

THE CONTRASTING NATURE OF GLOBAL VALUE CHAINS IN HIGH INCOME COUNTRIES AND DEVELOPING NATIONS

Cheick Wagué
Nandakumar P. Warriar

ABSTRACT

Global value chain linkages exhibited by high income nations, emerging market nations and the African countries are examined. It is noted that the upper income countries have more global supply chain linkages, which tend to be more of the backward linkage type, being more active in the downstream part of the production processes. African nations have lower total and backward global value chain linkages, and they are more upstream in production processes, exporting intermediate goods that are used for exports production by trading partners. Examining the regional aspects of global supply chain linkages, it is noted that the European Union countries have more global value chain linkages within themselves, thus substantiating the rationale for forming a union among themselves. The East and Southeast Asian group of countries have greatest global value chain linkages within the group, while African nations have low global value chain linkages among themselves. This observation raises the question whether the attempts to form monetary unions in Africa have followed the customary sequence of trade liberalization and expansion prior to monetary integration.

Keywords: Global value chain, trading partners, trade liberalization, monetary union

1. INTRODUCTION

One of the main reasons advanced for not opting to join a monetary union, as, for instance, influential at the time of the referendum on European Monetary Union (EMU) entry in the case of Sweden, is that membership means abandonment of the option of depreciation to maintain competitiveness and increase exports and domestic output. However, such reasoning may not be entirely valid when the presence of intermediate inputs in production is taken into

The significance of the use of imported inputs in production has been noted earlier regarding the effectiveness of macroeconomic policy under flexible exchange rates and international mobility of capital. As an important qualification to the Mundell's (1963) celebrated work on policy effectiveness in small open economies, Findlay & Rodriguez (1977) showed that under flexible exchange rates and international mobility of capital, fiscal policy can affect output when imported inputs in production are present. Recently, another feather has been added to the cap of the category of imported production inputs: it has become evident that the value of the real effective exchange rates (REERs) and the measured elasticity of exports to these exchange rates are affected by the presence of imported inputs in production that represent global value chain linkages.

This present paper explores and summarizes the position on the relationship between global value chains, REERs and their impacts on exports. Then attention is focused on selected emerging market nations to see how global supply chain linkages affect the relationship between REERs and exports, a relationship which may have been a key input into their decision to go for an export-led growth initiative, and which would have also affected the outcomes of such policy decisions.

2. GLOBAL VALUE CHAIN LINKAGES

– IMPLICATIONS FOR MACROECONOMIC POLICY AND TRADE

The importance of imported production inputs was first brought – painfully - into the limelight only during the oil price shocks of the 1970s. Modeling the effects of the shock in the economics literature was often done conveniently by a three-level production function with substitution between imported oil and a composite of capital and labor (see, for instance, Nandakumar, 1988). Such formal modeling showed clearly that adjustment to the oil price shock, to be successful, would have required a consensus on wage restraint and a hold-back of government spending - all of which was not forthcoming in the western economies in the aftermath of the first oil price shock of 1973. Current literature on the implications of global supply chains for exchange rates and exports also makes use of formal three-level production functions.

Quite apart from this recognition of an imported input as the source of a macroeconomic shock, its significance for the effects of aggregate macroeconomic policy was highlighted by Findlay & Rodriguez (1977), building on the elegant open-economy framework of Mundell (1963). They look at a Mundell-type economy with flexible exchange rates and international mobility of capital. In the absence of imported inputs, as in Mundell's original work, an expansionary fiscal policy tends to push up home interest rates, attracting a huge capital inflow that appreciates the exchange rate. The exchange rate appreciation, in turn, reduces exports, acting to nullify the original expansion in output brought about by the fiscal expansion. In other words, fiscal policy stands ineffective in affecting output under flexible exchange rates. Thus, Mundell's seminal contribution states that while fiscal policy is effective under fixed exchange rates, under flexible exchange rates monetary policy is the appropriate choice to influence output. However, when imported inputs are present, as modeled by Findlay & Rodriguez (1977), as the exchange rate appreciates as a result of fiscal expansion, the foreign input into production becomes cheaper, giving a stimulus to production; fiscal policy is seen to have the potential to affect output, even under flexible exchange rates.

