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## Working Party on International Trade in Goods and Trade in Services Statistics

## INTRA-FIRM TRADE: A WORK IN PROGRESS

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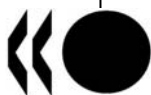
*Item 7 d) of the agenda.*

*This study on intra-firm trade is the third report dedicated to “new” trade flows resulting from the fragmentation of production, after “Vertical trade, trade costs and FDI” [TAD/TC/WP(2008)23/FINAL] and “Trade in intermediate goods and services” [TAD/TC/WP(2009)1/FINAL]. It assesses the patterns of intra-firm trade using available hard data and firm level estimates, the latter being based on the activities of vertical foreign affiliates. The analysis investigates the country and industry determinants of the share of intra-firm trade in total trade and focuses on the policy implications arising from intra-firm trade.*

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## EXECUTIVE SUMMARY

This report on intra-firm trade is the third dedicated to “new” trade flows resulting from the fragmentation of production, following “Vertical trade, trade costs and FDI” [TAD/TC/WP(2008)23/FINAL] and “Trade in intermediate goods and services” [TAD/TC/WP(2009)1/FINAL].

Intra-firm trade corresponds to international flows of goods and services between parent companies and their affiliates or among these affiliates, as opposed to arm’s length trade which is trade between unrelated parties (inter-firm trade). Thus, intra-firm trade arises only when firms invest abroad and trade with their foreign affiliates. On the other hand, offshoring –the relocation of activities abroad– captures not only intra-firm trade, but also arm’s length trade with independent suppliers.

The organisation of multinational firms has dramatically changed over the last two decades with the emergence of “global value chains” which has increased the importance of intra-firm trade flows. Interest of policymakers in this form of trade has also increased because trade policy objectives are likely to be different when considering trade flows between domestic companies and foreign companies on the one hand, and trade flows within MNEs headquartered in the domestic economy on the other. Whether trade is intra-firm or inter-firm presumably has an impact on the benefits from trade and the impact of firm strategies on the parent and host countries in terms of jobs and the location of activities. Intra-firm trade is also of interest for competition and tax authorities with regard to customs valuation and transfer pricing. For all these reasons, there is a need to better understand intra-firm trade and provide data on its importance in a greater number of countries than those for which statistics are already available.

Most countries collect few statistics on intra-firm trade or none at all. The main sources for intra-firm trade data are trade statistics (as collected by customs authorities), balance of payments (for services) and surveys on the Activities of Multinational Enterprises (AMNE). Trade statistics collected through customs are likely to provide the most complete picture of intra-firm trade, but such data are available only for the US where, in 2009, such trade accounted for 48% of US goods imports and about 30% of US goods exports. Available AMNE statistics allow comparing the share of intra-firm trade in total trade for seven OECD countries only (Finland, Italy, Japan, Netherlands, Poland, Sweden and US). Intra-firm goods exports of foreign affiliates for these seven countries represent on average 16% of total exports. However, this average masks wide differences; for example, the share of intra-firm trade in Poland was 31% in 2006 while in Japan it was 2%. Data on intra-firm trade in services is even rarer. According to US balance of payments data, in 2008, the share of intra-firm trade in total US private services trade was 22% for imports and 26% for exports. Firm level data covering a wide range of countries show that vertical FDI is more prevalent in services sectors than in manufacturing sectors, underscoring the particular importance of intra-firm trade in services.

At 83 percent of US imports, the automobile industry has the highest share of intra-firm goods imports. While the industry experienced an important decline in trade during the economic crisis of 2008-2009, at the aggregate level, we find no significant impact on the share of intra-firm trade in total US trade. In fact, the share of intra-firm trade in total US trade (or in the trade flows of US affiliates) has remained more or less unchanged over the past 10 years, while the share of intra-firm trade in services has increased.

Intra-firm transactions are more common among OECD countries than among emerging economies. In 2009, 58% of US goods imports from OECD countries were intra-firm, while only 33% of US goods imports from other major economies occurred between related parties. This is consistent with the fact that the bulk of FDI is among OECD countries, which also integrate vertically in high-value activities in high-cost countries.

Looking at firm-level data, we find that in most OECD countries there are foreign-owned affiliates that are in a vertical relationship with their parent company and are likely to export inputs to this parent. The data are not comprehensive enough to estimate shares of intra-firm trade that can be compared to aggregate data, but for a certain number of countries the estimated share of intra-firm trade is already quite high. Intra-firm trade appears especially important for Austria, Ireland, the Slovak Republic and Sweden. Another finding is that vertical specialisation and intra-firm trade are as developed in services industries as in goods industries.

Trade liberalisation, including the liberalisation of services trade, has been one of the drivers of the reorganisation of firms as international outsourcing or vertical integration abroad is cost efficient only if goods and services can be moved relatively freely across borders. This new organisation of production has in turn changed the kinds of products traded internationally with an increase in trade in intermediate inputs and more trade flows within MNEs leading to intra-firm trade, as well as higher trade flows of final products. This explains why the volume of trade has been multiplied by three over the two last decades, while GDP (in volume) increased 1.5 times.

This analysis of the determinants of intra-firm trade confirms theoretical predictions and existing empirical results. A higher product contractibility (which captures how easy it is for firms to negotiate contracts for inputs), tends to favour arm's length trade and a relative decrease in intra-firm trade. This is because the "hold-up" problem, which leads to under-investment and delays in delivery and payments, is less pronounced for "contractible" products, thus promoting firms' preferences to turn to independent suppliers and arm's length trade. On the other hand, the share of intra-firm imports is higher in capital and skilled labour intensive industries. These industries require relatively more relationship-specific investments (investments which have little or no value outside the relationship) resulting in greater vertical transactions by parent firms which prefer to integrate.

The vertical integration strategies of firms give rise to several issues of particular interest to policymakers. First, there are additional gains from trade liberalisation in the context of offshoring, both for arm's length and intra-firm trade. The fragmentation of production and the emergence of "global value chains" are the by-product of trade liberalisation, as well as of other decreases in trade costs. Lower trade costs and the liberalisation of services trade have made it profitable to split the production process. Of particular importance are lower costs for services linking the different production stages such as communication, transport and logistics services, but also financial and business services, which enable firms to locate production stages in countries with lower marginal costs. This new international division of labour leads to higher productivity levels. Welfare gains can arise from both international outsourcing (arm's length trade) and vertical FDI (intra-firm trade).

Furthermore, trade liberalisation will force the least productive firms out of the market and reallocate market shares towards the more productive firms in an industry. However, industries will still be characterised by firms at different productivity levels that engage in both domestic and foreign sourcing strategies, not always involving foreign production. The reallocation of market shares towards the most productive firms will increase the aggregate productivity level of the industry and is hence a source of welfare gains. These gains from trade liberalisation are not specifically the consequence of intra-firm trade, and can also be achieved through outsourcing (arm's length trade). Trade policy should therefore remain neutral with respect to these two approaches to offshoring. The preference for one or another will depend

on a sector's characteristics and firms' strategies. There is no reason for trade policy to encourage vertical integration over outsourcing.

The rise of intra-firm trade also means that trade policymakers need to take into account the benefits of trade liberalisation both for domestically-owned affiliates located abroad and foreign-owned companies in the domestic economy. Taking into account investment can change some of the traditional results of the political economy of trade liberalisation. Trade liberalisation does not lead to a unique type of firm and has a mixed impact on the choice between outsourcing and vertical integration. While some theories predict that trade liberalisation will increase international outsourcing relatively more than vertical FDI, particularly for headquarter-intensive sectors, this is based on assumptions on the relative size of trade costs and investment costs that are not always empirically verified. Empirical analysis has found no correlation between the share of intra-firm trade and trade liberalisation. This does not imply policy failure; rather companies make strategic options that are sector-specific.

This complex relationship between the impact of trade and FDI liberalisation complicates the task of trade policymakers when negotiating trade agreements. FDI liberalisation can be not only a substitute to trade liberalisation but can also lead to unilateral liberalisation because of its terms of trade effect that can encourage further trade liberalisation. Policy makers therefore have new incentives to liberalise trade with partner countries as well as to undertake FDI liberalisation alongside trade liberalisation. This justifies dealing with both liberalisation of trade and investment, including of services, in the same agreements, as is now the case in most regional trade agreements signed by OECD countries.

Trade policymakers also have a role to play in mitigating the "hold-up problem" arising from relationship-specific investments, *i.e.* situations where buyers and/or suppliers under-invest because they become vulnerable to a termination of the contract for inputs that are highly specialised. Trade liberalisation, including services trade liberalisation, has an impact on the buyer-supplier relationship and can contribute to solving the "hold-up problem" as it can correct for the externality of under-investment by providing new incentives to suppliers to invest. Attention should be given in trade agreements not only to market access and non-discrimination between domestic and foreign producers but also to the contracting environment between buyers and suppliers. These new competition issues in vertical relationships can be addressed through domestic regulation and national competition law but also have an important international, trade, dimension in the context of global production networks. There are other policy areas more traditionally covered in trade agreements, such as standards, that should also be re-examined in the light of the buyer-supplier relationship.

Lastly, to improve our understanding of the benefits of trade liberalisation and to provide more accurate estimates of the welfare gains from trade liberalisation, it is important to collect more data on intra-firm trade and the activities of multinational enterprises, as well as to improve the tools used to assess the impact of trade and investment liberalisation to fully take into account the role of firms' differing sourcing strategies.

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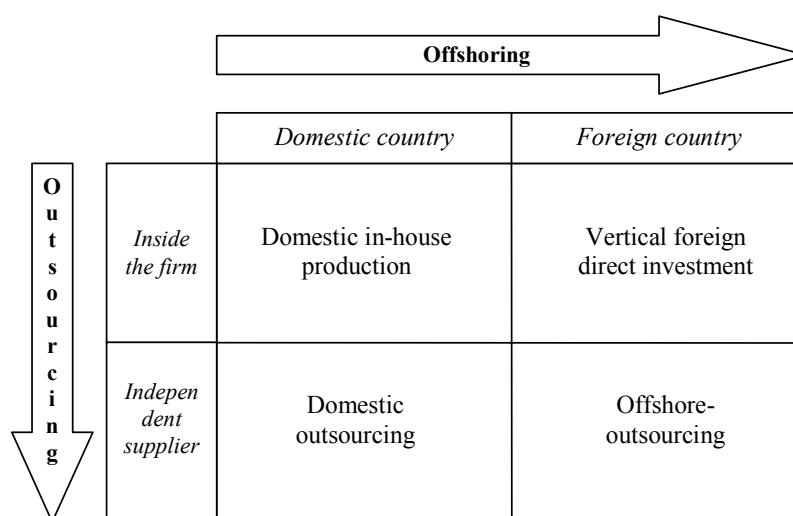
## 1. Introduction: the new boundaries of multinational firms and their trade implications

1. Intra-firm trade corresponds to international flows of goods and services between parent companies and their affiliates or among these affiliates, as opposed to arm's length trade which is trade between unrelated parties (inter-firm trade). Intra-firm trade is the consequence of activities of multinational enterprises (MNEs) that move goods and services across borders during the production process and provide final products to customers through their foreign affiliates.

2. The organisation of multinational firms has changed dramatically over the two last decades. This is not only a quantitative change with an increase in the scale of global operations of MNEs but also a qualitative change. MNEs were initially companies operating in several countries but with headquarter activities concentrated in their home economy. In the 1990s, a first qualitative change has been the development of vertical FDI and the fragmentation of production. Instead of using foreign subsidiaries to access new markets and circumvent trade policy barriers in the context of horizontal FDI, firms have increasingly relied on offshoring to specialize vertically and to spread the production process over several countries based on their respective advantages in terms of trade costs and production factors. This transformation has already thrown into question the "national identity" of MNEs when a large share of the production process is offshored. The "decentering" of MNEs (Desai, 2009) has been accentuated by an even more recent trend which is the offshoring of some headquarter activities and an increase in trade in business services. The location and organisation of value chains is not static. Firms constantly adapt their strategies to changes in their competitive advantages (through innovation, technological spillovers and catch-up) as well as the comparative advantage of countries (Mudambi and Venzin, 2010).

3. The boundaries of firms have changed both organizationally and geographically. To reduce costs, firms have started to redefine their activities and to disaggregate them into those that should be performed in-house and those that should be outsourced to independent contractors. This decision is based on transaction costs and whether it is better for the firm to retain control or not over the activity. In addition, firms have expanded geographically and relocated activities abroad to seize the opportunity of differences in costs and resources across countries and achieve a more efficient production process.

**Figure 1. Typology of sourcing strategies**



4. These two dimensions are represented on Figure 1 illustrating the different sourcing strategies of firms. When the supply of an input is outsourced, it can be produced by an independent supplier, either at home (“domestic outsourcing”) or abroad (“foreign outsourcing” or “offshore outsourcing”). Similarly, when the input is produced within the firm, this can be either carried out in the domestic economy (“in-house production”) or in a subsidiary abroad (“vertical foreign direct investment”). In the latter case, there is intra-firm trade, for example when the input produced in the foreign subsidiary is exported to the parent company in the domestic economy. Box 1 provides a more comprehensive typology of FDI motives and the type of intra-firm trade implied.

#### **Box 1. Motives for foreign direct investment and potential for intra-firm trade**

In the typology developed by J. Dunning, there are four types of MNE activity that can explain foreign investment. We explain below the four types and give an indication of the type of intra-firm trade flows that can be expected from these activities. It should be noted that in practice MNEs are pursuing multiple objectives and the same investment may combine several of the motives described below.

##### **1. Resource-seeking FDI**

The firm engages in FDI to have access to specific resources in the host economy (e.g., natural resources, material inputs or human resources). This is an example of vertical FDI (i.e. where the subsidiary is an input supplier to the parent company).

**Intra-firm trade?** Yes, raw material or the resource once processed is shipped to the parent company or sister firms (i.e. other affiliates). Local human resources can be used as well to produce goods or services traded intra-firm.

##### **2. Market-seeking FDI**

The objective of the firm is to supply goods or services in the host market (or in adjacent countries in the case of ‘export-platform FDI’). This is the main type of horizontal FDI (i.e. where the subsidiary produces the same good or service as the parent company).

**Intra-firm trade?** No, the subsidiary is created to sell the product in the local market. However, there might be intra-firm imports of inputs or of complementary finished products by the affiliate.

##### **3. Efficiency-seeking FDI**

The intention is to take advantage of different factor endowments to arbitrage cost and price differentials in order to improve the global efficiency of the firm by concentrating production in a limited number of locations. As with resource-seeking FDI, this is a type of vertical FDI. The difference is that resource-seeking FDI is a motive for initial FDI while efficiency-seeking FDI corresponds to sequential FDI. Once the firm has invested in different places, it rationalizes the whole production process and focuses on the most efficient locations in a global strategy.

**Intra-firm trade?** Yes, processed inputs are shipped to the parent company or to another affiliate in the global production network.

##### **4. Strategic asset-seeking FDI**

The objective is to acquire assets, such as knowledge, technology or information on local markets, to promote the long-term objectives of the firm and to increase its competitiveness. To the extent that the asset can be regarded as an input, this type would be considered vertical FDI but it is better to describe it as neither horizontal nor vertical.

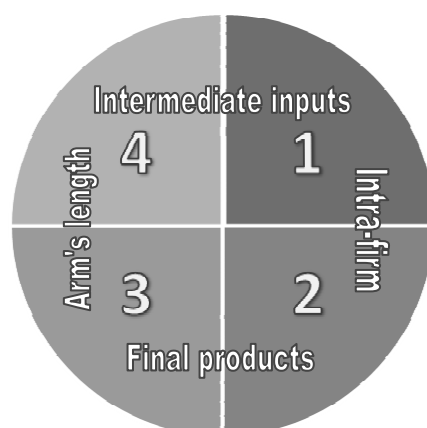
**Intra-firm trade?** No, there is no material input shipped to the parent company but transfers of knowledge may imply intra-firm trade in services.

Source: Dunning and Lundan (2008); Ivarsson and Johnsson (2000).



5. Foreign outsourcing also increases trade flows of intermediate goods and services, as the input produced by the independent supplier abroad is shipped to the buyer in the domestic economy. But intra-firm trade is not limited to inputs trade. There are also intra-firm flows of final goods and services. As illustrated in Figure 2, trade flows can be on the one-hand decomposed into arm's length trade (between independent companies) and intra-firm trade (between related parties), and on the other hand split between intermediate inputs and final products.

**Figure 2. Arm's length vs. intra-firm trade and trade in intermediate inputs vs. final goods**



Source : Bardhan & Jaffee (2005)

6. While cost reduction appears as the main motivation for firms to reorganise their production internationally, one should not underestimate related strategic drivers that can also explain firm strategies. One of them is access to knowledge. With the growing complexity of products and services, even the largest companies have to rely on external expertise (Contractor *et al.*, 2010). Knowledge about foreign markets is also key for firms to expand internationally. To access external knowledge or for other strategic reasons, firms can engage into “strategic-asset seeking FDI” (Dunning and Lundan, 2008).

7. But there are also looser forms of partnerships, such as alliances, that can also have an impact on trade but are not captured in FDI statistics. One should not limit the analysis to outsourcing and vertical integration strategies, the international activities of firms also take the form of licensing agreements, partnerships and long-term contracts with suppliers, resulting in a more complex and nuanced picture of global value chains. The term “related parties” covers such partnerships in the measurement of trade with related parties (as opposed to arm's length trade). Box 2 gives a concrete example of vertical integration in the mobile phone industry and illustrates the “heterogeneity” of firms, *i.e.* the fact that they adopt different sourcing strategies.

8. An OECD study from 1993 noted that little is known about intra-firm trade and that “the literature on the subject is still relatively limited and recent” (Bonturi and Fukasaku, 1993). Seventeen years later, this assessment remains valid. Despite many studies on the internationalisation of production and the role of MNEs in trade, data on intra-firm trade are sparse and few studies look at trade flows across firms. Recently, there have been efforts to measure trade in intermediate goods and services<sup>1</sup> but the decomposition of trade flows between affiliated and unaffiliated companies is available only in goods trade

1. See Miroudot *et al.* (2009), as well as Johnson and Noguera (2009) and Daudin *et al.* (2009).

statistics collected by the US. Some other countries collect data on intra-firm trade through business surveys on the Activities of Multinational Enterprises (AMNE) but disaggregated information on industries and partners remains scarce.

**Box 2. Intra-firm trade in the mobile handset industry: the example of Nokia**

Nokia, a company headquartered in Finland, is the largest firm in the mobile handset industry. In 2009, it shipped more than 400 million mobile devices to over 160 countries. To do so, it handled more than 100 billion parts that are manufactured in 10 factories around the world. Some of these plants are in OECD countries (Finland, Germany, Mexico and the UK) while others are in emerging economies (Brazil, China and India). While companies such as Apple, Motorola and Ericsson have largely outsourced part of the value chain, the choice of Nokia is to remain vertically-integrated (another example of a vertically-integrated firm in the industry is Samsung).

Handling a huge volume of intra-firm trade represents important challenges in terms of logistics and Nokia has to support the cost of managing affiliates that are geographically dispersed. But the company finds several advantages in being vertically integrated. First, it enables the company to control closely the production process and to customize products rapidly. Recently, mobile service providers such as Vodafone or AT&T have put pressure on mobile device manufacturers to install software and customize features before the handsets leave the factory. The production process is thus divided into the production of raw generic devices that are then customized to the requirements of markets and customers in a second process. Retaining a high degree of control on the manufacturing accelerates the customization, as basic handsets can be transformed into build-to-order phones in a matter of days.

While Nokia manufactures semiconductors, microprocessors, memory devices and displays in its 10 factories, the company also imports inputs from independent suppliers. But these represent a small share of overall inputs (about 20%).

*Source:* Lesser (2008), Mudambi and Venzin (2010), Nokia website.

9. Intra-firm trade is of interest for policymakers because trade policy objectives are likely to be different when considering trade flows between domestic companies and foreign companies on the one hand, and trade flows within MNEs headquartered in the domestic economy on the other hand. Whether trade is intra-firm or inter-firm presumably has an impact on the benefits from trade and the impact of firm strategies on the parent and host countries in terms of jobs and the location of activities. Intra-firm trade is also of interest for competition and tax authorities with regard to customs valuation and transfer pricing. For all these reasons, there is a need to better understand intra-firm trade and provide data on its importance in a greater number of countries than those for which statistics are already available.

