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Escaith, Hubert

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**OECD ROUNDTABLE ON IMPACTS OF THE ECONOMIC CRISIS
ON GLOBALIZATION AND GLOBAL VALUE CHAINS
PARIS, 28 OCTOBER 2009**

CONFERENCE PAPER (REVISED JUNE 2011)

**Trade Collapse, Trade Relapse
and Global Production Networks:
Supply Chains in the Great Recession**

Hubert Escaith,¹

Note to the revised version: this conference paper was somewhat hastily prepared in the midst of one of the most brutal recession since the 1930s. I revised the original 2009 version, basically to correct some embarrassing notation mistakes in my maths, while trying to keep the text as close as possible to the original. I added a post-face to mention a few developments that occurred since this conference in 2009. Thanks (sic) to the Great Trade Collapse, the subject matter of "Global Value Chains" has raised prominently in the academics' and policy maker' agendas, and a review of the most recent literature on the subject would now require dedicated volumes.

The nature of international trade and the very nature of globalization have changed dramatically in recent years, with the emergence of new global players and a radically different competitive landscape. This new landscape emerged during the late 1980s and early 1990s, when the Berlin Wall fall brought down the barriers that had split the post-WWII world, and the Brady Bonds put an end to the decade-long debt crisis that plagued many developing countries. The 1990s saw the conclusion of the Uruguay Round and the birth of the WTO, which brought down many trade barriers and led to further liberalization in areas like telecommunications, financial services and information technologies.

This transformation, which was both geopolitical and economic, was accompanied by the emergence of new business models that built on new opportunities to develop comparative advantages (Krugman, 1995; Baldwin, 2006). With the opening of new markets, the technical revolution in IT and communications, and the closer harmonization of economic models worldwide, trade became much more than just a simple exchange of merchandise across borders. It developed into a constant flow of investment, of technologies and technicians, of goods for processing and business services, in what has been called the "Global Supply Chain". In this global manufacturing model, products are no more "Made in UK", not even "Made in China", but actually "Made in the World". The Boston Consulting Group calls "globality" this new era of global business competition (Bhattacharya et al., 2008).

Those changes led the American author Tom Freidman to proclaim that "The World is flat". This new business model where countries do not trade wine for clothes anymore but "trade in tasks", as described by Grossman and Rossi-Hansberg (2006, 2008), amounts to a "Copernican revolution" for understanding international trade. It compelled trade analysts and international economists to revise their old beliefs and models (Baldwin, 2006). Trade statisticians and national account specialists have also been struggling to adapt their statistics to the new reality (Escaith, 2008). Despite important advances, the economic analysis of global value chains is still lacking appropriate models and good data to understand and measure appropriately this new dimension of globalization.

Twenty years after its emergence,² this new global business model was challenged on two grounds after the Great Recession which followed the financial crisis of September 2008:

¹ Economic Research and Statistics Division-WTO, Geneva; DEFI, Université de la Méditerranée, Aix-en-Provence. The views expressed in this document are those of the author and do not represent a position, official or unofficial, of the WTO Secretariat or WTO Members.

² Offshoring is not new, and the 1960s saw several success stories of factory-less designer brands in sportswear or clothes. But international supply chain management truly became the building block of global business administration in the late 1980s.

- First, because global supply chains were pointed by several analysts as a causing factor of the Great Trade Collapse of 2008-2009, and they had to be restrained in any post-crisis scenario;
- Second, because a return to “business as usual” after the international crisis was not deemed possible on objective economic ground, nor found desirable for normative social or environmental reasons.

Indeed, if the cause of the global crisis of 2008-2009 was clearly financial, its particular mode of dissemination through real channels has been related to the interdependency created by global productive networks, which served both as transmission and amplification channels. While the crisis spread initially to all developed countries through toxic assets and exposure to the US financial market and seemed to spare the developing economies, the premise of a new North-South "decoupling" vanished rapidly when the contagion spread to the real economy through the trade collapse. The amplitude and simultaneity of the transmission of shocks came as a surprise to many analysts. International supply chains, one of the most salient features of the "new globalization" were rapidly identified as one of the main factors for such a synchronization of shocks. For its intensity, the crisis has been dubbed the “Great Trade Collapse” : the dive of world trade was unprecedented, even in comparison with the Great Depression of the 1930s (Eichengreen and O’ Rourke, 2009).

Moreover, the implications of a global rebalancing, with the centre of gravity of world demand shifting from West to East, was expected to deprive global supply chains from their “raison d’être”, which is providing Western customers with cheap and diversified products. With unemployment increasing as recession spread in developed countries, the debate was also put on the public place; the delocalization of investment and jobs that sits behind these global productive networks, together with the lack of governance in international finance, became the focus of much public scrutiny.

Against this background, this communication explores in a first section the particular role of supply chains in transmitting and amplifying external shocks. A second part analyses their potential responsibility in the 2008-2009 trade collapse, and a third one is dedicated to exit scenarios and the perspective of global supply chains after the crisis, including some of the consequences of global rebalancing for least developed countries.

Supply chains as transmission channels

Since the every-day reality of international business models is running faster than the elaboration of new analytical paradigms, the crisis hit the global economy in largely uncharted waters. Like in previous global financial crisis, the international banking system came to a "sudden stop" after September 2008. Two aspects were nevertheless original: the shock emanated from the largest world financial centre instead of initiating in developing countries, and the shocks spread very quickly and almost simultaneously to many industrial and emerging countries. In particular, trade reacted very strongly to the first signals of recession, and industries were differently affected. The sectors most affected by the recession were fuels and minerals (due to a strong price effect), and machinery and transport equipment (strong demand effect).

With the financial crisis, the sectors producing consumer durable and capital goods were on the front line, as demand for these products relies on credit. In turn, the lower industrial activity reversed brutally the trend in the prices of key primary commodities, which had been rising substantively since 2003, at the point to qualify for the qualification of “bubble”. Trend reversal was abrupt, and between the third and the fourth quarter of 2008, the drop in quarterly growth rate was, respectively, 45 and 43 percentage points for iron and steel, and for minerals (Table 1). The collapse in trade mostly affected merchandises; except the financial transactions, the commercial services, other than those related to trade in goods (i.e., freight and insurance), were more resilient.

Table 1 Quarterly growth of world manufactures exports by product, Q1/2008-Q4/2009

(Quarter-on-quarter percentage change in current dollar values)

| Quarter/Sectors | Q1/08 | Q2/08 | Q3/08 | Q4/08 | Q1/09 | Q2/09 | Q3/09 | Q4/09 |
|------------------------------|-------|-------|-------|-------|-------|-------|-------|-------|
| Manufactures | -1 | 9 | -2 | -15 | -21 | 7 | 9 | 9 |
| Office and telecom equipment | -12 | 5 | 5 | -10 | -27 | 13 | 14 | 16 |
| Automotive products | 1 | 6 | -14 | -18 | -33 | 14 | 13 | 21 |
| Iron and steel | 11 | 23 | 7 | -34 | -31 | -8 | 10 | 10 |
| Ores and other minerals | 10 | 20 | 4 | -33 | -35 | 13 | 24 | 7 |

Source: WTO

Indeed, 2009 world trade dropped five times more rapidly than global GDP, supply chains playing their part in explaining the magnifying effect of the crisis on international trade. Some of the mechanisms are of purely accounting nature: while GDP is computed on a net basis, exports and imports are registered on their gross value. In addition, because supply chains cover various countries, a lot of double counting takes place while goods for processing cross the borders at each step of the production process. But the core of the explanation is to be found in the nature itself of the 2008-2009 crises and its mode of contagion.

Box 1 The Microeconomics of Supply Chains and Trade in Tasks

The question of what steers imports and exports has a very long history in the economic literature. Traditional normative trade theory is built on the premises of gains from international trade, based on the Ricardo's arguments of comparative advantages which allow increasing output by reallocating resources within countries. The Heckscher-Ohlin model extends the results when there are many productive factors and different factor endowments which create gains from international specialization. Economic theory points also to other sources of gains which are not linked to comparative advantages, for example access to a wider variety of goods and economies of scale on the consumption and production sides, or contesting monopoly powers on the institutional one. The critic and testing of these traditional hypotheses has led to a vast literature (see WTO 2008 for a review).