Thus, the work by Findlay & Rodriguez (1977) highlights the relationship between exchange rates and imported inputs, i.e., global supply chain linkages. The global value chain literature on REERs has a similar focus. A depreciation of the exchange rate makes home final goods exports competitive, expanding exports and output. But when imported inputs are used in the final

good exports production process, the depreciation raises their costs, which tends to reduce exports. Hence the response of exports, the exchange rate elasticity of exports, will be lower. This is termed the backward linkage effect on the real exchange rate elasticity of exports.

There is also a forward linkage effect on the REER elasticity of exports (seen empirically to be less important): when the home country's intermediate goods are used by its trading partner for production of exports to a third country, a depreciation of the home exchange rate reduces the cost of such production, giving a positive stimulus to exports going to third country – which increases competitiveness upstream. Thus, a depreciation lowers the real exchange rate elasticity of exports when backward linkages (with imported inputs in export production) are present, but the effect of forward linkages, with the depreciation raising demand for intermediate goods exports from the country, is to raise this elasticity.

We will now look at the construction of the global value chain indices, which take into account imported inputs in exports production, in practice.

The forward linkage index of a country exporting using imported intermediate goods is stated as the ratio of imported intermediate goods value added to the country's gross exports. i.e.,

$$GF_{ix} = DV_{ix} / Exp_{ix}$$

where DV_{ix} is the value of the import of intermediate goods in a particular export sector 'i', and Exp_{ix} is the value of the gross exports from that sector.

The backward linkage index is constructed as

$$GB_{ix} = FV_{ix} / Exp_{ix}$$

where FV_{ix} is the value of the country's exports of intermediate goods in total gross exports from that sector.

The Global participation Index is the sum of the forward and backward linkage indices.

The global positioning index is constructed using both the forward and backward linkage indices as

$$GPIndex = \ln(1 + \text{forward linkage index}) - \ln(1 + \text{backward linkage index}),$$

and is positive if forward linkages are more important (Koopman et.al., 2010).

Also, there would be more forward linkages when the country is more upstream in the production processes. High Global backward participation Indices lower the REER elasticity of exports, but global positioning has an ambiguous impact on this elasticity.

In the actual construction of the indices, multi-regional input-output tables have to be used. This will take care of issues posed by re-export of imported goods etc. While this is usually done assuming no differences in elasticities of substitution, a more comprehensive approach allows for differences in elasticities between various production inputs, including imported inputs, and between countries. The elasticities of substitution between production inputs influence the net exports after an exchange rate change, because with greater substitution between domestic and imported inputs, there will be more cut-back from imported inputs after a devaluation, which means the constraining effect on net exports is less. This has been emphasized in multi-country studies of the adjustment process to the oil price shocks of the 1970s.

The impact of global value chains on REER elasticities, lowering them, has been established in a number of studies. Ahmed, Appendino and Ruta (2015) show that higher participation in global supply chains is related to lower elasticity of exports to the REER, the effect being stronger at sectoral levels than for the export economy as a whole. Their study was done for around 46 countries from the high income as well as the emerging market group of nations and revealed a lowering impact of the global value chain on the REER elasticity of 22% on the average, and up to 30 percent for countries with higher global linkages.

In this paper we do not attempt a regression analysis to establish the role of global value linkages on the REER elasticity of exports. Rather, in the next section, we explore the effects of the global supply chain on the participation indices of a number of emerging market nations in Asia, Africa, and discuss the implications of this on their REER elasticities of exports as well as for constructed REER indices. Particular attention is paid to countries that are members of a monetary union, as expanded international trade – which is affected by the REER elasticity of exports would have been one of the reasons for their membership decision.

3. GLOBAL VALUE CHAINS IN HIGH INCOME NATIONS & EMERGING MARKETS

The exchange rate elasticity of exports is of special significance to developing economies as major development policy decisions hinge on it. For instance, a policy of export-led growth for these nations will not be feasible if exports respond only feebly to exchange rate depreciation or a formal devaluation. It may be noted that policy advice to these nations from the IMF has usually involved an expansion of exports (via an exchange rate depreciation), and not an expansion of government spending or an expansionary monetary policy. However, a higher import content in the exports of these developing nations would have weakened the effects of such a policy, as exports would have been less elastic to exchange rate changes than what was assumed by the policy makers. Table 1 lists the global linkage indices for high income and major emerging market nations.