10. This report on intra-firm trade is the third dedicated to “new” trade flows resulting from the fragmentation of production, following “Vertical trade, trade costs and FDI” [TAD/TC/WP(2008)23/FINAL] and “Trade in intermediate goods and services” [TAD/TC/WP(2009)1/FINAL]. The report is organised as follows. Section 2 is dedicated to data issues and includes an overview of existing data as well as new estimates based on firm-level data. Section 3 analyses the determinants of intra-firm trade and why the share of intra-firm trade differs across countries and industries. Section 4 explores some of the policy implications of intra-firm trade and in particular the gains from intra-firm trade, the question of transfer pricing and the role of firms in the transmission of international macro-economic shocks<sup>2</sup>. Section 5 concludes.

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2. This last issue will be further analysed in the next iteration of the report as the data needed were only made available recently to the Secretariat.

## 2. Existing data on intra-firm trade and new estimates

11. As previously noted, there are very few statistics available on intra-firm trade and this is why the few available studies focus on a limited number of countries where these statistics are collected. There are currently several initiatives to improve the availability of intra-firm trade statistics and the topic is discussed in various OECD bodies in charge of statistics. Firm-level data offer new opportunities to measure intra-firm trade, as will be shown in this Section, but it is too early to rely on such estimates. The econometric estimation of intra-firm trade flows, as proposed in TAD/TC/WP(2010)17, is also not solid enough to trust estimates and we do not report such estimates (the methodology is, however, sketched out in Annex 4).

12. Sources for intra-firm trade data are trade statistics (as collected by customs authorities), balance of payments and surveys on the Activities of Multinational Enterprises (AMNE). However, most countries collect few statistics on intra-firm trade or none at all. Hatzichronoglou (2007) provides an overview of measurement issues in the collection of AMNE statistics outlining a possible framework for the collection of trade data. Bertrand and Hatzichronoglou (2009) provide definitions and examples of intra-firm trade that are relevant for the collection through AMNE surveys. Maurer and Degain (2010) assess the possibilities of intra-firm trade data being collected in trade statistics or in the balance of payments. Regarding the latter, they highlight issues regarding the determination of economic ownership of the traded good or service, the need for price estimation and the treatment of services.

13. Annex 1 explains in more detail how intra-firm trade is measured. In particular, it provides an overview of the coverage of intra-firm trade statistics in the OECD Activities of Foreign Affiliates (AFA) Database. Furthermore, it describes the measurement of intra-firm goods and services trade in US trade statistics. The OECD AFA database covers intra-firm trade as measured by AMNE statistics. Since AMNE statistics are based on firm surveys and the response rate of firms is often rather limited, they will tend to underestimate intra-firm trade. In contrast, the related party database of the US Census Bureau covers intra-firm trade in goods as collected through customs authorities and hence comprises the full population of importing and exporting firms. Furthermore, intra-firm trade will be higher in US goods trade statistics i) because the ownership thresholds are lower (6% for imports, 10% for exports) than in AMNE statistics (50%) and ii) because they include trade flows for both U.S. and foreign parents, while inward AMNE statistics cover intra-firm trade of foreign affiliates only.

### *a) The patterns of intra-firm trade*

14. The following description of the patterns of intra-firm trade uses the OECD AFA database (covering intra-firm trade from AMNE statistics for 7 OECD countries), the US related party database for goods and US balance of payments data for services. The main patterns are the following:

- Goods trade statistics as collected by customs authorities can provide a full picture of intra-firm trade and may hence be best suited to assess the overall importance of intra-firm trade. In the US in 2009, intra-firm transactions accounted for 48% of US imports and 30% of US exports.
- According to AMNE statistics for seven OECD countries, intra-firm goods exports of foreign affiliates represent on average 16% of a country's total exports<sup>3</sup>. However, this average masks wide differences across these seven countries: While intra-firm exports of foreign affiliates in Japan account for 2% of total country exports, the share for Poland is 31%.

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3 . The 16% are calculated as the simple average of the country shares.

- For the US, the share of intra-firm exports in total services exports was 26% in 2008, while the respective share for intra-firm imports was 22%. In contrast to US goods trade, the share of intra-firm trade in services has clearly increased over the period 1992-2008 reflecting the increasing importance of ‘Other private services’ such as ‘Business professional and technical services’.
- Firm-level data underscore the importance of intra-firm trade for services. Estimates show that vertical FDI is more prevalent in services sectors than in manufacturing sectors.
- According to US data, intra-firm trade in goods is more common among OECD countries, while intra-firm transactions in services are of similar importance in OECD countries and emerging economies. However, in volume terms, OECD countries dominate intra-firm trade of both goods and services.

#### *How important is intra-firm trade?*

15. The first question that comes to mind when thinking about intra-firm trade is: “How important is it?” Figure 3 answers this question for seven OECD countries by reporting the share of intra-firm exports (as measured by inward FATS statistics) in a country’s total exports. According to AMNE statistics, intra-firm exports represent on average across the seven countries, 16% of total exports. However, the relative magnitude of intra-firm trade differs significantly across the seven countries. While in Sweden and Poland the share of intra-firm exports in total exports is about 30%, in Japan the respective share is only 2%.

16. To give a picture of the overall importance of MNE trade, Figure 3 also shows the share of exports of foreign affiliates in a country’s total exports. The overall trade activity of foreign affiliates accounts for a significant share in the countries’ trade, but also varies widely across countries. For instance, while exports of affiliates account for 67% of total exports in Poland, they account for only 9% of Japanese and 19% of US exports<sup>4</sup>.

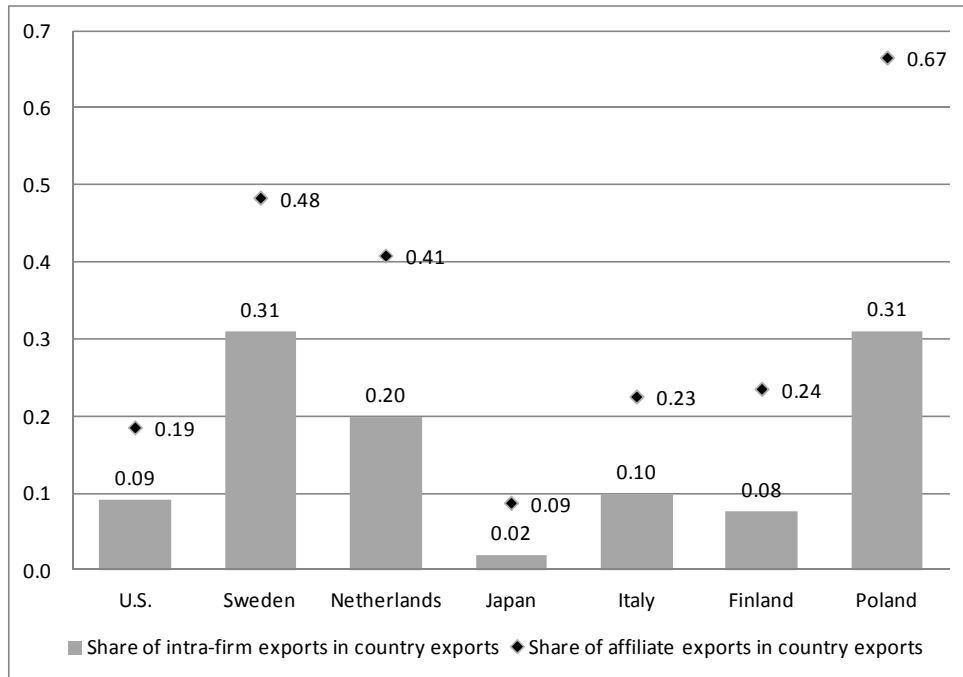
17. While, Figure 3 reports the share of intra-firm exports in country exports for seven countries, the share of intra-firm imports in country imports can be calculated for even less countries and hence no figure is presented. However, available data show that intra-firm imports of foreign affiliates tend to be more important for large countries than exports. For instance, for the US and Italy the share of intra-firm imports of foreign affiliates in total imports was 22% and 24% respectively, compared to 9% and 10% in the case of exports as presented in Figure 3.

18. While Figure 3 indicates the importance of intra-firm trade in overall country trade, Figure 4 underscores the importance of intra-firm trade in total affiliate trade. Intra-firm trade constitutes about half of affiliate trade on average, *i.e.* 45% for exports and 52% for imports. Generally, intra-firm trade shares of affiliates vary significantly across countries, likely reflecting both differences in the industry composition of foreign affiliates and country characteristics such as market size. Foreign affiliates in countries with large consumer markets such as the US, Japan and Italy tend to have much higher shares of intra-firm imports compared to intra-firm exports.

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4. The share for Poland refers to the manufacturing sector.

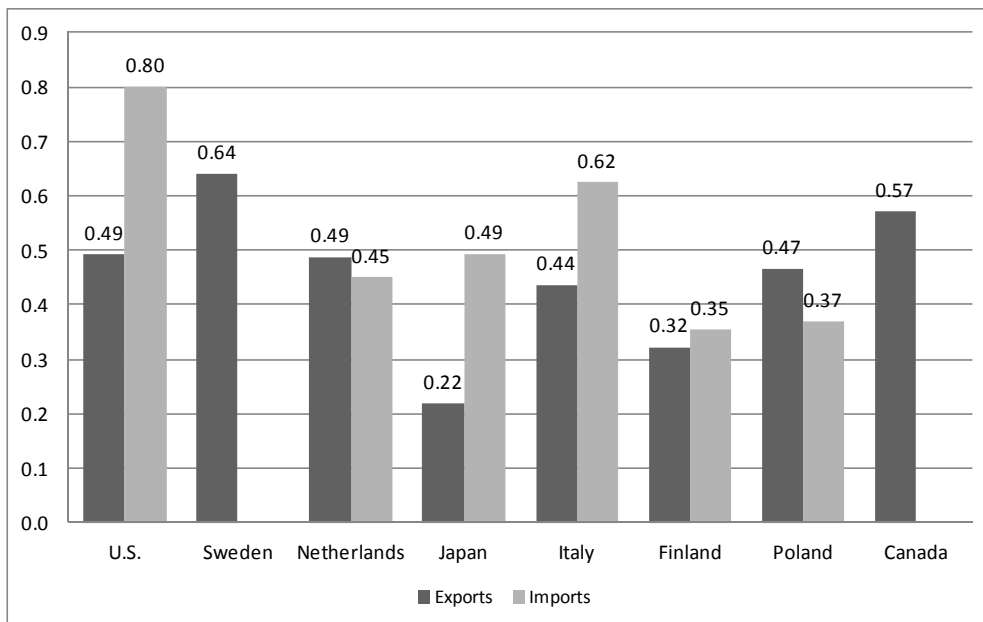
**Figure 3. Share of intra-firm and affiliate exports in total country exports for 7 OECD economies**



Notes: Data are for the year 2007 for the US, Japan, Italy and Poland; 2006 for Finland; 2002 for Sweden and the Netherlands; 1994 for Canada. Data for Poland refer to the manufacturing sector only.

Source: OECD AFA Database, Statistics Finland.

**Figure 4. Share of intra-firm trade in affiliate trade for 8 OECD economies**

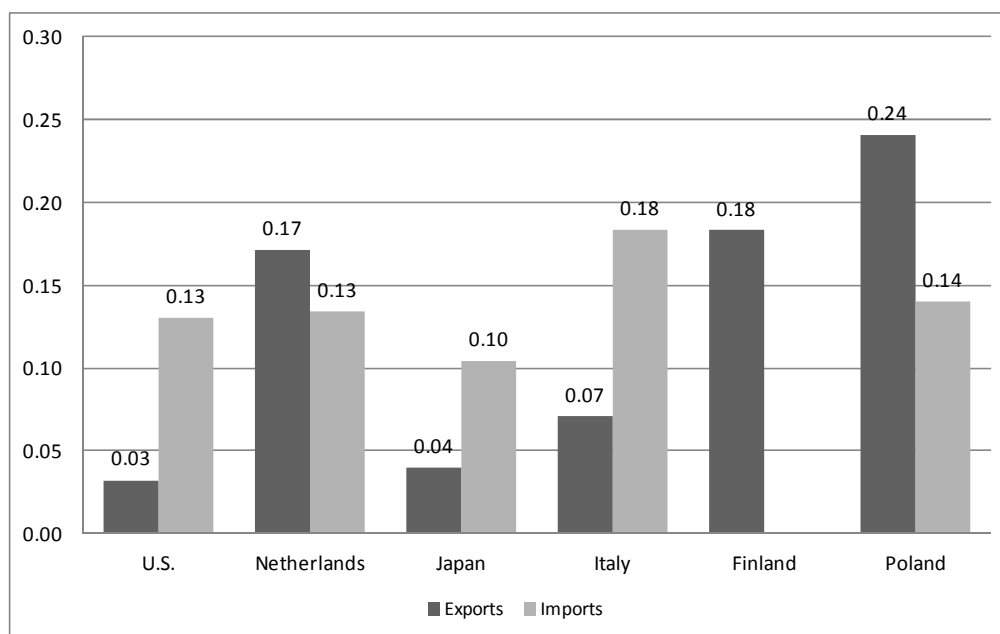


Notes: Data are for the year 2007 for the US, Japan, Italy and Poland; 2006 for Finland; 2002 for Sweden and the Netherlands; 1994 for Canada. Data for Poland refer to the manufacturing sector only.

Source: OECD AFA Database, Statistics Finland.

19. Figure 5 reports intra-firm trade shares in the turnover of foreign affiliates and hence informs about the importance of intra-firm trade relative to the activities of foreign affiliates. The low shares of intra-firm exports in turnover relative to the respective import shares for the US, Japan and Italy reflect the fact that foreign direct investment (FDI) in large markets follows more the strategy of selling the output domestically (horizontal FDI) which can involve the imports of intermediates or final goods rather than shipping it back to the parent firm (vertical FDI) or to a third country for sale to consumers (export-platform FDI).

**Figure 5. Share of intra-firm trade in affiliate turnover for 6 OECD economies**



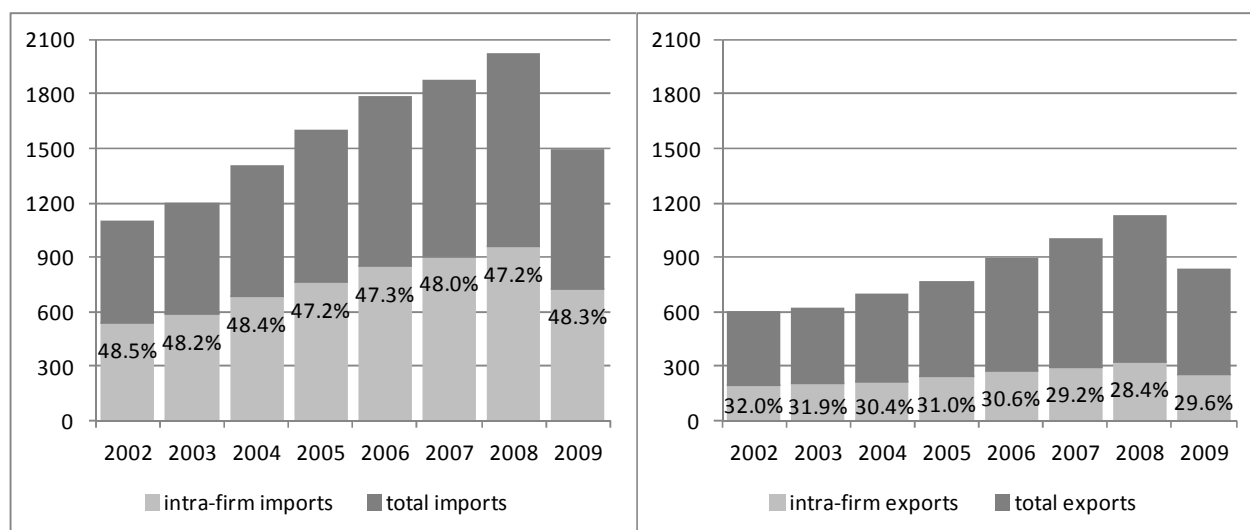
*Notes:* Data are for the year 2007 for the US, Japan, Italy and Poland; 2006 for Finland; 2002 for the Netherlands; 1994 for Canada. Data for Poland refer to the manufacturing sector only.

*Source:* OECD AFA Database, Statistics Finland.

20. As mentioned earlier in the paper, the United States is the only country collecting ownership information together with goods trade data. Using data from the related party database of the US Census Bureau, Figure 6 shows how big intra-firm trade is in comparison to total US trade. Intra-firm imports accounted for 48.3% or almost half of total goods imports in 2009. In contrast, exports are traded significantly less intra-firm constituting only 29.6% of total exports in 2009<sup>5</sup>.

21. Figure 6 furthermore shows the evolution of intra-firm trade over time. Total imports and exports grew continuously in value from 2002 to 2008 before plunging in 2009, reflecting the so-called “trade collapse” during the economic crisis. The share of intra-firm imports in total imports has been stable over this period implying that intra-firm imports have been growing in line with total trade. For intra-firm exports, a slight downward trend can be observed with the share in total trade declining from 32% in 2002 to 29.6% in 2009.

<sup>5</sup> The intra-firm trade shares from trade data are significantly higher than the respective shares from the AMNE data because the ownership thresholds are lower and the trade data include trade flows for both U.S. and foreign parents, while the presented AMNE statistics cover only foreign parents.

**Figure 6. Total US goods trade and the share of intra-firm trade (Bill. USD, 2002-2009)**

Source : US Census Bureau, Related Party Database

22. Following Lanz (2010), Table 1 applies the UN Broad Economic Categories (BEC) classification and decomposes US imports and exports along the “main end use” dimension into intermediate, consumption and capital goods in addition to the ownership dimension. Table 1 shows that most of intra-firm trade is in intermediate goods, *i.e.* 45.6% for imports and 54.8% for exports. Tables 5 and 6 in Annex 2 show that intermediate goods dominate US trade, representing 48% of imports and 60% of exports in 2009, respectively<sup>6</sup>. While intra-firm trade is more important for intermediate and capital goods imports than for consumption goods imports, the opposite pattern can be observed for intra-firm exports.

**Table 1. Share of intermediate, consumption and capital goods in US intra-firm trade 2009**

<i>Intra-firm imports in Mill. USD</i>	<i>720,683</i>	<i>Intra-firm exports in Mill. USD</i>	<i>247,097</i>
Intermediate (%)	45.6%	Intermediate (%)	54.8%
Consumption (%)	17.7%	Consumption (%)	16.1%
Capital (%)	21.5%	Capital (%)	16.3%
Not classified (%)	15.2%	Not classified (%)	12.8%

Source : US Census Bureau, Related Party Database.

