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Deep integration and production networks

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Over the last three decades there has been an increased role of international production networks in the global economy, which are characterised by the unbundling of stages of production across borders. International production networks have evolved due to technological innovation in communication and transportation that has not only decreased physical distance, but has also facilitated the establishment of services links, necessary for the efficient combination of various fragments of the production processes.

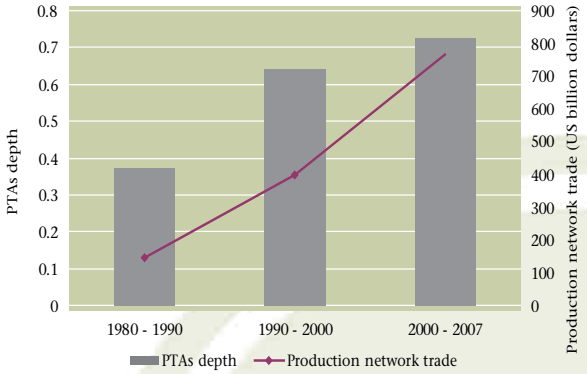
Participation in preferential trade agreements has also accelerated over time. As the World Trade Report 2011 shows, in 1990 there were only about 70 preferential trade agreements (PTAs) in force. Thereafter, PTA activity increased to almost 300 preferential trade agreements in force in 2010 alone. The coverage of policy areas in PTAs, particularly those of a regulatory nature, has also been widening in recent years. These agreements go beyond tariff liberalisation and include disciplines such as the movement of capital, investment, intellectual property, competition policy, services trade, and technical barriers to trade.

The expansion of international production networks is related with the proliferation of deep agreements aimed at filling the governance gap between countries. In order for cross-border production to operate smoothly, certain national policies need to be harmonised to facilitate business activities in several countries (Lawrence 1996). This generates a demand for deep forms of integration.

The rise of production networks trade flows involving the exchange of customised inputs, incomplete contracts and costs associated with the search for suitable foreign input suppliers creates new forms of cross-border policy effects – as compared with a situation where goods are produced in a single location – that go beyond the standard trade policy externalities. Therefore, the changing nature of trade (from trade in final goods to trade in intermediate goods) is directly responsible for the growing demand for deep agreements that can address these new cross-border effects (see Antras and Staiger 2008).

Descriptive evidence suggests that there is a positive relationship between production networks trade and deep integration (see figure 1). However, this relationship can go in both directions. On the one hand, deep PTAs may stimulate the creation of production networks by facilitating trade among potential members of a supply chain. On the other hand, countries already involved in international fragmentation of production are willing to sign deeper preferential trade agreements with their partners in order to secure their trading relationships as providers of intermediate goods and services.

Figure 1. Deep integration and production networks trade



Source: Authors calculations on WTR database

This policy insight highlights new evidence on both directions of causality between deep integration and production networks.

Measuring deep integration

Despite the wide literature on the determinants and the effects of PTAs,[1] empirical studies on the relationship between trade and deep integration are very limited in number. One of the main reasons for this derives from the difficulties that arise when defining and measuring the depth of an agreement. The concept of deep integration is widely used to refer to any arrangement that goes beyond a simple free trade area. As the World Trade Report 2011 highlights, there are at least two distinct dimensions to any deeper integration agreement. The first dimension, the extensive margin, refers to an increase in the coverage of an agreement beyond the lowering of tariffs (*eg* the harmonisation of national regulations in financial services). The second dimension, the intensive margin, refers to the institutional depth of the agreement, such as the extent to which certain policy privileges are delegated to supranational entities (*eg* the formation of a customs union).

In order to capture the depth of an agreement, we construct a set of indices[2] in terms of the coverage of policy areas (extensive margin) using WTO data[3] on the content of preferential trade agreements derived from a comprehensive mapping and coding of 96 PTAs signed during the time interval 1958-2010. The dataset is an extension of the Horn *et al* (2010) dataset in which a set of policy areas can be classified into two different groups (see Table 1). The first group is represented by WTO+ provisions that fall under the current mandate of the WTO and are already subject to some form of commitment in WTO agreements. The second group of policy areas, which are denoted as WTO-X provisions, refer to obligations that are outside the current mandate of the WTO. The main objective of these indices is to condense a large amount of data on the existence and enforceability of each single provision into a single number that can be compared across different countries.

The results we present in this policy insight correspond to a particular index containing only those provisions with the highest degree of commonality across the agreements. Specifically, deep integration will be captured by five areas only, two WTO+ areas namely State Trading Enterprises and TRIPS and three WTO-X areas namely Competition Policy, Intellectual Property Rights and Movement of Capital.[4] The assumption behind this approach is that if one of the main causes for signing deep agreements is the promotion of production networks, the set of provisions that most frequently appear in these agreements should be more correlated with production networks trade.[5]

Adoption of competition policy, for instance, preventing the abuse of market power, will allow multinational firms to take full advantage of differences in costs among countries by fragmenting production. In addition, provisions such as movement of capital, aimed at protecting firm-specific assets such as human capital and intellectual property, will give international firms a competitive advantage and therefore will encourage more production sharing. Finally, provisions on intellectual property rights aimed at the harmonisation of standards to a single regulatory regime, including a common set of rules that governments apply to private firms in many nations, will tend to foster competition and trade.