Table 1: Global Value Chain Participation, Developed & Emerging Economies

Country	Backward Index (T)	Forward Index (T)	Total GVC	Country	Backward Index (T)	Forward Index(T)	Total GVC
Argentina	14.1	16.4	30.5	Malaysia	40.6	19.8	60.4
Australia	14.1	25.5	43.6	Philippines	23.5	27.4	50.9
Brazil	10.7	24.5	35.2	Singapore	41.7	19.9	61.6
Canada	23.4	19.0	42.4	Thailand	39.0	15.4	54.3
Chile	20.2	31.7	51.9	Vietnam	36.3	16.0	52.3
China	32.1	15.6	47.7	European Union			
Colombia	7.6	30.2	37.9	Belgium	34.4	23.5	57.9
Iceland	33.2	26.1	59.3	Denmark	32.8	24.1	56.9
India	24.0	19.1	43.1	Finland	34.6	22.7	57.3
Israel	25.0	19.3	44.2	France	25.0	21.9	47.0
Japan	14.6	32.8	47.4	Germany	25.5	24.1	49.6
Mexico	34.7	15.1	46.8	Greece	24.9	18.3	43.3
New Zeal.	16.6	16.7	33.3	Hungary	48.5	16.6	65.1
Russia	13.7	38.1	51.8	Ireland	43.5	15.7	59.2
South Africa	19.5	26.5	46	Italy	26.4	21.1	47.5
Switzerland	21.7	25.6	47.3	Latvia	28.6	24.0	52.6
Tunisia	32.4	18.3	50.7	Luxembourg	58.9	11.9	70.8
Turkey	25.7	15.3	41	Holland	20.0	27.5	47.4
USA	15.0	24.9	39.8	Poland	32.3	23.3	55.5
ASEAN				Portugal	32.6	17.7	50.3
Cambodia	36.8	11.9	48.7	Romania	24.4	24.6	49.0
Indonesia	12.0	31.5	43.5	Spain	26.8	19.7	46.5
Korea	41.6	20.5	62.1	Sweden	29.0	24.6	53.7
				U. K.	22.9	24.7	47.66

Source: UNCTAD-EORA GVC database

The indices, especially the backward linkages are higher for the European Monetary Union nations. Ireland, for instance, which is known for exports of computers using imported parts has a high backward GVC index. The forward index is higher only for the UK and the Netherlands, which could be due to the exports of natural gas. A similarly high backward index is seen in the case of the ASEAN nations Korea and Singapore.

Though exhibiting high GVC indices in general, there are variations within these nations, the EU and the ASEAN nations, that form monetary unions. This means that with any change in the common exchange rate against the rest of the world, they will be experiencing varying developments in exchange rate competitiveness. For instance, Hungary and Ireland have higher backward and total GVC indices relative to France and Germany. A depreciation of the Euro will increase net exports less for Hungary and Ireland who will have to pay higher prices now for their imported inputs in production. For Germany and France who are less dependent on imported inputs for their exports, the reduction in net exports due to export dependence on imported goods will be less. Similarly, in the case of the ASEAN nations, Korea, Singapore and Malaysia, who are more globally integrated than Indonesia and The Philippines, as can be seen from the GVC indices, an equal depreciation in exchange rates will have less positive effect on net exports.

These effects can be directly read off from real effective exchange rate (REER) indices adjusted for the global value chain linkages.

Table 2 shows the reconstructed REER indices taking into effect the GVC linkages, for some of the EMU nations (see Bems & Johnson, 2015; Patel, Wang & Wei, 2017).