23. Data on intra-firm trade in services are even less widely collected than for goods: data is only available for the US economy. The United States distinguishes affiliated and unaffiliated cross-border service trade in their balance of payments. Total private services exports and imports amounted to 526 billion USD and 364 billion USD in 2008, respectively. The share of intra-firm exports in total services exports was 26% in 2008, while the respective share for intra-firm imports was 22%. One reason for these somewhat low shares is that the services classified under ‘Travel’ and ‘Passenger fares’ can by definition

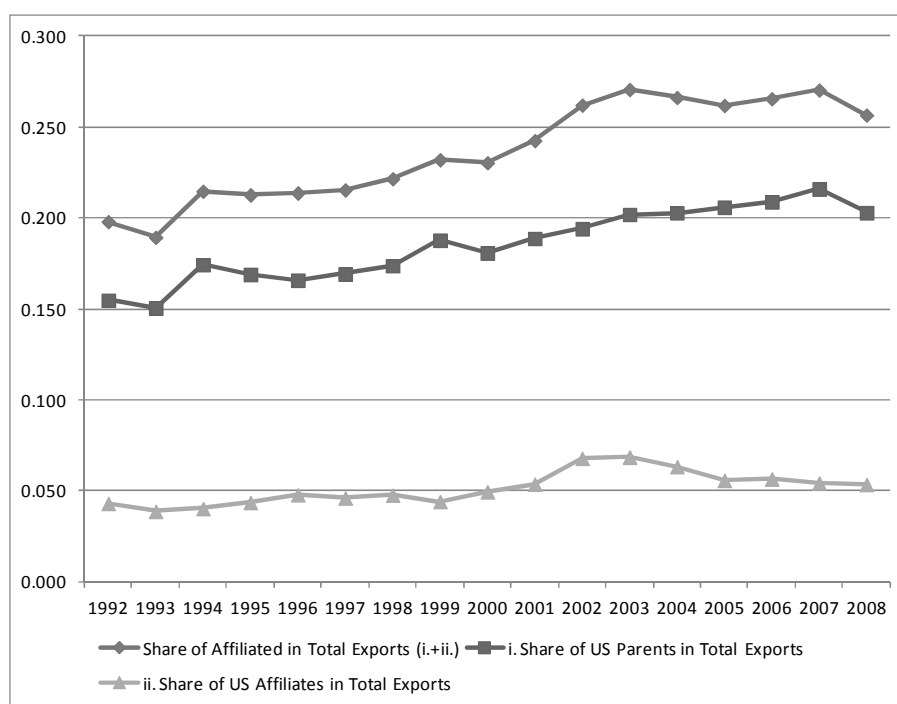
6. See Miroudot *et al.* (2009) for a comprehensive assessment of trade in intermediate goods and services.

not be traded intra-firm<sup>7</sup>. On the other hand, in the aggregate category ‘Other private services’, intra-firm transactions accounted for 40% of imports and 32% of exports, respectively.

24. Figures 7 and 8 show the trend of intra-firm trade shares of exports and imports over the period 1992 to 2008. The share of intra-firm exports in total private services exports has increased by 6 percentage points from 20% in 1992 to 26% in 2008. The respective increase in the share of intra-firm imports was by 9 percentage points from 13% to 22%. The main driver of these increases was a composition effect arising from the faster growth of trade in ‘Other private services’ compared to other aggregate services categories. Figures 7 and 8 furthermore show the shares of intra-firm trade according to whether the US firm is the parent or the affiliate of a foreign parent. While the volume of intra-firm exports of US parent firms is three to four times higher than for US affiliates, parents and affiliates are of similar importance for intra-firm imports.

25. Figures 9-12 in Annex 2 answer a slightly different question, namely which economies account for most of intra-firm services trade with the US. The EU accounts for about half of intra-firm trade of the US. While 45% of exports of US parents go to affiliates in the EU (Fig. 9), 54% of exports of US affiliates go to EU parents (Fig. 10). The strength of India as an outsourcing location is reflected by the fact that it accounts for large shares of US intra-firm imports, *i.e.* 8% for imports of US parents (Fig. 11) and 15% for imports of US affiliates (Fig. 12). On the other hand, India does not belong to the major destinations of intra-firm exports of the US.

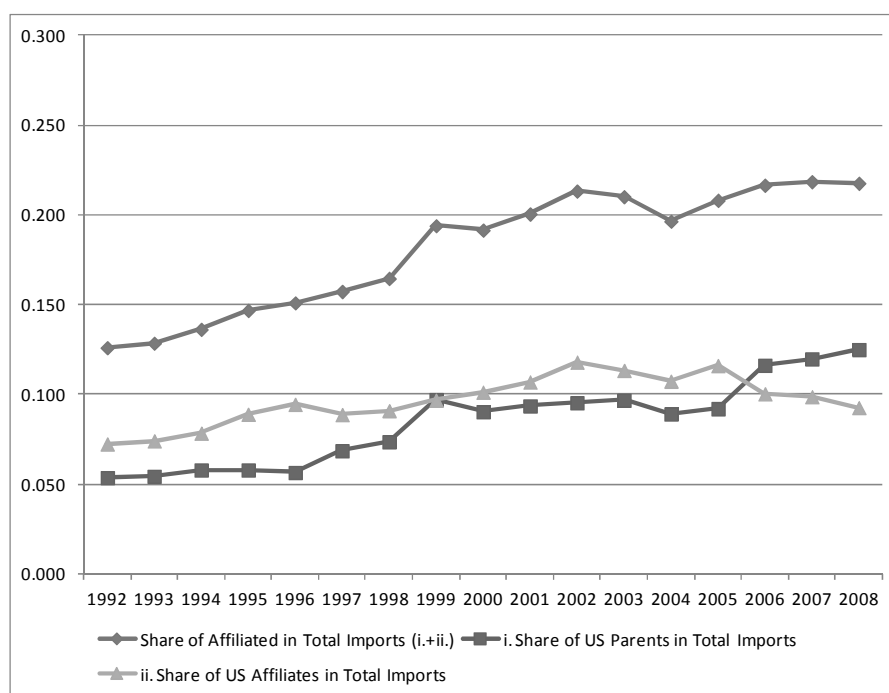
**Figure 7. Share of intra-firm exports in private services exports for the US**



Source: US Bureau of Economic Analysis

7. The US trade in services statistics distinguish the following five broad categories: ‘Travel’, ‘Passenger fares’, ‘Other transportation’, ‘Royalties and licence fees’ and ‘Other private services’.



**Figure 8. Share of intra-firm imports in private services imports for the US**

Source: US Bureau of Economic Analysis

### *Intra-firm trade by industry*

26. Using the OECD AFA database, Tables 9 and 10 in Annex 2 provide an overview of the importance of intra-firm imports and exports at the affiliate and the country level by industry. Generally, intra-firm shares differ widely across both countries and industries. Italy has its highest shares of intra-firm imports in affiliate imports (85%) in natural resources industries ('Mining and quarrying' and 'Refined petroleum and coal products'). Also, the Netherlands have a high share of intra-firm imports in affiliate imports in the Mining and quarrying industry (80%), but even a higher one (100%) in Office, accounting and computing machinery. Japan has the highest share of intra-firm imports in affiliate imports in Basic and fabricated metal products (93%), while the US has the highest share in Drugs and medicines (93%).

27. Table 11 in Annex 2 indicates the products which are traded the most intra-firm in the case of US goods trade. In particular, it shows the top and bottom 20 HS2 product chapters in terms of US intra-firm import and export shares in 2009. The HS2 chapter 'NonRailway vehicles', which consists above all of automobiles, has with 83% the highest share of intra-firm imports. The fact that 'NonRailway vehicles' have with 45% also the fifth highest share in intra-firm exports indicates that the automobile industry consists of large MNEs that have subsidiaries in many countries. Most of the products have a similar symmetric pattern of intra-firm trade shares, *i.e.* products with high intra-firm import shares have also high shares of intra-firm exports and products with low intra-firm import shares have also low shares of intra-firm exports. For instance, trade in 'Pharmaceutical products' and 'Photographic goods' occurs to a large extent within the boundaries of firms for both imports and exports. On the other hand, 'Live animals', 'Works of art, antiques' and 'Footwear, gaiters' are characterised by high shares of arm's length trade.

28. Table 12 in Annex 2 reports total and intra-firm trade by disaggregated services sector for the US. Within 'Other private services', the two sectors with the highest shares of intra-firm trade are 'Management and consulting services' (88% for exports, 86% for imports) and 'Research and development

and testing services' (83% for exports, 73% for imports). Furthermore, the category 'Computer and information services' has a high share of intra-firm imports with 77%, but a relatively low share of 43% for intra-firm exports.

***b) Vertical FDI and intra-firm trade: estimates using firm-level data***

29. To further characterize the prevalence of intra-firm trade and how its volume relates to activities of multinational enterprises, this section provides new analysis based on firm-level data. As very few aggregate data are available on intra-firm trade, firm-level analysis appears a promising alternative to measure trade flows of MNEs. Intra-firm trade can be directly measured at the firm level in datasets that indicate whether import transactions are with related parties. This is the case for example of the US Linked/Longitudinal Firm Trade Transaction Database (LFTTD) used by Bernard *et al.* (2010) to analyse the determinants of intra-firm trade.

30. However, not all firm-level datasets report information on trade flows with related parties. Alfaro and Charlton (2009) nonetheless propose to infer intra-firm trade from three types of variables that are usually found in firm-level datasets: (1) the links between parent companies and foreign affiliates (based on the ownership information); (2) the sales of foreign affiliates and (3) the comparison of the industry of the parent company and its subsidiary to characterize the type of FDI involved (whether this is vertical, horizontal or complex). Alfaro and Charlton (2009) apply this methodology to a dataset of 625,427 affiliates reporting to 72,978 parent firms. They use the WorldBase dataset compiled by Dun & Bradstreet for the year 2005.

31. In Annex 3, we provide a similar analysis based on another firm-level dataset, Bureau Van Dijk's ORBIS database that was recently acquired by OECD. ORBIS includes information on about 44 million firms in 190 countries. Most of these companies are located in the OECD area (about 32 million). Through the ownership information, we were able to identify 135,679 foreign affiliates and their parent companies.

32. Before estimating intra-firm trade flows, we use the dataset to identify horizontal and vertical links between parent companies and their affiliates in foreign countries. Table 2 provides the decomposition for subsidiaries producing goods or services. The results in this table are obtained by comparing the industry code of the parent company and its subsidiary.<sup>8</sup> According to this analysis, 38% of the subsidiaries producing goods are found in a horizontal relationship with their parent company.<sup>9</sup> For services, the number is lower (about 30%).

33. Horizontal FDI is generally assumed to be the main motivation for international investment. For example, Glass (2008) indicates that "the bulk of FDI is horizontal rather than vertical". This result is contradicted by firm-level data. As emphasised by Alfaro and Charlton (2009), FDI appears to be mainly horizontal only when the analysis is conducted at the aggregated level and that the parent company and the affiliate appear to be in the same sector very broadly defined. At the two-digit level, they find that 70% of FDI in manufacturing industries is horizontal, but at the four-digit level their share drops to 48%. Our analysis is carried out at an even more disaggregated level (6-digit industry codes) and we have therefore a smaller share of horizontal FDI (38% for manufacturing industries).

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8. See Annex 3 for the technical details. For each subsidiary or parent company, we have information on the primary activity and secondary activity of the company. This means that at least 4 industry codes are compared. In addition information on the ultimate domestic owner and immediate main shareholder are used when relevant. Vertical links are identified on the basis of input-output information.

9. The percentage is calculated for subsidiaries that we could identify as resulting from vertical, horizontal or complex FDI. There are subsidiaries not identified or neither in a vertical or horizontal relationship with their parent company. See Annex 2.

**Table 2. Distribution of subsidiaries in ORBIS according to the type of FDI (percentage, 2006)**

	Percentage of affiliates
<b><i>Manufacturing industries</i></b>	
Horizontal FDI	38.1%
Vertical FDI	49.9%
Complex FDI	12.0%
<b><i>Services industries</i></b>	
Horizontal FDI	29.8%
Vertical FDI	62.0%
Complex FDI	8.2%

Source: Authors' calculations based on Bureau Van Dijk's ORBIS database. See Annex 3 for the methodology.

34. Among affiliates identified in our sample, about half of FDI is not horizontal but vertical<sup>10</sup>. Vertical FDI occurs when firms locate different stages of the production process in different countries to benefit from location-specific advantages (such as relatively lower production costs). For a long time, vertical FDI was predicted in theoretical models but not well measured empirically (Bergstrand and Egger, 2009). From the data in Table 2, we can see that vertical FDI can be identified for many subsidiaries on the basis of the comparison between industry codes and information from an input-output matrix that tells us whether the affiliate is in an upstream industry that generally provides an input to the industry of the parent company. It is only at a disaggregated level that these relationships appear and this is why earlier literature had some difficulties in identifying vertical MNEs.

35. Another important result from Table 2 deals with services affiliates. Little emphasis in the literature on vertical FDI has been put on services despite FDI occurring largely in services industries. Our analysis shows a higher share of vertical affiliates for services. While many services are likely to be provided through Mode 3 trade in services with horizontal motives for FDI, one should also keep in mind that services are essential inputs into all sectors of the economy. On the basis of the input-output matrix used to identify vertical links, there are many manufacturing sectors where the input requirement is high for different types of business services. Services are also produced with other services inputs. Hence a high number of vertical links exist between parent companies and services suppliers resulting in a high number of vertical foreign affiliates in services industries. The fact that data on intra-firm trade in services are even less available than for goods certainly explain why the focus has been more on “outsourcing in services” rather than intra-firm trade in services. There is evidence in firm-level data that vertical integration is also prevalent in services industries (see Box 3 for the example of the banking industry) and that manufacturing firms rely on services affiliates.

10. The share of vertical FDI depends on the threshold used in the input requirements matrix to regard one industry as being a key input supplier to another (that can justify the establishment of a subsidiary abroad to increase the efficiency in the production of this input). See Annex 2 for a discussion and sensitivity analysis.

36. The last type of FDI identified in Table 2 is “complex FDI”: the firm level data reveals evidence of both vertical links and horizontal links between parent companies and their foreign affiliates. The share of complex FDI illustrates that lines between horizontal and vertical FDI are often blurred and the structure of production networks more intricate than suggested by the simple horizontal/vertical dichotomy. Affiliates can have multiple activities and supply inputs while producing also the same good or service as their parent company. As shown in Table 18 in Annex 3, a large share of foreign affiliates are neither vertical nor horizontal. This results on the one hand from insufficient data or limitations in the methodology. But the high share of affiliates for which no horizontal or vertical link can be found also suggests that the distinction between horizontal and vertical FDI in the theoretical literature cannot fully explain the patterns of FDI observed. There is room for further analysis and refinement in the determinants of FDI. Some of these determinants highlighted in the literature are strategic or related to taxation issues. Firms also tend to diversify into a variety of related activities in order to increase their competitiveness. FDI is often motivated by the acquisition of knowledge and know-how and this is not reflected in the input-output matrix. As previously highlighted, the boundaries of MNEs are changing and the location and distribution of activities are becoming even more complex.

### **Box 3. Intra-firm trade in services: the example of the banking industry**

As very few data are available on intra-firm trade in services, vertical integration in services industries is less well documented. Most of the papers on the fragmentation of production and vertical trade have focused on manufacturing industries. There are however global value chains in services sectors also and the banking industry is a good example of how the value chain can also be sliced up in the case of services activities. In the firm-level data analysed in Section 2, about 10% of the affiliates in a vertical relationship with their parent company are in the banking industry.

Some banks are now highly internationalised. For example, Citigroup is present in 100 countries and serves over 200 million client accounts with a full range of financial services. HSBC, headquartered in London, has 8,000 offices in 87 countries. Recently, banks from emerging economies have also expanded their international network, such as the Industrial and Commercial Bank of China (ICBC) which is now the largest bank in the world in terms of market capitalisation. In 2007, ICBC acquired 20% of South Africa’s Standard Bank, a company with many clients in emerging countries. ICBC has 162 overseas subsidiaries at the end of 2009.

Most of banking activities are easy to disaggregate and to be supplied cross-border due to their high degree of digitalisation. Tangibles (IT backbone, branch offices) are only needed at the end of the chain, involving contacts with the customer. Other services can be decomposed and operated in remote places due to their digital component and the fact that they do not require physical resources. The difference with manufacturing value chains is that banking activities cannot be represented in the form of a linear sequential value chain. Value-creating activities are undertaken in financial services hubs (such as London or New York) and in offshored locations with skilled human resources and processing capabilities.

Some of these activities are outsourced and do not result in any intra-firm trade. For example, equity research business process outsourcing (BPO) and knowledge process outsourcing (KPO), as well as software development and call centres can be outsourced. Many Indian companies have been successful in developing such services. There are however activities that banks prefer to keep within their subsidiaries, in particular to link competencies to knowledge-intensive activities in research & development. The Unicredit Group, an Italian financial services company, is a good example of how vertical integration can apply to the banking sector. The firm has created competence centres that can be seen as “global factories” located in diverse places to provide group-wide services by leveraging local skills, market conditions and scale effects. Core banking competences are located in Italy, asset management in Ireland, investment banking in Germany, loans and mortgages in Austria, credit cards in Turkey and payments in the Czech Republic.

*Source:* Mudambi and Venzin (2010), Venzin (2009).

**Table 3. Intra-firm trade estimates based on ORBIS (2006)**

	<i>Estimates from ORBIS</i>			
	Intra-firm (Mil.USD)		% of total trade	
	Low	High	Low	High
Australia	4,397	9,187	3%	7%
Austria	51,011	59,850	38%	45%
Belgium	5,846	7,719	2%	2%
Canada	4,472	10,359	1%	3%
Chile	42	502	0%	1%
Czech Republic	516	518	1%	1%
Denmark	9,396	11,648	11%	14%
Finland	4,785	15,460	7%	22%
France	47,094	85,099	9%	16%
Germany	92,673	131,129	10%	14%
Greece	167	514	0%	1%
Hungary	89	89	0%	0%
Iceland	810	956	14%	16%
Ireland	3,830	18,273	5%	24%
Italy	9,816	25,951	2%	6%
Japan	371	514	0%	0%
Korea	916	2,505	0%	1%
Mexico	249	2,177	0%	1%
Netherlands	17,659	38,485	5%	12%
New Zealand	-	1,702	0%	6%
Norway	7,736	9,751	12%	15%
Poland	529	530	0%	0%
Portugal	2,645	4,743	4%	7%
Spain	50,786	52,097	15%	16%
Sweden	20,099	26,846	16%	21%
Switzerland	43,127	57,554	30%	41%
Turkey	49	74	0%	0%
United Kingdom	64,082	199,509	11%	33%
United States	166,425	408,570	9%	21%
<b>Total OECD members</b>	<b>690,975</b>	<b>1,267,819</b>	<b>8%</b>	<b>15%</b>
Brazil	63	172	0%	0%
China	1,804	1,804	0%	0%
Estonia	39	39	0%	0%
India	1,078	1,806	1%	1%
Israel	2,399	2,661	5%	6%
Russian Federation	5,619	10,271	4%	7%
Saudi Arabia	-	9,843	0%	14%
South Africa	454	463	1%	1%
<b>Total Other major economies</b>	<b>11,456</b>	<b>27,059</b>	<b>1%</b>	<b>2%</b>
Other countries	15,210	37,571	1%	3%
<b>Total</b>	<b>717,641</b>	<b>1,332,449</b>	<b>7%</b>	<b>12%</b>

*Note:* These estimates are based on the methodology detailed in Annex 2 and caution should be exercised as they rely on strong assumptions regarding the nature of trade flows between parent companies and their affiliates.

*Source:* Authors' calculations using Bureau Van Dijk's ORBIS database.

37. The next step in the analysis is to estimate intra-firm trade flows on the basis of the vertical links identified in the firm-level data. The assumption is that foreign affiliates that produce inputs (as identified in the input-output table) sell all their production to the parent company and that the value of their sales is shipped to the country of the parent company as intra-firm trade. This, of course, may be a strong assumption but necessary in order to estimate intra-firm trade in the absence of any information on trade flows other than the turnover of firms. This assumption is to some extent unrealistic and will tend to overestimate intra-firm trade flows. At the same time, the flows are estimated only on the basis of the companies for which there is enough information in ORBIS to determine (i) which are foreign affiliates and (ii) the nature of the relationship with the parent company. This is a source of underestimation for intra-firm trade.

38. The estimates that we have calculated for each country can be seen in Table 3. We give a low and a high estimate based on the threshold chosen for vertical links, as this key parameter has an important influence on the intra-firm trade flow estimated. Table 3 also reports the share of intra-firm trade in total trade, but one should bear in mind that the total trade figure comes from aggregate trade statistics where all firms are accounted for (while we work with a sample of firms in ORBIS). This is only for a small number of countries that our sample of firms is likely to be close to the overall number of exporters. Overall, the estimated share of 15% for OECD countries is similar to the average share of 16% measured in AMNE statistics. However, this does not imply that the estimates are accurate. The range of values between the low and high estimate is quite high and caution should be exercised regarding the figures indicated as the estimation relies on strong assumptions on trade flows between affiliates and their parent companies. With the update of ORBIS at the end of the year, we expect more robust result in the next version of the paper.

