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Do global value chains amplify global imbalances?*

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Abstract

This paper addresses the impact of countries' participation in global value chains (GVCs) on their current account balances. Relying on a panel of 57 advanced and emerging countries, we do not find evidence that GVC participation directly raises economies' current account positions. On the contrary, we show that backward participation makes a negative contribution to current account balances: our results contradict the speculation that current account imbalances of downstream countries are likely to benefit more from GVC participation than economies which are located further upstream. Moreover, we show that there is no significant indirect effect of GVC on the current account operating through the exchange rate. Finally, our findings indicate that whereas GVC participation boosts exports, this increase is not accompanied by improvements in price competitiveness, nor by higher levels of saving rates.

JEL Classification: F32, F4, F62.
Keywords: Global value chains; Current account imbalances.

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1 Introduction

Economic globalization has brought about profound changes in international trade. Among all of them, one of the most prominent is the increasing dispersion of stages of production across countries in recent years. Indeed, the production structure of the past where goods or services remained within national borders was internationalized so as to take advantage of the decline in transportation costs, the adoption of more open trade policies as well as advances in information and communication technologies. This evolution towards international production fragmentation gave rise to various concepts and definitions among which global value chains (GVCs)[1]—referring to the case where a source country produces intermediate goods that are used as inputs in other countries to produce/assemble the final good—play a key role. This international production process in which production is split in several stages and located in various countries refers to what Baldwin (2016) called the second unbundling of globalization—the first one being the separation between production and consumption countries.

International fragmentation has been accompanied by an increasing participation of countries in GVCs, with an intense involvement of emerging and developing economies (Gary, Humphrey, Kaplinsky, and Sturgeon, 2001; Cattaneo, Gereffi, and Staritz, 2010; Baldwin, 2014). The consequence of this process was a steady increase in trade flows, particularly in intermediate goods and services.[2] According to Krugman, Cooper, and Srinivasan (1995), international fragmentation is among the main key changes explaining the sharp rise in the trade to GDP ratio since the mid-eighties. This dispersion of production stages across countries may also explain why some of them display very high levels of export propensity, given that their exports incorporate a very low share of domestic value added (De Backer, De Lombaerde, and Iapadre, 2018).

As a result of this evolution of the global production process, it is highly relevant to study current account balances by accounting for the relationships between trade and international production, i.e., by paying attention to participation in GVCs. Specifically, the stark increase in the dispersion of stages of production across countries has been coupled with large and persistent global imbalances. Indeed, as widely documented in the literature,[3] the 2008 financial and economic crisis was preceded by a dramatic increase in global imbalances, whose level remains still high despite the adjustments since 2009.

[1] See, e.g., Gary, Humphrey, Kaplinsky, and Sturgeon (2001), Gary, Humphrey, and Sturgeon (2005), Elms and Low (2013), and Baldwin (2013).

[2] See Antràs (2005) among others. Trade in intermediate goods and services nowadays respectively accounts for 56% and 73% of overall trade flows in goods and services (e.g. Miroudot, Lanz, and Ragoussis, 2009).

[3] See Aizenman and Sun (2010), Bracke, Bussière, Fidora, and Straub (2010), Christopoulos and León-Ledesma (2010), Chen (2011), and Schoder, Proaño, and Semmler (2013).

These simultaneous developments suggest that the presence of global imbalances can not be dissociated from the process of globalization and the expansion of GVCs.

The scarce literature has detected two mechanisms through which GVCs could impact a country's current account. According to the first mechanism, a higher participation in GVC implies a larger share of a country's exports that represents value added to its imported intermediates. The resulting increase in the economy's trade balance feeds through to the current account balance. This transmission channel has been investigated by Brumm, Georgiadis, Grab, and Trottner (2016) who developed a two-country international real business cycle model with trade in both final consumption goods and intermediate inputs in production—domestic and imported intermediates being imperfect substitutes in production. Assuming that the efficiency of imported intermediates in home production is subject to transitory shocks, the authors show that a positive shock (i) increases the share of foreign value added incorporated in home exports, and (ii) stimulates, through improvements in competitiveness of home exports, foreign demand for domestic goods and home income. Accordingly, the shock being transitory, at equilibrium, the domestic economy saves part of its income gains to smooth consumption through time, resulting in current account surpluses. Note that this interpretation is, in principle, limited to one exclusive form of participation in GVC, namely backward participation, which consists in importing intermediate goods or services that are then used to assemble the final product that is exported. However, Brumm, Georgiadis, Grab, and Trottner (2016) present empirical evidence that increased forward participation—i.e., rising the domestic value added contained in inputs used to produce exports in the destination country—can also improve the current account balances, even though the impacts are quite weaker and operate through other channels than for backward participation.

There are, however, two missing points in the above hypothesized mechanism. Firstly, increasing GVC participation should have a positive effect on the current account position because, especially in the case of backward participation, higher participation implies that there are more imports which are then used as inputs for exports. There is a gain in efficiency and competitiveness. However, if we look at the current account, we should consider that even if exports are increasing, imports are rising also with higher participation. The relationship between GVC participation and the current account is, therefore, ambiguous.[4] Secondly, there is a second, indirect mechanism which operates through the effect that the real exchange rate exerts on the current account. This transmission channel has been examined by Riad, Errico, Henn, Saborowski, Saito, and Turunen (2012). The authors rely on a partial equilibrium approach to assess the effect of relative price

[4]Contrary to Brumm, Georgiadis, Grab, and Trottner (2016), Haltmaier (2015) shows that changes in GVC position are significantly negatively related to changes in a country's current account balance.

changes on the trade structure of China, the Eurozone, Japan and the United States. Under this perspective, participation in GVC, in particular through a downstream position in the supply chain, cushions the impact of a relative price change on both exports and imports (Riad, Errico, Henn, Saborowski, Saito, and Turunen, 2012). This reflects the higher foreign content in the downstream country's exports which should mitigate the effect of exchange rate changes—an appreciation lowering the relative cost of imports. Therefore, for countries situated in a downstream position in the supply chain, such as China, the exchange rate is no longer a tool to adjust the current account. In this case, the "ideal scenario" proposed by the IMF regarding the gradual adjustment in the U.S. fiscal position—operating through a decrease in China's saving rate, a renminbi appreciation, and a decline in Chinese current account surplus—would no longer be pertinent.

Our work aims at taking stock of this recent literature by investigating the link between global imbalances and GVCs. We contribute to the existing studies in several ways. First, we consider a large panel of countries, composed of 57 advanced and emerging economies. Second, compared to Haltmaier (2015) and Brumm, Georgiadis, Grab, and Trottner (2016) which are the closest papers to ours, our current account specification is much richer. Indeed, while only two determinants are used in Haltmaier (2015), we include various control variables to better describe the global imbalances' dynamics. In addition, while Haltmaier (2015) and Brumm, Georgiadis, Grab, and Trottner (2016) deal with static representations, we also consider a dynamic specification to account for persistence of imbalances. Allowing for such inertia in our framework is of primary interest as persistence of global imbalances in several countries—especially industrial—has become a key issue.[5] Turning to technical considerations, this leads us to depart from Brumm, Georgiadis, Grab, and Trottner (2016) also from a methodological viewpoint as we rely on the generalized method of moments (GMM) approach to derive reliable estimates. Third, we pay particular attention to the effects of the exchange rate to capture the potential indirect impact of GVCs on current account balances. Finally, we go further than previous studies which only deal with current account positions by also considering the GVC participation effect on (i) the dynamics of exports, (ii) price competitiveness, and (iii) savings—i.e., the key elements in the hypothesized mechanism that underlies the positive impact exerted by GVC participation on the current account balance.

Our results show that economies with stronger GVC participation do not display larger current account surpluses; this finding holding for both backward and forward participation. In addition, we find that whereas a rise in backward participation boosts exports, this increase does not improve the current account position as it is not accompanied by a gain in price competitiveness, nor by higher levels of saving rates.

[5] See e.g. Aizenman (2010), Gnimassoun and Mignon (2015) and the references therein.

The rest of the paper is organized as follows. Section 2 describes the sample and data, and provides some stylized facts. Section 3 displays our main estimation results regarding the effect of GVCs on (i) current account balances and (ii) exports' growth, competitiveness and savings. Section 4 concludes the paper.