Trade in tasks and the fragmentation of production along global supply chains has challenged the validity of the traditional models, based on the exchange of final goods. As for trade in intermediate goods, two main approaches have been explored. The first one rests on the hypothesis that factors (capital and labour) are fixed. Offshoring is similar to technical progress in the production of the final good: by shifting production processes to the countries with comparative advantages, more of the final goods can be produced with the same (fixed) amount of factors. A firm with better technology at home will offshore some tasks if the initial wage gap is larger than the offshoring costs. Offshoring releases domestic workers who, under the traditional neo-classical market assumptions, can focus on the tasks where they have a trade-cost-adjusted comparative advantage.

When some factors are mobile sectorally and internationally, the law of comparative advantage can be generalized, albeit analysing the outcome of even simple normative models becomes a complex matter, particularly regarding the distributional effects. Comparative advantages are no more a robust predictor of a country's trade pattern. For example, reversal of comparative advantages is possible under certain assumptions. When factors are mobile, movement of factors between sectors and between countries that tend to equalize endowments reduce the incentives to trade. The return of the mobile factor rises, while those of sector-specific factors decline. But if factor prices are not equalized, factor mobility will at contrary lead to an increase in the volume of trade.

The new trade theory, by introducing imperfect competition, consumer preference for variety and economies of scale, look at explaining why countries that are similar in factor endowment and technology, have a significant part of their trade in the same industries. When two such identical countries open up to trade, firms with differentiated products gain access to larger markets and offer more choice to consumers. But because the total size of the market does not increase, some firms will go out of business.

A similar pattern can be used to model trade in intermediate goods; provided the cost of production is lower the larger is the number and scale of production of intermediates. If trade is restricted, the domestic firm needs to use outsourcing to realize these economies of scale and choice. When trade is free, it does not matter where the production of intermediaries is located, and the firm producing the final good uses a mix of outsourcing and offshoring.

Source: Based on WTO (2008) World Trade Report

International transmission of shocks takes usually two forms, commercial and financial. In previous

instances of global crisis, most of the systemic commercial and financial shocks were of macroeconomic nature. The present crisis has also a systemic micro-economic dimension, because of the geographical segmentation of the productive chains. These effects are still largely unknown as they affect firms that are eminently "heterogeneous", as recognized by the new "new trade theory". It is a cliché to say that time is accelerating, but it carries a lot of truth in the present situation. In the race between the practitioners –engineering and business schools– on the one hand, and the university, on the other hand, praxis is well ahead despite significant advances in the theoretical aspects (Box1).

In previous occurrences of global turmoil, shocks were mainly of macroeconomic nature. A recession in a foreign economy reduced demand for exports, which in turn depressed the activity in the home country. The propagation of such demand-driven shocks through the productive sectors of the home economy can be traced using an input-output model, through traditional Input-Output modelling. In addition, both financial and real channels are interlinked at the macro level, because credit crunch affects household consumption and firms' investment.

The gradual substitution of trade in goods by trade in tasks that took place during the 1990s changed this traditional mode of transmission, and added another layer of transmitters which are operating at micro economic level. When industrial production is spread across various countries, and that all segments of the chain are critical (supplied constrained), a shock affecting one segment of the chain will reverberate through all the chain. At the difference of the macro-economic case, shocks are moving forward, from supplier to clients, and not backward as in the demand-driven Leontief model (from client to suppliers).

Escaith and Gonguet (2009) (E-G09 thereafter) jointly models the financial and real supply-side effects from a complementary viewpoint of monetary circuit and international Input-Output matrices. In order to produce, individual firms need to obtain a loan from a bank. The bank grants the loan in relation to three parameters: the macroeconomic context, the specific behaviour of the sector of activity in the business cycle, and the specific situation of the firm (credit rating, soundness of the management).

Money created by the bank when according the loan is spent by the firm on wages and other production costs. This money remains in the circuit as long as the firm does not sell the products and reimburse the loan. A traditional result of the endogenous money theory is that any increase in stock of credit money corresponds to an increase in inventories in the national account circuit. E-G09 adds to this classical building blocks a late 20th century feature: ³ the capital-asset adequacy ratio, a prudential mechanism –such as in Basel I and II– set by the authorities and designed to guarantee liquidity and solvability of the banking sector. At the difference of monetary circuit and I-O tables, which track flows, the adequacy ratio is a stock variable reflecting the accumulation of loans and assets.

Under normal conditions, the ratio is not binding and the circuit is almost a pure flow model. Bank can modulate their assets to accommodate new credits, and client firms can shift to alternative partners when faced with the unexpected failure of one of their suppliers. But shifting to an alternative supplier, when decision results from an unexpected event (a shock), always carries a cost (paying the spot-market price instead of the negotiated one for merchandises and transportation, using air-freight instead of shipping lines, etc.).

The real and monetary circuit can interfere negatively when an unexpected financial shock, such as a credit crunch affecting production or trade finance, impede a foreign supplier to fulfil its contractual engagement. As mentioned, when confronted to such a disruption of their supply chain, client firms can shift to alternative partners, but paying a premium price. Higher production costs are transmitted along the global supply, reducing firms' profitability, while the longer production circuit increase demand for loans. The transmission across sectors and countries of the increased cost of production is modelled by E-G09 using an international input-output matrix (a set of interlinked national I-O matrices), rearranged to track forward linkages.⁴

³ Even if endogenous money and sectoral modeling seems quite heterodox now-a-days, both monetary circuit and supply-use tables can be traced to the Physiocrats.

⁴ In an international IO matrix (I-IO), cross-national transactions of intermediate goods are identified: exports of intermediate consumption are separated from final demand and traced to the importing country and sector.

E-G09 computes an indicator, called "imported real supply-driven impact coefficient" (IRSIC), defined as:

$$\text{IRSIC} = \Delta Q \cdot (\text{I-B})^{-1} \bullet 1/Q \quad \text{Eq. 1}$$

Where, for "n" countries and "s" sectors:

Q: line vector of initial sectoral outputs for all countries (1 x n.s)

B : matrix of technical coefficients (n.s x n.s)⁵

(I-B)⁻¹: Ghosh-inverse matrix, i.e. the sum of direct and indirect forward effects

ΔQ : line vector of supply shocks (initial increases in sectoral production costs emanating from the shock-exporter country "i") (1 x n.s, with $\Delta q_{j,s}=0, j \neq i$)

\bullet : Hadamard (entry wise) product

Albeit the supply oriented Ghosh matrices are very similar to the Leontief demand-driven model, their theoretical robustness for modelling real shocks is much weaker, in particular because it cannot track substitution effects in presence of bottlenecks. For this reason, IRSIC is used only (i) in the price space, and (ii) as a tracking mechanism.

Results based on an international I-O matrix based on IDE-JETRO data, covering the USA, Japan, Korea and selected emerging Asian countries, and updated to 2006 by the authors, indicate that:

1. In 2000 and 2006, Japan is the largest potential exporter of cost-push supply shocks, because it is a large supplier of intermediate goods to the other economies.⁶

2. Malaysia and Thailand are the largest importers of such shocks, because of the high degree of integration of their manufacturing sectors in international supply chains and their reliance on imported inputs rather than domestic ones.

3. Between 2000 and 2006, China increased notably its forward international linkages and its domestic backward linkages. It became a large exporter of "shocks" in 2006, at par with Japan, but its vulnerability to an imported shock remained relatively stable because Chinese manufacturers are increasingly relying on domestic suppliers.