### **3. Why does the share of intra-firm trade in total trade differ across countries and industries?**

39. As described in Section 2, intra-firm trade shares vary considerably across countries and industries. This section first describes the so called “hold-up problem”, which is a main factor for firms when deciding between outsourcing and in-house production as sourcing strategy. Annex 4 describes two related theoretical models and provides a review of the empirical literature. The second part of this section summarizes results for the determinants of the share of intra-firm trade in total trade as obtained from regression analysis. The details of the regression analysis are outlined in Annex 4.

#### ***a) Incomplete contracts and the hold-up problem: the micro-foundations of intra-firm trade***

40. Theoretical trade models (Antràs, 2003; Antràs and Helpman, 2004 and 2008) have emphasised the role of the so-called “hold-up problem” for the international sourcing decisions of firms, *i.e.* whether to source intermediate inputs intra-firm through a foreign affiliate or at arm’s length through an independent supplier. The “hold-up problem” refers to the situation where the parties to a contract underinvest because they fear that the counterparty will not comply with the contract but try to take advantage of them. It emerges if two conditions exist. First, contracts are not fully enforceable or incomplete, *i.e.* it is not possible to specify all possible details in a contract. Second, the investment undertaken by one or both contracting parties is relationship-specific, *i.e.* has no or only limited value outside the relationship.

41. For instance, in the relationship between a final goods producer and the supplier of an intermediate input, the final goods producer may require the supplier to customise the input according to his needs. Since the investment of the supplier will be relationship-specific and contracts are incomplete, the final goods producer can “hold-up” the supplier after the latter has made the investment and then renegotiate the expected surplus. Normally, the supplier will foresee such behaviour of the final goods producer and underinvests in the first place to keep the relationship-specificity of his investment low. However, not only the supplier but also the final goods producer may face a hold-up problem if the latter

makes a relationship-specific investment as well. In this case, there is a two-sided hold-up problem and both parties, final goods producer and supplier, will underinvest.

42. According to property rights models such as Antràs (2003) and Antràs and Helpman (2004), the contracting party which has to shoulder the greater burden of the relationship-specific investment should obtain the property rights, *i.e.* ownership rights, to the investment. Since the party with the property rights to the investment will be able to capture a greater share of the surplus because it has more bargaining power, it will have a greater incentive to invest in the first place. For the relationship between the final goods producer and the supplier, this means that the final goods producer will choose integration as the organisational form, if his investment is more important relative to the investment of the supplier. On the other hand, the final goods producer will choose outsourcing if the supplier makes the larger relationship-specific investment.

### ***b) Regression analysis using US data***

43. In this section, regression analysis is used to assess the determinants of the share of intra-firm trade in total trade. Hence, conclusions can be drawn regarding the product, industry and country characteristics that make firms prefer sourcing goods intra-firm compared to at arm's length. Findings show that a strong rule of law makes it more likely for firms to invest and hence intra-firm trade to occur. Furthermore, firms will prefer to integrate in countries if the rule of law is weak. The share of intra-firm trade is found to be higher for products that are difficult to contract and in capital and skill-intensive sectors, because these sectors typically require more relationship-specific investment from the parent firm.

44. Using intra-firm trade data from the US Census Bureau at the HS6 level, we assess the determinants of the share of intra-firm trade in total trade following closely on the empirical estimation strategy of Bernard *et al.* (2010). This includes the investigation of the determinants of both the extensive and intensive margin of intra-firm trade. The extensive margin of intra-firm trade refers to whether intra-firm trade takes place or not and is analysed using Probit regressions. On the other hand, the intensive margin of intra-firm trade refers to the share of intra-firm trade in total trade and is analysed using OLS regressions. Annex 4 describes in detail the regression specifications and the data used. The analysis extends the findings from Bernard *et al.* (2010) by using alternative measures for transport and investment costs and by analysing intra-firm exports in addition to intra-firm imports.

45. Table 13 in Annex 2 reports results from the regression analysis. Columns (1) and (2) correspond closely to the specification used in Bernard *et al.* (2010) and hence gives similar results. A higher contractibility of products (*Intermediation*) decreases the share of intra-firm trade (Col. 2). If products are easy to contract, the hold-up problem is less severe so that firms rely more on outsourcing as compared to integration. Improvements in the contracting environment (*RuleofLaw*) increases the probability that intra-firm trade takes place (Col. 1) but decreases the share of intra-firm imports once a foreign affiliate has been established. The positive interaction term of product contractibility and the contracting environment (Col. 2) indicates that the contractibility of products is more important in countries with a poor contracting environment. In particular, products which are difficult to contract are traded more intra-firm in all countries, but even more so in countries with a low quality of the rule of law.

46. Furthermore, the finding that the share of intra-firm imports is higher in capital (*capital*) and skilled labour (*skilled labour*) intensive industries (Col. 2) confirms Antràs (2003) and Antràs and Helpman (2004). Capital and headquarter intensive industries require more relationship-specific investment of parent firms which prefer to integrate in order to alleviate the hold-up problem they face.

47. In columns (1) and (2), trade and investment costs are measured as in Bernard *et al.* (2010) using trade (HFI\_trade) and investment (HFI\_investment) restrictiveness indices from the Heritage Foundation

Economic Freedom Indices. While a reduction in trade costs decreases the share of intra-firm trade (Col. 2), a reduction in investment costs has the opposite effect. This is in line with theoretical predictions. Antràs and Helpman (2004) predict that, while a reduction in trade costs will increase foreign sourcing overall, it will increase international outsourcing (arm's length trade), relative to vertical FDI (intra-firm trade). On the other hand, a reduction in international investment barriers will reduce the costs of FDI relative to domestic investment so that vertical FDI becomes more profitable compared to international outsourcing and hence the share of intra-firm trade will increase. Summarising, trade liberalisation increases outsourcing relative to vertical FDI and investment liberalisation increases vertical FDI relative to outsourcing.

48. In columns (3) and (4), alternative measures for trade and investment costs are used. In particular, bilateral trade costs (*Trade Cost*) are now micro-founded estimates derived from international trade and domestic output data, while investment costs are measured using the OECD FDI Restrictiveness Index (*FDI Restrictiveness*). Column (4) shows that the coefficients of these alternative variables have opposite signs to the ones used in column (2), that is they are contrary to the theoretical predictions. Besides differences in the way the variables capture trade and investment restrictiveness, another explanation for this result might be that the sample changes considerably, i.e. the number of countries that are included in the regression drops from 103 to 2611.

49. Columns (5) to (8) report regression results for the determinants of intra-firm exports. While results are similar to the regressions for intra-firm imports, some important differences are noteworthy. First, while the rule of law variable has a significant negative impact on the share of intra-firm imports, it has no significant impact on the share of intra-firm exports. Second, while the population has a significant negative impact on the share of intra-firm imports, the respective coefficient is positive and significant in the case of exports.

#### **4. Exploring some of the policy implications of intra-firm trade**

50. We identify three areas of interest for trade policy. First this section examines the impact of intra-firm trade on the benefits associated with trade liberalisation and on trade policymaking. Secondly, intra-firm trade has received a great deal of attention recently concerning transfer pricing. While the measurement of intra-firm trade has implications for customs valuation and tax policy, we limit the analysis here to the trade area. The third topic of interest deals with the transmission of macro-economic shocks, as highlighted in the 2008-2009 financial crisis, where global value chains were regarded as a possible explanation for the “great trade collapse”.<sup>12</sup>

##### ***a) Intra-firm trade and the benefits of trade liberalisation***

51. Intra-firm trade raises questions for trade policy in several ways. From a mercantilist perspective, imports from foreign affiliates cannot be perceived as a threat for the domestic economy as they are inputs in a more efficient production process that involves international offshoring to the benefit of domestic MNEs. The lines between “Us” and “Them” are blurred.<sup>13</sup> While any import in a free-trade environment

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11. The next iteration of the paper will assess in more detail the impact of trade liberalisation by including tariffs in regressions.

12. Tables 14 and 15 in Annex 2 show which product categories experienced the largest decreases in absolute and relative terms during the trade collapse in 2009. Disaggregated data for the period of interest were made available to the Secretariat too late for the analysis to be included in the paper. This topic will be dealt with in the next iteration of the paper.

13. These expressions refer to the questions asked by Robert Reich at the beginning of the 1990s in two articles of the *Harvard Business Review*: “Who is Us?” and “Who is Them?” (See Reich 1990 and 1991).



should benefit the domestic economy, there are differences in the types of gains stemming from trade in general and intra-firm trade in particular. This section first reviews the gains from trade and how they should be understood in the context of vertical integration and intra-firm trade. Then it examines the implications of intra-firm trade for trade policy and the negotiation of trade agreements.

*Gains from trade in the context of offshoring and heterogeneous firms*

52. While the gains from trade have been known and discussed for a couple of centuries, some theories have recently highlighted “new” gains that had been neglected. One reason is that these gains become significant in the context of recent changes in world production and the organisation of firms. While the extent to which “globalisation” is a recent phenomenon may be debatable, it is undeniable that the two last decades the organisation of multinational firms has changed (Desai, 2009).

53. Two types of “new” gains from trade can be highlighted in the context of offshoring and heterogeneous firms. First, the gain from the fragmentation of production is the direct consequence of lower trade costs and services trade liberalisation. Jones and Kierzkowski (1990) were the first to point out that international trade involving fragmented production blocks yields extra gains for producers. Service inputs linking internationally dispersed production units can lower the total production cost as each “block” is produced in the country where the marginal cost is the lowest. As long as this cost advantage can offset the additional fixed costs of the fragmentation of production (the service cost to link the blocks), the production process is more efficient than if performed in a single country. There is also an “optimal” number of blocks, as increasing fixed costs to manage a production split up across several countries at some point offset the gains from further fragmentation.

54. These gains exist both with international outsourcing (with each block being an independent firm) or in a vertically integrated structure (a single firm) with intra-firm trade. The “services inputs” that link the blocks are services such as communication, transport and logistics services, but also financial and business services. There is no “global value chain” without these services and the gain from offshoring is directly related to their efficiency.

55. The second type of gains comes from intra-industry reallocation of market shares among heterogeneous firms, *i.e.* firms of different productivity levels, following the liberalisation of trade. As described by Melitz (2003), trade liberalisation forces the least productive firms to exit the market while the most productive firms increase their market share. The result is a productivity increase at the aggregate industry level. One consequence of the changes in the boundaries of the firm and of international production is that more than before firms are heterogeneous. Depending on their organisation and size, they have different levels of productivity. Firms that are relatively less productive and not involved in offshoring can coexist with MNEs in the same industry because of the plurality of cost-efficient strategies focusing on competing advantages in terms of location, size and organizational choices. As illustrated in the next sub-section, trade liberalisation does not lead to a unique type of firm and has a mixed impact on the choice between outsourcing and vertical integration.

56. Other new sources of gains can be mentioned as well, such as the increase in product variety or technological spillovers that can be related to the interaction between FDI and trade. Quantifying these new gains from trade is not straightforward and traditional CGE models used to measure welfare gains are not yet able to fully capture them. Analysing the EU, Corcos *et al.* (2009) find that gains from trade are much larger when accounting for selection effects (*i.e.* the reallocation of market shares towards the most productive firms). Blonigen and Soderbery (2009) show that by accounting for product variety, welfare

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His point was that a foreign firm established in the domestic economy may better serve the nation’s interests than a domestic firm with most of its operations abroad.

gains from trade are also much larger. They are related to FDI as some varieties are created by foreign-owned affiliates. An important challenge for trade modellers will be to provide new tools to capture these gains, so that the policy debate is correctly informed on potential gains of trade liberalisation.

*Trade liberalisation and the choice between outsourcing and vertical integration*

57. Another important implication of the analysis of intra-firm trade is that trade liberalisation has an impact on the boundaries of firms. Trade liberalisation means lower trade costs, a reduction in the costs faced by companies when they trade goods or services (including tariffs and various non-tariff barriers, as well as transport and communication costs). A reduction in trade barriers leads to lower variable costs for firms that source their intermediate inputs from abroad. Hence, some firms which have previously sourced the input domestically will now find it profitable to source the input from abroad thereby increasing trade. However, does trade liberalization affect vertical FDI and international outsourcing equally, leaving the ratio of intra-firm to arm's length trade unchanged?

58. Antràs and Helpman (2004) predict that trade liberalisation will increase international outsourcing relatively more than vertical FDI. In component-intensive sectors, all firms that source inputs from abroad will tend to choose international outsourcing over vertical FDI (see Section 3). Hence, trade liberalisation will increase international outsourcing and arm's length trade but not intra-firm trade. In headquarter intensive sectors, firms engage in both international outsourcing and vertical FDI. After trade liberalisation, some firms that have previously sourced the input domestically will now source it through international outsourcing, while some firms that have already been engaged in international outsourcing, will find it now profitable to source the input through a foreign affiliate. Antràs and Helpman (2004) show that the first effect is bigger, *i.e.* more firms will switch from domestic production to international outsourcing than from international outsourcing to vertical FDI. Hence, trade liberalisation will lead to a decrease in the share of intra-firm trade relative to arm's length trade in both component- and headquarter-intensive sectors.

59. Despite the complexity of the relationships described, this simple theoretical framework is far from reproducing all the intricacies of firms' sourcing strategies and the different types of interactions between domestic and international markets of final products and intermediate inputs.<sup>14</sup> This is however a useful framework to illustrate the trade-offs involved and to understand the impact of trade liberalisation.

60. In all types of sectors, trade liberalisation implies the exit of firms that are not productive enough in the domestic market. As previously highlighted, this intra-industry reallocation is an important source of productivity gains associated with trade liberalisation (Melitz, 2003). For the supply of inputs, trade liberalisation encourages offshoring in general and international outsourcing in particular. Depending on sector-specific characteristics, vertical integration abroad can be the preferred strategy of the most productive firms. But in the absence of FDI liberalisation or other policies that can affect the fixed costs of international investment, trade liberalisation is not expected to increase vertical integration and consequently intra-firm trade. Bernard *et al.* (2010) find for example no strong correlation between the share of intra-firm trade and trade liberalisation in their econometric analysis of the determinants of intra-firm trade.

61. While policymakers should be concerned about the impact on efficiency and welfare of high trade costs, there is no specific reason to consider a lower share of intra-firm trade as the sign of policy failure. The theory suggests that with trade liberalisation this share should on the contrary be lower and the

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14. See Alfaro *et al.* (2010) for another mechanism through which trade liberalisation leads to outsourcing and higher tariffs to vertical integration.

ratio of intra-firm trade to arms' length trade reflects strategic options for companies that are sector-specific and can lead to higher productivity through vertical integration as well as outsourcing.

62. The gains from intra-firm trade are not specifically the consequence of trade flows within companies but are part of a larger set of gains related to a more efficient organisation of world production in global value chains. Similar gains can be achieved through outsourcing. The first policy implication of the analysis is that trade policy should favour the efficient reorganisation of firms. This can be achieved by providing equal opportunities to independent foreign suppliers and affiliated companies and by letting economic determinants (rather than policy determinants) decide the optimal sourcing strategy of firms. This implies that market access should involve both trade and investment liberalisation (and in the case of services trade, both cross-border and commercial presence commitments).

#### *Intra-firm trade and trade agreements*

63. The literature on outsourcing has emphasised that trade in intermediate inputs introduces new challenges in trade policy as opposed to the standard representation of trade flows in terms of final goods. Section 3 has described the "hold-up problem" in international trade arising from specialized inputs and contracts with foreign suppliers that are hard to enforce. The international hold-up issue can create distortions and lead to an inefficient outcome with a low volume of inputs trade (Wes, 2000). Some authors have suggested that new types of active trade policies could encourage a return to an efficient level of trade in intermediates, through for example subsidies to trade in intermediate inputs combined with free trade in final goods (Antràs and Staiger, 2008). However, such policy options are not very realistic and would introduce distortions between inputs and final products leading to changes in the effective rate of protection.

64. Through vertical integration and intra-firm trade, firms can to some extent solve the hold-up problem. When the buyer is the owner of the supplier (or vice-versa), the nature of the bargain is different and one party cannot really "threaten" the other as the two parties are under the control of the same entity. It could therefore be argued that vertical integration mitigates the implications of the international hold-up problem and brings trade policy back to the standard models. Still, final goods producers and their suppliers must make relation-specific investments. This is true both for the integrated firm and the arm's length relationship. Bargaining issues are of a different nature but still exist in integrated firms (Antràs and Helpman, 2004; Antràs and Staiger, 2008).

65. Moreover, the presence of foreign owned companies in the domestic economy as well as domestic investors abroad has an impact on trade agreements. Blanchard (2006) shows that cross-border ownership alters the role of trade agreements and the way governments negotiate. First, in the context of international investment, the traditional terms of trade externality through which large countries can extract rents from their trading partners should be re-examined in light of the fact that "domestic welfare" includes the revenue of foreign-owned affiliates and some of the "rents" are extracted from domestic producers who produce abroad (through custom duties on intra-firm trade). The consequence is that the "optimal tariff" should be lower in the presence of international vertical integration.

66. There are several implications for this "FDI-terms of trade effect". First, providing market-access to foreign investors can reduce the overseas tariff barriers faced by the investment-host country's export sector (Blanchard, 2007). For example, country A allows investors from country B to establish. Once country B is aware of having foreign affiliates in country A, it should lower its tariffs for country A (as its optimal tariff is now lower because of the revenues of foreign affiliates). This is a benefit of FDI not often highlighted that could explain why FDI is more often allowed in export sectors than in import-competing industries. A corollary is that FDI liberalisation may be not only a substitute for tariffs liberalization (tariff-jumping FDI) but can also lead to unilateral liberalisation because of its terms of trade effect. The larger

the stock of (vertical) FDI the lower is the optimal tariff for a country. Investment liberalisation can thus encourage trade liberalisation.

67. One should however be cautious with this implication, as the reverse would happen in import-competing sectors where investment should encourage higher tariffs and these higher tariffs in turn increase incentives for tariff-jumping FDI in a vicious circle. Moreover, the relationship between increased FDI at home and lower tariffs abroad faced by domestic exporters can also be a rationale for discriminatory preferential trade agreements departing from the first best solution of non-discriminatory multilateral trade liberalisation.

68. In addition, international ownership introduces two other cost-shifting effects. By influencing the local price relative to the world price, trade policy can shift rents from local producers (who are partly foreign-owned) to domestic consumers. The local relative price can then be manipulated to shift rents across sectors, from those with a relatively high degree of foreign ownership to those mainly domestically owned.

69. There is no evidence that in practice governments have been tempted to use trade agreements to introduce such manipulations of prices (or have been successful in doing so). But the point is that the whole political economy of trade negotiations can be reassessed by taking into account international investment. One concern among trade policymakers should be to look not only at the impact of trade agreements on the “country” welfare but also on the revenues of affiliates abroad and on the revenues of local foreign-owned companies (who also participate in “domestic” welfare). This tends to complicate the task of trade agreements and the job of policymakers.

70. Another implication from the rise of offshoring (whether through outsourcing or vertical integration) is that more attention should be given to the relationship between suppliers and buyers. The hold-up problem and the bargaining issues pointed out in the new trade literature suggest that trade agreements should go beyond traditional market access concerns and focus also on domestic measures that can influence bargains between suppliers and buyers (Antràs and Staiger, 2008). We saw in Section 3 that the rule of law was a significant determinant of intra-firm trade. Concretely, what can matter is the legal protection afforded to companies, the law of contracts and some elements of competition policy. This is a new intersection between trade policy and competition policy. In addition to ensuring fair competition between domestic and foreign suppliers, trade agreements in the future may also have to take into consideration the bargaining conditions between suppliers of specialized inputs and buyers.

