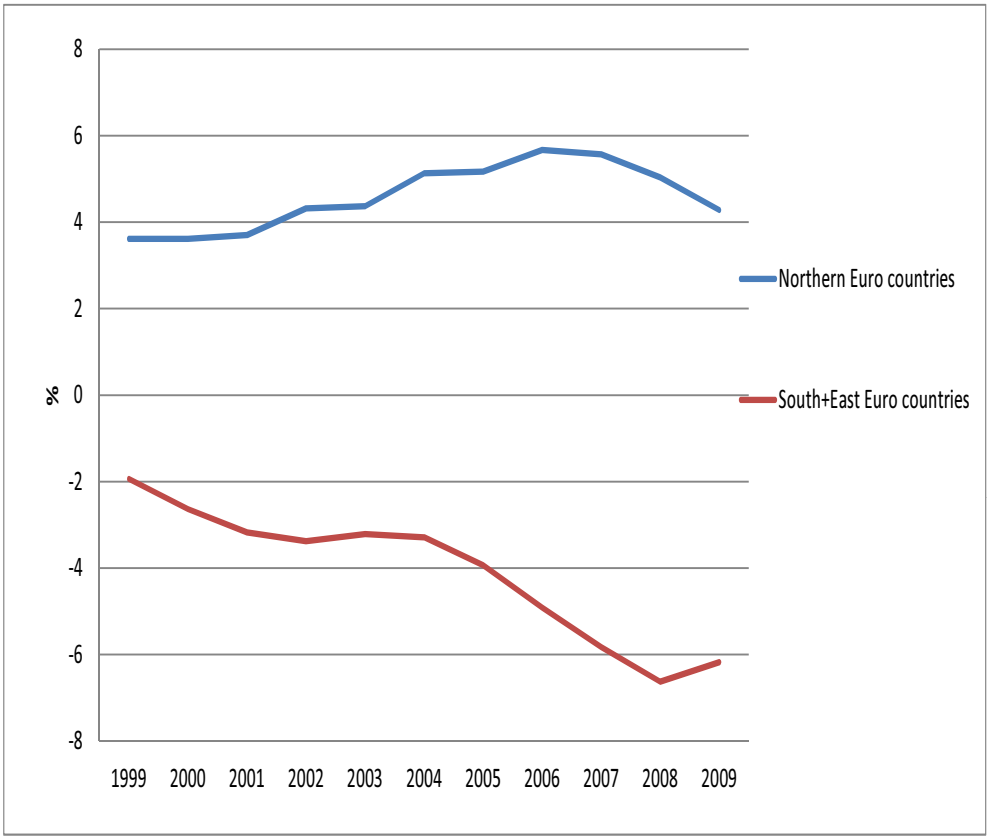
Note: Dependent variable: Current Account balance in goods and services as a ratio to GDP. All models include year and country fixed effects. Driscoll-Kraay standard errors, robust to general forms of spatial correlation, are reported. All the set of variables of the previous specification are included. (a): within R-squared.

