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Global Economic Crisis and Vertical Specialization in Developing Countries

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The world has witnessed an impressive increase in trade over the past four decades. World merchandise trade increased from US$217 billion in 1962 to US$22.8 trillion in 2006. While industrialized countries accounted for the vast majority of this growth, between 1985 and 2006, developing countries' total trade increased from US$1.1 trillion to US$8.4 trillion, growing at an average annual rate of 9.8 percent, outpacing the world trade growth of 8.7 percent over this period.

A key feature of the dramatic growth in trade since the mid-1980s has been the emergence and expansion of vertically integrated production networks, which now characterize a wide range of manufacturing industries from apparel to automotive to electronics. Vertical networks also include services such as information technology, business processes, and, more recently, "knowledge processing."[1] All of these networks involve multiple countries in the production (services) sequence. Developing countries have largely benefitted from this trend as it has enabled them to better exploit their comparative advantages through a finer degree of specialization and, therefore, to accelerate their trade integration.

As the current economic and financial crisis unfolds, the world is now witnessing a dramatic and unexpectedly rapid contraction of trade, far beyond what would be expected in a typical Keynesian-style contraction (Baldwin, 2009). Developing countries are expected to be adversely affected as the volume of world trade is expected to decline by more than 2 percent in 2009, the first such decline since 1982 (World Bank, 2009). Understanding the key factors that have driven the expansion of vertically integrated trade over the past decade or so can provide policy makers with insight into the underlying factors that are now causing the unexpectedly rapid contraction.

Framework for Understanding Vertical Trade and Production Patterns

Various authors have approached the changing trade and production patterns from different vantage points, each with their own terminology. Outsourcing has been studied by Katz and Murphy (1992) and Feenstra and Hanson (1996); delocalization by Leamer (1998); fragmentation by Deardorff (1998) and Jones and Kierzkowski (2001); intra-product specialization by Arndt (1997);

slicing the value chain by Krugman (1995); and trade in tasks by Grossman and Rossi-Hansberg (2006).

Hummels et al. (1999) documented a key aspect of these vertical linkages, which they termed *vertical specialization* (VS). VS requires that a good be produced with two or more sequential stages; that a country specializes in producing some, but not all, stages of the good; and that at least one stage crosses an international border more than once. This definition captures the essence of the emerging production and trade patterns in which countries are linked together sequentially in two or more stages to produce a final good.

Simulated predictions based on the Hummels et al. (1999) model demonstrate that specialization in stages, through a finer division of labor, leads to higher welfare gains compared to exports not of the VS type. Because vertically specialized goods cross multiple borders during the course of production, trade costs are incurred repeatedly. Therefore, a given reduction in trade barriers yields a multiple reduction in the cost of producing the good, resulting in multiple increases in trade. It is the presence of VS that magnifies the impact of tariff reductions (or other trade transaction costs) and enabled the rapid expansion of trade over past decades. In the context of the current economic and financial crisis, one can therefore expect a magnified impact in the reverse.

Key Determinants of Vertical Specialization

Many models have been developed to study the impact of increased VS on factor prices, production and trade patterns, and welfare. Many of the models, including Hummels et al. (1999), postulated that reductions in trade barriers, such as tariffs and transportation costs (direct trade costs), are the primary exogenous shocks driving the growth of VS and trade. However, to date, only a few empirical studies have been undertaken on the determinants of VS and none specifically on developing countries.[2]