71. An interesting implication is that the impact of trade liberalisation on these bargaining conditions can explain a new type of benefit from free trade. Ornelas and Turner (2008) show that the standard hold-up problem is aggravated when trade incurs a tariff. Lower tariffs help to solve the hold-up problem in two ways. First, they increase the incentives of foreign suppliers to undertake cost-reducing investments. A lower cost translates into higher input trade flows (closer to the efficient level). Second, trade liberalisation has an impact on the organizational form and encourages vertical integration where the hold-up problem is less severe. There will be more vertical integration because it becomes advantageous for the firm to incur the fixed cost of investment in the context of lower trade costs. Trade liberalisation can thus be seen as a solution to the hold-up problem and this is an additional gain from free trade (correcting for the externality of the hold-up problem).<sup>15</sup>

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15. Antràs and Helpman (2004) and Ornelas and Turner (2008) provide two opposite views on the impact of trade liberalisation, as it should increase outsourcing for the first and encourage vertical integration for the second. We have shown in the econometric analysis that there is no robust relationship between trade liberalisation and the share of intra-firm trade. The theories point out different competing mechanisms and are based on different assumptions, which is consistent with the empirical finding of no robust relationship

72. Lastly, a category of trade barriers that matter for firms decisions in the context of global value chains are standards (Kaplinsky, 2010). Whether set by governments or the private sector, standards can be seen as part of the lock-in costs supported by suppliers when they invest to meet the requirements of buyers. On the one hand, standards can create competition issues (for example by ruling out local suppliers) and should not become new trade barriers or a source of under-investment. On the other hand, standards can be promoted by lead firms (global buyers) and benefit suppliers by helping them to upgrade and develop capacities. This is another area where policymakers should focus their attention in the context of global value chains and intra-firm trade.

### ***b) Transfer pricing issues***

73. Another important issue for policy makers that arises in the context of intra-firm trade is transfer pricing, which refers to the pricing of goods, services or other assets in transactions between affiliated enterprises. Since the pricing of intra-firm transactions occurs off the market, MNEs may face difficulties in determining the comparable market price but may also consciously under- or over-price transactions in order to maximise their income. From a trade policy perspective, the most crucial question is then how transfer pricing affects the measurement of trade: Does the pricing of intra-firm trade distort the actual trade patterns between countries? And to what extent is intra-firm trade over- or underestimated? Building on Ping and Silberstein (2007), the following paragraphs describe in more detail transfer pricing and the policy issues at stake.

74. Transfer pricing is of interest to governments because it affects their revenues from both direct and indirect taxes. Transfer prices affect the income of the selling and the purchasing enterprise and hence the direct income taxes they have to pay in the two respective tax jurisdictions. Furthermore, transfer pricing also affects the revenues from indirect taxes such as tariffs and value-added tax (VAT). From an income tax perspective, MNEs might have an incentive to shift profits from high-tax to low-tax countries. Hence, an affiliate situated in a high-tax country might under-price exports and over-price imports in order to lower taxable income. From a tariff perspective, MNEs might have an incentive to under-price goods that are traded inside the firm in order to reduce tariff payments. Furthermore, if the calculation of the VAT is based on the customs value, a mis-pricing of goods will also distort this tax revenue.

75. Hence, since the pricing strategy of affiliated enterprises might be different for income tax and for customs reasons, tax and customs authorities can have opposing interests. Customs authorities are interested in collecting more duties and are hence generally interested in detecting under-estimations of prices. On the other hand, tax authorities are interested to collect more income taxes and will try to detect over-estimations of prices for intra-firm imports. Tax authorities face the challenge to find the right balance between protecting the national tax base and avoiding double taxation that would hamper international trade.

76. National tax and customs authorities follow two different sets of international rules. Tax authorities base their regulation regarding transfer pricing on the OECD Transfer Pricing Guidelines for Multinational Enterprises and Tax Administrations<sup>16</sup>, while customs authorities are bound by the WTO Customs Valuation Agreement. While the activities of tax and customs authorities are governed by these two different sets of rules, they follow the same basic principle, namely that the price of the transaction must not be affected by the relationship between the parties involved.

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in one direction or the other between trade liberalisation and the choice between outsourcing and vertical integration.

16. While the first edition of the Transfer Pricing Guidelines date back to 1995, the most current version was published in 2010.

77. Customs authorities follow the WTO Customs Valuation Agreement when assessing the values of intra-firm trade transactions. To determine the value of intra-firm transactions, customs authorities rely on values of goods that are traded between unrelated parties. To assess whether the transaction value is acceptable, customs authorities use the “circumstances of sale” test or the “test values” test. While the former test evaluates whether the price is influenced by the relationship of the parties, the latter test compares the transfer price to one of three types of test values. If customs authorities find that the transaction value is not acceptable, they determine the customs value by relying on the following five methods listed in terms of hierarchy: i) transaction value of identical goods, ii) transaction value of similar goods, iii) deductive method, iv) computed method and v) fall-back method.<sup>17</sup>

78. The OECD Transfer Pricing Guidelines for Multinational Enterprises establish the arm’s length principle as the basic rule for transfer pricing. The arm’s length principle demands that transactions between associated enterprises are priced like i) a comparable transaction occurring ii) between independent enterprises and iii) in comparable circumstances<sup>18</sup>. The arm’s length principle treats each affiliate of an MNE group as a separate entity (separate entity approach). This ensures that both associated and independent enterprises are treated equally and hence no type of enterprise suffers a disadvantage in terms of taxation.

79. However, in practice, the application and the monitoring of the arm’s length principle is subject to some difficulties. For instance, in contrast to many goods transactions, for intangibles, services or specialised goods it may be difficult to find comparable transactions between independent enterprises under comparable circumstances. Another challenge in the context of transfer pricing is the high administrative burden that both public authorities and enterprises face. Tax authorities may be involved in the costly verification process of the correct application of the arm’s length principle to certain transactions. On the other hand, enterprises can face significant costs that arise by the administrative requirements from tax and customs authorities in two different jurisdictions. Many MNEs seek advice of auditing firms that offer comprehensive advisory services regarding transfer pricing strategies in order to manage and fulfil the requirements of tax authorities of the countries in which MNEs operate. The fact that most of these advisory services aim at meeting demand regarding taxation, suggests that tariff considerations play only a secondary role in the transfer pricing strategies of multinational enterprises.

80. Despite these challenges, the regulation of transfer prices is of great importance to countries since a considerable amount of tax revenue is at stake. In particular, the application of the arm’s length principle ensures the correct distribution of MNE income across countries. Hence, it allows countries to capture the correct amount of tax revenue from MNEs and ensures that unaffiliated firms are not put at a disadvantage.

*Are transfer prices generally lower or higher than arm’s length prices?*

81. Given the lack of data on intra-firm trade, only few studies exist that actually compare prices of arm’s length and intra-firm transactions. While Clausing (2003) and Bernard *et al.* (2008) use price data for the US, most other studies assess transfer pricing using indirect evidence by looking not at prices but at other variables such as profits (for a survey, see Hines, 1997). In the following, only the first two studies are discussed since they allow direct conclusions regarding the transfer prices of intra-firm goods compared to prices of arm’s length goods.

82. Clausing (2003) uses monthly data on US trade prices for the years 1997, 1998 and 1999 from the International Price Program (IPP) of the US Bureau of Labour Statistics (BLS) in order to assess the

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17. These methods are described in detail on the internet site of the WTO regarding technical information on customs valuation: [http://www.wto.org/english/tratop\\_e/cusval\\_e/cusval\\_info\\_e.htm#4](http://www.wto.org/english/tratop_e/cusval_e/cusval_info_e.htm#4)

18. The arm’s length principle is defined in Article 9 of the OECD Model Tax Convention.

impact of tax rates on intra-firm versus arm's length trade prices. To capture the effect of tax rates on intra-firm prices compared to arm's length prices, she interacts an intra-firm dummy variable with the tax rate of the foreign country. She finds that intra-firm prices are significantly lower than arm's length prices for products exported to low tax countries. Similarly, for imports from low tax countries she finds that intra-firm prices are significantly higher than arm's length prices. In particular, she finds that a 1 percent lower tax rate in the foreign country is associated with prices for US intra-firm trade that are 1.8 percent lower for exports and 2 percent higher for imports compared to arm's length prices. Furthermore, she finds that intra-firm prices are generally higher than arm's length prices for both exports and imports. This surprising result also points to the weakness of her study, namely that the dummy indicating intra-firm prices does not achieve the arm's length principle, *i.e.* the dummy does not identify "comparable price" prices but just compares intra-firm and arm's length prices in general across countries and industries.

83. Thanks to firm level data, Bernard *et al.* (2008) are able to define a "comparable price" and to calculate the price wedge between the intra-firm and the comparable arm's length price. For their analysis, Bernard *et al.* (2008) use the Linked/Longitudinal Firm trade Transaction Database (LFTTD) that links trade data with individual firms in the United States. Their database spans over the period 1993 to 2000 and includes information on intra-firm and arm's length trade at the HS10 digit level. They calculate the export price for a HS10 good as the unit value of the transaction. Their comparable arm's length price is the price that the same firm charges to an unrelated party for the same HS10 good, in the same country, in the same month and shipped by the same mode of transport<sup>19</sup>. They then define the price wedge between arm's length trade and intra-firm trade as the difference between the logarithms of the comparable arm's length price and the intra-firm price.

84. Bernard *et al.* (2008) find that for a given good, US export prices for intra-firm transactions are significantly lower than comparable export prices for arm's length transactions. Interestingly they find that this wedge is positive in all cases meaning that the comparable arm's length price is in all cases higher than the intra-firm price with the mean difference being 0.43 log points, *i.e.* 54%. Furthermore, while this gap is on average only 8.8 percent for undifferentiated goods it is 66.7 percent for differentiated goods.

85. Results from their econometric analysis suggest that transfer prices are influenced by both tax and tariff considerations of MNEs. In particular, they find that a higher tax rate in the foreign country increases the prices of intra-firm transactions relative to the comparable arm's length prices. Hence, high taxes in the destination country give incentives to US MNEs to lower profits in that country. Furthermore, they find a significant negative relationship between tariffs and the price wedge. This is also in line with expectations, since higher tariffs give stronger incentives to MNEs to underprice intra-firm trade and hence increasing the wedge between arm's length and intra-firm trade. In terms of elasticity they find that a 1 percentage point increase in tariffs of the importing country increases the price wedge by about 0.6 percentage points.

86. Results from the studies described above provide some answers for the questions raised at the beginning of this section, namely whether transfer pricing issues distort the trade patterns between countries and whether trade flows are generally over- or underestimated. In particular, existing research finds that tariffs and especially taxes influence the prices of intra-firm goods transactions and hence may distort trade patterns. Furthermore, Bernard *et al.* (2008) find that transfer prices for intra-firm goods transactions are generally lower than for comparable arm's length transactions. However, one must be very cautious in drawing conclusions regarding the way taxes or tariffs may distort trade statistics at a broader international level given the lack of available studies and data.

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19. Since more comparable arm's length prices can exist, they use the average of these comparable prices.

## 5. Conclusion

87. This report has provided an overview of intra-firm trade flows and summarized what we know so far on the determinants of intra-firm trade. Some of the key findings are the following.

88. Despite the lack of data on intra-firm trade, there is evidence that with new sourcing strategies of firms and the emergence of global value chains, vertical integration and intra-firm trade have increased. The increase is clear in the case of services: firm-level data have highlighted that intra-firm trade in services is probably more common than initially thought. In the case of goods, the share of US intra-firm trade has remained rather constant but as is the case with trade in intermediate goods, this is explained by a similar growth rate for both arms' length trade and intra-firm trade. This is consistent with the theory and the fact that new firm strategies involve both outsourcing and vertical integration.

89. Trade liberalisation, including the liberalisation of services trade, has been one of the main drivers of the reorganisation of firms, as international outsourcing or vertical integration abroad is cost efficient only if goods and services can be moved relatively freely across borders. This new organisation of production has in turn changed the nature of trade flows with an increase in trade in intermediate inputs and more trade flows within MNEs leading to intra-firm trade, as well as higher trade flows of final products. This explains why the volume of trade has multiplied by three over the two last decades, while GDP (in volume) has increased (only) 1.5 times.

90. Even if relatively little data are available for non-OECD countries, intra-firm transactions seem more common among OECD countries than among emerging economies. In 2009, 58% of US goods imports from OECD countries were intra-firm, while only 33% of US goods imports from 'other major economies' occurred between related parties. This is consistent with the fact that the bulk of FDI is among developed countries. Firm-level data also suggest that fewer foreign-owned affiliates in emerging countries are in a vertical relationship with their parent company.

91. Our analysis of intra-firm trade confirms theoretical predictions and existing empirical results regarding product and industry determinants of intra-firm trade. A higher contractibility of products decreases the share of intra-firm trade because the possibilities of contracting parties to "exploit" each other are limited and confidence is greater with independent suppliers on an arm's length basis. Furthermore, the share of intra-firm imports is higher in capital and skilled labour intensive industries. These industries require relatively more relationship-specific investments of parent firms which therefore prefer to integrate. Results regarding the impact of trade and investment liberalisation on the share of intra-firm trade seem to confirm theoretical predictions that trade liberalisation increases outsourcing relative to vertical FDI and investment liberalisation increases vertical FDI relative to outsourcing. However, this is not a robust result. Some theories predict that trade liberalisation should encourage vertical integration and evidence in the case of French firms supports this opposite assumption.

92. The main policy implications of the report are the following:

1. The gains from intra-firm trade are part of the gains stemming from offshoring and the reorganisation of firms in global value chains. They are similar to the gains from outsourcing and arm's length trade. Trade policy should therefore remain neutral with respect to firms' sourcing strategies. Depending on the industry and firms characteristics, the ratio of intra-firm trade to arm's length trade can increase or decrease and there is no reason for trade policy to encourage or discourage vertical integration as opposed to outsourcing.
2. There are challenges in the measurement of new gains from trade associated with offshoring and intra-firm trade but these gains appear to be large when taking into account selection effects, the



increase in variety and the full benefits of global value chains. Developing statistics on intra-firm trade and statistics at the firm-level are key to a deeper understanding of the benefits of trade liberalisation.

3. Firms redraw their boundaries under trade liberalisation. The least productive firms exit the market, while more productive firms engage in outsourcing and/or vertical integration (or other forms of partnerships with foreign suppliers). Both theories and empirical evidence confirm the existence of heterogeneous firms: in the same industry firms with different levels of productivity and different sourcing strategies coexist. Concretely, this means that MNEs can coexist with domestic companies that are less productive but still profitable and that outsourcing and vertical integration can happen at the same time at home and abroad (offshoring). Trade liberalisation should therefore not be understood as unambiguously moving some activities abroad while keeping others at home. However, as some firms exit the market and others reorganise their production, there is an impact on the domestic economy that should be addressed by the relevant policies to minimise restructuring costs and ensure a smooth transition to the more efficient structure of production.<sup>20</sup>
4. The data collected on intra-firm trade and the firm-level data highlight that vertical integration occurs primarily among OECD countries. Offshoring does not seem to be mainly motivated by low labour costs in developing economies as most affiliates of OECD MNEs are created in other OECD economies and often in high-cost countries. Firms tend to favour the vertical integration strategy for high-value activities that are intensive in knowledge. The challenge for developing economies is to become attractive locations for this type of activities as well and not to be confined to low-value activities.
5. For trade policymakers, the rise of intra-firm trade should underscore the benefits of trade liberalisation for domestically-owned affiliates located abroad and foreign-owned companies in the domestic economy. Taking into account investment can change some of the traditional results of the political economy of trade and provides new incentives for trade liberalisation. Investment liberalisation is not only a substitute for trade liberalisation but can also encourage further trade liberalisation. This justifies dealing with both trade and investment liberalisation in the same agreements, as is now the case in most regional trade agreements signed by OECD countries.
6. In addition to traditional market access concerns, trade agreements should take into account vertical relationships between buyers and suppliers. Maximising the gains from trade implies not only ensuring non-discrimination in the treatment of foreign and domestic producers but also fair bargaining conditions between buyers and suppliers. This is how the impact of the hold-up problem on intermediate trade can be mitigated. To what extent trade agreements can deal with the new competition issues arising in this vertical relationship should be given more thought. The issue may also be addressed through national competition law, while recognising its strong international dimension. There are other policy areas more traditionally covered in trade agreements, such as standards, that should also be re-examined in light of the buyer-supplier relationship.
7. Because in this buyer-supplier relationship the two companies can be either goods manufacturers or services providers, there is no rationale for covering only goods in trade agreements or for having a separate set of rules on “goods” and on “services” to deal with the issues of vertical trade.

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20 . In this report, we do not look at employment and wages issues as the question is investigated in another project of TAD on trade and employment, as well as the forthcoming report on “trade in tasks”.

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## ANNEX 1 – SOURCES OF INTRA-FIRM TRADE DATA

*Statistics on Activities of Multinational Enterprises (AMNE)*

Business surveys that include information on intra-firm trade are collected by several OECD countries and are accessible through the OECD Activities of Foreign Affiliates (AFA) Database<sup>21</sup>. Table 4 provides an overview of data on intra-firm trade in the AFA database. Seven countries provide data on intra-firm trade of foreign affiliates operating in their territory, *i.e.* Canada, Italy, Japan, Netherlands, Poland, Sweden and the United States<sup>22</sup>. Data coverage is best for Japan and the United States. Both countries report bilateral intra-firm imports and exports for a long time span and for disaggregated sectors. Three countries in the database seem to have stopped collecting data on intra-firm trade. For Canada the data stops in 1994, while for the Netherlands and Sweden intra-firm trade is reported until the year 2002. While all seven countries report intra-firm exports, data on intra-firm imports are not available for Canada and Sweden.

**Table 4. Coverage of intra-firm trade in the OECD AFA database**

	Canada	Italy	Japan	Netherlands	Poland	Sweden	U.S.
Years	1991-1994	2005-2007	1991-2007	1997-2002	2004-2007	1990-2002	1977-2007
Intra-firm exports	yes	yes	yes	yes	yes	yes	yes
Intra-firm imports	no	yes	yes	yes	yes	no	yes
Number of partners for aggr. manufacturing	10	World only	62	64	61	65	13
Number of disaggregated goods industries (partners)	25 (-)	17 (-)	30 (9)	30 (12)	none	31 (10)	28 (13)
Number of services industries	2	2	4	4	none	4	4

While most of these countries report data for disaggregated manufacturing sectors, data availability for services sectors is limited. At most, countries report intra-firm trade for the following four sectors: i) Electricity, gas and water supply, construction; ii) Trade, repair, hotels and restaurants; iii) Finance, insurance, real estate, business activities; and iv) Other activities. Furthermore, it is important to notice that intra-firm trade in services sectors does not necessarily reflect trade in services. For instance, for the United States, the Netherlands and Japan, intra-firm trade in these services sectors only covers intra-firm trade in goods.

In the EU, the collection of data on intra-firm trade is still under discussion as part of AMNE statistics. The Regulation (EC) No 716/2007 has established a common framework for the collection of statistics on the activity of foreign affiliates defining the geographical breakdown, the activity breakdown and the list of variables that should be collected by EU countries. The regulation neither requires the collection of data on exports and imports nor on intra-firm exports and imports of foreign affiliates.

21 . The OECD has contributed to the development of statistics on intra-firm trade through its *Handbook on Economic Globalisation Indicators* (2010). The *Manual on Statistics of International Trade in Services* – developed with the UN, Eurostat, IMF, UNCTAD and WTO- also recommends the collection of such data.

22 . Data on intra-firm trade is even scarcer in outward FATS statistics. While Japan and Sweden provide aggregate numbers for total manufacturing, the US provide detailed bilateral data.

However, as foreseen by the regulation, these trade variables are collected in pilot studies in order to assess the feasibility and benefits of obtaining the data against the costs of collection. After having sent requests to the countries that have conducted such pilot studies, the OECD Secretariat has obtained additional data on intra-firm trade from Finland for the year 2006. Some other countries preferred not to share data for the moment due to concerns about low response rates of firms and quality issues.

### *Trade Statistics*

The United States is the only country that collects data on intra-firm trade in goods through customs authorities. In particular, importers and exporters have to report whether transactions occur between related or unrelated parties. The new Concepts and Definitions of International Merchandise Trade Statistics (IMTS 2010), approved by the UN Statistical Commission in February 2010, recommends the collection of intra-firm trade data in customs-based merchandise trade statistics.

In the US, import transactions are recorded as occurring between related parties if either of the parties owns or controls 6% of the outstanding voting stock or shares. For exports the respective threshold is 10% corresponding to the threshold used for the definition of FDI. Because of this difference in ownership thresholds, import transactions are more likely to be classified as occurring between related parties. However, differences between imports and exports in the aggregate shares of intra-firm trade in total trade can be expected for economic reasons rather than these thresholds. It should be noted that trade statistics on intra-firm trade differ from AMNE statistics because in the case of AMNE data the ownership threshold used to define the parent company is 50%.