2 Data and estimation issues

2.1 Estimation strategy

We estimate the following reduced-form model for countries' current account balances:

$$CA_{i,t} = \alpha_i + \delta CA_{i,t-1} + \beta Z_{i,t} + \gamma GVC_{i,t} + \varepsilon_{i,t} \quad (1)$$

where $CA_{i,t}$ is the current account to GDP ratio of country i in year t, $Z_{i,t}$ is a set of current account economic determinants, $GVC_{i,t}$ is a measure of global value chain participation, and α_i represents country-specific factors. We present both, the static fixed effects model ($\delta = 0$) and the dynamic two-stage GMM model ($\delta \neq 0$).[6]

2.2 Sample and control variables

We consider a panel of 57 countries including both advanced and emerging economies, listed in Table 1. Data are annual and cover the period from 1995 to 2011.[7]

As stated in Equation (1), our dependent variable is the current account to GDP ratio, extracted from the WEO (World Economic Outlook) database of the IMF. Turning to the choice of control variables, we fall into the strand of the literature on current-account medium-term determinants,[8] and consider the following fundamentals:

- The relative GDP series, defined as the difference between the growth rate of trading-partners' and domestic GDP for each country. This variable is extracted from the

[6]Let us recall that OLS and fixed effects estimators are biased when the lagged endogenous variable is included in the list of regressors. The OLS estimate of δ is biased upward because the same constant is imposed to all individuals of the panel. The fixed effects estimate of δ is biased downward (Nickell bias) due to the correlation between the lagged current account variable and the error term, particularly in the small T, large N context. To overcome these drawbacks, the two-step GMM procedure is used when the dynamic specification is considered. We include up to 6 lagged values of the current account as instruments. For the sake of robustness and to avoid any endogeneity issues, note that Equation (1) has also been estimated using the lagged value of $GVC_{i,t}$ instead of the contemporaneous one. The results (available upon request to the authors) are similar to those reported in Table 2. Overall, our estimation results are robust to both the instruments' structure and endogeneity.

[7]The time span is guided by data availability issues regarding GVC measures (see Section 2.3).

[8]See Augusto, Chong, and Loayza (2002), Chinn and Prasad (2003), Gruber and Kamin (2007), Ca'Zorzi, Chudik, and Dieppe (2012), Lane and Milesi-Ferretti (2012), and Cheung, Furceri, and Rusticelli (2013) among others.

Table 1: List of countries

Advanced	**CEE**	**Latin America**	**Emerging Asia**	**Africa**
Australia	Bulgaria	Argentina	Cambodia	Morocco
Austria	Croatia	Brazil	China	South Africa
Belgium	Czech Rep.	Chile	India	Tunisia
Canada	Estonia	Colombia	Indonesia	
Cyprus	Hungary	Costa Rica	Korea	
Denmark	Latvia	Mexico	Malaysia	
Finland	Lithuania	Peru	Philippines	
France	Poland		Thailand	
Germany	Romania		Vietnam	
Greece	Slovakia			
Iceland	Slovenia			
Ireland				
Israel				
Italy				
Japan				
Malta				
Netherlands				
New Zealand				
Norway				
Portugal				
Russia				
Spain				
Sweden				
Switzerland				
Turkey				
United Kingdom				
United States				

Note: This table reports the list of countries. CEE: Central and Eastern European countries.

EQCHANGE database provided by CEPII, and is related to the demand driven difference between growth of exports and imports. The relative GDP series aims at capturing the stages of economic development hypothesis (see, e.g., Freund, 2005). The underlying idea is the following: when countries start their development process, they run current account deficits due to important capital imports. Indeed, such economies are typically characterized by low saving rates, as the optimal consumption levels are high relative to current income. This implies increased external borrowing against future income, which, in addition to substantial initial investment needs, would translate into larger current account deficits at an early stage of development. Once they reach a higher stage of development, these countries undergo current account surpluses to repay accumulated debt and export capital. On the whole, the relative GDP variable is expected to be positively related to saving and the current account.

- The real effective exchange rate (REER), expressed in logarithm and extracted from the EQCHANGE database. The variable is defined such that an increase denotes a currency appreciation. A negative sign is expected for this variable in Equation (1) as an increase in REER tends to decrease saving and, in turn, the current account.

- The (relative) fiscal position, expressed as percent of GDP, issued from WEO. The relationship between fiscal policy (general government saving minus investment as percent of GDP) and the current account position depends on the extent to which consumers react in a Keynesian or Ricardian manner (see Faruqee and Debelle (1996) for a survey). The Keynesian model assumes that a higher fiscal deficit (or lower fiscal surplus), as a result of lower taxes or higher government spending, increases disposable income and thereby consumption and decreases private saving, leading to a higher current account deficit (or lower current account surplus). The economic reaction of private agents under the Keynesian model supports the twin-deficit hypothesis, according to which wider fiscal deficits should usually be accompanied by wider current account deficits. However, the twin-deficit hypothesis does not necessarily hold when consumers act in a Ricardian manner. If the fiscal situation is perceived by agents as increasingly unsustainable, then tax increases or reduction in government spending (i.e., fiscal consolidation) are expected in the future.

- The initial net foreign asset (NFA) position as percent of GDP, taken from Lane and Milesi-Ferretti's database. Its effect on the current account is expected to be positive as economies exhibiting large net foreign asset positions are also generally characterized by substantial current account surpluses: an increase in the net foreign asset position tends to augment income issued from foreign direct investment, thus improving the current account.

- The population growth rate, taken from WDI (World Development Indicators, World Bank). The introduction of this demographic variable is justified by the fact that the age profile of the population is likely to be a structural determinant of domestic saving. Specifically, population growth is expected to contribute to the deterioration of the current account due to the lack of savings among the very young population.

2.3 Indicators of global value chain participation and position

Measuring GVCs is far from being a simple task due to the fragmentation of production across several countries. While trade data have been widely used to measure GVCs,[9] this raises important concerns. The most obvious drawback is that trade data are expressed in gross terms, meaning that the value of intermediate inputs traded along the supply chain is accounted for several times distorting the measure. As recalled by De Backer, De Lombaerde, and Iapadre (2018) the key progress in terms of GVC measurement has come from the construction of multi-country input-output tables linking national input-output tables using bilateral trade flows. Those tables allow to quantify the contributions of the various production stages withing the global supply chain in the final product value. In this paper, we rely on the international inter-country input-output (ICIO) table provided by OECD that contains data for all countries of our sample over the 1995-2011 period, and on the accompanying OECD Trade in Value Added (TiVA) database recording figures on the role of the countries in GVCs through time.

Following Koopman, Powers, Wang, and Wei (2010), country i's participation in GVC for sector k is defined as follows:

$$GVC_{ki} = \frac{B_{ki} + F_{ki}}{X_{ki}} \tag{2}$$

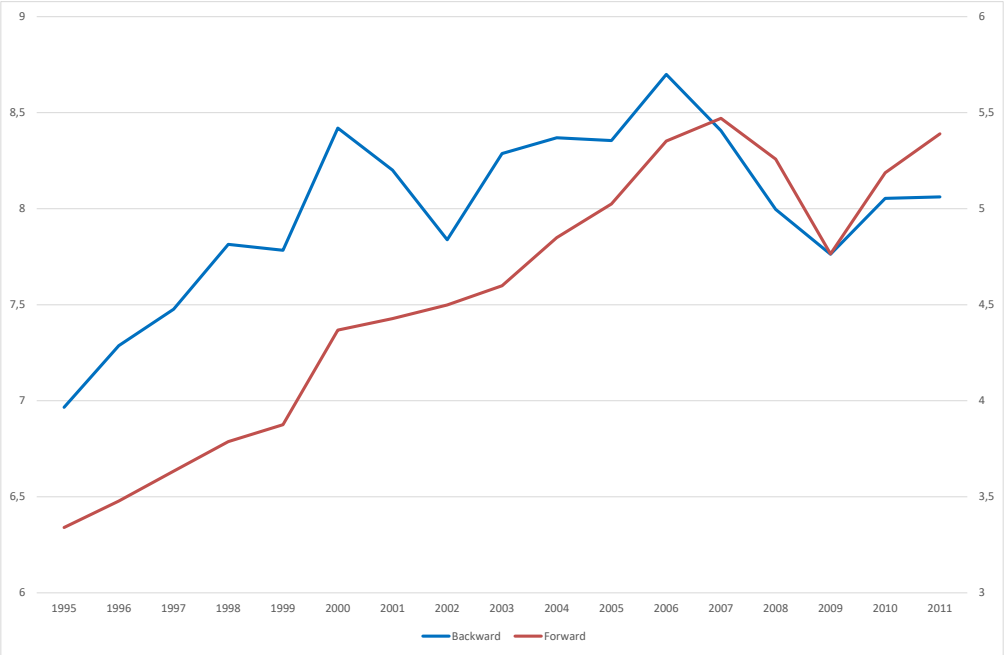
where B_{ki} denotes backward participation, that is a scalar measuring the import content of exports; F_{ki} stands for forward participation, i.e., the domestic value added contained in intermediates exported to a first economy that re-exports them; and X_{ki} is country i's gross exports. All the data are extracted from TiVA database. Note that participation in GVC is expressed in relative terms, i.e., with respect to other countries.