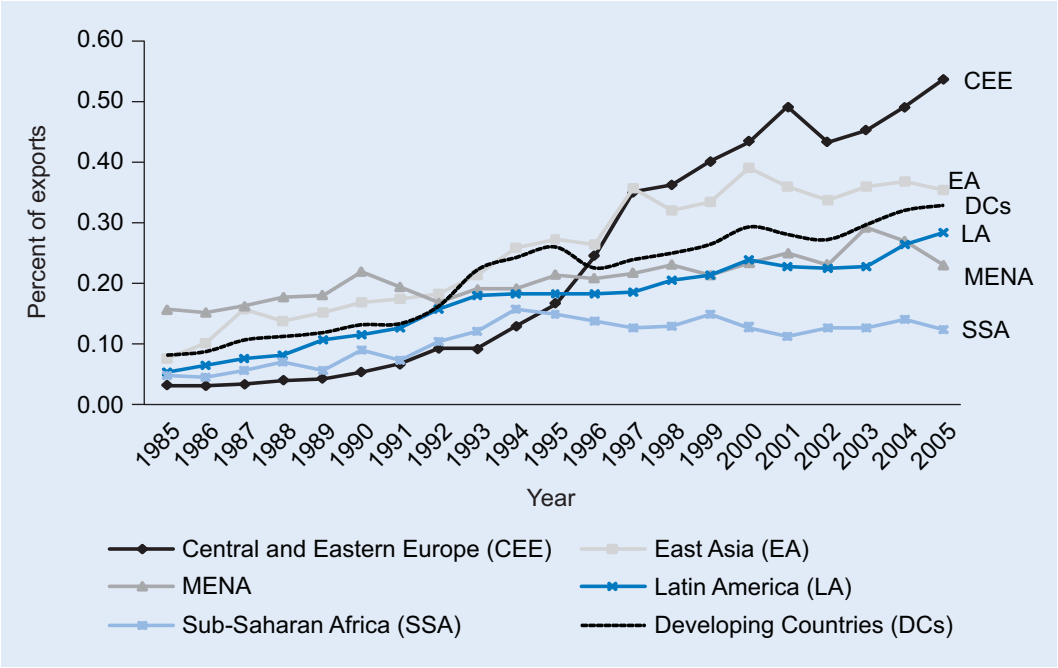
Following Hummels et al. (1999), Pitigala (2008) shows that vertical trade in developing countries increased from 8 percent in 1985 to around 33 percent in 2005 (figure 1).[3] Eastern Europe and East Asia have shown dramatic increases in vertical trade in the 1990s, whereas Sub-Saharan Africa has shown weak integration through international production chains. Many developing countries have benefited from this expansion of vertical production chains, which has enabled them to better exploit their comparative advantages at a finer degree of specialization, and has accelerated and diversified their global trade integration.

Using a gravity equation on a panel of 47 developing countries, Pitigala (2008) estimated determinants of VS on bilateral equations and country-specific equations, respectively, using both the preferred source of many studies, GTAP input-output data, as well as trade and production data. It is worth noting that strong similarities were found between the two measures of VS across countries; in some cases, the trade-based measures appear more reliable, boding well for future research, due to the availability of longitudinal data.

Pitigala demonstrated that tariffs have become less important for production-sharing activities, as most of developing countries are administering export-processing zones, duty suspension, and/or drawback facilities for export-oriented production activities and most developing countries are entitled to Generalized System of Preferences or other bilateral arrangements wherein applied duties on manufacturing are zero-rated or relatively low.

The most important determinants of VS are, instead, access to finance (Finance),[4]

Figure 1. Regional Trends in VS as % of Exports (1985–2005)



Source: Authors calculations using U.N. COMTRADE data.

political stability and governance (Political Risk),[5] and quality of infrastructure (Infrastructure).[6] For example, a one percent improvement in Finance is associated with a 0.78 percent increase in VS. The importance of Finance is further highlighted by case study evidence, where the cost of finance was estimated to be one of the top three costs impacting the ability of firms to engage in vertical trade, ranking above transport costs.[7] The empirical relevance of the Finance-VS linkage arises from the need for intra-period credit because final-goods producers cannot pay their intermediate-goods suppliers before they sell the final good. In the absence of short-term credit, the firm that produces first in the production chain receives its factor payments, and therefore its profits, last. Consequently, the global credit crunch, which includes a squeeze on trade finance, is already taking a toll on the intricate supply chains, as thinly capitalized suppliers, the weak links in many international supply chains, are struggling to obtain credit (Leach, 2008).

The empirical results further showed that an improvement in the Political Risk environment is associated with a remarkable 1.6 percent increase in VS. It is worth emphasizing that while there is no direct empirical reference to the Political Risk estimates and VS, the concepts of "governance" and "corruption", both elements of Political Risk, have been modeled in a number of studies (Lavalle, 2006; Nordås, 2004).[8] For example, Nordås suggested that corruption is a significant obstacle to VS in the apparel sector. However, the concept of Political Risk extends beyond the concept of corruption to encompass the overall political stability of a country. Vertically integrated industries view risk from a broader perspective because output disruption in a given location due to political instability can disturb production plans for the entire production chain.

The quantitative importance of the Infrastructure variable is also particularly noteworthy. If a country could improve its own infrastructure by one percent, then, other things being equal, VS can be expected

to increase by more than 1.3 percent. The results are of higher magnitude than found by Nordås (0.9 percent); it appears that by isolating developing countries, Pitigala (2008) revealed a higher sensitivity of VS to changes in transport infrastructure. These results are aligned with what one can expect from the state of most developing-country transport logistical chains. As reorganization of international production chains began with a greater orientation towards just-in-time production and inventory methods, the ability of developing countries to engage in vertical specialization is strongly associated with the quality of their transport infrastructure networks. This implies that better behind-the-border infrastructure is expected to decrease lead times and reduce damage during transit for both internal and international trade, factors that could otherwise seriously impede developing countries in exploiting their comparative advantages.