The US Census Bureau gathers intra-firm trade data in its related party database. Our study uses data on intra-firm imports and exports for the years 2002 to 2009 at the Harmonized System 6-digit (HS6) level. While these trade statistics have the advantage of being at a disaggregated level, they have the drawback that they do not reveal whether the US firm or the foreign firm is the parent. Besides different ownership thresholds, this constitutes another difficulty when comparing trade statistics with AMNE statistics. In particular, inward AMNE statistics cover trade between foreign parents and their affiliates in the collecting economy and outward AMNE statistics cover trade between domestic parents and their affiliates abroad. Hence, it would be necessary to sum exports and imports to have comparable figures to goods trade statistics.

Services trade is recorded in the balance of payments. However, with the exception of the United States, countries generally do not break down services trade by affiliation. For the United States, intra-firm imports and exports of services are available for the period 1992-2008. While bilateral data on intra-firm trade are reported for aggregate services categories only, total US intra-firm imports and exports are collected for disaggregated services items. Since services trade is an element of the balance of payments statistics, the definition of an affiliated party is the same as in the case of FDI, *i.e.* applying a 10% ownership threshold.

## ANNEX 2 – ADDITIONAL FIGURES AND TABLES

**Table 5. US imports, 2009 - Decomposition by main end use and ownership**

Main end use (BEC classification)	Number of HS6 lines	Imports in Mill. USD	Total imports (%)	Intra-firm imports (%)	Arm's length imports (%)
Total Imports	4,984	1,491,534	100.0%	48.3%	50.6%
Intermediate	3,106	713,347	47.8%	46.1%	51.8%
Consumption	1,210	358,478	24.0%	35.6%	64.4%
Capital	640	272,108	18.2%	57.0%	43.0%
Not classified	28	147,601	9.9%	74.2%	25.8%

*Notes:* Data do not include trade flows of HS special classification provisions since no HS6-BEC correspondence exists. If these data are included, total imports amount to 1,549,163 Mill. USD, of which 47.8% are intra-firm and 50.1% are at arm's length. The shares of intra-firm and arm's length imports do not sum up to full 100% because some flows lack ownership information.

Source : US Census Bureau, Related Party Database

**Table 6. US exports, 2009 - Decomposition by main end use and ownership**

Main end use (BEC classification)	Number of HS6 lines	Exports in Mill. USD	Total exports (%)	Intra-firm exports (%)	Arm's length exports (%)
Total Exports	5,012	835,839	100.0%	29.6%	68.8%
Intermediate	3,125	499,773	59.8%	27.1%	71.3%
Consumption	1,217	126,852	15.2%	31.3%	65.9%
Capital	643	142,055	17.0%	28.4%	70.2%
Not classified	27	67,158	8.0%	47.1%	52.8%

*Notes:* Data do not include trade flows of HS special classification provisions since no HS6-BEC correspondence exists. If these data are included, total exports amount to 936,503 Mill. USD, of which 27.9% are intra-firm and 68.6% are at arm's length. The shares of intra-firm and arm's length exports do not sum up to full 100% because some flows lack ownership information.

Source : US Census Bureau, Related Party Database.



Table 7. Intra-firm trade for the US by partner country in 2009

Country	Imports				Exports			
	Number of HS6 lines	Total (Mill. USD)	Intra-firm (Mill. USD)	Intra-firm (%)	Number of HS6 lines	Total (Mill. USD)	Intra-firm (Mill. USD)	Intra-firm (%)
Australia	2,285	7,998	2,837	35.5	3,789	18,244	4,978	27.3
Austria	2,139	5,984	3,670	61.3	1,887	2,365	240	10.1
Belgium	2,598	13,736	8,547	62.2	3,076	19,407	8,572	44.2
Canada	4,260	224,584	107,315	47.8	4,796	171,695	71,478	41.6
Chile	945	6,047	997	16.5	3,154	8,694	2,173	25.0
Czech Republic	1,623	1,897	885	46.7	1,705	841	152	18.1
Denmark	1,938	5,553	3,964	71.4	2,176	1,890	352	18.6
Finland	1,421	3,963	2,402	60.6	2,018	1,539	233	15.2
France	3,603	33,961	18,991	55.9	3,499	24,367	6,749	27.7
Germany	3,969	69,790	45,000	64.5	3,963	40,229	11,902	29.6
Greece	776	848	247	29.2	1,897	2,410	175	7.3
Hungary	1,171	2,232	1,314	58.8	1,427	987	275	27.9
Iceland	261	179	60	33.2	934	342	102	30.0
Ireland	1,413	28,102	23,808	84.7	2,380	6,969	2,118	30.4
Italy	3,576	26,232	10,255	39.1	3,427	11,202	2,224	19.9
Japan	3,722	96,002	73,859	76.9	4,085	47,074	15,038	31.9
Korea	3,141	38,770	24,778	63.9	3,854	27,074	4,594	17.0
Luxembourg	309	435	233	53.7	699	964	246	25.6
Mexico	3,507	176,309	100,935	57.2	4,690	105,718	39,653	37.5
Netherlands	2,810	15,820	10,187	64.4	3,474	29,169	15,784	54.1
New Zealand	1,359	2,536	1,152	45.4	2,728	2,049	326	15.9
Norway	1,307	5,660	2,768	48.9	2,045	2,645	427	16.2
Poland	1,686	2,018	945	46.8	2,070	2,181	381	17.5
Portugal	1,339	1,487	606	40.7	1,551	1,013	213	21.0
Slovak Republic	780	621	443	71.4	799	193	48	25.1
Slovenia	730	385	198	51.3	869	224	26	11.5
Spain	2,792	7,797	2,881	37.0	2,975	8,382	1,307	15.6
Sweden	2,237	8,193	5,445	66.5	2,521	4,078	796	19.5
Switzerland	2,627	16,204	9,547	58.9	2,717	15,365	2,229	14.5
Turkey	1,801	3,649	1,108	30.4	2,573	6,898	568	8.2
United Kingdom	3,755	47,019	27,952	59.4	4,144	41,990	9,913	23.6
<b>OECD Members</b>	<b>4,940</b>	<b>854,010</b>	<b>493,326</b>	<b>57.8</b>	<b>4,986</b>	<b>606,198</b>	<b>203,273</b>	<b>33.5</b>
Argentina	1,313	3,821	1,005	26.3	2,792	4,768	1,186	24.9
Brazil	2,505	19,612	5,899	30.1	3,527	22,135	4,843	21.9
China	4,286	295,545	84,829	28.7	4,097	65,124	8,954	13.7
Estonia	379	144	77	53.4	745	173	13	7.5
India	3,244	21,228	6,023	28.4	3,272	14,629	1,264	8.6
Indonesia	1,766	12,917	3,040	23.5	2,329	4,970	400	8.1
Israel	2,015	18,743	10,957	58.5	3,168	6,237	1,724	27.6
Russian Federation	1,074	17,420	5,707	32.8	2,178	5,160	652	12.6
Saudi Arabia	395	21,366	16,179	75.7	2,929	10,235	590	5.8
South Africa	1,447	5,877	2,372	40.4	2,875	4,203	823	19.6
<b>Other Major Economies</b>	<b>4,638</b>	<b>416,672</b>	<b>136,088</b>	<b>32.7</b>	<b>4,661</b>	<b>137,634</b>	<b>20,450</b>	<b>14.9</b>
<b>Other Economies</b>	<b>4,279</b>	<b>278,481</b>	<b>111,067</b>	<b>39.9</b>	<b>4,917</b>	<b>192,672</b>	<b>37,473</b>	<b>19.4</b>
<b>Total</b>	<b>4,993</b>	<b>1,549,163</b>	<b>740,481</b>	<b>47.8</b>	<b>5,024</b>	<b>936,503</b>	<b>261,196</b>	<b>27.9</b>

Source : US Census Bureau, Related Party Database

**Table 8. Share of intra-firm trade in Other Private Services trade for the US by partner country**

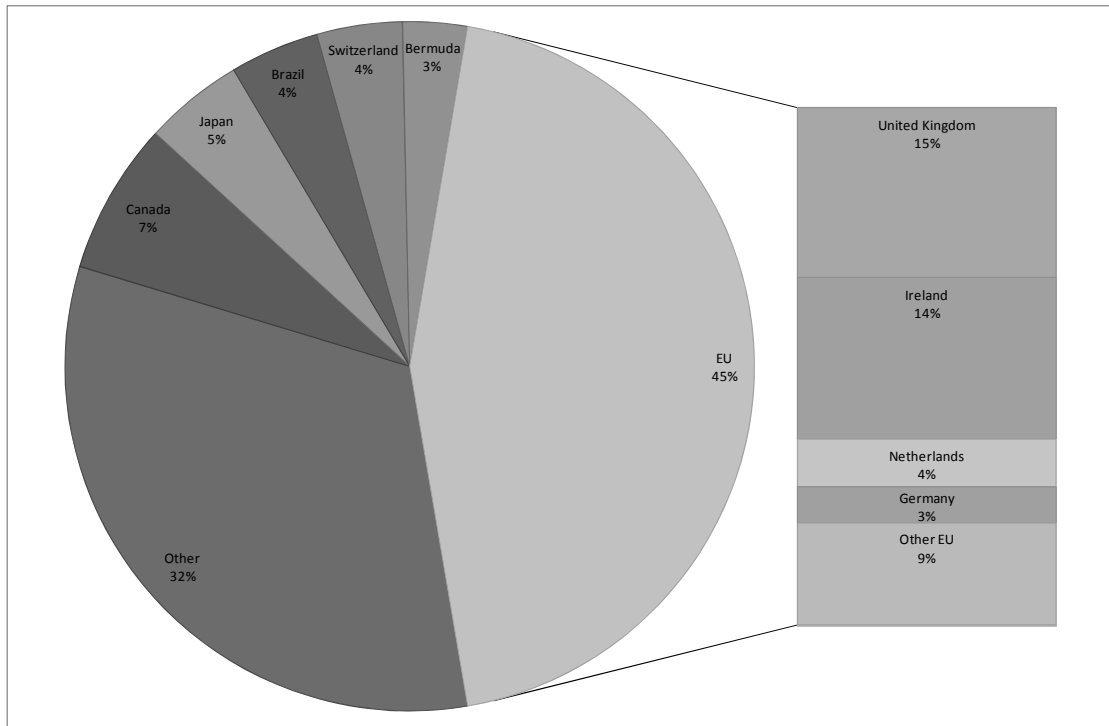
(In Millions of US Dollars, 2008)

	<i>Exports</i>				<i>Imports</i>			
	Total	Share of Intra-Firm Trade	By U.S. parents to foreign affiliates	By U.S. affiliates to foreign parents	Total	Share of Intra-Firm Trade	By U.S. parents from foreign affiliates	By U.S. affiliates from foreign parents
Total	233,529	0.32	0.22	0.10	153,267	0.40	0.27	0.12
Canada	17,502	0.27	0.21	0.07	11,412	0.44	0.23	0.21
Europe	98,902	0.41	0.26	0.15	74,851	0.39	0.25	0.14
Belgium-Luxembourg	3,553	0.35	0.19	0.16	2,751	0.72	0.58	0.13
France	7,584	0.30	0.19	0.11	4,818	0.51	0.30	0.21
Germany	10,089	0.42	0.15	0.26	11,442	0.40	0.20	0.20
Ireland	8,653	0.86	0.82	0.04	7,594	0.12	0.10	0.02
Italy	3,481	0.27	0.23	0.04	1,955	0.42	0.29	0.13
Netherlands	8,765	0.44	0.24	0.20	4,394	0.62	0.18	0.43
Norway	1,197	0.29	0.08	0.21	445	0.41	0.06	0.34
Spain	3,397	0.21	0.20	0.01	1,558	0.33	0.29	0.04
Sweden	2,785	0.53	0.09	0.43	908	0.49	0.20	0.29
Switzerland	6,981	0.54	0.29	0.25	10,309	0.18	0.07	0.11
United Kingdom	31,949	0.35	0.23	0.12	24,645	0.46	0.34	0.12
Other	10,468	0.25	0.11	0.14	4,032	0.41	0.32	0.09
Latin America and Oth. West. Hemisphere	46,007	0.26	0.22	0.04	31,037	0.17	0.15	0.02
South and Central America	23,675	0.23	0.21	0.02	9,535	0.42	0.38	0.04
Argentina	1,291	0.39	0.38	0.00	588	0.57	0.54	0.03
Brazil	5,192	0.42	0.41	0.01	3,045	0.68	0.67	0.01
Chile	786	0.25	0.16	0.09	332	0.26	0.23	0.03
Mexico	10,671	0.12	0.10	0.02	3,204	0.31	0.24	0.07
Venezuela	1,638	0.38	0.37	0.01	220	0.55	0.54	0.02
Other	4,097	0.19	0.15	0.04	2,146	0.16	0.14	0.02
Other Western Hemisphere	22,332	0.28	0.22	0.06	21,502	0.05	0.04	0.01
Bermuda	5,574	0.43	0.27	0.16	15,292	0.02	0.02	0.00
Other	16,757	0.23	0.20	0.03	6,210	0.15	0.11	0.03
Africa	6,245	0.29	0.28	0.02	2,442	0.26	0.26	0.01
South Africa	895	0.16	0.15	0.01	675	0.60	0.59	0.01
Other	5,350	0.32	0.30	0.02	1,767	0.13	0.13	0.01
Middle East	9,231	0.20	0.08	0.12	2,612	0.47	0.44	0.03
Israel	968	0.21	0.19	0.03	1,451	0.74	0.71	0.04
Saudi Arabia	3,195	0.36	0.07	0.29	238	0.01	0.01	(*)
Other	5,069	0.09	0.07	0.03	922	0.16	0.14	0.02
Asia and Pacific	52,918	0.27	0.18	0.09	30,892	0.62	0.45	0.17
Australia	5,263	0.23	0.20	0.03	2,874	0.41	0.36	0.05
China	6,756	0.19	0.16	0.02	2,835	0.62	0.59	0.03
Hong Kong	3,043	0.44	0.35	0.08	2,660	0.79	0.73	0.06
India	4,663	0.12	0.09	0.03	8,877	0.71	0.39	0.32
Indonesia	957	0.27	0.21	0.06	199	0.03	0.03	(*)
Japan	14,691	0.39	0.16	0.23	5,975	0.72	0.47	0.26
Korea, Republic of	4,784	0.10	0.09	0.02	955	0.26	0.23	0.02
Malaysia	1,246	0.30	0.17	0.13	865	0.84	0.83	0.02
New Zealand	638	0.21	0.21	0.00	258	0.19	0.18	0.00
Philippines	694	0.15	0.13	0.02	1,068	0.54	0.50	0.04
Singapore	4,216	0.40	0.36	0.04	2,052	0.74	0.55	0.19
Taiwan	2,145	0.13	0.10	0.03	770	0.40	0.35	0.05
Thailand	1,005	0.30	0.27	0.04	792	0.24	0.24	0.00
Other	2,817	0.11	0.10	0.00	714	0.07	0.07	0.01
International organisations and unallocated	2,725	0.00	0.00	(*)	22	(*)	(*)	(*)
European Union	86,578	0.41	0.26	0.15	62,688	0.43	0.28	0.15

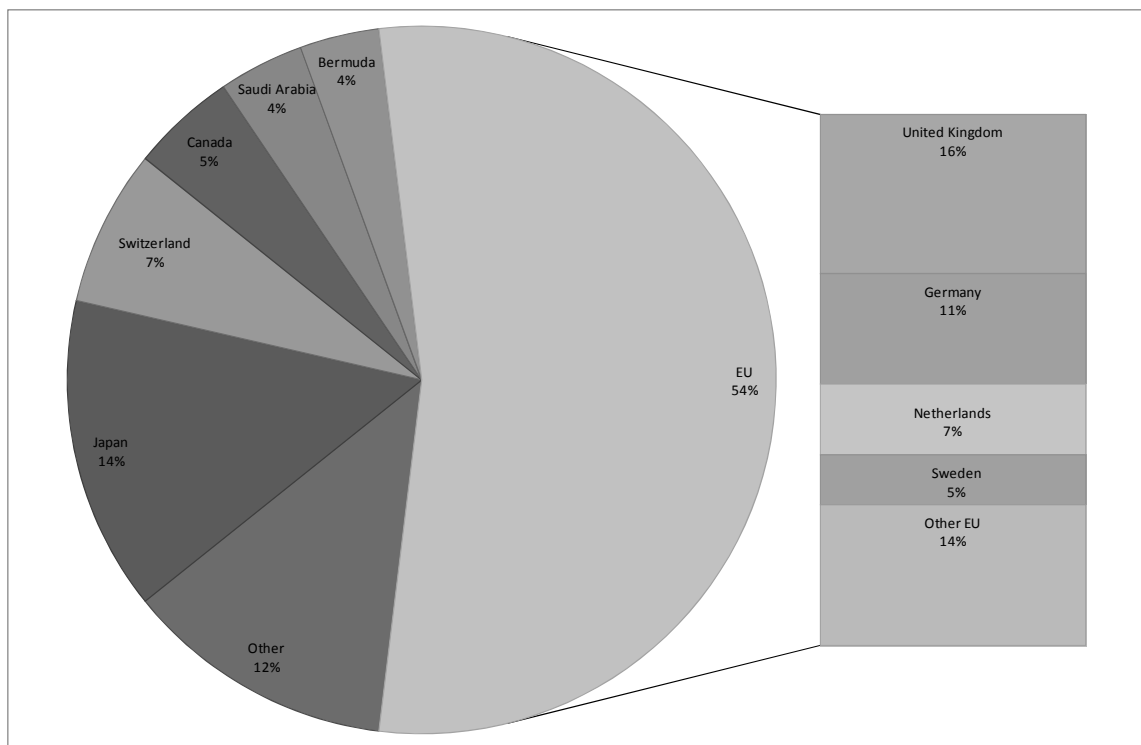
Note: (\*) Less than \$500,000.