In the spirit of Koopman, Powers, Wang, and Wei (2010), we also define a position index in GVC for each country i in a particular sector k. We measure a country i's downstream position in the value chain as:

$$Downstream_{ki} = \ln(1 + B_{ki}) - \ln(1 + F_{ki}) \tag{3}$$

[9] See, for instance, Feenstra and Hanson (1996), as well as João and Sónia (2014) and Haltmaier (2015) for a survey.

Figure 1: Evolution of averaged (absolute value) backward and forward participation in GVC over the 1995-2011 period



Note: Authors' calculations based on data extracted from TiVA database.

A high value of $Downstream_{ki}$ implies that a country has relatively large shares of imported content in its exports. In other words, countries exhibiting a large position index are located downstream in the supply chain. On the contrary, countries which are more "upstream" in the supply chain generally produce technologically advanced products, and send them to countries that are located downstream and use them as inputs in the less skill-intensive production/assembly process.

2.4 Some stylized facts

As a first illustration, Figure 1 displays the evolution of our measures of backward and forward participation (in absolute value) aggregated over the all 57 countries over the whole period. This figure confirms the widespread view according to which participation in GVC has followed an increasing trend since 1995 (see, e.g., Daudin, Rifflart, and Schweisguth, 2011; Johnson and Noguera, 2016; Brumm, Georgiadis, Grab, and Trottner, 2016). Specif-

ically, both backward and forward participation exhibit an upward trend between 1995 and 2007, before experiencing a sharp decline during the world financial crisis and tend to recover an increasing dynamics after the collapse.

More in detail, at the disaggregated level, Figure 5 in Appendix shows the relative participation in GVC of each country of our panel at the beginning (1995) and the end (2011) of the sample. Clearly, emerging European countries tend to display high participation rates throughout the period under study. More generally, participation rates are globally higher for emerging economies than for advanced countries. Asian emerging economies exhibit quite important participation rates, especially Vietnam, Korea, Malaysia and Thailand in 2011. Latin American countries appear to be much less engaged in GVCs.

These patterns can be explained by various regional characteristics. Consider first the case of Europe. As recalled by Pomfret and Sourdin (2018), GVCs have emerged in response to price signals within an integrated market that imposes no rules of origin and other constraints on intra-EU trade. After the adoption of the euro in 1999 by eleven countries followed by Greece in 2001, various Central and Eastern European (CEE) countries have since joined the eurozone. With this enlargement, the most advanced new members—generally characterized by quite low wage costs and relatively good human capital—easily took part to GVCs. This is in particular the case for the Czech Republic, Hungary and Poland, as well as East Germany. The less developed new eurozone members have also been quickly engaged in GVCs due to their lower trade costs and the absence of currency risk. Overall, fragmentation of production in Europe has been encouraged by integration of countries exhibiting huge differences in factor prices, explaining the high levels of GVC participation observed for emerging European countries. Turning to the Asian economies, their participation in GVCs should be linked to the aim of (i) facilitating trade through various agreements, and (ii) using supply chains to increase competitiveness. In particular, as emphasized by Pomfret (2011), the main explanation of the existence of several trade agreements in East Asia after 2000 lies in the efforts made to remove obstacles, such as reducing trade costs, to GVCs. As a corollary of these important regional supply chains, particularly in Europe and East Asia, countries belonging to other regions such as Latin America or Africa are much less engaged in GVCs. Among the various explanations that have been provided, poor conditions for doing business and high trade costs appear to play a major role (see, e.g., Kowalski, Lopez-Gonzalez, Ragoussis, and Ugarte, 2015).

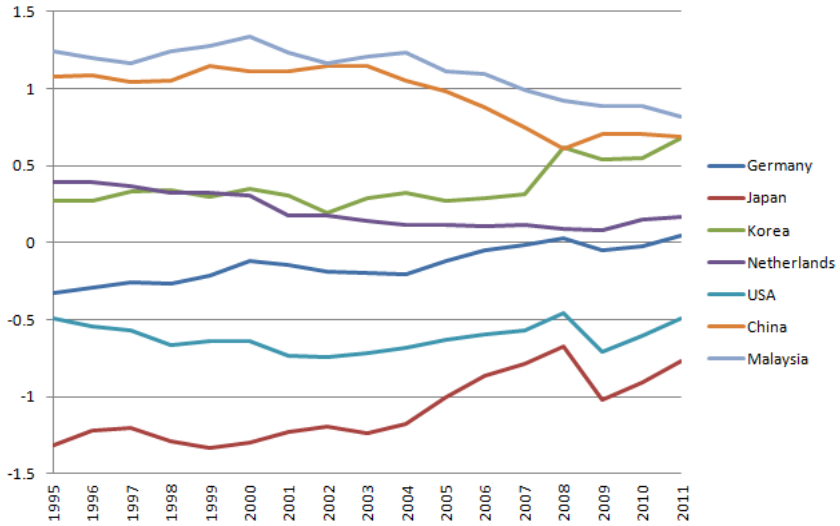
Focusing on relative backward participation, Figure 6 in Appendix confirms that emerging European countries are highly engaged in GVCs. For some of them—such as Hungary, Slovakia, the Czech Republic, and Poland to name a few—the level of backward participation has even increased through time, although they already exhibited relative high

levels in 1995. Relative backward participation of Asian emerging countries is also noticeable, while Latin American countries—such as Argentina, Brazil, Chile, Colombia and Peru—are much less involved in GVCs. Japan, the United States and Australia display the lowest participation rates among the group of advanced economies—the latter being typically involved in GVCs at the design or marketing stage. Overall, it appears that high levels of backward participation rates are mostly observed for quite small countries. This may be explained by a weak diversification of the production sector of these economies, justifying a high share of imported inputs in gross exports.

Figure 7 in Appendix displays the GVC position measure (as defined by Equation (3)) for each country of our panel, in 1995 and 2011. Identifying a country's position in GVC is important as it can help in designing country-oriented trade policies. This is especially relevant for countries belonging to a common internal market where converging policies have to be implemented. Similarly, accounting for countries' position in GVC matters in defining policy measures related to investment barriers, obstacles to innovation or labor market inefficiencies to name a few. Let us briefly comment Figure 7, by considering first the advanced economies. The latter are generally located upstream compared to emerging and developing economies. Japan and the United States are the most upstream among the advanced countries. However, while Japan has somewhat reduced its upstream position, Australia, Canada and Norway clearly evolve further upstream between 1995 and 2011. In contrast, Germany has been moving downstream, with its position measure turning from negative to positive at the end of the sample—this is also the case, to a lesser extent for France. Central Eastern European countries are generally located downstream in GVC. Indeed, all CEE countries display positive measures, with the exception of Romania. In addition, for most of them—such as Czech Republic, Hungary, Poland, and Slovak Republic—they have been moving further downstream over the period under study. Turning to Asian countries, China and Malaysia appear to be the most downstream among this group of economies, but they have been moving further upstream from 1995 to 2011, on the opposite of Cambodia whose position turns from negative to positive in 2011. Finally, it is worth mentioning that Latin American countries—such as Argentina, Brazil, Chile and Colombia—are mainly located upstream. For all Latin American economies but Argentina, the position in GVC tends to ameliorate.