Figure 1: Current Account balance in % of GDP, 2007



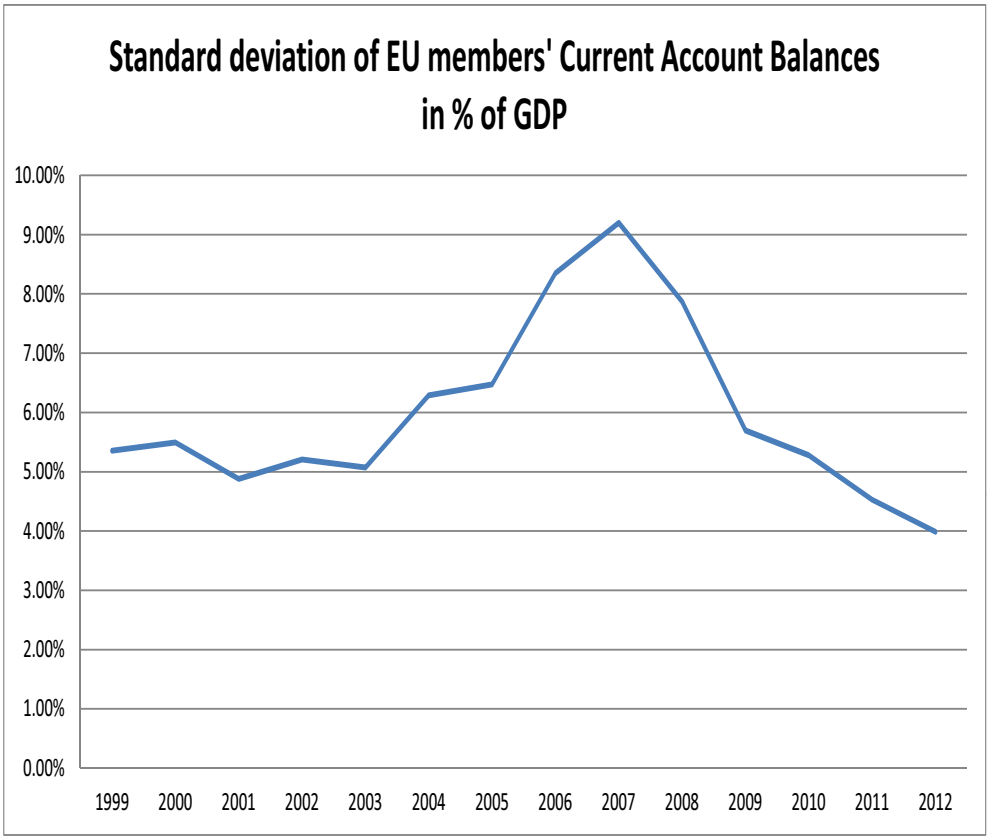
Source: Eurostat database.

Figure 2: Current Account balance in % of GDP, 1999-2009



Source: our elaborations on Eurostat database.
Note: Northern Countries include Austria, Belgium, Germany, Finland, Netherlands, Luxemburg, while South and Eastern Countries include Portugal, Greece, Spain, Italy, Slovenia, Slovakia, Ireland and France. The graph displays the simple average for each group.

Figure 3: Standard Deviation of EU members Current Account balance (% of GDP)



Source: Eurostat database.

5 Appendix

5.1 Partners splitting

List of partners in WIOD data: Austria, Australia, Belgium, Bulgaria, Brazil, Canada, China, Cyprus, Czech Rep., Germany, Denmark, Estonia, Greece, Spain, Finland, France, Hungary, Indonesia, Ireland, India, Italy, Japan, Korea, Lithuania, Luxembourg, Latvia, Malta, Mexico, Netherlands, Poland, Portugal, Romania, Russia, Sweden, Slovenia, Slovakia, Turkey, Taiwan, United Kingdom, United States and Rest of the World (41, 40 plus RoW; 27 EU).

List of countries by group when the splitting is on the basis of their gdp per capita. We build the groups of countries on the basis of the median value in 1998.

- High-income countries: Austria, Belgium, Luxemburg, Netherlands, Sweden, Denmark, Spain, Finland, France, UK, Italy, Germany, Ireland, Japan, Australia, USA, Canada, Cyprus, Taiwan.
- Low-income countries: Bulgaria, Czech Rep., Hungary, Estonia, Lithuania, Latvia, Poland, Portugal, Greece, Romania, Slovakia, Slovenia, Turkey, Brazil, Mexico, India, China, Korea, Indonesia.
- Residual group: 'Rest of the World' and Russia.

Russia is excluded because of the role of oil trade in its trade relationships.

List of countries by group when the splitting is on the basis of the 'normalized quality index' provided by Hallak and Shott (2010). We build the groups of countries on the basis of the median value in 1998. The classification does not change if we consider 2003.

- High-quality countries: Austria, Belgium, Netherlands, Sweden, Denmark, Finland, France, United Kingdom, Italy, Germany, Ireland, Japan, Korea, Hungary.
- Low-quality countries: Canada, Australia, Poland, Portugal, Romania, Turkey, Brazil, Mexico, India, Indonesia, China, Greece, Spain, Taiwan.