4. Repatriating the production of manufactured parts in Japan and the USA would lead to an average increase in total sectoral production costs of 2%. Albeit this seems a small impact, it should be remembered that the input-output matrix used to compute the coefficients are based on nation-wide samples of enterprises. For these developed economies, most intermediate consumption is sourced domestically. In addition, new "new trade theory" reminds us of the decisive impact of firm heterogeneity when it comes to understanding international economics. Only a minority of firms actively engage in outsourcing, and the 2% average cost increase would fall disproportionately on a few firms, causing serious disruptions at microeconomic level. Because these outward oriented firms are also the most dynamic and innovative ones, these

This provides a better definition of vertical network participation of the countries included in the I-IO, allowing tracking shock transmission caused by vertical integration.

⁵ In a typical supply-use table, horizontal lines show the use of goods and services to supply other firms, final consumers and rest of the world (exports). The vertical columns describe the requirements by sector j: purchases from suppliers (domestic and rest of the world) needed to produce the goods, value added and taxes. Inter-sectoral relationships are represented by the coefficients Q_{ij} . The technical coefficients conforming the input-output matrix (I-O) are derived by normalizing the intermediate coefficients Q_{ij} by the value of total production ($a_{ij} = Q_{ij}/Q_j$). These I-O coefficients present the direct requirements of inputs from "i" for producing one unit of output of industry "j". As in the Leontief case, the Ghosh matrix B, ($b_{ij} = Q_{ij}/Q_i$). is build using the inter-sectoral transaction matrix Q_{ij} , but the allocation coefficients are normalized in line (destination of output) by the value of production, and not in column as for technical coefficients (origin of productive factors used in the production). The Ghosh matrices are similar to the Leontief demand-driven model, but their theoretical robustness for modeling supply shock is much weaker. For this reason, E-G09 uses them only as a tracking mechanism.

⁶ [revised version] Using a similar methodology, Escaith *et al.* (2011) measure the impact on neighbouring economies of the March 2011 disaster which devastated Japanese coasts and disrupted supply chains.

microeconomic disruptions would have significant negative systemic effects.

The accumulation of micro-disruptions in the productive chain, typical of a recession, disturbs the monetary circuit: production plans take longer to be completed, leading to an accumulation of outstanding loans, a lower profit margin and a reduction of the credit worthiness of firms. Under Basel II, banks have to adjust their asset holding in order to compensate for the higher risk of their loan portfolio. This is not an issue when financial markets are functioning normally, but in times of global crisis and flight to liquidity, not only the risk profile of borrowers deteriorates, but also the market value of assets goes down. Because assets are priced to market, banks can rapidly be squeezed when evaluating their capital adequacy ratio: They are confronted to the rising risk-ratings of their debtors on the one hand, and the shrinking value of their asset portfolio on the other hand.

When such situation arises, as happened after September 2008, the circuit unravels: banks run for safety, stop extending new credit and even do not renew existing credit lines. The very same pro-cyclical mechanisms that led to the apparition of financial bubbles, with the concomitant asset price inflation and lower perception to risk (meaning lower interest rates and larger volume of credit), can have a catastrophic outcome when the trend is reversed and a resonance effect between real and financial circuits amplifies the initial supply shocks.

Moreover, the accumulation of supply shocks leads to secondary demand-driven adjustments, either through a price effect (increasing production costs translate into higher retail prices and lower demand) or income effect (lower activity leading to unemployment). The succession of micro waves followed by secondary macro shocks leads to "W" or even "L" crisis patterns and can be jointly modelled through international I-O.⁷

Crisis, exits and (de)globalization

Trade in tasks and the greater interconnections of the global economy have created, as we saw, newer and faster channels for the propagation of adverse external shocks. Because production is internationally diversified, adverse external shocks affect firms not only through final demand, but also through a rupture in the flow of inputs received from their suppliers.

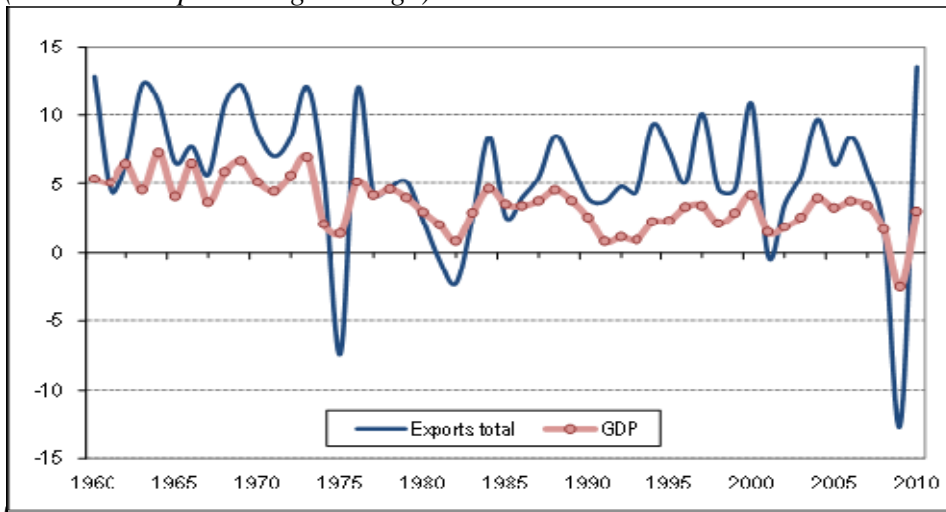
• *Trade Collapse: the Role of Supply Chains*

- *Structural Trade Elasticity*

Various authors attribute the large drop in trade registered since the end of 2008 (figure 1) –with an apparent trade-GDP elasticity close to 5— to the leverage effect induced by the geographical fragmentation of production (Tanaka, 2009; Yi, 2009). Others contest the hypothesis of higher demand elasticity due to vertical integration (Benassy-Queré et al., 2009) because it affects only the relative volume of trade in relation to GDP, while elasticity should remain constant in a general equilibrium context. It is probable that the observed reality lays somewhere in-between the variable trade elasticity hypothesis and the constant one.

⁷ IRSIC is well suited to model the secondary demand effects created by an increase in prices: after adjusting the price effect by their respective demand elasticity, E-G09 applies a traditional Leontief model to the international input-output matrix. But a similar reasoning can be applied to a demand shock caused by unemployment and lower income.

Figure 1 World merchandise exports and GDP, 1960-2010
(Real annual percentage change)



As seen in Figure 2, the world trade elasticity is shaped like an inverted "U", increasing at the end of the 1980s and decreasing in the most recent years. Because elasticity should indeed remain constant in an equilibrium context, this humped shape probably signals a long-term transition from one steady state to a new one. World trade and GDP are aggregated indicators, therefore two structural changes can be at work: within countries (technological shocks and change in business models), and between them (emergence of economies with different production functions).

Short-term shocks can also affect apparent elasticity, even in presence of stable structural relationships. These short-term variations are to be expected when external shocks do not apply uniformly to all industries. A negative shock suffered by a single sector with high reliance on imported input will initially translate into a higher change in trade than in total GDP, leading to higher elasticity.

In absence of structural changes affecting production function (i.e., when technical coefficients, as described by an input-output matrix, are constant), the relationship linking import for intermediate consumption (IC) with demand can be described by the following linear relationship:

$$\Delta M^{IC} = M^{\circ} \cdot (I-A)^{-1} \cdot \Delta D \quad \text{Eq. 2}$$

Where, in the case of a single country with "s" sectors): ⁸

ΔM^{IC} : endogenous variations in total imported inputs (s x 1)

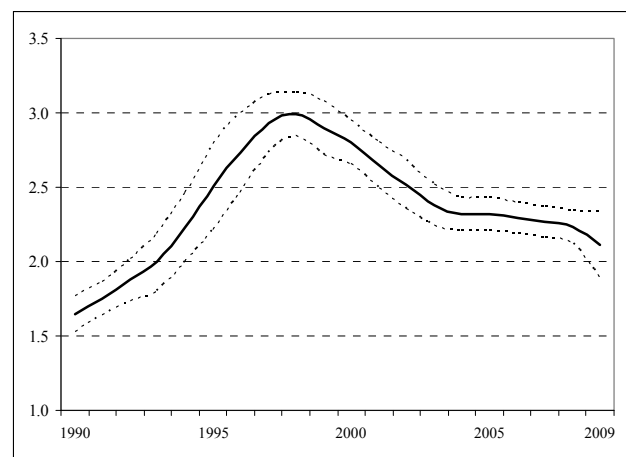
M° : diagonal matrix of intermediate import coefficients (s x s)

$(I-A)^{-1}$: Leontief inverse, where A is the matrix of fixed technical coefficients (s x s)

ΔD : initial exogenous final demand shocks (s x 1) ⁹

⁸ The model can be extended easily to the case of "n" countries, as in E-G09 by modifying accordingly the summation vector "u".