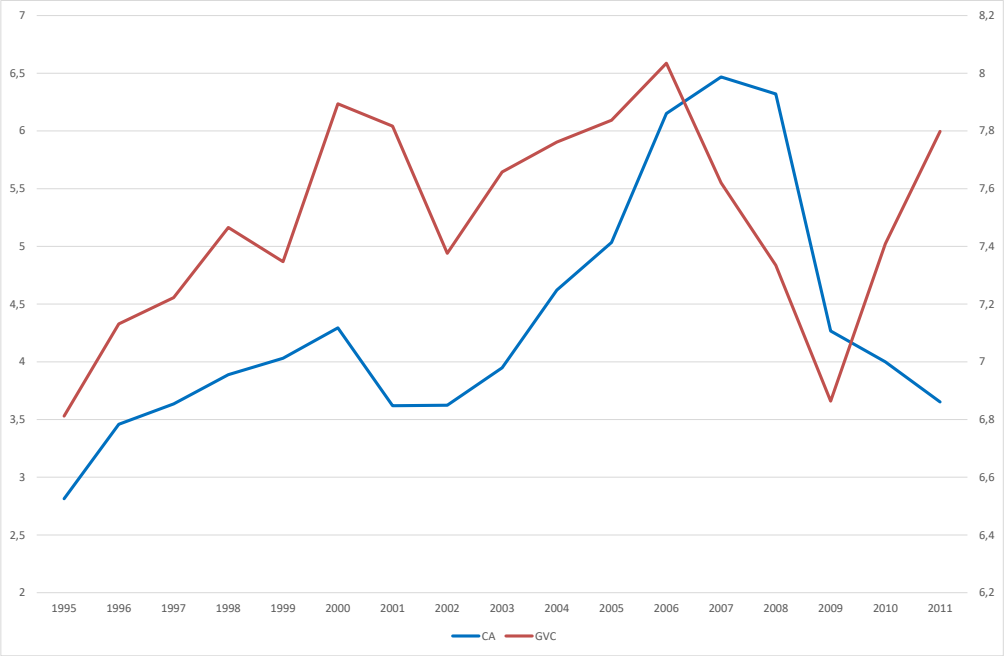
Regarding more specifically the characteristics of some key players in global trade and global imbalances—namely China and other Asian emerging countries, Japan, some eurozone countries, and the United States—Figure 2 shows that advanced economies (Japan, United States) tend to be upstream in the global supply chain, while emerging countries (China, Malaysia) are located further downstream. Indeed, exports of many emerging countries stem from lower value added production processes that largely use imported

Figure 2: Evolution of "downstreamness" position over the 1995-2011 period for a selection of countries



Note: Authors' calculations based on data extracted from TiVA database.

Figure 3: Global value chain participation and current account imbalances, 1995-2011



Note: Authors' calculations based on data extracted from WEO and TiVA databases.

intermediates to assemble final goods for exports. Such processing trade accounts for a significant share of exports from China which, together with many other Asian emerging economies, serves as a downstream hub in the Asian supply chain (Riad, Errico, Henn, Saborowski, Saito, and Turunen, 2012). As noticed by Koopman, Powers, Wang, and Wei (2010), compared to advanced economies, emerging countries have relatively large imported contents in their exports. In addition, they tend to have a smaller share of indirect exports that are sent to third countries. The ratio of these two measures provides a useful summary of a country's position in GVC, confirming the downstream position of emerging economies in supply chains.

As a first illustration regarding our relationship under investigation, Figure 3 displays the participation in GVC aggregated over all countries, together with the current account imbalances (in absolute value). Both series exhibit a similar global trend, at least up until the end of the 2000s, suggesting the existence of a potential relationship between

participation in value chains and global imbalances. Comparing Figures 5 and 8 (in Appendix) and calculating some basic correlations tend to show that the correlation between countries which are engaged in GVCs and current account imbalances (in absolute value) is positive in 1995, while for countries characterized by a negative participation measure, the correlation is almost null. The opposite is observed in 2011. Indeed, in 2011, while the correlation between economies which participate in GVCs and current account imbalances is close to zero, it is positive for countries which are weakly engaged in GVCs. When the sign of current account balances is accounted for, the correlation coefficient between both series is found to be negative for countries involved in GVCs, while it is positive for the other economies. These findings tend to suggest that participation in GVC tends to reduce current account balances.

Turning to the link between position in GVC and global imbalances, the differences are noticeable between the beginning and the end of our sample. Indeed, comparing Figures 7 and 8 (in Appendix) and calculating some basic statistics indicate a higher correlation between current account imbalances (in absolute value) and position for countries which are located downstream than for those which are upstream. Specifically, being downstream in the value chain tends to reduce current account balances, while the sign of the correlation coefficient turns to be positive for countries located upstream. In 2011, this result does not further hold as the correlation for the countries located downstream becomes very weak.

As shown, the relationship between (i) participation in GVCs and global imbalances, and (ii) position in GVCs and current account imbalances are far from being obvious. Let us now investigate these links in more detail.

3 Results

3.1 Direct and indirect effects of GVCs on current account positions

Table 2 reports the estimation results of the regression of the current account balance as a percent of GDP on the various considered control variables: the real effective exchange rate ($REER$, in logarithm), the difference between the growth rate of trading-partners' and domestic GDP for each country ($RGDP$), the fiscal balance (as a percent of GDP), the initial net foreign asset position (NFA, in percent of GDP), and population growth rate. The lagged value of the current account is introduced to account for some persistence in imbalances.[10]

[10]Recall that when considering the dynamic specification, the two-step dynamic GMM estimation procedure is used. In that case, we perform the Sargan, J-stat test for the validity of instruments, as well as the AR(2) test for the absence of serial autocorrelation of order 2. As shown in Table 2, according to both

Table 2: GVC and the current account

	Fixed effects			Dynamic GMM		
	Coeff.	Coeff.	Coeff.	Coeff.	Coeff.	Coeff.
	(t-stat)	(t-stat)	(t-stat)	(t-stat)	(t-stat)	(t-stat)
	(1)	(2)	(3)	(4)	(5)	(6)
lagged CA				0.460	0.421	0.378
				(5.51)	(4.87)	(3.63)
ln $REER$	−0.066	−0.068	−0.068	−0.162	0.177	−0.179
	(−6.83)	(−7.09)	(−7.04)	(−2.03)	(2.25)	(−1.99)
ln $RGDP$	0.001	−0.002	−0.003	−0.025	−0.039	−0.041
	(0.14)	(−0.28)	(−0.35)	(−0.43)	(−0.62)	(−0.58)
Fiscal balance	0.008	0.002	0.002	−0.171	−0.248	−0.285
	(0.18)	(0.04)	(0.04)	(−0.92)	(−1.19)	(−1.02)
Initial NFA	−0.003	−0.003	−0.003	−0.008	−0.013	−0.021
	(−0.97)	(−1.02)	(−0.98)	(−0.62)	(−0.91)	(−1.15)
Population growth	−2.138	−2.182	−2.182	2.013	−2.151	−2.396
	(−6.24)	(−6.43)	(−6.43)	(−2.01)	(−1.77)	(−1.83)
GVC indicators						
Participation	−0.188			−0.608		
	(−4.64)			(−2.98)		
Backward participation		−0.255	−0.248		−0.832	−0.621
		(−6.31)	(−5.84)		(−3.44)	(−2.33)
Forward participation			0.036			0.804
			(0.55)			(1.52)
AR(2)				0.149	0.469	0.737
Sargan test				0.972	0.970	0.954