Table 2: REERS Adjusted for Imported inputs In Production

Country	Appreciation of the REER index with imported inputs considered	Appreciation with Varying substitution elasticities also included	Country	Appreciation of the REER index with imported inputs considered	Appreciation with imported inputs considered
Australia	0.0	0.13	India	0.0	0.02
Austria	0.21	0.19	Italy	-0.01	0.0
Belgium	0.24	0.08	Japan	0.03	0.09
Brazil	-0.01	-0.02	Korea	0.01	0.01
Canada	-0.06	0.07	Mexico	-0.03	0.01
China	-0.01	0.0	Holland	0.04	-0.01
Germany	0.33	0.0	Sweden	0.10	0.13
Spain	0.03	0.13	Turkey	-0.01	-0.03
France	0.27	0.05	USA	0.08	0.04
UK	0.08	0.06			

Source: Bems & Johnson (2015). Figures are median values for 1970-2009

Columns 2 and 4 in table 2 give the difference between conventional REERs and the REER obtained when imported inputs in exports production are taken into account, thus marking the difference between value added and gross output. So, we are not talking here about appreciation in the usual sense! This figure does not consider differences in substitution elasticities between final goods, between production inputs etc. Columns 3 and 6 in the table give the change from conventional REERs when variations in substitution elasticities are considered.

An appreciation of the REER index, that is, an increase in the value of the index (note that in the definition of the real effective exchange rate, the nominal exchange rate is in terms of units of foreign currency per unit of home currency) makes the country's exports less competitive. Hence, when we note that Belgium's REER index rises by 0.24 due to GVC links, it is because of the backward GVC linkage represented by the index of 34.4 in Table 1: an increase in exports of the final good following a depreciation would be offset to some extent by the increased value paid for imported inputs. The forward GVC linkage index of 23.5 means that more demand for the country's exports used in production of exports by the trading partner will ameliorate this dampening effect on exports.

The second column shows the effect on the REER index when substitution between production inputs, including imported inputs, is also taken into account. It can be seen from the table that the appreciation of the RRER index due to the presence of imported inputs used in exports production is offset to a large extent by substitution away from the inputs that have become costlier. Thus, the RRER appreciation of 0.33 is contained to 0.0 and that of 0.27 for France is contained to 0.05.

What does the change in the REER index when GVC linkages are considered have to say for the real exchange rate elasticity of exports? The acknowledgement of the use of imported inputs in exports production means that for a given rate of depreciation, the increase in net exports will be less: that is, the real exchange rate elasticity of exports is reduced. The change in the REER index is a mirror image of this reduction in the exchange rate elasticity of exports: the rise in the REER index (which reduces exports) reflects this negative effect on exports when imported inputs in exports production are explicitly considered.

In the next section we take a look at the extent of global value chain linkages in developing nations, with emphasis on Africa, where a number of efforts at monetary union formation in the various regions have taken place or are under way.

4. GLOBAL VALUE CHAINS IN DEVELOPING ECONOMIES

Table 3 presents data on backward GVC linkages and total GVC linkages for the African nations. The forward linkage is easily derived from this data. It is seen that the backward linkages are weak except for some nations such as Lesotho, Seychelles, and Swaziland. For most nations the forward linkage, with the country's exports being used in production of exports by the trading partner, seems to be stronger.

It will be interesting to note the linkages in the countries that have pushed economic and monetary integration most. Let us look at the countries that formed the GVC linkages for the African nations.

Table 3: Global Value Chain: Total and Backward Linkages, African Nations

Country	Total GVC	FVA (Backward Linkage)	Country	Total GVC	FVA
Sao Tome	64%	41%	Burundi	51	20
Swaziland	58	45	South Africa	49	15
Liberia	48	18	Gabon	41	9
Cape Verde	51	29	Togo	38	19
Botswana	47	30	Sierra Leone	46	21
Guinea	68	12	Niger	42	15
Mauritius	50	38	Mauritania	51	18
Djibouti	52	27	Zimbabwe	46	8
Ethiopia	55	34	Mozambique	37	13
Rwanda	52	21	Mali	35	12
D.R. Congo	67	13	Somalia	41	16
Central African Rep.	54	17	Burkina Faso	39	18
Lesotho	59	43	Benin	33	12
Namibia	42	25	Kenya	37	19
Angola	40	7	Chad	34	5
Zambia	44	17	Ghana	35	7
Congo	43	9	Malawi	37	15
Gambia	47	20	Madagascar	38	16
Cameroon	46	8	Senegal	35	12
Nigeria	43	6	Uganda	32	14
Seychelles	52	36	Tanzania	40	23
Cote d'Ivoire	31	6			

Source: Foster-McGregor et al., (2015), UNCTAD-EORA GVC database

It is readily noted from table 3 that, except for some nations like Sao Tome, Swaziland, Mauritius and Lesotho, forward linkages (the difference between total GVC and backward GVC given in the table) are more important for African nations. This is in stark contrast to the European Union nations and emerging market nations (data in table 1) nations for which the backward

linkages figure more importantly. Thus, the African nations are more active in the upstream part of the production processes in the global supply chain.