Source : US Bureau of Economic Analysis

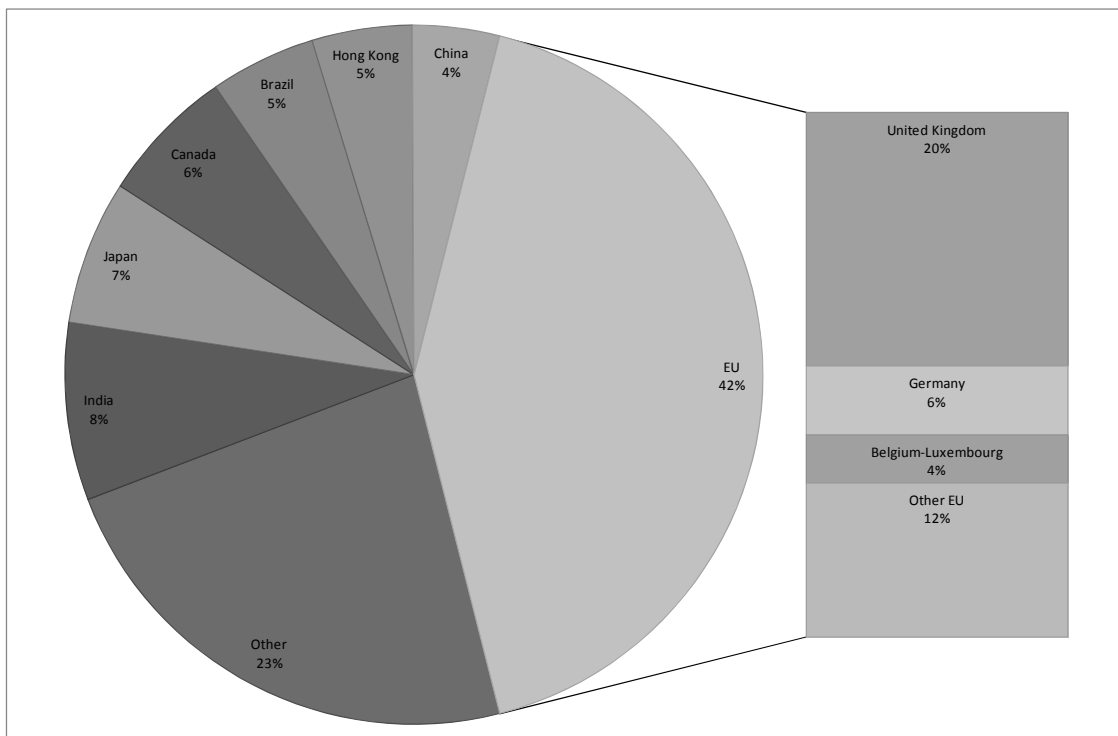
**Figure 9. Share of intra-firm exports in Other Private Services exports of US parents to foreign affiliates in 2008**



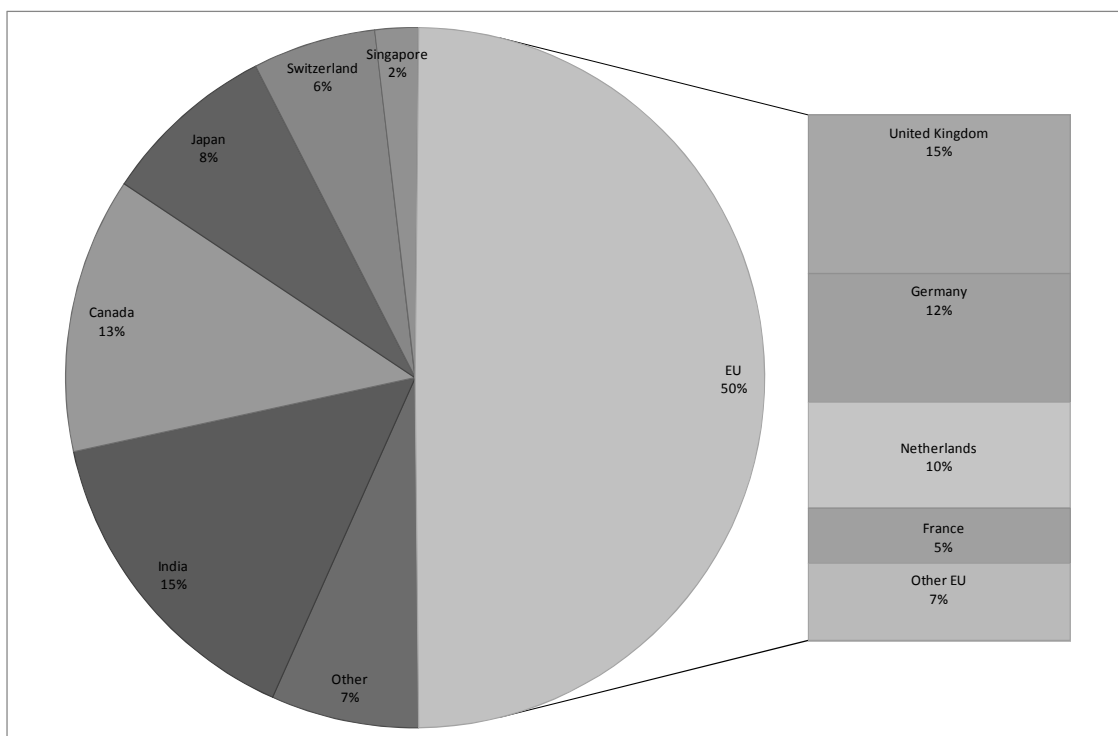
**Figure 10. Share of intra-firm exports in Other Private Services exports of US affiliates to foreign parents in 2008**



**Figure 11. Share of intra-firm imports in Other Private Services imports of US parents from foreign affiliates in 2008**



**Figure 12. Share of intra-firm imports in Other Private Services imports of US affiliates from foreign parents in 2008**



**Table 9. Percentage share of intra-firm imports in affiliate imports and in country imports for 4 OECD economies**

ISIC	Industry	Share of Intra-Firm Imports in Affiliate Imports				Share of Intra-Firm Imports in Country Imports			
		Italy	Japan	Netherlands	U.S.	Italy	Japan	Netherlands	U.S.
10 to 14	Mining and quarrying	85.11	n.a.	0.80	71.06	0.11	n.a.	0.01	0.69
15 to 16	Food, beverages and tobacco	47.08	49.81	42.61	71.87	8.15	0.02	21.42	5.77
17 to 19	Textiles, wearing apparel, leather, footwear	10.30	n.a.	38.85	61.61	0.37	0.07	1.05	0.24
20	Wood and wood products, except furniture	46.00	n.a.	0.00	25.30	0.53	n.a.	0.00	1.03
21 to 22	Paper and products, printing and publishing	19.36	41.65	41.86	88.81	3.14	0.22	12.55	8.71
23	Refined petroleum and coal products	85.41	18.76	41.75	47.44	87.45	0.13	45.71	26.57
24	Chemical products	49.32	9.28	34.58	88.14	17.39	1.31	15.49	18.46
24-23	Drugs and medicines	n.a.	4.81	27.07	93.04	n.a.	2.36	11.47	28.42
25	Rubber and plastic products	52.36	28.16	33.38	74.93	13.46	0.75	4.31	13.44
26	Non-metallic mineral products	71.21	13.43	43.64	81.53	14.85	0.38	11.87	9.99
27 to 28	Basic and fabricated metal products	36.33	93.07	19.81	74.56	6.98	3.95	4.16	3.85
29	Machinery and equipment n.e.c.	40.40	23.59	20.50	77.16	8.84	0.44	2.15	7.20
30	Office, accounting and computing machinery	n.a.	9.58	99.98	90.99	n.a.	0.57	3.56	2.12
30 to 33	Electrical and optical equipment	43.42	n.a.	78.51	n.a.	6.90	3.52	8.36	n.a.
31	Electrical machinery and apparatus n.e.c.	n.a.	76.79	71.80	63.17	n.a.	19.23	25.75	3.86
32	Radio, TV and communication equipment	n.a.	n.a.	6.14	61.90	n.a.	0.12	0.05	4.22
33	Medical, precision, opt. instruments	n.a.	4.59	78.92	81.82	n.a.	0.09	19.88	5.89
34	Motor vehicles	n.a.	2.80	42.35	81.27	n.a.	0.53	10.72	20.02
34 to 35	Transport equipment	54.29	n.a.	42.48	81.91	4.71	0.32	9.77	18.02
35	Other transport equipment	n.a.	n.a.	43.69	91.21	n.a.	0.04	5.25	7.89
36 to 37	Furniture, recycling and manufacturing n.e.c.	32.22	19.94	11.67	34.87	2.52	0.03	0.42	0.62

*Notes:* Data are for the year 2007 for the U.S., Japan, Italy; 2002 for the Netherlands. For the U.S. the following industry shares refer to other years: 1996: Medical, precision, opt. instruments and Furniture, recycling and manufacturing n.e.c.; 2006: Textiles, wearing apparel, leather, footwear, Paper and products, printing and publishing, Office, accounting and computing machinery and Radio, TV and communication equipment; 2001: Wood and wood products, except furniture. For Japan the following industry shares refer to other years: 2004: Paper and products, printing and publishing; 2006: Refined petroleum and coal products, Furniture, recycling and manufacturing n.e.c.

*Source:* OECD AFA Database, OECD STAN Bilateral Trade Database (BTD).

Table 10. Percentage share of intra-firm exports in affiliate exports and in country exports for 4 OECD economies

ISIC	Industry	Share of Intra-Firm Export in Affiliate Exports (in %)					Share of Intra-Firm Export in Country Exports (in %)				
		Italy	Japan	Netherlands	Sweden	U.S.	Italy	Japan	Netherlands	Sweden	U.S.
10 to 14	Mining and quarrying	24.07	100.00	12.79	16.20	32.84	0.97	10.57	2.05	1.76	11.54
15 to 16	Food, beverages and tobacco	73.15	2.90	59.22	63.30	47.41	9.15	0.01	19.41	17.00	11.87
17 to 19	Textiles, wearing apparel, leather, footwear	55.78	n.a.	41.54	23.38	45.69	2.77	n.a.	2.59	4.09	0.94
20	Wood and wood products, except furniture	33.33	n.a.	64.22	45.31	n.a.	0.48	n.a.	3.56	10.72	n.a.
21 to 22	Paper and products, printing and publishing	33.94	14.58	45.51	14.52	37.30	6.71	0.19	22.33	4.31	2.15
23	Refined petroleum and coal products	89.68	80.73	47.99	15.90	n.a.	13.71	0.24	16.32	2.85	n.a.
24	Chemical products	44.58	14.54	57.62	79.15	62.45	19.34	0.34	30.69	55.63	12.00
24-23	Drugs and medicines	n.a.	4.09	67.42	110.29	80.84	n.a.	0.33	43.86	82.14	22.63
25	Rubber and plastic products	58.76	7.29	50.21	38.16	41.13	16.46	0.06	13.70	9.02	5.37
26	Non-metallic mineral products	65.38	n.a.	30.20	45.51	30.71	7.95	n.a.	16.61	30.85	4.23
27 to 28	Basic and fabricated metal products	45.51	7.74	35.67	61.21	32.54	8.56	0.06	16.16	17.96	3.06
29	Machinery and equipment n.e.c.	41.87	5.30	24.74	60.86	47.74	8.51	0.02	4.32	18.17	4.00
30	Office, accounting and computing machinery	n.a.	1.61	97.74	29.46	13.19	n.a.	0.02	3.78	2.83	0.21
30 to 33	Electrical and optical equipment	43.87	n.a.	46.60	49.89	n.a.	11.60	1.08	5.37	9.98	n.a.
31	Electrical machinery and apparatus n.e.c.	n.a.	52.03	5.60	60.58	23.61	n.a.	5.15	2.58	29.05	1.63
32	Radio, TV and communication equipment	n.a.	n.a.	1.38	22.59	45.81	n.a.	0.01	0.03	0.99	3.68
33	Medical, precision, opt. instruments	n.a.	7.29	67.15	46.56	48.33	n.a.	0.02	14.26	18.34	5.10
34	Motor vehicles	n.a.	1.15	82.13	90.89	48.16	n.a.	0.17	28.40	59.20	12.38
34 to 35	Transport equipment	25.12	1.15	75.80	89.06	43.91	4.66	0.14	22.07	49.95	6.93
35	Other transport equipment	n.a.	0.80	13.82	43.87	18.35	n.a.	0.00	1.58	5.56	0.87
36 to 37	Furniture, recycling and manufacturing n.e.c.	32.12	3.79	39.93	51.12	43.88	1.72	0.01	2.11	6.35	5.99

*Notes:* Data are for the year 2007 for the U.S., Japan, Italy; 2002 for Sweden and the Netherlands. For the U.S. the following industry shares refer to other years: 1996: Medical, precision, opt. instruments and Furniture, recycling and manufacturing n.e.c.; 2006: Textiles, wearing apparel, leather, footwear, Paper and products, printing and publishing, Office, accounting and computing machinery and Radio, TV and communication equipment; 2001: Wood and wood products, except furniture. For Japan the following industry shares refer to other years: 2004: Paper and products, printing and publishing; 2006: Refined petroleum and coal products, Furniture, recycling and manufacturing n.e.c.

Source: OECD AFA Database, OECD STAN Bilateral Trade Database (BTD).

Table 11. Top 20 and bottom 20 HS chapters according to US intra-firm trade in 2009

HS2	Chapter	Imports in Mill. USD.	Intra-Firm (%)	Arm's Length (%)	HS2	Chapter	Exports in Mill. USD.	Intra-Firm (%)	Arm's Length (%)
Top 20 Intra-Firm Import Shares					Top 20 Intra-Firm Export Shares				
87	NonRailway vehicles	131,887	83	17	37	Photographic goods	2,619	69	30
30	Pharmaceutical products	56,027	80	20	9	Coffee, tea, spices	615	61	35
29	Organic chemicals	49,615	76	24	24	Tobacco	1,650	54	46
75	Nickel and articles thereof	1,867	72	28	30	Pharmaceutical products	38,416	48	52
31	Fertilisers	4,194	70	30	87	NonRailway vehicles	68,741	45	53
37	Photographic goods	1,360	66	34	18	Cocoa	1,031	44	55
90	Instruments	49,566	65	35	19	Cereals, flour, milk	2,827	42	56
25	Salt, earths and stone	3,362	63	37	34	Soap, waxes, candles	4,938	42	55
38	Misc. chemical products	7,480	61	39	40	Rubber and articles thereof	8,937	41	54
32	Tanning or dyeing extracts	2,422	59	41	32	Tanning or dyeing extracts	5,562	40	57
84	Nuclear reactors, machinery	202,079	59	41	27	Mineral fuels, oils, waxes	54,574	40	60
35	Starches, glues, enzymes	1,739	58	42	21	Misc. edible preparations	4,885	38	61
40	Rubber and articles thereof	15,380	58	42	90	Instruments	55,906	38	61
91	Clocks and watches	3,000	58	42	36	Explosives	589	37	63
85	Electrical machinery	212,100	57	43	56	Wadding, yarns, ropes, cables	1,641	37	62
45	Cork articles	209	54	46	38	Misc. chemical products	17,249	37	62
33	Oils; perfumery	7,342	54	46	33	Oils; perfumery	7,577	37	60
59	Textile fabrics	1,472	47	53	59	Textile fabrics	1,249	35	63
76	Aluminum and articles thereof	11,339	46	54	35	Starches, glues, enzymes	2,135	35	63
54	Manmade filaments	1,606	45	55	39	Plastics and articles thereof	41,361	35	63
Bottom 20 Intra-Firm Import Shares					Bottom 20 Intra-Firm Export Shares				
42	Leather; saddlery and harness	8,093	13	87	3	Fish, crustaceans	3,306	10	89
58	Woven fabrics; tapestries	542	12	88	47	Pulp of wood	6,699	10	90
61	Knitted or crocheted apparel	33,333	12	88	52	Cotton	4,880	10	90
26	Ores, slag and ash	2,597	12	88	4	Dairy produce; honey	1,929	9	91
41	Raw hides, skins, leather	450	11	89	64	Footwear, gaiters	620	9	83
50	Silk	141	11	89	6	Trees and plants	355	8	78
46	Straw; basketware	346	10	90	7	Vegetables	2,972	8	81
14	Vegetable products	95	9	91	2	Meat	10,552	6	94
10	Cereals	2,062	9	91	71	Pearls, precious metals, coin	27,512	6	94
78	Lead and articles thereof	459	9	91	91	Clocks and watches	356	6	87
60	Knitted or crocheted fabrics	652	9	91	41	Raw hides, skins, leather	1,811	5	95
52	Cotton	818	9	91	67	Feathers and down articles	58	4	73
3	Fish, crustaceans	9,990	9	91	53	Vegetable textile fibres	18	4	88
80	Tin and articles thereof	529	8	92	8	Fruit and nuts	7,694	4	95
65	Headgear and parts thereof	1,357	6	94	5	Animal products	772	4	96
97	Works of art, antiques	5,036	5	95	45	Cork articles	33	2	91
64	Footwear, gaiters	17,666	5	95	14	Vegetable products	60	2	97
66	Umbrella, walkingsticks	385	4	96	50	Silk	21	2	90
67	Feathers and down articles	1,261	3	97	1	Live animals	785	2	98
1	Live animals	2,004	1	99	97	Works of art, antiques	4,589	2	98

Source : US Census Bureau, Related Party Database

**Table 12. Cross-border trade in Other Private Services for the US in 2008**

(In Millions of US Dollars, 2008)

	Exports			Imports		
	Total	Affiliated	Share	Total	Affiliated	Share
A. Other private services	233,529	74,551	0.32	153,267	60,762	0.40
1. Education	17,796	[1]	[1]	5,204	[1]	[1]
2. Financial services	60,190	9,723	0.16	19,143	7,636	0.40
3. Insurance services	10,756	[2]	[2]	42,939	[2]	[2]
4. Telecommunications	9,163	3,916	0.43	7,193	(D)	
5. Business, professional, and technical services	113,525	55,483	0.49	76,284	50,603	0.66
Computer and information services	12,599	4,124	0.33	16,139	12,417	0.77
Computer and data information services	8,044	3,495	0.43	15,214	11,962	0.79
Database and other information services	4,555	629	0.14	925	455	0.49
Management and consulting services	26,942	23,705	0.88	21,565	18,529	0.86
Research and development and testing services	17,139	14,292	0.83	14,885	10,877	0.73
Operational leasing	7,942	2,412	0.30	958	517	0.54
Other business, professional, and technical services	48,901	10,952	0.22	22,736	8,263	0.36
Accounting, auditing, and bookkeeping services	1,399	809	0.58	2,269	518	0.23
Advertising	4,019	2,832	0.70	2,194	822	0.37
Architectural, engineering, and other technical services	5,918	1,097	0.19	1,086	411	0.38
Construction	1,679	652	0.39	827	205	0.25
Industrial engineering	3,776	609	0.16	1,603	714	0.45
Installation, maintenance, and repair of equipment	9,661	1,386	0.14	4,945	2,648	0.54
Legal services	7,269	136	0.02	1,902	153	0.08
Mining services	3,080	1,159	0.38	728	8	0.01
Trade-related services	6,112	1,626	0.27	1,047	741	0.71
Training services	1,414	45	0.03	779	37	0.05
6. Other services	22,099	5,428	0.25	2,505	(D)	
Film and television tape rentals	13,598	5,428	0.40	1,878	(D)	

Notes: Millions of US Dollars; (D) - Suppressed to avoid disclosure of data of individual companies.

[1] Education consists of expenditures for tuition and living expenses by students studying in foreign countries, so these are transactions between unaffiliated parties.

[2] Most insurance services transactions are deemed to be unaffiliated even when they are between affiliated companies, because the services are deemed to be provided to the policyholders who pay the insurance premiums and who are unaffiliated with either company.

Source: US Bureau of Economic Analysis



**Table 13. Determinants of bilateral US intra-firm trade at the extensive (Probit) and the intensive (OLS) margin**

	Imports				Exports			
	Probit (1)	OLS (2)	Probit (3)	OLS (4)	Probit (5)	OLS (6)	Probit (7)	OLS (8)
Intermediation	-1.639*** (0.161)	-0.483*** (0.049)	-1.970*** (0.205)	-0.460*** (0.066)	-1.709*** (0.198)	-0.074*** (0.023)	-2.237*** (0.287)	-0.137*** (0.039)
RuleofLaw	0.179*** (0.011)	-0.028*** (0.003)	0.113*** (0.023)	0.038*** (0.007)	-0.044*** (0.007)	0.002 (0.002)	0.043** (0.017)	0 (0.004)
Interm. X RuleofLaw	-0.542*** (0.090)	0.122*** (0.032)	-0.501*** (0.165)	0.074** (0.032)	-0.391*** (0.059)	-0.056*** (0.012)	-0.592*** (0.116)	0.018 (0.023)
capital	-0.111*** (0.023)	0.073*** (0.007)	-0.114*** (0.028)	0.074*** (0.010)	-0.046* (0.025)	0.017*** (0.005)	-0.074*** (0.028)	0.022*** (0.006)
K/L	0.163*** (0.013)	0.072*** (0.004)	0.312*** (0.027)	0.032*** (0.008)	0.196*** (0.008)	0.019*** (0.002)	0.061*** (0.018)	0.012*** (0.004)
capital x K/L	0.062*** (0.012)	0.010* (0.005)	0.093*** (0.026)	0.030*** (0.011)	0.011 (0.008)	0.012*** (0.002)	-0.109*** (0.019)	0.011* (0.007)
skilled labour	0.423** (0.174)	0.120** (0.051)	-0.024 (0.229)	0.007 (0.059)	0.935*** (0.197)	0.090*** (0.025)	0.345 (0.255)	0.011 (0.034)
H/L	0.200*** (0.040)	-0.065*** (0.013)	-0.057 (0.064)	-0.081*** (0.022)	0.190*** (0.023)	-0.024*** (0.006)	-0.003 (0.054)	-0.072*** (0.010)
skilled labour x H/L	0.366 (0.354)	-0.461*** (0.107)	0.825 (0.554)	-0.376*** (0.145)	0.976*** (0.198)	0.210*** (0.045)	0.41 (0.397)	0.145 (0.090)
Population	0.244*** (0.007)	-0.034*** (0.002)	0.214*** (0.012)	-0.031*** (0.003)	0.157*** (0.006)	0.013*** (0.001)	0.240*** (0.013)	0.018*** (0.002)
HFI_trade	-0.457*** (0.054)	0.293*** (0.019)			0.392*** (0.049)	0.092*** (0.011)		
HFI_investment	-0.162*** (0.036)	-0.034** (0.014)			-0.333*** (0.033)	-0.032*** (0.005)		
Trade Cost			-0.867*** (0.097)	-0.128*** (0.025)			-1.336*** (0.105)	-0.210*** (0.015)
FDI Restrictiveness			0.033 (0.145)	0.565*** (0.043)			1.581*** (0.114)	0.257*** (0.019)
Constant	-3.773*** (0.125)	0.948*** (0.030)	-2.585*** (0.247)	1.016*** (0.057)	-2.836*** (0.089)	-0.102*** (0.015)	-3.537*** (0.263)	-0.064 (0.045)
Pseudo R-squared	0.089		0.079		0.06		0.127	
R-squared		0.101		0.078		0.022		0.086
Observations	134,139	80,619	55,905	39,309	196,007	158,432	60,958	49,040
Countries	107	103	26	26	107	107	26	26
HS6 Goods	4,663	4,476	4,499	4,240	4,647	4,622	4,525	4,468
NAICS6 Industries	383	383	383	383	384	384	384	384

*Notes:* The dependent variable in probit regressions is a dummy indicating whether there is intra-firm trade in a HS6 product between two countries or not, while in OLS regressions it is the share of intra-firm trade if the latter is positive. All variables entering interactions terms have been centered at the mean so that coefficients of main effects can be interpreted at sample means. Robust standard errors clustered at the 6-digit NAICS level are reported in brackets. \* significant at 10%; \*\* at 5%; \*\*\* at 1%.