Figure 2 World: GDP Elasticity of Imports, 10 year average.



Note: Rolling windows of 10 years; the date indicates the last year. World GDP is the sum of countries' data using market exchange rates; 2009 based on forecasts.

Source: Escaith, Lindenberg and Miroudot (2010)

Similarly, changes in total production [ΔQ] caused by the demand shock (including the intermediate inputs required to produce the final goods) is obtained from:

$$\Delta Q = A \cdot \Delta Q + \Delta D \quad \text{Eq. 3}$$

Solving for ΔQ yields the traditional result:

$$\Delta Q = (I-A)^{-1} \cdot \Delta D \quad \text{Eq. 4}$$

Aggregating all sectoral effects, we have:

$\delta M^{IC} = u \cdot \Delta M^{IC}$ and $\delta Q = u \cdot \Delta Q$; with
 u : summation vector ($1 \times s$), δM^{IC} and δQ being scalar.

The comparison between equations 2 and 4 is illustrative. Given that $[M^{\circ} \cdot (I-A)^{-1}]$ is a linear combination of fixed coefficients, at equilibrium, the ratio ($\delta M^{IC} / \delta Q$) is a constant within each country. As mentioned, because elasticity must be constant in any steady state regime, the observed increase in apparent trade elasticity during the 1990s could be attributed to a structural change, a transition from an inward-oriented business model (where parts and components are mainly sourced from the producing country) to a global one (intensive in trade in intermediate goods, where products are “Made in the World”). This structural shift corresponds to the “flattening of the World” mentioned by Tom Freidman.

A “between countries” effect may have accentuated this “within country” trend. Because M° differs from country to country and is usually higher for (i) small economies and (ii) developing countries, the emergence of developing countries as major players in world trade would lead to a slow increase in the apparent trade-GDP elasticity, during the transition process. This effect explains probably part of the rise of the elasticity during the 1990s. Moreover, both “within” and “between” countries effects are closely linked, as the emergence of global manufacturing and the rise of “trade in tasks” led to the successful outcome of export-led growth strategies of emerging economies,

- *Composition effects*

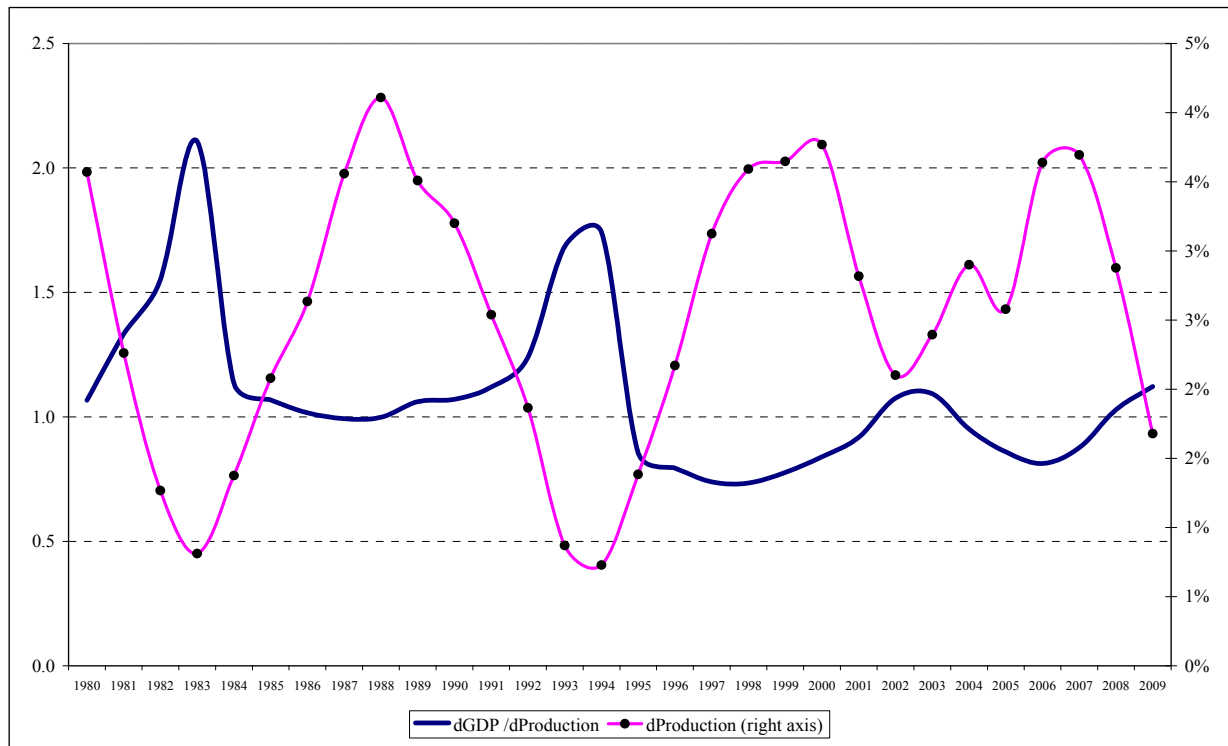
Nevertheless, this long term perspective tells only part of the story. Going back to equation 2, one notes that the initial shock [ΔD] is not a scalar, but a vector ($s \times 1$). Individual shocks affecting each individual element of [D] (i.e, particular industries) do not need to be always in the same proportion from one year to another one. As the sectoral import requirements [M°_s] differ from sector to sector, the short term apparent import elasticity will change according to the sectoral distribution of the shock.¹⁰

In particular, it was the case after the financial crisis of September 2008, as the demand of consumer durable and investment goods (consumer electronics, automobile and transport equipment, office equipment and computers, etc.) was particularly affected by the sudden stop in bank credits. Because these sectors are also vertically integrated, the impact on international trade in intermediate and final goods was high. And because services sectors, which are the main contributors to GDP in developed countries, were also more resilient to the financial crisis, the drop in imports (mainly goods) was much higher than the fall in GDP (mainly services). Thus, in the initial phase of the financial crisis, the apparent Trade-GDP elasticity soared to more than 5.

⁹ In this traditional IO framework considering one country and the rest of the world, exports of intermediate goods are considered as being part of the final demand. The situation differs when extending the IO relationship to include international transactions of intermediate consumptions, as in equation 1.

¹⁰ The more complex the production process, the more potential for gaining in outsourcing part of it (Box 1); thus it is natural to expect much more vertical integration in the manufacturing sector. Miroudot and Ragoussis (2009) show that manufacturing sectors in OECD countries generally use more imported inputs than other industrial and services sectors. It is specially the case for final consumer goods like ‘motor vehicles’ and ‘radio, TV and communication equipments’, or computers. Services are, as expected, less vertically integrated into the world economy. But even these activities show an upward trend in the use of imported services inputs (e.g. business services).

Figure 3 World Production and GDP response, 1980-2009 (percentage growth and elasticity)



Notes: Five year rolling periods. Production includes agriculture, mining and manufactures.
Source: Based on WTO International Trade Statistics data base.