Let us see how the African nations that have driven the process of economic and monetary integration stand in this respect: have they become more integrated into the global value chain than the other countries in Africa? And how does their extent of global linkages compare with that of the high income and emerging market nations?

The Economic Community of West African nations (ECOWAS), set up in 1975 in Nigeria with the goal of economic and monetary integration of the region, consists of the following nations: Benin, Burkina Faso, Cote d'Ivoire, Gambia, Ghana, Guinea, Guinea Bissau, Ivory Coast, Liberia, Mali, Niger, Nigeria, Senegal, Sierra Leone, Togo. Some of the ECOWAS nations joined together to form the West African Economic and Monetary Zone (WAEMU) that used a common currency CFA Franc tied to the French Franc. These WAEMU nations comprise of Benin, Burkina Faso, Cote d'Ivoire, Mali, Niger, Senegal, Togo and Guinea Bissau.

What can be noted from table 3 is that none of the WAEMU nations – except Togo, which has a backward index of 19, equal to the forward index - have a backward index that reaches anywhere close to their forward participation index (but some nations like Guinea, Gambia, Liberia, Niger, Nigeria and Sierra Leone match some of the high income and ASEAN nations in total GVC linkage). In contrast, nations that are not part of ECOWAS and WAEMU, such as Botswana, Lesotho, Sao Tome, Swaziland, and Djibouti have high backward GVC linkages relative to these countries that have been active in formal economic and monetary integration processes.

4.1. Regional integration in economic unions relative to global integration:

Trade reforms that increase integration of goods markets are normally undertaken prior to financial integration initiatives. And, in countries striving to form a monetary union, trade flows in the region must be enhanced before plunging into a full-fledged monetary union relationship. It will be instructive to see how African nations have fared in this respect, relative to European Monetary Union nations and the ASEAN group. Tables 4 and 5 provide some information on regional and global linkages for the various groups of nations.

Table 4: Total Global Value Chain Participation (Total GVC) - Region-wise Linkages

	USA	EU	Japan	East & S.E. Asia	South Asia	Africa	South America
USA	9%	11%	2%	9%	1%	< 1%	6%
EU	3	37	1	6	2	1	1
East & S.E. Asia	3	11	5	22	3	<1	1
Africa	3	29	1	7	2	2	1
S. America	8	10	1	6	1	<1	7

Source: UNCTAD-EORA database, Foster-McGregor et.al, (2015). Figures have been rounded off.

Table 5: Backward Linkages Region-wise

	USA	EU	Japan	East & S.E. Asia	South Asia	Africa	South America
USA		3%	2%	3%	1%	1%	4%
EU	3%	19	1	4	2	2	1
Japan	2	2		6	2	<1	1
East & S.E. Asia	3	5	4	11	3	<1	<1
South Asia	1.5	3.5	1	4	2	<1	<1
Africa	1	5	<1	2	1.5	1.5	<1
S. America	2.5	3	<1	2	<1	<1	4

Source: UNCTAD-EORA database, Foster-McGregor et.al, (2015). Figures have been rounded off.

From table 4, much of the European Union group's global value chain linkages are within the group itself. Thus, the GVC total index with the EU nations themselves is 37% for the EU group (reading row-wise). In contrast, the total index with the U.S is only 3, and somewhat more, 6%, with the East and Southeast Asian nations. Thus, it may be said that the economic union EU is well-integrated within themselves. For the U.S, maximum total GVC linkages are with the EU (11% from table 4), followed by the linkage with east and Southeast Asia (9%) in terms of importance. For the east and Southeast Asian nations also, much of the total GVC linkages are within that group itself, 22%, followed by their linkages with the European Union.