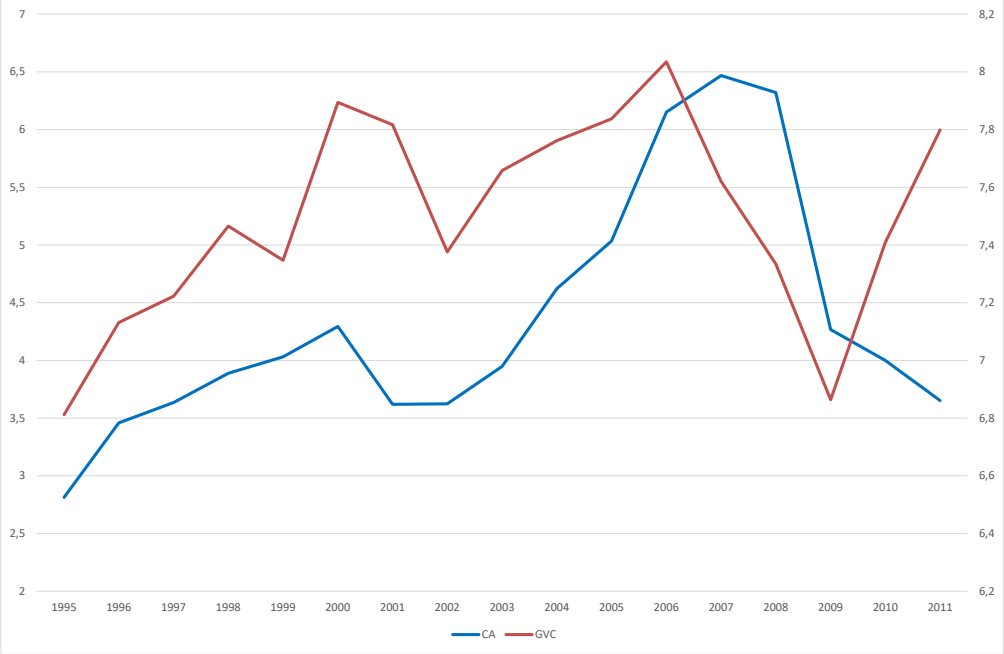
Notes: (a) This table reports the estimated coefficients from Equation (1), (b) Corresponding t-statistics based on robust standard errors are given in parentheses, (c) The null hypothesis of the Sargan test is the validity of instruments, (d) The null hypothesis of the AR(2) test is the absence of serial autocorrelation of order 2.

As shown, all the variables which are significant are correctly signed. In particular, an exchange rate appreciation tends to deteriorate the current account, as well as an increase in the population growth rate. Turning to our main variable of interest, GVC participation is negatively signed—in line with Haltmaier (2015)'s findings—implying that participation in GVCs tends to reduce current account balances. Distinguishing between forward and backward participation, our findings indicate that only backward participation is significant, even when controlled for forward participation. In other words, backward participation makes a negative contribution to current account balances. A country's current account balance will not benefit from higher GVC participation if its primary role is to export intermediates for further processing in other countries, explaining the non-significance of forward participation. In other words, abstracting from the direct arithmetic effect of GVC position on current accounts, whereas an increase in "upstreamness" does not directly affect the current account balance, a rise in downstreamness decreases it.

A crucial question when dealing with global imbalances is that the rising importance of GVCs may have altered the traditional relationship between exchange rate movements

tests, the models are correctly specified.

Figure 4: Global value chain participation and exports' growth, 1995-2011



Note: Authors' calculations based on data extracted from WDI and TiVA databases.

Table 3: GVC, real exchange rate and the current account

	Fixed effects Coeff. (t-stat) (1)	Dynamic GMM Coeff. (t-stat) (2)
lagged CA		0.536 (7.81)
$\ln REER$	−0.076 (−8.19)	−0.067 (−3.99)
$\ln RGDP$	−0.003 (−0.43)	−0.012 (−1.10)
Fiscal balance	−0.054 (−1.15)	−0.066 (−0.86)
Initial NFA	0.011 (1.72)	−0.010 (−1.57)
Population growth	−2.035 (−6.60)	−1.600 (−3.10)
GVC indicators		
Downstream position	−6.897 (−1.12)	−25.336 (−1.29)
Downstream position × $\ln REER$	0.005 (0.41)	0.042 (1.01)
AR(2)		0.219
Sargan test		0.997

Notes: (a) This table reports the estimated coefficients from Equation (1), (b) Corresponding t-statistics based on robust standard errors are given in parentheses, (c) The null hypothesis of the Sargan test is the validity of instruments, (d) The null hypothesis of the AR(2) test is the absence of serial autocorrelation of order 2.

and competitiveness because imports of intermediate goods in a GVC are inputs into exports. Therefore, the impact of exchange rate changes on trade may vary and could be dampened or amplified depending on an economy's position in the GVC. In particular, the question is whether countries that are located downstream in the supply chain are more isolated to shocks in the real exchange rate. To investigate this hypothesis of an indirect GVC effect passing-through the exchange rate, we interact the real exchange rate with the "downstream" (i.e., position) variable.

Table 3 displays the estimation results. The non-significance of GVC position, both when entered alone and when interacted, deserves some comments. Brumm, Georgiadis, Grab, and Trottner (2016) find a positive link between position in GVC and current account balances. They explain this result through the value added channel: countries that are situated upstream in the supply chain have an important amount of value added included in their exports, improving, in turn, their current account position. However, as rightly emphasized by Haltmaier (2015), it is the gap between gross exports and imports that matters for the current account position, not the amount of value added in a country's exports. As a consequence, an upstream-located country in the supply chain may (i) export intermediate goods with a high value added content to its GVC trading partners, but also (ii) import other products from countries involved in GVCs. On the whole, the current

account is not impacted, in line with our findings.

Turning to our main variable of interest, the interaction variable—i.e., the product between downstream position and the real effective exchange rate—does not enter significantly in the regression. This result may be seen as counterintuitive at a first sight. Let us briefly explain why it is not the case by describing the underlying mechanisms. An exchange rate appreciation reduces exports and, in turn, negatively affects the current account position. However, at the same time, this upward trend in the exchange rate decreases the price of imported intermediate goods that are used as inputs in exported goods. As a consequence, the previous negative effect on the current account is weakened. More generally, the exchange rate appreciation pushes downwards not only the price of imported inputs, but also the price of all imported goods—i.e., even those that are not used to produce exported goods—positively affecting the current account position. Gathering those two effects together, they tend to compensate and the total impact on the current account position becomes non-significant.

Overall, our results do not corroborate those of Riad, Errico, Henn, Saborowski, Saito, and Turunen (2012). According to those authors, if the real exchange rate affects the current account balance, a higher foreign content share in the exports of a country can mitigate the impact of exchange rate changes. In other words, the relationship is expected to be weaker for countries whose main role in the supply chain consists in importing intermediate goods or services that are then used to assemble the final product that is finally exported. The non-significance of the interaction variable in our estimated model indicates that downstreamness does not cushion the impact of the exchange rate.

3.2 GVC effects on exports' growth, competitiveness and savings

Contrary to what could have been expected, our empirical results show that the current account is negatively related to GVC participation. To understand this finding, we have to look at some further elements that are at play in the relationship. As in Brumm, Georgiadis, Grab, and Trottner (2016), assuming that domestic and imported intermediate goods are substitutes in production, a decrease in the cost of the latter relative to the former implies substituting less expensive imported intermediate goods for those produced domestically. Higher participation in GVCs should result, therefore, in a raise in the economy's exports. Because exports are cheaper, there is a gain in competitiveness for domestic exporters. Furthermore, since this gain in competitiveness is perceived to be only temporary—foreign economies will also exploit the advantages of higher GVC participation—in order to smooth consumption over time, part of the income gain in the domestic economy will be saved, which improves the current account balance.

Table 4: GVC and exports' growth

	Fixed effects			Dynamic GMM		
	Coeff. (t-stat)	Coeff. (t-stat)	Coeff. (t-stat)	Coeff. (t-stat)	Coeff. (t-stat)	Coeff. (t-stat)
	(1)	(2)	(3)	(4)	(5)	(6)
lagged *Exports*				0.057 (1.27)	0.056 (1.29)	0.008 (0.19)
$\ln REER$	−0.067 (−4.19)	−0.066 (−4.08)	−0.075 (−4.67)	−0.141 (−2.81)	−0.137 (−2.99)	−0.191 (−3.52)
ΔGDP	3.056 (2.68)	3.056 (2.72)	2.475 (4.87)	3.005 (3.47)	3.006 (3.94)	2.341 (8.88)
GVC indicators						
Participation	0.083 (1.13)			0.245 (1.01)		
Backward participation		0.152 (2.09)			0.506 (2.60)	
Growth intermediate imputs			0.092 (5.52)			0.109 (3.53)
AR(2)				0.061	0.083	
Sargan test				0.986	0.408	

Notes: (a) This table reports the estimated coefficients from Equation (4), (b) Corresponding t-statistics based on robust standard errors are given in parentheses, (c) The null hypothesis of the Sargan test is the validity of instruments, (d) The null hypothesis of the AR(2) test is the absence of serial autocorrelation of order 2.