- Residual group: RoW, Luxembourg, United States, Bulgaria, Czech Rep., Estonia, Lithuania, Latvia, Slovakia, Slovenia,Cyprus, Russia, Malta.

The residual group is larger due to the limited overlapping between the countries for which Hallak and Shott (2010) provide the quality index and WIOD data.

5.2 The Foreign Value Added in a country's export

Here we show part of the Inter-Country Input-Output model of Koopman et al. (2014) we used to measure the foreign value-added embodied in a country's exports.

Assume a G-country world, in which each country produces goods in N differentiated sectors. Goods in each sector might be consumed directly or used as intermediate inputs. Each country can also export both intermediate and final goods to the others.

All gross output produced by country r must be used as an intermediate good or a final good at home or in other countries, or

$$X_r = A_{rr}X_r + A_{rs}X_s + Y_{rr} + Y_{rs} \;\; r, s = 1, ..., G \; s \neq r \tag{4}$$

where X_r is the $N \times 1$ gross output vector of country r, Y_{rs} is the $N \times 1$ final demand vector that represent demand in country s for final goods produced in r and A_{rs} is the $N \times N$ Input-Output coefficient matrix, giving use in s of intermediate goods produced in r. The G-country production and trade system can be written as Inter-Country Input-Output model in block matrix notation

$$\begin{bmatrix} X_1 \\ X_2 \\ \vdots \\ X_G \end{bmatrix} = \begin{bmatrix} A_{11} & A_{12} & ... & A_{1G} \\ A_{21} & A_{22} & ... & A_{2G} \\ \vdots & \vdots & \ddots & \vdots \\ A_{G1} & A_{G2} & ... & A_{GG} \end{bmatrix} \begin{bmatrix} X_1 \\ X_2 \\ \vdots \\ X_G \end{bmatrix} + \begin{bmatrix} Y_{11} + Y_{12} + ... + Y_{1G} \\ Y_{21} + Y_{22} + ... + Y_{2G} \\ \vdots \\ Y_{G1} + Y_{G2} + ... + Y_{GG} \end{bmatrix} \tag{5}$$

and rearranging

$$\begin{bmatrix} X_1 \\ X_2 \\ \vdots \\ X_G \end{bmatrix} = \begin{bmatrix} 1-A_{11} & -A_{12} & ... & -A_{1G} \\ -A_{21} & 1-A_{22} & ... & -A_{2G} \\ \vdots & \vdots & \ddots & \vdots \\ -A_{G1} & -A_{G2} & ... & 1-A_{GG} \end{bmatrix}^{-1} \begin{bmatrix} Y_{11}+Y_{12}+...+Y_{1G} \\ Y_{21}+Y_{22}+...+Y_{2G} \\ \\ Y_{G1}+Y_{G2}+...+Y_{GG} \end{bmatrix} = \begin{bmatrix} B_{11} & B_{12} & ... & B_{1G} \\ B_{21} & B_{22} & ... & B_{2G} \\ \vdots & \vdots & \ddots & \vdots \\ B_{G1} & B_{G2} & ... & B_{GG} \end{bmatrix}^{-1} \begin{bmatrix} Y_1 \\ Y_2 \\ \vdots \\ Y_G \end{bmatrix} \tag{6}$$

where B_{sr} denotes the $N \times N$ block Leontief inverse matrix, which is the total requirement matrix that gives the amount of gross output in producing country s for one-unit increase in final demand in country r, Y_r is the $N \times 1$ vector that gives the global use of r's final products. This system can be also expressed as:

$$X = (I - A)^{-1}Y = BY \tag{7}$$

where X and Y are $GN \times 1$ vectors, and A and B as $GN \times GN$ matrices.