Landlocked countries are at an 86 percent greater disadvantage than are both island and coastal-trading nations in vertical specialization. These results reinforce the findings of Nordås (2004), Radelet and Sachs (1998), and Limão and Venables (2001), all indicating that being landlocked tends to raise overland transport costs considerably higher than sea freight costs. These findings also highlight the importance of developing the entire logistics sequence, including cross-border road transport infrastructure, customs, and other border controls for landlocked countries.

Conclusion

The emergence of vertical specialization has allowed a large number of developing countries to exploit their comparative advantages at a much finer level of specialization in global production chains, enabling them to both boost their exports and diversify away from traditional, commodity-based exports. It is the presence of VS, with its back-and-forth trade, that has magnified the impact of trade cost reductions and has enabled the rapid expansion of trade over past decades. It can be expected that some of the factors that have driven the rapid growth of trade in recent decades are feeding the current downward spiral, which may have long-lasting impacts on the global trading system.

The ability of a developing country to participate in cross-border production chains is strongly associated with availability of finance; the overall strength of its hard infrastructure, which includes the quality and capacity of transport and communication networks; and "soft" infrastructure such as political risk (political stability and overall governance).

The rapid contraction of trade during the present crisis is directly linked to the vast network of vertical supply chains that have been hit not just by a severe (Keynesian) economic slowdown, but also a financial system on the verge of collapse. Given the depth and breadth of vertical supply chains, one can expect that trade flows would contract much faster than in the case of non-vertically specialized trade. International supply chain arrangements have promoted the development of sophisticated supply-chain financing operations, which have been critical to enabling small and medium-size enterprises in developing countries to engage in vertical trade (Auboin, 2009). Even if the financial market collapse was isolated to one country (and it is not), the knock-on effects on supply chains and, consequently, trade flows, could still be substantial: one weak link in the vertical production chain can stall production, and hence trade flows, between other parts of the chain. While the importance of traditional trade policy variables such as tariffs has declined in recent decades, the rise of protectionist sentiments in developed countries in response to the growing crisis could, if acted upon, further threaten developing countries that have

come to depend on vertical trade to promote export-led growth.

The factors that have enabled the expansion of vertically specialized trade are mainly domestic policy and regulatory challenges, and addressing them at the national level can have a positive impact on the ability of developing countries to engage in VS. However, given the multilateral nature of vertical production chains, and the rapid domino effect of the ongoing economic and financial crisis, a rapid and internationally integrated response is imperative, particularly with respect to staving off protectionism and increasing the flow of trade finance.

The IFC and regional development banks (including the Inter-American Development Bank, European Bank for Reconstruction and Development, and African Development Bank) have already enhanced their trade financing programs, enabling the financing of up to some US$30 billion of trade involving developing countries and small amounts. While efforts are underway to loosen credit markets, particularly for trade finance, many fear that many small and medium-size enterprises in developing countries may not last long enough for the trade finance to trickle down to their level (Leach, 2008). The impact of the current credit crunch could therefore have long-lasting impacts beyond the current financial crisis as U.S. and European companies, who have spent decades perfecting their intricate supply chains, are forced to reconstruct not just weak but broken links in their supply chains.

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Endnotes

1. *Knowledge process outsourcing* refers to the growing trend towards outsourcing higher skill-based processes, including design, research, and development, as well as professional services, such as legal and accounting services.

2. The exception is Nordås (2004), who analyzed the determinants of VS using the O-ring theory of production on a panel of 52 (developed and developing) countries.

3. This measure only captures one channel through which countries participate in vertical trade, whereby VS represents the foreign value-added embodied in exports. Countries can also contribute to VS through raw material or intermediate good exports that are embodied in a second country's export goods.

4. Access to finance was proxied by a composite index composed of the Economic and Financial Risk ratings published by the International Country Risk Group (ICRG) of Political Risk Services (PRS). Financial and Economic Risk are associated with the cost of borrowing: a 10-percentage-point increase raises the home country's economic risk index by 52 basis points and its financial risk index by about 63 basis points (see the World Bank's Global Development Finance database, 2007; http://publications.worldbank.org/GDF/).

5. As measured by ICRG's Political Risk rating.

6. Following Limão and Venables, an index of infrastructure (total roads, paved roads, railroads and telephones) is adopted to proxy the cost of transport and other infrastructure.

7. Based on a firm-level case study in on costs structures of firms engaged in vertical trade in Sri Lanka.

8. Lavalle (2006) assessed the effects of North-South trade on the quality of governance in developing countries by applying a gravity trade model for a sample of 21 OECD countries and 95 developing countries from 1984 to 1997.

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