According to this mechanism, three testable hypotheses are at play in the analysis. First, the ability of a country to integrate foreign inputs in its domestic production implies that GVC participation should be positively related to exports' growth. Second, higher backward participation in globalized production processes suggests competitive improvements, i.e., a depreciation of the real exchange rate. Finally, higher GVC participation is accompanied by higher savings, otherwise the current account balance is likely to deteriorate as consumption, and thus imports, rise commensurately to permanent income.

To investigate the previous underlying relationships, we estimate the following equations using (i) the growth rate of exports of country i , (ii) the real effective exchange rate of country i, and (iii) the saving rate of country i as the dependent variables:

$$Y_{i,t} = \alpha_i + \delta Y_{i,t-1} + \beta Z_{i,t} + \gamma GVC_{i,t} + \varepsilon_{i,t} \tag{4}$$

where $Y_{i,t}$ is either the annual growth rate of exports of country i in year t, the (log) real effective exchange rate or the saving rate.[11] $Z_{i,t}$ is a vector of explanatory variables usually considered as the main determinants of the aforementioned dependent variables. As for the current account regressions, we present both, the static fixed effects model ($\delta = 0$)

[11]Data on exports and savings are extracted from WDI. Specifically, regarding exports, we consider the annual growth rate of exports of goods and services based on constant local currency. Aggregates are based on constant 2010 U.S. dollars. Exports of goods and services represent the value of all goods and other market services provided to the rest of the world.

and the dynamic two-stage GMM model ($\delta \neq 0$).

As a first insight and as for the current account position (Figure 3), it is worth mentioning that participation in GVC and growth in exports (Figure 4) aggregated over all countries exhibit a similar global trend, whereas there are some discrepancies at both the beginning and the end of the sample. Overall, this figure is suggestive of a relationship between participation in value chains and exports' growth. Table 4 displays the corresponding estimation results. As for the current account regression, the control variables are correctly signed: the world GDP growth is positive, driving the current account upwards, and the exchange rate appreciation has a detrimental effect on exports, as expected. Turning to our main variable of interest, we show that while participation in GVC does not significantly influence exports, backward participation plays a key role by boosting exports' growth. Similarly, an increase in intermediate inputs imports positively affects exports, which is explained by the fact that such goods will be used to produce goods that will be further exported. Comparing results in Tables 2 and 4 suggests that the non-significance of the effect of GVC participation on current account balances comes from the increasing value of imports from countries involved in GVCs—that mitigate what would be the positive impact on exports. These findings illustrate the relevance of complementing the analysis of the impact of GVC participation on current account positions by an investigation of its effect on exports.

Let us now turn to the next hypothesized relationship, namely, the positive link between GVC and competitiveness. Our estimated specification includes three usual exchange rate determinants: the relative productivity ($PROD$), which stands as a proxy for the Balassa-Samuelson effect, expressed in logarithm and extracted from the EQCHANGE database; the net foreign asset position as percentage of GDP (NFA); and the terms of trade (TOT) expressed in logarithm and taken from the WDI database. Table 5 shows that, when significant, the control variables have the expected positive sign. Indeed, a rise in relative productivity as well as in the net foreign asset position leads to an exchange rate appreciation. Turning to GVC, whereas its estimated coefficient is negatively signed, the effect is globally non-significant. An increase in GVC participation does not significantly depreciate the exchange rate, suggesting the absence of competitiveness gains.[12]

Finally, the results corresponding to the case where the saving rate is the dependent variable are presented in Table 6. As seen, most variables are statistically significant and have

[12]Note that for the sake of robustness and falling into the strand of the literature on equilibrium exchange rates, we have also estimated a cointegrating relationship between the real effective exchange rate and its considered determinants. The results (available upon request to the authors) confirm those reported in Table 5, with no significant effect of GVC participation on the REER.

Table 5: GVC and the real exchange rate

	Fixed effects		Dynamic GMM	
	Coeff. (t-stat)	Coeff. (t-stat)	Coeff. (t-stat)	Coeff. (t-stat)
	(1)	(2)	(3)	(4)
lagged ln $REER$			0.732 (10.19)	0.733 (10.69)
ln $PROD$	0.322 (11.31)	0.320 (11.21)	0.212 (2.91)	0.212 (2.90)
NFA	−0.011 (−1.10)	−0.008 (−0.82)	0.059 (3.33)	0.060 (3.30)
ln TOT	0.056 (1.31)	0.053 (1.19)	−0.048 (−0.46)	−0.058 (−0.49)
GVC indicators				
Participation	−0.382 (−2.44)		−0.176 (−0.83)	
Backward participation		−0.186 (−1.11)		−0.132 (−0.46)
AR(2)				
Sargan test				

Notes: (a) This table reports the estimated coefficients from Equation (4), (b) Corresponding t-statistics based on robust standard errors are given in parentheses, (c) The null hypothesis of the Sargan test is the validity of instruments, (d) The null hypothesis of the AR(2) test is the absence of serial autocorrelation of order 2.

the expected signs.[13] Indeed, the age structure, i.e., the dependency rate of the population, influences the saving rate in accordance to the life-cycle hypothesis: the aggregate saving rate is lower for relatively older populations. Domestic credit as a percentage of GDP, used to capture credit availability, lessens the need for precautionary savings and, therefore, correlates negatively with the saving rate. The level of public social protection spending, proxied by the government expenditure as a percentage of GDP, is negatively associated with the saving rate as it reduces the need for precautionary savings by individuals. Our results also indicate that a low real interest rate prompts people to increase their savings to compensate for the low rate of return. Finally, the whole picture is completed with the negative and significant sign of both total and backward GVC participation.

In sum, while promoting exports, the hypothesis that a country's participation in global value chains leads to competitive exchange rates and, thus, higher domestic saving is not validated for our panel of countries. A possible explanation lies in the missing role of imports on the current account. Indeed, (i) total imports being the sum of consumption and intermediate imports, and (ii) intermediate imports being cheaper and substituting domestic intermediates, the current account can deteriorate if exports grow less than

[13]The sources of the variables are the following: (i) WDI for gross savings expressed as percent of GDP (SAV), the dependency ratio (DEP), domestic credit to private sector expressed as percent of GDP ($CREDIT$), and the real interest rate (RIR); and (ii) WEO for GDP per capita at purchasing power parity, in constant 2011 international dollar ($GDPPC$) expressed in logarithm, and general government expenditure as percent of GDP ($GOVEXP$).

Table 6: GVC and the saving rate

	Fixed effects		Dynamic GMM	
	Coeff.	Coeff.	Coeff.	Coeff.
	(t-stat)	(t-stat)	(t-stat)	(t-stat)
	(1)	(2)	(3)	(4)
lagged SAV			0.618	0.564
			(5.22)	(6.50)
DEP	−0.451	−0.395	−0.587	−0.532
	(−4.47)	(−4.05)	(−1.89)	(−1.11)
$CREDIT$	−0.025	−0.028	−0.009	0.012
	(−4.97)	(−5.71)	(−3.51)	(−2.95)
$GOVEXP$	−0.084	−0.086	−0.118	−0.116
	(−2.11)	(−2.24)	(−10.67)	(−1.85)
RIR	−0.087	−0.086	−0.116	−0.113
	(−4.23)	(−4.70)	(−3.14)	(−4.05)
$\ln GDPPC$	9.026	8.895	3.803	4.446
	(10.59)	(10.82)	(2.68)	(1.82)
GVC indicators				
Participation	−0.232		0.096	
	(−6.40)		(−4.08)	
Backward participation		−0.347		−0.185
		(−9.33)		(−2.88)
AR(2)			0.171	0.186
Sargan test			0.989	1.000

Notes: (a) This table reports the estimated coefficients from Equation (4), (b) Corresponding t-statistics based on robust standard errors are given in parentheses, (c) The null hypothesis of the Sargan test is the validity of instruments, (d) The null hypothesis of the AR(2) test is the absence of serial autocorrelation of order 2.

imports. In addition, as shown by our findings, the product between GVC downstream position and the real effective exchange rate does not significantly impact the current account, indicating that the negative effect of an exchange rate appreciation can not be avoided.