Table 1. WTO+ and WTO-X policy areas in Preferential Trade Agreements

WTO+ AREAS	WTO-X AREAS	
PTA Industrial goods	Anti-Corruption	Health
PTA agriculture	Competition Policy	Human Rights
Customs Administration	Environmental Laws	Illegal Immigration
Export Taxes	IPR	Illicit Drugs
SPS Measures	Investment Measures	Industrial Cooperation
State Trading Enterprises	Labour Market Regulation	Information Society
Technical Barriers to Trade	Movement of Capital	Mining
Countervailing Measures	Consumer Protection	Money Laundering
Antidumping	Data Protection	Nuclear Safety
State Aid	Agriculture	Political Dialogue
Public Procurement	Approximation of Legislation	Public Administration
TRIMS Measures	Audiovisual	Regional Cooperation
GATS	Civil Protection	Research and Technology
TRIPs	Innovation Policies	SMEs
	Cultural Cooperation	Social Matters
	Economic Policy Dialogue	Statistics
	Education and Training	Taxation
	Energy	Terrorism
	Financial Assistance	Visa and Asylum

Source: Horn et al (2010).

1 Baier and Bergstrand, 2004; 2007; Bergstrand *et al*. 2010; Silva and Tenreyro, 2006; Soloaga and Winters, 2001; Ghosh and Yamarik, 2004; Magee, 2008).

2 For more details on the methodologies used to construct the different indices, see Orefice and Rocha (2011).

3 This dataset is an extension of Horn et al. (2010) and has been created by the Research division of the WTO for the World Trade report (WTR) 2011.

4 These areas have been selected through a Principal Component Analysis

5 Another way to choose a sub-set of provisions would be according to their correlation with production networks trade. However, , using an index generated in such a way would overestimate the results.

The two-way link between production networks and deep integration

Estimations for a set of 200 countries during the time period 1980-2007 confirm the positive relation between production networks trade and deep integration. In particular, signing deeper agreements increases trade in production networks between member countries by almost 35 percentage points on average. In addition, higher levels of trade in production networks raise the likelihood of signing deeper agreements by approximately six percentage points. This effect is still significant after taking account of other PTA determinants, such as the economic similarity between countries and their differences in relative factor endowments.

Different effects for different industries

The impact of deep integration is heterogeneous across industries. While signing deeper agreements increases production networks trade in automotive parts and information and communication technology products (ICT) by 81% and 56% respectively, the impact on textiles trade is only 20% on average. One interpretation of this result is that the textiles industry might be less influenced by deep integration due to the higher levels of standardisation and the lower levels of capital intensity of its production processes, compared with other industries. In other words, whilst regulating areas such as intellectual property rights or capital movement will be fundamental for the development of automotive or ICT production networks, these areas are not as relevant for the promotion of textiles production networks.

The interaction between production networks and deep integration has also evolved over time. In particular, compared with the average impact across the whole period (35%), the impact of deep integration was ten percentage points higher in the time period 1990-2007 and almost 30 percentage points higher in the period 2000-2007. This is not surprising given that in recent years, industries such as the automotive sector and ICT, which require higher levels of integration by their very nature, have become more important. In the past decade, the growth rate of production networks trade was very high for the automotive industry (93%) compared to the ICT and textiles industries, where production network trade grew only 47 and 36 percentage points respectively.

North-South production networks and deep integration

Countries engaging in production sharing were initially mainly rich countries.[6] From the mid 1980s, however, production networks between developed and developing countries started to increase. As Baldwin (2011) points out, in this scenario, some of the costs related with international fragmentation of production such as managerial and logistic costs of monitoring and coordinating international production, learning about the laws, and regulations to do business in another country might be particularly high for developing nations who mostly lack the sophisticated business law and the product and labour regulations which are essential for rich countries to consolidate their trade in intermediates.

Empirical evidence supports the fact that the positive impact of an increase in production networks trade on the likelihood of signing deeper agreements is five times higher for North-South countries compared to countries with similar income levels.

This outcome confirms the fact that one of the reasons why deep agreements are signed is to fill the governance gap between countries. In particular, disciplines including competition policy, capital movement, TRIPS, intellectual property rights and state trading enterprises, would make production sharing activities between North and South countries more secure and less likely to encounter disruptions or restrictions.

Deep integration: The case of East Asia

Papers such as Athukorala and Menon (2010), Ando and Kimura (2005) and Kimura *et al* (2007) show that production networks are an extremely important phenomenon for this region. In addition, one feature that makes Asian production networks distinctive is that they take place between countries of different income levels. In the region, the growth of production sharing first took place through *de facto* economic integration. More recent agreements, such as Japan's economic partnerships with Malaysia, Indonesia, Thailand and Viet Nam, or ASEAN, push for deeper disciplines and clearly show that this region is moving towards deeper integration.

Empirical evidence confirms that in countries belonging to Asia and in particular to the East Asia region, the relevance of production networks trade is one of the driving forces for governments to sign deeper agreements.

This outcome confirms the fact that while the increased regionalisation of production networks would not have been possible in this region without the increasing levels of trade liberalisation and openness to foreign investment that was achieved through agreements such as ASEAN, integration going beyond tariff liberalisation and aiming at higher levels of predictability in

6 See Grunwald and Flamm (1985).

economic policy is a prerequisite for production networks to prosper. High trade costs could still be an obstacle for the development of production networks because of inadequate infrastructural services. In addition, differences in legal systems and economic institutions among countries in areas as intellectual property rights protection, investment protection, become more critical as a potential obstacle for production networks to develop.[7]

This policy insight is based on Orefice and Rocha (2011) "Deep Integration and Production Networks: an Empirical Analysis", WTO working paper N.2011-11. The views presented in this article are those of the authors and do not reflect the World Trade Organization. They are not meant to represent the positions or opinions of the WTO and its Members and are without prejudice to Members' rights and obligations under the WTO.

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7 These results are also in line with studies such as Pomfret and Sourdin (2009) and (2010) which showed that one of the driving forces behind recent agreements signed among Asian countries is in part a response to the need to facilitate trade in order to make regional value chains more profitable.

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