The initial reaction of international trade to a large shock in demand was to overshoot GDP. Then, the initial impulse reverberated through the rest of the world economy, transforming the financial crisis into a great recession. After the initial shock, GDP will continue to slow down but the decrease in trade will stabilise as the import content of services sectors is much lower than those of manufacturing sectors. As can be seen in Figure 3, there is a negative correlation between the variation in the volume of production of goods and the growth in total GDP that can be attributed, at least partially, to this lag effect between goods and services. It is thus normal to expect a regression to normality of the trade elasticity for 2010.¹¹

- *Inventory effects*

But recent changes in the apparent trade elasticity are also probably linked to global supply chain management practices. Even under "just-in-time" management (production-to-order), geographically fragmented networks need to maintain a minimum level of inventories (buffer stocks) in order to face the usual risks attached to international transportation. While large players try to keep their inventories at the lowest possible level considering their sales plans and the acceptable level of risk, they tend in the same time to force their suppliers to maintain large stocks (production-to-stock) in order to be able to supply them quickly upon request. In addition, some up-stream suppliers, engaged in highly capitalistic processes such as foundries, need to process large batches in order to benefit from economies of scale and lower their unit costs.

As a result, there is always a significant level of inventories in a global supply chain, translating into a higher demand for banking loans (E-G09). When a drop in final demand reduces the activity of down-

¹¹ [revised version] As a matter of facts, after a fall of 12% in trade volumes in 2009, world trade has grown by 14.5% in 2010. Trade in 2010 overshoot again GDP, but in the positive range this time, and it will take an additional year for elasticity to return to normal (trade was expected to grow at 6.5% in 2011).

stream firms, or/and when they face a credit crunch, their first reaction is to run down their inventories. Thus, a slow-down in activity transforms itself into a complete stand-still for the supplying firms that are located up-stream. These amplified fluctuations in ordering and inventory levels result in what is known as "bullwhip effect" in the management of production-distribution systems (Stadtler, 2008). As long as the down-stream inventories have not been reduced to their new optimum level, suppliers are facing a sudden stop in their activity and must reduce their labour force or keep it idle.

The timing and intensity of the international transmission of supply shock may differ from traditional demand shocks applying on final goods. For example, the transmission index proposed by E-G09 implicitly assumes that all secondary effects captured by the Ghosh inverse matrix occur simultaneously; in real world-economy, these effects may propagate more slowly than traditional final demand shocks depending on the length of the production chain and the existence of long-term contractual arrangements guaranteeing minimum level of orders. For example, there might be contractual pre-commitments for the order of parts and material that manufacturers have to place well in advance in order to secure just-in-time delivery in accordance to their production plans (Uchida and Inomata, 2009). Indeed, since the 1990s, suppliers in high-tech manufacturing are no more minor partners in global supply chains. These suppliers have consolidated and moved up in the global value chain, taking a more prominent role in the industry through a process of mergers and acquisitions (Sturgeon and Van Biesebroeck, 2009). Lynn (2009) provides an example from the US automobile industry where key suppliers of parts had a quasi-monopolistic position and were able to impose their terms to the up-stream firms (automobile constructors).

Nevertheless, in closely integrated networks, these mitigating effects are probably reduced, especially when the initial shock is large. A sudden stop in final demand is expected to reverberate quickly thorough the supply chain, as firms run-down their inventories in order to adjust to persistent changes in their market. This inventory effect magnifies demand shocks and is principally to blame for the initial collapse of trade in manufacture that characterised the world economy from September 2008 to June 2009.

Dvorak (2009), reporting on the exposition of the electronic equipment sector during the crisis, mentions that a fall in consumer purchase of 8% reverberated into a 10% drop in shipments of the final good and a 20% reduction in shipments of the chips that go into the product. The velocity of the cuts, according to operators, was much faster than in previous slumps, as reordering is now done on a weekly basis, instead of the monthly or quarterly schedules that prevailed up to the early 2000s. In addition, previously, supply chains were simpler, involving fewer links; the complexity of today's productive networks makes their management much more complex.

When faced with an unprecedented crisis such as the September 2008 one, "everybody under-bet to a certain extent", with forwards and backwards ricocheting effects through the supply chain, affecting in turn investment plans and capital goods providers. Because the reactivation of the supply chain is only gradual, and final demand (household consumption and firm's investment) has been reduced because of higher unemployment and increased risk aversion, the road to recovery can be a slow and bumpy one.

- *Trade finance*

Some 80% to 90% of world trade relies on some sort of trade finance, mostly of a short-term nature. Financing supply-chain operations - especially for small- and medium-size companies - is crucial to modern trade, and the potential damage to the real economy of shrinking trade finance is enormous (Auboin, 2009). Starting from a dual approach mixing international input-output matrices and monetary circuits, Escaith and Gonguet (2009) study the potential role of international supply chains as transmission channels for financial shocks. In particular, a credit crunch affecting trade finance can have a strong disruptive impact on international supply chains. Yet they mention also, citing anecdotal evidence from the automobile industry, that firms closely inserted in large supply chains can rely on their larger partners for liquidity, and may be sheltered from credit crunch. Firms located in emerging countries are more exposed to shocks reducing trade finance (Menichini, 2009).¹²

¹² [revised version] Levchenko et al. (2010) do not find support for the hypothesis that trade credit has been important for the 2008-09 collapse. Available firm-level data in two European countries during the crisis seem

Exit scenarios and global supply chains

The debate on the role of vertical specialization in shaping globalization and international trade is central for understanding the present crisis, but even more crucial for analysing alternative exit scenarios. In the second half of 2009, there were signs that the crisis was reaching a bottom. Guided by "old" economic models, the major developed and developing economies, known as G-20, met head-on the risk of a world-wide depression and coordinated global responses in the early months of 2009. The package, reminiscent of traditional Keynesian recipes, addressed principally the macro-economic transmission channels through massive fiscal stimulus. With the risk of global recession diminishing after the second quarter of 2009, the debate has now shifted to the exit strategies.

Analysts remained divided on the medium-run prospects. Alternatives conjectures range from "back-to-business-as-usual" to "deglobalization" scenarios, offering a menu of alphabetical potages made of L, U, V and Ws. The last three scenarios are roughly based on a return to normal, after a period of recession that could be short (V), long (U) or bumpy (W). The L scenario is more pessimistic for international trade, as it involves a lasting deterioration from the high levels of globalization registered during the 1990s and the 2000s.

Pessimistic forecasts point to the huge fiscal deficits that have sustained public consumption in industrialized countries, while private consumption and investment remains depressed. If the danger of inflation seems under control, rebalancing the current account imbalances which characterized the pre-crisis period would create an additional negative shock, as high spending countries would have to eventually increase their national savings. Most observers point to the USA and the UK, but also to the most vulnerable Euro-area countries (the PIGs).

Rising transaction costs are also threatening supply chain operations. Oil prices have been on the rise for structural reasons (booming demand from large emerging countries), and this trend is expected to resume after the crisis. The collapse of world trade in 2008-2009 saw also the rise of murky protectionism as well as a higher risk aversion. All in all, the chances on the micro-economic side are that manufacturers abandon global strategies to repatriate their operations domestically, or maintain them within a closer regional perspective.

The next sections will look into some of the macro and microeconomic aspects of the exit scenarios.

• *Supply Chains in Global Rebalancing*

During the 1990s, large trade imbalances developed in several regions of the world; the US has been running persistent deficits while Japan, Germany and later China, registering trade surpluses. Many believe that these imbalances, financed by an increase in US liabilities, created a persistent situation of financial distortion which led to the September 2008 crisis; the financial bubble drove also the growth of the UK economy, where financial services weight heavily in the economy. Similarly, the crisis questioned the economic sustainability of many periphery Euro-area countries, such as Ireland and Greece, but also Portugal or Spain.

Rebalancing is therefore a key objective in the exit strategy, while many fears that such a rebalancing might lead to a secondary demand shock, "fragilizing" further the international financial system as such correction could only be possible thanks to a large correction in the bilateral exchange rates of concerned countries. From a macroeconomic perspective, rebalancing can be analysed from several angles; the present section will focus on two particular aspects: balance of payments and global

also to support the view that the traditional impacts of financial restriction on final demand, through a reduction of the intensive margin, dominated the supply-driven microeconomic disruptions that would have affected specific industrial channels through the extensive margin: Bricongne et al. (2010) show that the impact of credit constraints on the trade collapse has been rather limited for French firms; similarly, Behrens, Corcos and Mion (2010) conclude that the collapse of export volumes for Belgium firms was caused by a standard demand-driven trade shock.

effective demand.