4 Conclusion

This paper addresses the impact of participation of countries in GVCs on their current account balances. Specifically, since the world economy has been marked by a sharp rise in both global imbalances and GVCs, we investigate whether the increase in GVC has contributed to amplify global imbalances.

Relying on a panel of 57 advanced and emerging countries, we do not find evidence that GVC participation directly raises economies' current account positions. On the contrary, we show that backward participation makes a negative contribution to current account balances: our results contradict the speculation that current account positions of downstream countries are likely to benefit more from GVC participation than economies which are located further upstream. Moreover, we show that there is no significant indirect effect of GVC on the current account operating through the real exchange rate. In this sense, the

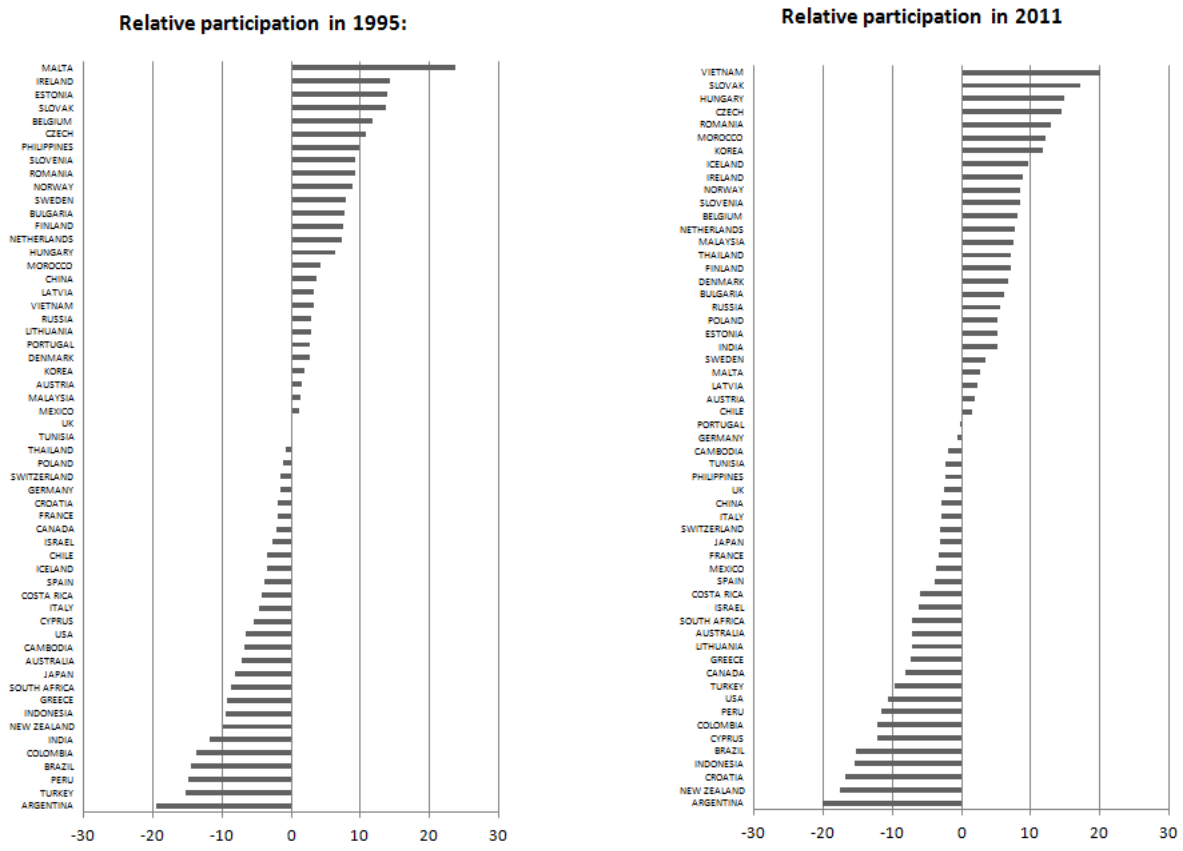
latter can still be viewed as a tool to adjust current account imbalances, even for countries situated in a downstream position. In addition, whereas higher backward participation plays a key role by boosting exports, there are no gains in terms of price competitiveness. Finally, we find evidence that participation in GVC is not accompanied by an increase in savings and, therefore, does not lead to improvements in current account balances.

By contributing to a better understanding of GVCs, our findings have important policy implications. Specifically, a better identification of countries' characteristics in terms of domestic value added content of gross exports together with a better understanding of where countries are positioned (upstream or downstream) along the global supply chain will help in studying international linkages and designing trade policies. In particular, such a better knowledge will help in examining the effects of GVCs on the international transmission of shocks, the evolution of trade imbalances, specialization patterns, and the role of protectionist measures such as trade barriers.

Regarding specialization patterns, it is worth mentioning that GVCs have deeply impacted trade theory. As a simple illustration, whereas standard models of international trade based on comparative advantages mostly deal with final goods, the rising international production fragmentation process renders necessary to define specialization patterns at a more disaggregated level, i.e., at a particular stage in the global supply chain. Similarly, international fragmentation has obviously important implications for the distributive effects of trade. More generally, GVCs start to be accounted for by policy-makers in the design of trade policies. As emphasized by De Backer, De Lombaerde, and Iapadre (2018) among others, several policies—including trade policies, export and investment promotion policies, and industrial policies—have recently been re-defined in terms of participation in GVCs. Among the main implications of GVCs from a trade policy viewpoint, fragmentation of production across various countries tends to rise the cost of tariff and non-tariff trade barriers due to the high number of border crossing during the production stages.

In sum, a better understanding of GVCs to which the present paper contributes will help in determining the actual costs of specific trade policies as well as in assessing the sensitivity of economies to protectionist measures. Overall, the international fragmentation of production together with the increasing role of GVCs have profoundly modified the configuration of international trade, requiring a re-thinking of standard international trade theories. Furthermore, given the link we found between GVCs and current-account positions, policies aiming at narrowing global imbalances should account for participation of countries in supply chains.