Consider now the GVC linkages of the African nations as exhibited in table 4. Africa has clearly maximum GVC linkages with the EU nations, at 29%, followed by the East and Southeast Asian nations in terms of the extent of linkages (7%). What is intriguing is that the GVC linkages within the African nations as a group are weak, negligible compared to those with East and South east Asia. So, it seems that the ground has not been well-prepared by African nations embarking on the path of a monetary union, as a sufficient degree of trade integration has not been attained within the region.

The pattern seen in table 5 for backward linkages is the same as for total GVC linkages. The EU and the East and Southeast Asian nations have maximum backward linkages within their own group, while Africa is linked most with the EU, and then with the East and Southeast Asian nations. Hence, Africa lags behind in trade integration within the region, a necessary

prerequisite for monetary integration in the region. In contrast, the economic unions in Europe and Asia have driven the process of regional trade integration, facilitating monetary integration or the decision to undertake such integration.

The story of the European Union convinces many geopolitics observers to consider EU as a model of regional integration to follow or even copy. In fact, the EU has generated huge economic gains and sharply narrowed the income gap among member states, by drafting common rules, promoting close coordination among national authorities, and developing strong regional institutions that advance economic integration. EU governments also cooperate closely in foreign and security policy, competition rules and antitrust law, as well as in justice and home affairs.

Regionalism in Asia has developed rather differently. Regional integration has been driven more by markets than by governments. Asia's pragmatic and flexible approach to regionalism is partly dictated by history. Asian countries—in particularly those in South and Southeast Asia—are little inclined to compromise their independence by pooling sovereignty with their neighbors, not least because several nation states have only recently emerged from colonialism and need first to build their national identities. Disparities in economic development, socio-political structures, and systems are also much greater in Asia than Europe.

In Africa, leaders have long envisaged regionalism as a viable strategy to pursue with a view to uniting the continent both politically and economically. While regionalism in Africa has taken on different forms to accommodate the changing geopolitics environment, all organizations and institutions that aim to integrate regional economies in Africa have adopted market integration as a component of their strategy, with a view to increasing intra-regional trade. The European Union is the model for such integration.

5. CONCLUDING COMMENTS

In this paper we have looked at the global value chain linkages exhibited by high income nations, emerging market nations and developing economies represented by African countries. It is noted that the upper income countries have more global supply chain linkages, which tend to be more of the backward linkage type; that is, they are more active in the downstream part of the production processes, importing intermediate goods as inputs into exports production. African nations are having lower total and backward global value chain linkages and they are more upstream in production processes, i.e., they have greater forward linkages, exporting intermediate goods that are used for exports production by trading partners.

The paper also considers the regional aspects of global supply chain linkages. It is noted that the European Union countries have more global value chain linkages within themselves, thus substantiating the rationale for forming a union among themselves – though, of course, trade expanded substantially between these nations as an effect of the economic and monetary union.

The East and Southeast Asian group of countries also have greatest global value chain linkages within the group, followed by the extensive linkages with the EU. In contrast, African nations have low global value chain linkages among themselves. These nations are linked much more to the EU and the east and Southeast Asian nations. This observation raises the question whether the attempts to form monetary unions in Africa have followed the customary sequence of trade liberalization and expansion prior to monetary integration.

The presence of global value chain linkages also challenges the assumption of exchange rate stability accruing when joining a monetary union. With a depreciation of the common exchange rate, the effects will vary among the members, depending on their global value chain linkages. And the change in the real effective exchange rate will also vary between members. Also, the usual criticism that devaluations create a pauper of the trading partner may not hold - the net effect depends on the various substitution elasticities.

Finally, the current literature on global value chains seems to have failed to acknowledge the seminal contribution of Findlay & Rodriguez (1977), who added imported inputs in production to the open economy Mundell-type model to challenge the prevailing wisdom of the ineffectiveness of fiscal policy – which appreciates the currency - under flexible exchange rates.

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Cheick Wagué,
Professor
South Stockholm University – Södertörn University
Alfred Nobels allé 7
SE-14189 Stockholm SWEDEN
E-mail: cheick.wague@sh.se

Nandakumar P. Warriar,
Professor emeritus
Indian Institute of Management Kozhikode
c/o Dr. Sheela Warriar
MS Women's College Road
673011 Calicut - Kerala INDIA
E-mail: nanda7285@yahoo.com