- *Balance of Payments*

The pre-crisis years saw the encroachment of a polarized trade pattern, where large deficit from the US found their counterpart in large surplus in emerging countries, especially China, who accumulated international reserves denominated in dollar. At a smaller scale, a similar process occurred in the euro area, where deficit countries could finance their booming demand on the cheap, thanks to the strength of the euro. As occurs when a bicycle stops and fall, the borrow-and-consume pattern fall into pieces when credit vanished.

According to many quarters, any sustainable recovery must address the global imbalances, in particular the twin US-China trade mismatch.¹³ The role of supply chains in amplifying trade flows should prove a blessing when it comes to redress the bilateral “imbalances”, particularly between the US and China. A back-of-the envelope calculation shows that the bilateral deficit of the USA vis-à-vis China measured with conventional trade statistics over-estimates the imbalances measured in value added content by about 60% (Table 2).

This estimate, derived from an indirect measurement of value added content estimated from international input-output matrices, is based on the hypothesis of homogeneous production on the US side (i.e., the US production of final goods is similar for exports and for domestic use) and heterogeneity for China (technological dichotomy between firms producing for the domestic market and firms producing for exports, with higher import contents for the latter).

Table 2 Bilateral trade balance China-USA, Gross vs. Value Added measurement.

| <u>Billion USD</u> | <u>2000</u> | <u>2008</u> | |
|------------------------------|-------------|-------------|---|
| 1. US exports to China | 19 | 77 | <i>Note:</i> Asymmetric trade flows were averaged, and may differ from balance of payments values. Value added content for US exports is about 0.9, based on input-output coefficients; the respective value for China was 0.8, and adjusted to 0.5 to account for re-exports and Export Processing Zones. <i>Source:</i> Author's estimate based on COMTRADE and IDE-JETRO data |
| 2. Chinese exports to USA | 80 | 305 | |
| Balance (1-2) | (61) | (228) | |
| 3. US-VA exports to China | 18 | 70 | |
| 4. Chinese VA exports to USA | 40 | 152 | |
| Balance (3-4) | (22) | (83) | |
| 5. Ratio (3-4)/(1-2) | 0.4 | 0.4 | |

Because the domestic value added content of trade is lower than the gross commercial value recorded in the balance of payments, closing the gap between China and the USA will be faster and, more importantly, cheaper in terms of lost welfare. This said, measuring trade in value added may, as in this case, reduce bilateral imbalances, but in other instances it will increase it, or even change their sign (Daudin et al., 2009). From a balance of payments perspective, the overall imbalance of an economy vis-à-vis the rest of the world will remain the same. Thus, the US and China still need to adjust their domestic demand and change their composition; but the implications in terms of effective bilateral exchange rates adjustments are much different. More importantly for international politics and global governance, measuring trade in value added makes clear that rebalancing is chiefly a matter of domestic policy.

- *Global Effective Demand*

Even if some bilateral imbalances may prove easier to resolve, it remains that the rebalancing will imply for the deficit countries a relative decrease in domestic absorption and an exacerbated competition to generate net exports in order to sustain final demand. These forces will lead to

¹³ The issue of choosing the appropriate timing for reducing "Keynesian" type policies and reduce fiscal and monetary stimuli is a difficult one for Western economies. Indeed, curren-account reversals are often disruptive and the expected long-term benefits of rebalancing have a short term cost.

fundamental changes in the source of global effective demand, from an "older industrialized West" to an "emerging East".¹⁴ Because of the difference in consumer behaviour between these two groups of countries, such an exit scenario implies, at least for the medium term, a relative reduction in the international demand for labour intensive manufactured consumer goods (from clothing to consumer electronics) and an increase in demand for commodities (agricultural, fuels and minerals) and investment goods.

In addition, un-coordinated "Keynesian" policies may prove ineffective in a situation where final demand (both domestic and exports) has a large imported contents. As was indicated in equation 4, the expected total increase in production engineered by an increase in demand in the traditional Leontief model is:

$$\Delta Q = (I-A)^{-1} \cdot \Delta D \quad \text{Eq. 4}$$

On the other hand, the higher the vertical specialization of an economy, the higher its reliance on imported inputs (the $[M^o]$ in equation 2).

Combining equations 2 and 4, the net sectoral effect on the domestic economy is:

$$\Delta Q^D = (I - M^o) \cdot (I-A)^{-1} \cdot \Delta D \quad \text{Eq. 5}$$

Aggregating across sectors, we obtain $\delta Q^D = u \cdot \Delta Q^D$

As modern economies are characterized by increasing levels of vertical specialization (Miroudot and Ragoussis, 2009), $[M^o]$ is higher now than it was twenty or thirty years ago. Traditional counter-cyclical economies become less efficient as demand for intermediate imported goods adds to the imports of final goods (for consumption and investment), unless governments focus their demand impulse on relatively closed sectors dealing with non-tradable or less-traded goods and services.

Another temptation is to raise protective barriers to decrease M^o as well as demand for imported final goods. As this second-best strategy has clear limits in an inter-connected world economy,¹⁵ the first-best strategy is to coordinate internationally the macro-economic response to global shocks. Indeed, the 2008-2009 crisis did not developed into a 1929-like great depression, as feared by many economists –or excitedly awaited by some alternative quarters– because the major developed and developing economies were able to sit-down and meet in the G-20 to coordinate a global response in the early months of 2009. The sustainability of this first-best solution will eventually depend upon the capacity of national policy makers to resist the temptation of playing foul and opt for un-cooperative protectionist policies, answered in turn by Tit-for-Tat counter-policies from their trade partners.

• Deglobalization risks in a post-crisis scenario

The globalization process may effectively be expected to slow down in the years to come. A September 2009 report by OECD, UNCTAD and WTO prepared before G-20 leaders meet in Pittsburgh states that as most leading economies have invoked "trade defence mechanisms" to weather the downturn, and the growing unemployment due to the crisis will also continue to fuel protectionist pressures for the years to come.¹⁶ Analysts are also concerned about longer term developments, fearing that the West-to-East repositioning of the world trade gravity centre may spur a series of "buy domestic" and "produce where

¹⁴ The term "emerging East" may include some western hemisphere countries, like Brazil or Mexico. The concept of effective demand refers to a demand-driven model, where production responds to final demand and where some large importing countries (typically the USA and the EU in the pre-crisis scenario) play the role of world locomotive.

¹⁵ Higher demand for non-traded products over-appreciates the real exchange rate and depresses international competitiveness and the production of tradables, while beggar-your-neighbours policy is usually matched by similar moves by trade partners which nullify, and ultimately reverse, the expected outcome.

¹⁶ "Report on G20: Trade and Investment Measures", 14 September 2009.

you sell" pressures, leading to renewed trade and investment confrontations and an increase in protectionism.

This outcome would have dire consequences on global value chains, and the related international production networks.¹⁷ Indeed, supply chains are very sensitive to even small increase in transaction costs, be they caused by higher tariffs or oil prices. A series of not-so-anecdotic evidences tend to support this hypothesis. In August 2009, the head of Ernst & Young's supply chains department declared that regulatory changes and also the downturn are forcing many organizations to consider restructuring their supply chains, leading to smaller and more regional supply chains (Financial Times, 9 August 2009).

This deglobalization is not only linked to the present crisis situation, but may be more structurally caused by the difficulties of decentralizing increasingly complex industrial procedures. For example, after an accumulation of delays, and confronted with a series of difficulties in the production of its latest model, Boeing decided to abandon the original fragmented chain and repatriate key production processes in its main establishments. Differentiated regional markets, as well as political pressure to voluntarily restrict exports and "build where they sell" have also encourage automobile constructors to relocate their final assembly closer to their final markets, keeping only the heavy engineering work truly global (Sturgeon and van Biesebroeck, 2009).