Having defined the Leontief inverse matrix, we turn to measures of domestic and foreign contents of gross exports. Let V_s be the $1 \times N$ direct value-added coefficient vector. Each element of V_s gives the share of direct domestic value added in total output. This is equal to one minus the intermediate input share from all countries (including domestically produced intermediates):

$$V_r \equiv u(I - \sum_s A_{sr}) \tag{8}$$

where u is a $1 \times N$ unity vector. To be consistent with the Inter-Country model, we define V the $G \times GN$ matrix of direct domestic value added for all countries,

$$V \equiv \begin{bmatrix} V_1 & 0 & 0 & 0 \\ 0 & V_2 & 0 & 0 \\ 0 & 0 & \ddots & 0 \\ 0 & 0 & 0 & V_G \end{bmatrix} \tag{9}$$

As in Koopman et al. (2014), combining V with Leontief inverse matrix B produces the $G \times GN$ value-added share (VB) matrix, VB is our basic measure of value-added shares by source of production:

$$VB = V \equiv \begin{bmatrix} V_1B_{11} & V_1B_{12} & ... & V_1B_{1G} \\ V_2B_{21} & V_2B_{22} & ... & V_2B_{2G} \\ \vdots & \vdots & \ddots & \vdots \\ V_GB_{G1} & V_GB_{G2} & ... & V_GB_{GG} \end{bmatrix} \tag{10}$$

Within VB, each element V_rB_{rs} is a $1 \times N$ vector. Vectors on the diagonal denote domestic value-added share of domestically produced N products. The out-diagonal vectors denote instead the foreign country's value-added shares in the same domestically produced N products. Each of the first N columns in the VB matrix includes all value added, domestic and foreign, needed to produce one additional unit of domestic products at home.

Because all value added must be either domestic or foreign, the sum along each column is unity.

The VB matrix contains all the information to separate domestic and imported content shares in each country's gross exports at the sectoral level.

Let E_{rs}be the $N \times 1$ vector of gross exports from r to s. For consistency with the Inter-Country Input-Output model we also define

$$E_{r*} = \sum_{s \neq r} E_{rs} = \sum_{s} (A_{rs}X_s + Y_{rs}) \;\; r, s = 1...G \tag{11}$$

$$E = \begin{bmatrix} E_{1*} & 0 & ... & 0 \\ 0 & E_{2*} & ... & 0 \\ \vdots & \vdots & \ddots & \vdots \\ 0 & 0 & ... & E_{G*} \end{bmatrix} \tag{12}$$

where E is a $GN \times GN$ matrix.

The combination of value added share matrix VB and the export matrix E produces a $G \times G$ matrix (VBE) that represents the aggregate measures of value-added by source in a country's gross exports

$$VBE = \begin{bmatrix} V_1B_{11}E_{1*} & V_1B_{12}E_{2*} & ... & V_1B_{1G}E_{G*} \\ V_2B_{21}E_{1*} & V_2B_{22}E_{2*} & ... & V_2B_{2G}E_{G*} \\ \vdots & \vdots & \ddots & \vdots \\ V_GB_{G1}E_{1*} & V_GB_{G2}E_{2*} & ... & V_GB_{GG}E_{G*} \end{bmatrix} \tag{13}$$

Diagonal elements of VBE define the domestic value-added in each countrys gross exports. Off-diagonal elements along each column give the foreign value-added embodied in each countrys exports by source. Therefore, gross exports can be decomposed into domestic value-added (DV) and foreign value-added (FV) as follows

$$DV = \begin{bmatrix} V_1 B_{11} E_{1*} \\ V_2 B_{22} E_{2*} \\ \vdots \\ V_G B_{GG} E_{G*} \end{bmatrix} \tag{14}$$

$$FV = \begin{bmatrix} \sum_{s \neq 1} V_s B_{s1} E_{1*} \\ \sum_{s \neq 2} V_s B_{s2} E_{2*} \\ \vdots \\ \sum_{s \neq G} V_s B_{sG} E_{G*} \end{bmatrix} \tag{15}$$

FV and DV are both $G \times 1$ matrices. Elements of FV are the result of the sum of out-diagonal elements along each column of VBE.

It also holds that

$$DV + FV = diag(E) \tag{16}$$

Dividing (11) and (12) with (13) we can easly derive the aggregate measures of domestic and foreign shares of value-added incorporated in a country's gross exports as

$$DVA = DV/diag(E) \tag{17}$$

$$FVA = FV/diag(E) \tag{18}$$

Obviously it is possibile to split the aggregate measure of foreign value-added share of country's gross exports by source considering separately the off-diagonal terms along each column of VBE.