Figure 5: Ranking of relative participation in GVC in 1995 and 2011



Appendix

Figure 6: Ranking of relative background participation in GVC in 1995 and 2011

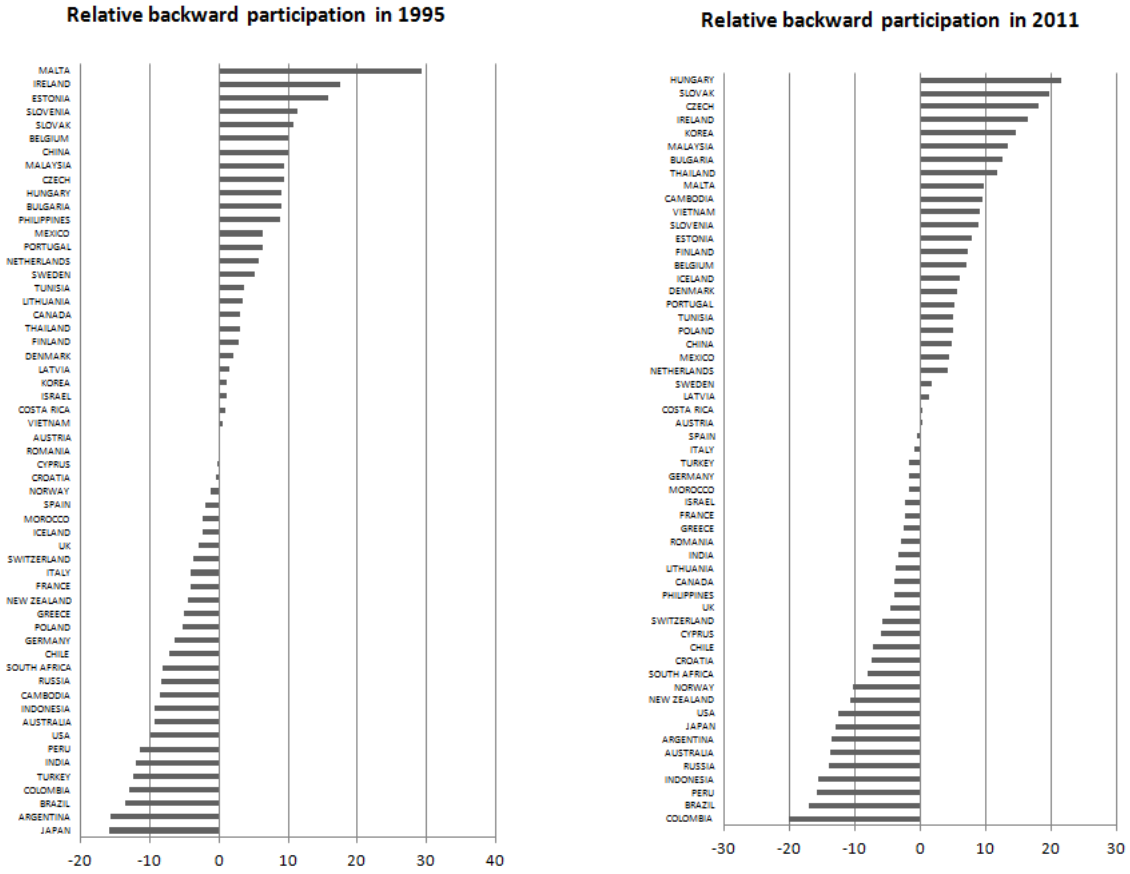


Figure 7: "Downstreamness" position in 1995 and 2011

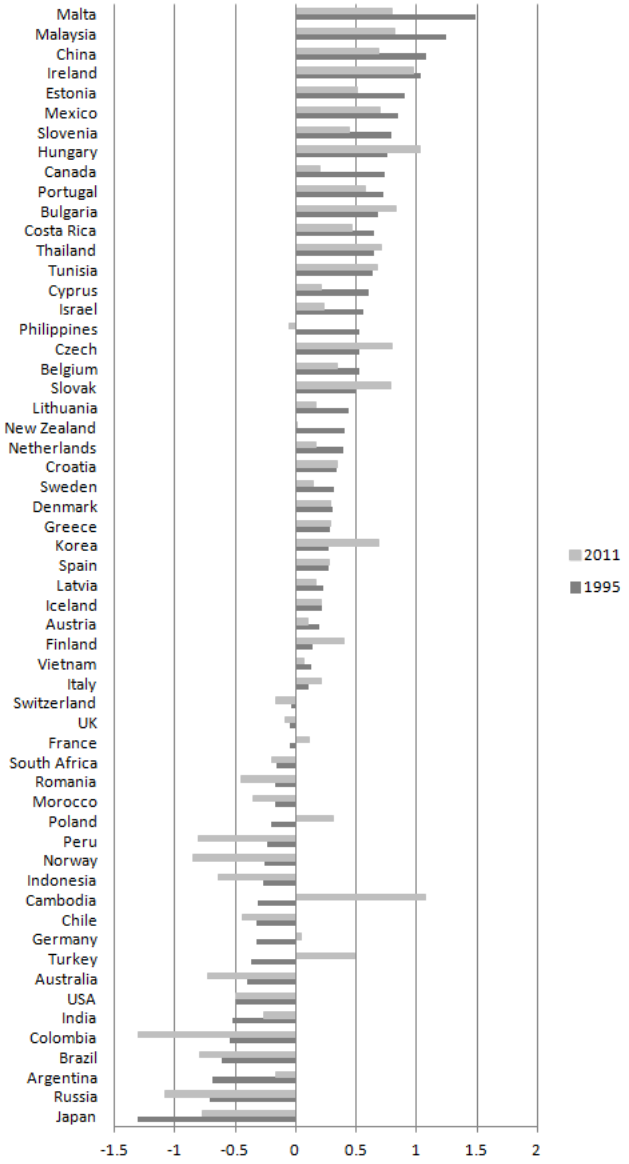
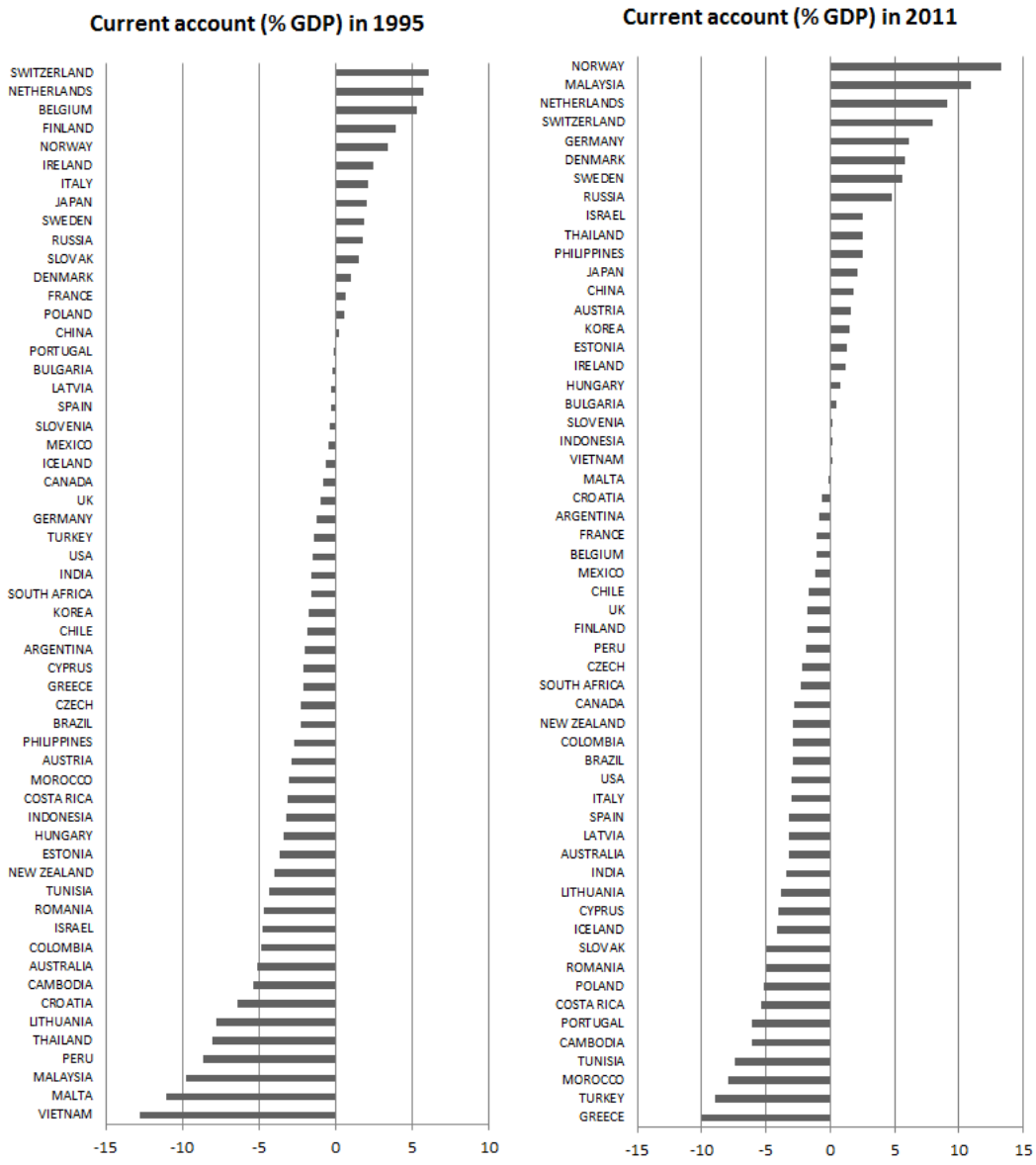


Figure 8: Current account balance (% of GDP) in 1995 and 2011



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