Moreover, firms established in mature Western markets –the leader of present global value chains– may not be the best placed to surf on the new demand wave created by the rise of a large middle class in emerging countries. Increased demand from these new consumers, whose absolute income remains much lower than their middle class counterparts in the West, tends to focus on basic needs (housing, food, health and education) and commodity-like manufactured goods (e.g., no-frill vehicles such the Tata's Nano). Meanwhile, large companies from Brazil, China, India or other emerging countries no longer restrict their operations on their local markets, but invest internationally and challenge Western multinational firms, including in their home markets.

Other structural factors are also at work, which may increase transaction costs and push global firms to reconsider their production networks. Since 2003, oil price has been increasing, reflecting, inter alia, the additional demand coming from large emerging countries. This trend is probably installed for some time now, and production managers will have to adapt to a future where energy is more expensive and less plentifully available. The same structural factors that led to an increase in the consumption of fossil fuels are also causing a change in the perception of businesses, consumers, and policy makers. Indeed, carbon footprints (accumulated CO₂ emissions) have become increasingly associated with supply chain or through the life-cycle of a product. Using input-output matrices, Hertwich and Glenp (2009) calculates that trade margins –representing the accumulated emissions from distribution between the producer and final consume– account for 5.5% of greenhouse gases emissions.

As concerns about global warming increases, purchasing managers are concerned about the carbon footprint of their supply chains, while consumers are increasingly offered carbon-labelled products and economists talk about internalizing environment costs through ad hoc consumption taxes. As these trends accentuate, there will be a natural tendency to shorten global supply rely more on regional or domestic networks.

If those trends are confirmed, this underlying deglobalization process would hinder the medium-term possibilities of recovery for international trade at its pre-crisis level. Because the most dynamic markets are in emerging countries, a regionalization or a repatriation of global supply chain would negatively affect developed countries' exports of intermediate goods, slowing down their recovery and augmenting the risk for an L shaped exit pattern. But because global supply chains are a source of efficiency gains and technical progress diffusion (see Box 1 again), even emerging countries would see their potential growth reduced in the process.

¹⁷ Global value chains include the conception and marketing aspects of the products, and are sensitive to risk of breaches in intellectual property and patents; their production component (the supply chains) are also highly sensitive to international and cross-border transaction costs as the goods for processing typically cross several border during production.

o **Least Developed Countries and the deglobalization risk**

More importantly, deglobalization may also deprive the poorest developing countries, located far from established or emerging markets, of the opportunities of following the industrialization path taken by China or Mexico, a powerful strategy for frog-leaping through the Rostovian take-off model by attracting foreign direct investment, creating large volume of manufacturing jobs and transferring technologies (Box 2). Thus the micro-economic debate on the future of global supply chains spills over very critical trade and development issues.

Adjusting to this trend will prove difficult for non-emerging countries, both in the North and the South. Even for resource rich developing and least developed countries, which are benefiting from the increase in commodity prices (see box 3), the long term impact on their development prospects is not clear. From both the effective demand and the sustainable development perspective, exporting non-renewable commodities does not have the same benefits than exporting labour-intensive merchandises.

For the poorest deficit developing countries, which cannot count on net export of oil and other commodities, the situation will be worst. The potential for inserting themselves in global supply chains and export labour intensive products to the North will decline in the same time as their import bill in oil

Box 2. Global Supply Chains, Industrialization and Development

There is a heated debate, reminiscent of the 1970s controversies about the role of trans-national corporations, between the liberal and the heterodox schools on the role of global supply chains in fostering industrialization or, at the contrary, causing "inmisering growth", low labour standards and more informality.

Graph B2 Economies with significant share of processing trade in total exports



The establishment of export processing zones (EPZs) in developing countries and their success in attracting foreign direct investment have usually been balanced by a bias towards a low qualification and low salary profile for their employees. Because the establishments in EPZs in lesser advanced developing countries are predominantly labour intensive and foot-loose industries (e.g., apparel and garments), critics to an industrial strategy based on processing industries point to (i) their lack of backward and forward linkages with other domestic industries; (ii) their reliance on informal markets to lower labour costs; and (iii) their sensitivity to conjunctural downturns. Partial field data from Asian countries on the impact of the crisis show declines in both average working hours and average earnings, especially in footwear and furniture industries. In addition, it seems that the crisis hurt more the formal sector, while the informal sector saw increases in average working hours (Hurst, Buttle and Sandars, 2009).

The controversy is partially based on an erroneous supposition that inward oriented (domestically integrated) and outward oriented (globally connected to supply chains) industrialization processes are mutually exclusive forms of industrialization for developing countries. It needs not being so as capital and skill requirements are quite different, especially at the earliest stages of the export-processing industrialization.

Bacchetta, Bustamente and Ernst (2009) indicates that EPZs actually compete more with informal activities than established national industries, "offering better, more stable employment opportunities for those previously working in the informal economy" (p.111). Using the tools of structural economics, Escaith (2007) shows also that outward-oriented Asian economies, which inserted themselves actively in global supply chains, were able to successfully absorb their growing active population, while the more domestic based manufactures in Latin American countries could not provide enough formal jobs in the manufacturing sectors to the new entrants, pushing them instead into a growing urban informal service sector.

and food will increase. The reshaping of global effective demand in any future scenario is of particular importance for these labour abundant developing countries that where relying on the strength of the global supply chain movement to attract productive investments.

Global Supply Chains are based on comparative advantages derived from costs and specialization. Complementarities based on cost differential between countries arise naturally when factors endowments are very different. This explains the specialization in trade in tasks between industrialised economies and labour abundant developing countries. Complementarities based on specialization are, at the contrary, the domain of intra-sectoral trade between complex industries, typical of the developed economies (for example, intra-EU trade in manufacture).

The capacity of LDCs and least-advanced developing countries to successfully insert themselves into supply chains led by, and for, emerging economies is still unclear. The difference in factor endowments and production costs is not large (as in the case of mature industrialised countries), and most emerging countries still count with a large reservoir of labour. The issue is particularly acute for African lesser advanced economies, where transaction costs (both monetary and in terms of transportation time) remain prohibitive, compared to larger developing Asian or American countries. For the time being, the preferential treatment granted by industrialised countries (EBA in the case of the EU, or AGOA for the US) are gradually eroded by the structural trend in these advanced economies of reducing MFN tariffs and importing an increasing share of their demand under duty free treatment.¹⁸

Thus, besides fostering trade facilitation to reduce monetary and non-monetary transaction costs, one issue for LDCs and other lesser advanced economies located far from Emerging East would be to receive significant duty-free quota-free access to these burgeoning markets, where MFN tariffs are usually much higher than for industrialised economies.

Box 3: Least Developed Countries Exports: Products and Markets

Export concentration has been a structural characteristic of LDC economies. Almost three quarters of LDC total merchandise exports depends upon only three main products (which change from country to country), accounting sometimes for more than 95 per cent of export receipts. The recent trends in commodity prices reinforce this tendency, not only by increasing the weight of those commodities, but also for discouraging diversification efforts.

The value of fuels and mineral exports between 2000 and 2007 rose annually by more than 27 per cent and represent now 67 per cent of total LDC exports. For commodity exporters, the non-traditional (labour intensive) activities appear less lucrative to domestic investors due to their lower relative prices. In addition, exchange rate appreciation linked to commodity booms – the so-called Dutch Disease – reduces the international competitiveness of labour intensive activities, such as light manufacture. This increased concentration on commodities reduced the weight of clothing, the second product in importance, to below 13 per cent for the LDC group. All other product groups, including agriculture, are now contributing less than 10 per cent to the total export value.

The market for LDC exports have increasingly become diversified, with developing economies, such as China, India and Thailand having a greater weight in LDC exports than one would expect from their share in world total imports. As a result developing economies have become the major destination for LDC exports of mineral fuels (56 per cent in 2006), copper (83 per cent), wood products (87 per cent), cotton (89 per cent) or some food products like vegetables and oil seeds (84 and 73 per cent). On the contrary, developed economies remain largely a dominant export destination for manufactured articles such as clothing (95 per cent) and some high value-added agricultural and food products such as fish and crustaceans, beverages or tobacco, with 67, 73 and 57 per cent, respectively.

Service exports are of particular importance to some LDCs. Travel, a close proxy of tourism receipts, is the dominant sector, representing 52 per cent of their services exports in 2008. This activity grew steadily since the beginning of 2000, at an average annual rate of 15 per cent, and was particularly dynamic during the last three years. This promising sector is vulnerable in the present economic cycle, because a large part of these revenues originate from tourists arriving from developed countries, where the economic impact of the crisis has been primarily felt.

Source: WTO "Market Access for Products and Services of Export Interest to Least-Developed Countries" WT/COMTD/LDC/W/46, October 2009.

¹⁸ It has been estimated that when preferences are lower than 4 percentage points, they become ineffective in promoting exports.

Concluding remarks

The geographical segmentation of industrial production has played a major role in shaping international economy in the past 15 years. It was at the root of the emergence of new global players, such as China or Malaysia, and the correlated dramatic reduction in absolute poverty levels. It allowed also some old industrial economies like Germany or the USA, to regain international competitiveness through increased productivity and efficiency. In the same time, the content of merchandise statistics and the economic significance of trade balances became more and more difficult to interpret.

Supply chains reshaped international trade and changed the relationship between trade and development: the surge of trade in intermediate commodities remodeled regional and international networks through a bottom-up angle and forced governments to reconsider the previous identification of industrial development with protectionism; developing countries were able to leap-frog the traditional industrialization phases by inserting themselves into complex industrial networks; the criss-crossing of manufacture networks led to large investments in transportation equipment and infrastructure in order to accommodate the huge transit of goods for processing that removed bottlenecks and favored economic development.

Off-shoring altered also the social panorama. If global economic and welfare benefits have been substantial, their distribution remains contentious. While creating numerous jobs in emerging countries, outsourcing and offshoring increased wage disparity in both developed and developing economies, fuelling an active political debate on the pro and cons of globalization.

Instead of observing a decoupling of developing countries, global supply chains have strengthened the complementarities as well as the competition between industrialised and emerging economies. Their role in the synchronization of trade collapse that followed the financial crisis of September 2008 has been determinant. And determinant is also their role in shaping the alternative exit scenarios from the Great Recession, as is their future contribution in any post-crisis scenario.

The increase in objective and subjective transaction costs, from higher oil prices to "buy local" campaigns and murky protectionism, indicates that in the future, supply chains will probably be smaller and more regional. Let unchecked, these centripetal forces may cause a deglobalization process which will directly affect less advanced developing economies but, in the end, will also be detrimental to both developed and emerging countries.

Yet, against this pessimistic outcome, many considerations militate in favour of productive network continuing to extend their global reach. In the short run, abandoning the present global network of suppliers carries a heavy cost for the multinational firms. Off-shoring has been a central objective of many key industries, which heavily invested in their international network. Often, the new plants build off-shore are more modern and efficient than the older domestic ones, and selling them to a competitor would create a comparative disadvantage (remember the dilemma of GM when selling Opel).

In the longer run, the constant flow of innovations and the extension of the technological frontier are lowering the cost of communication and creating new opportunities for redesigning the international division of labour. The technical factors that made possible the internationalization of production, from the IT revolution to innovations in engineering and business management, still promote further "flattening of the Earth".

Large emerging countries are becoming new markets for final goods that reshape existing production networks, while new actors are emerging from the "not-so-emerging" countries. Thus deglobalization is probably a distant menace on objective grounds, even if it is a new global effective demand that will drive the world economy, forcing some difficult adjustments. Indeed, the 2008-2009 crisis is a structural break, and the world economy will certainly not return to "business as usual". Old giants tumbled, new global players emerged. Public opinion is also changing and the citizens' concerns on the lack of governance of the previous phase of globalization will have to be addressed, while the present

gains in opening trade opportunities, in particular for least developed countries, will have to be preserved.

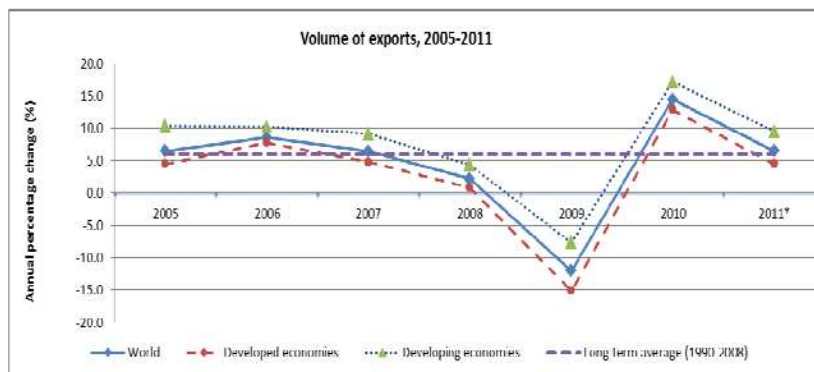
Post face to the revised version, June 2011.

As recalled by The Economist Intelligence Unit, the global crisis was in part a crisis of globalization, and raised fears of backlash against the internationalisation of flows of goods, capital and people that has been one of the overriding trends of the past three decades.¹⁹ With economic recovery under way and international trade back to normal in 2011 after a strong rebound in 2010, the world economy seems to enter a new era of globalization, characterised by its multi-polarity, and will avoid a regression to national trade fortresses.

Since the October 2009 OECD conference when this paper was presented, the role of international supply chains in explaining the depth and synchronization of the 2008-2009 trade collapse has been more thoroughly examined. *Inter alia*, Di Mauro and Mandel (2011) edited a review of the factors contributing to the high elasticity observed during the crisis. The consensus tends to indicate that it is not because of global value chains per se that industries, such as the automotive industry, were severely impacted, but rather because of abrupt shifts in demand and consumer preferences during the recession. The swings in world trade should not be explained by structural high trade elasticity created by the fragmentation of global manufacturing, but by the sheer size of the initial financial shock and the new microeconomic transmission channels created by global supply chains.

Indeed, after two years of roller-coaster in 2009 and 2010, where world trade overshoot world GDP, the 2011 forecasts point to a return to normality. Growth in volume should stabilise at about 7 per cent, with an income elasticity of 2, both parameters being in line with their long-run average (figure 4). Japan's earthquake and tsunami in March 2011 showed both the fragility of international supply chains to a major disruption of a key partner, and the resilience of international trade, as the global economic impact was expected to remain limited (Escaith et al., 2011).

Figure 4: Growth rates of world exports, 2005-2011 (in volume)



Source: WTO (2011: forecast)

Seen from the mid-2011, the 2008-2009 trade collapse looks like a standard –yet outsized– effect of a fall in the demand for durable goods and postponed purchases of intermediates drawing down inventories. Eventually, supply-side disruptions –caused by a shortage of trade finance, the interruption and breaking-down of international supply chains, and the increase in tariff and non-tariff trade barriers– played a minor role. Thus, the Great Trade Collapse is seen more a tale of greater economic interdependence and short-term volatility than a structural and irreversible shift in trade elasticity, unwarranted systemic instability and rampant deglobalization.

Yet, this crisis was –and remains– a call to both academics and policy makers to have a closer look at the role of global value chains in explaining today’s international economy. The World Trade Organization launched in 2001 a dedicated website on the implications of “Made in the World” on

¹⁹ The Economist Intelligence Unit, 10 January 2011.

trade policy.²⁰ OECD and World Bank jointly launched a book in September 2010 on the implications of global value chains on the world economy (Cattaneo, Gereffi and Staritz, 2010). It reviews, in particular, the opportunities for developing countries, with a particular focus on entry and upgrading possibilities in global value chains. But the development prospects for the resource-poor lesser developed countries located at the periphery of the global or regional value chains remains -as it were at the time of writing this conference paper- a huge challenge for both the international community and the LDCs' policy makers.

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