**Table 14. HS chapters with the largest absolute and relative decreases of US imports in 2009**

HS2	Chapter	Imports in Mill. USD.	Intra-Firm (%)	Arm's Length (%)	<i>Absolute Change in Mill. USD</i>		
					Overall	Intra-Firm	Arm's Length
27	Mineral fuels, oils, waxes	257,735	40	54	-212,254	-79,195	-115,989
87	NonRailway vehicles	131,887	83	17	-63,818	-52,470	-11,346
84	Nuclear reactors, machinery	202,079	59	41	-44,580	-17,163	-27,414
85	Electrical machinery	212,100	57	43	-38,289	-25,351	-12,942
72	Iron and steel	12,378	39	61	-19,693	-6,056	-13,637
29	Organic chemicals	49,615	76	24	-13,502	-8,861	-4,641
73	Articles of iron or steel	24,223	33	67	-13,429	-4,555	-8,873
71	Pearls, precious metals, coin	38,495	19	81	-11,031	-1,287	-9,744
94	Furniture; prefab buildings	30,064	20	80	-8,272	-2,520	-5,752
90	Instruments	49,566	65	35	-7,446	-4,845	-2,601
39	Plastics and articles thereof	28,163	36	64	-7,305	-3,520	-3,785
28	Inorganic chemicals+Z77	11,422	45	55	-6,555	-1,947	-4,608
76	Aluminum and articles thereof	11,339	46	54	-5,814	-3,690	-2,123
74	Copper and articles thereof	6,407	15	85	-5,293	-754	-4,539
40	Rubber and articles thereof	15,380	58	42	-4,924	-2,978	-1,945
62	Apparel, not knitted or crocheted	30,891	13	87	-4,793	-761	-4,031
44	Wood articles; wood charcoal	9,806	23	77	-4,336	-880	-3,454
31	Fertilisers	4,194	70	30	-4,242	-2,095	-2,147
95	Toys, games	27,576	39	61	-4,203	-910	-3,292
61	Knitted or crocheted apparel	33,333	12	88	-3,993	-407	-3,586
HS2	Chapter	Imports in Mill. USD.	Intra-Firm (%)	Arm's Length (%)	<i>Relative Change in Percentage</i>		
					Overall	Intra-Firm	Arm's Length
72	Iron and steel	12,378	39	61	-61	-56	-64
53	Vegetable textile fibres	132	24	76	-53	-11	-59
75	Nickel and articles thereof	1,867	72	28	-50	-54	-39
31	Fertilisers	4,194	70	30	-50	-42	-63
25	Salt; earths and stone	3,362	63	37	-46	-44	-49
74	Copper and articles thereof	6,407	15	85	-45	-45	-45
81	Other base metals	1,587	40	60	-45	-42	-47
27	Mineral fuels, oils, waxes	257,735	40	54	-45	-43	-46
50	Silk	141	11	89	-42	-38	-42
47	Pulp of wood	2,441	34	66	-39	-47	-34
78	Lead and articles thereof	459	9	91	-38	-36	-38
28	Inorganic chemicals+Z77	11,422	45	55	-36	-28	-42
73	Articles of iron or steel	24,223	33	67	-36	-36	-35
80	Tin and articles thereof	529	8	92	-35	-56	-33
26	Ores, slag and ash	2,597	12	88	-35	-37	-34
41	Raw hides, skins, leather	450	11	89	-35	-32	-35
76	Aluminum and articles thereof	11,339	46	54	-34	-41	-26
51	Wool, woven fabric	199	21	79	-33	-47	-29
87	NonRailway vehicles	131,887	83	17	-33	-32	-33
97	Works of art, antiques	5,036	5	95	-32	-3	-34

Source : US Census Bureau, Related Party Database

**Table 15. HS chapters with the largest absolute and relative decreases in US exports 2009**

HS2	Chapter	Exports in Mill. USD.	Intra-Firm (%)	Arm's Length (%)	<i>Absolute Change in Mill. USD</i>		
					Overall	Intra-Firm	Arm's Length
84	Nuclear reactors, machinery	127,240	27	71	-56,569	-16,500	-39,724
87	NonRailway vehicles	68,741	45	53	-34,669	-17,516	-16,966
85	Electrical machinery	86,500	35	63	-25,317	-11,111	-14,078
27	Mineral fuels, oils, waxes	54,574	40	60	-21,445	-7,645	-13,643
10	Cereals	17,323	17	83	-11,495	-1,421	-10,002
71	Pearls, precious metals, coin	27,512	6	94	-10,169	-820	-9,263
39	Plastics and articles thereof	41,361	35	63	-8,431	-2,814	-5,588
72	Iron and steel	14,957	12	87	-8,146	-647	-7,292
29	Organic chemicals	30,147	31	69	-6,751	-3,395	-3,247
90	Instruments	55,906	38	61	-5,385	-298	-5,048
38	Misc. chemical products	17,249	37	62	-4,503	-953	-3,535
73	Articles of iron or steel	12,612	25	70	-3,648	-683	-2,863
76	Aluminum and articles thereof	8,025	16	83	-3,574	-765	-2,802
31	Fertilisers	3,515	13	87	-3,283	-122	-3,157
26	Ores, slag and ash	3,420	13	87	-3,030	-702	-2,293
28	Inorganic chemicals+Z77	10,721	16	84	-2,739	-474	-2,264
74	Copper and articles thereof	4,886	13	86	-2,086	-253	-1,828
48	Paper; articles of paper pulp	13,307	29	69	-1,855	-176	-1,644
40	Rubber and articles thereof	8,937	41	54	-1,852	-953	-896
94	Furniture; prefab buildings	5,983	22	66	-1,773	-280	-1,397
					<i>Relative Change in Percentage</i>		
HS2	Chapter	Exports in Mill. USD.	Intra-Firm (%)	Arm's Length (%)	Overall	Intra-Firm	Arm's Length
31	Fertilisers	3,515	13	87	-48	-21	-51
26	Ores, slag and ash	3,420	13	87	-47	-61	-44
80	Tin and articles thereof	86	24	75	-45	-57	-40
60	Knitted or crocheted fabrics	891	33	67	-42	-29	-47
4	Dairy produce; honey	1,929	9	91	-41	19	-44
10	Cereals	17,323	17	83	-40	-32	-41
89	Ships, boats, etc.	1,907	12	88	-39	-41	-38
43	Furskins and artificial fur	204	19	80	-39	-34	-40
75	Nickel and articles thereof	1,252	21	79	-38	-9	-43
72	Iron and steel	14,957	12	87	-35	-26	-36
81	Other base metals	1,697	15	85	-35	-31	-35
79	Zinc and articles thereof	177	21	77	-34	-39	-33
50	Silk	21	2	90	-34	-5	-35
87	NonRailway vehicles	68,741	45	53	-34	-36	-32
76	Aluminum and articles thereof	8,025	16	83	-31	-37	-30
84	Nuclear reactors, machinery	127,240	27	71	-31	-33	-30
41	Raw hides, skins, leather	1,811	5	95	-30	-56	-28
74	Copper and articles thereof	4,886	13	86	-30	-29	-30
54	Manmade filaments	1,118	32	66	-30	-24	-32
5	Animal products	772	4	96	-29	-19	-29

Source: US Census Bureau, Related Party Database.

### ANNEX 3 – ESTIMATES BASED ON FIRM-LEVEL DATA: TECHNICAL DETAILS

To estimate intra-firm trade with firm-level data, the methodology proposed by Alfaro and Charlton (2009) has been applied to Bureau Van Dijk's ORBIS dataset (update of July 2008) that includes financial information on 44,707,330 companies around the world. Most of these companies are in the OECD area (see Table 17 below). For certain of these companies, the subsidiaries of foreign companies can be identified on the basis of the ownership information that includes in particular the country of origin of the "ultimate owner". But such information is not available for all companies in the dataset. Ownership information enabled us to identify 135,679 subsidiaries of foreign companies. The ultimate owner is defined with a minimum percentage of 50.01% in the links between the subsidiary and the ultimate owner. The information is collected for the last year available over the period 2005-2007<sup>23</sup>.

There is no direct measure of intra-firm trade in the ORBIS dataset<sup>24</sup>. Our strategy consists in identifying horizontal and vertical links between parent companies and their affiliates. For each company, information is available on the primary and secondary activity at the NAICS 6-digit level. Relying on the North American Industry Classification System (NAICS) (the most disaggregated industry classification reported in ORBIS), we then match the codes with US input-output tables provided by the US Bureau of Economic Analysis.

Following Alfaro and Charlton (2009), we define horizontal FDI as the activity of foreign-owned subsidiaries in the same industry as their parent and vertical FDI as the activity of foreign-owned subsidiaries in industries upstream from the parent company. A comparison between the NAICS code of the parent company and its subsidiary determines whether there is a horizontal link. If the 6-digit code is the same, we assume that the purpose of the subsidiary is to reproduce the production process of the parent company to sell final goods (or services) in the destination market. Horizontal FDI can happen, for example, when there are important trade barriers in the destination market and the parent company can circumvent trade protection by directly producing in the foreign country. Costly transport costs can be another form of trade costs that can justify horizontal FDI. Another motivation for horizontal FDI can be a need to adapt the product or service to the taste of local consumers.

If the 6-digit code corresponds to the code of an upstream industry, as identified in the input-output matrix, we assume that there is vertical FDI and that the subsidiary has been set up to produce an input that is shipped to the country of the parent company. The sales of the affiliate are regarded as intra-firm trade (exports to the parent company).<sup>25</sup>

As we work with two industry codes for each company (primary and secondary activity) and both horizontal and vertical links can be found at the same time, we have four categories of companies, as described in Table 16 below. 'Complex' FDI occurs when we find both a horizontal and a vertical link between the subsidiary and its parent company. We have also a category 'neither' for cases where none of

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23 . For 63% of the subsidiaries, the latest year available is 2006.

24 . Even information on total imports of companies is scarce.

25 . Like Alfaro and Charlton (2009), we only identify upstream links from subsidiaries to their parents. Naturally, it is also possible that the parent company is the upstream company shipping inputs to its affiliate. Hanson *et al.* (2005) analyse such parent-to-affiliate input trade using US AMNE statistics.

the above connections exist. For example, this is the case when a subsidiary is in a different industry than the parent company but without any input-output relationship. In addition, as suggested by Alfaro and Charlton (2009), we exclude from the estimation of intra-firm trade the sales of foreign-owned subsidiaries that are in the same country as another subsidiary in a downstream industry. For example, if a car manufacturer has a subsidiary in a foreign country producing auto parts and components and at the same time another subsidiary producing cars, one can assume that at least part of the auto parts and components will be sold to the other subsidiary and not to the parent company. In this case, the sales are excluded from the calculation of intra-firm trade. Lastly, the “neither” category also includes subsidiaries where the information on the industry of the ultimate owner is unknown.

**Table 16. Typology of activities of MNEs in the firm-level data**

Type of FDI	Identification in the dataset	Intra-firm trade
Horizontal	The foreign-owned subsidiary and the parent company share at least one identical 6-digit NAICS code.	No
Vertical	The foreign-owned subsidiary has at least one 6-digit NAICS code which is an input for the industry of the parent company (according to the input-output matrix). Additionally, there is no domestic ultimate owner with a vertical link.	Yes (exports from the subsidiary to the parent company)
Complex	There is both a horizontal and a vertical link (at least one identical 6-digit NAICS code and one that corresponds to an upstream industry).	Partly, but cannot be measured (ignored)
Neither	None of the previous connections.	No

Ideally, we should use a different input-output table for each parent country. At this stage, we were able to work only with the US BEA 2002 Benchmark I-O Table for which we have a detailed concordance with NAICS codes at a disaggregated level. The concordance is not perfect as BEA input-output tables are based on BEA six-digit industry codes that do not always match NAICS codes. But this is the best tool available so far. We will explore in the next iteration of the report the possibility of including information from other I-O tables to provide more robust estimates of vertical and horizontal links.

As compared to Alfaro and Charlton (2009), we work at a more disaggregated level to identify vertical and horizontal links (6-digit NAICS codes as opposed to 4-digit SIC codes<sup>26</sup>). We have however less foreign-owned subsidiaries in the dataset (despite a higher number of companies). First, the study of Alfaro and Charlton reports information at the establishment level using Dun & Bradstreet’s WorldBase database, while ORBIS is at the firm level. Second, we have a majority ownership requirement. All ownership links are based on a direct or indirect share of ownership above 50%. Lastly, the difference in the overall number of subsidiaries could also be explained by less comprehensive ownership information in ORBIS. However, the OECD will soon receive a new update from Bureau Van Dijk’s ORBIS dataset with a significant increase in the number of ownership links. And then we expect to be able to produce better intra-firm trade estimates. In any case, information based on firm-level data depends on the coverage of the dataset. It is therefore normal to obtain estimates that are different from aggregate measures or other firm-level datasets. As the methodology used to identify vertical FDI and intra-firm trade flows is based on strong assumptions, estimates presented in the report should be interpreted with caution.

26. The NAICS classification was introduced in the US 2002 Benchmark I-O Table to replace SIC codes. The new classification is more detailed, in particular for high-tech industries and services.

Table 17 indicates the number of companies and foreign owned subsidiaries in each OECD country on which the intra-firm trade estimates are produced. As can be seen in the Table, the number of companies varies significantly from country to country. There are countries with a very good coverage (e.g., the UK) and others where the number of companies is very low (e.g., New Zealand or Turkey). This should be taken into account when looking at the estimates of intra-firm trade. To the extent that the sample of companies is representative, the heterogeneity in the country coverage is less problematic when looking at the distribution of subsidiaries according to the type of FDI (horizontal, vertical or complex).

While Table 2 in Section 2 has summarized the results of this analysis for all countries in the ORBIS dataset, it is also interesting to look at the distribution of foreign affiliates in specific countries. Table 18 provides such a breakdown. The share of vertical FDI highlights different patterns across OECD countries. The Czech Republic, Hungary, Ireland and Slovak Republic have higher shares of vertical affiliates confirming that these EU countries are the main recipients of vertical FDI (although the highest shares are for the Netherlands and Luxembourg). Outside the OECD area, it is not surprisingly China that has the highest share of vertical FDI. On average, non-OECD countries receive less vertical FDI. Contrary to what is often assumed, offshoring does not occur mainly in developing countries where production costs are lower. Vertical FDI is more prevalent within the OECD area.

**Table 17. Overview of companies and affiliates by country in the ORBIS dataset**

	Number of companies in ORBIS	Number of foreign affiliates identified	Number of parent companies identified
Australia	3,943	345	2,499
Austria	467,025	3,878	2,650
Belgium	727,272	3,617	3,946
Canada	1,248,758	4,698	2,081
Chile	57,377	570	84
Czech Republic	105,187	1,086	61
Denmark	210,875	2,554	3,334
Finland	110,785	1,250	1,906
France	1,289,511	9,714	13,378
Germany	1,469,839	15,243	15,826
Greece	37,486	508	307
Hungary	371,909	666	74
Iceland	23,191	33	437
Ireland	231,431	2,982	2,469
Italy	717,395	3,309	5,154
Japan	1,387,359	207	1,107
Korea	24,681	309	435
Luxembourg	20,697	436	1,721
Mexico	522,431	2,530	197
Netherlands	2,438,788	7,398	6,833
New Zealand	564	68	85
Norway	238,501	2,502	1,674
Poland	64,416	2,415	127
Portugal	326,073	1,747	453
Slovak Republic	12,438	191	2
Slovenia	38,031	23	42
Spain	1,766,988	5,723	3,468
Sweden	311,554	2,748	6,307
Switzerland	40,377	1,890	5,887
Turkey	427	39	112
United Kingdom	4,085,271	33,104	11,715
United States	14,484,365	13,030	30,674
<b>Total OECD members</b>	<b>32,834,945</b>	<b>124,813</b>	<b>125,045</b>
Argentina	709,949	929	31
Brazil	3,953,975	1,762	176
China	307,354	326	68
Estonia	78,050	553	53
India	9,392	89	466
Indonesia	40,773	27	11
Israel	431	9	520
Russian Federation	3,554,837	1,167	579
Saudi Arabia	-	-	26
South Africa	214,176	156	494
<b>Total Other major economies</b>	<b>8,876,015</b>	<b>5,018</b>	<b>2,424</b>
Other countries	2,994,176	5,848	5,765
<b>Total</b>	<b>44,705,136</b>	<b>135,679</b>	<b>133,234</b>

Source : Bureau Van Dijk's ORBIS database (2008).

**Table 18. Distribution of foreign affiliates according to the type of FDI - By country (2006)**

	FDI motives (vertical linkages threshold=0.01)			
	Horizontal	Vertical	Complex	Neither/Not identified
Australia	15.1%	22.6%	7.8%	54.5%
Austria	12.2%	17.3%	1.5%	68.9%
Belgium	11.6%	22.2%	3.5%	62.7%
Canada	13.5%	18.5%	3.2%	64.7%
Chile	15.1%	20.7%	4.9%	59.3%
Czech Republic	11.0%	25.9%	4.2%	58.9%
Denmark	13.2%	18.8%	1.8%	66.2%
Finland	12.7%	15.3%	1.9%	70.1%
France	10.2%	18.1%	1.3%	70.4%
Germany	9.6%	22.0%	2.7%	65.7%
Greece	15.4%	19.1%	2.6%	63.0%
Hungary	10.7%	27.9%	6.0%	55.4%
Iceland	24.2%	24.2%	0.0%	51.5%
Ireland	7.3%	24.4%	2.5%	65.8%
Italy	11.1%	14.6%	1.9%	72.4%
Japan	12.1%	15.9%	3.4%	68.6%
Korea	10.0%	20.4%	6.8%	62.8%
Luxembourg	11.7%	30.3%	13.3%	44.7%
Mexico	14.1%	19.1%	3.6%	63.2%
Netherlands	7.5%	35.6%	2.8%	54.1%
New Zealand	14.7%	13.2%	14.7%	57.4%
Norway	12.4%	14.8%	4.4%	68.5%
Poland	11.9%	16.3%	2.8%	69.0%
Portugal	14.3%	19.1%	2.2%	64.5%
Slovak Republic	17.3%	26.2%	11.5%	45.0%
Slovenia	13.0%	17.4%	26.1%	43.5%
Spain	12.2%	17.2%	2.4%	68.3%
Sweden	14.6%	19.3%	2.3%	63.8%
Switzerland	10.1%	18.2%	5.7%	66.1%
Turkey	15.4%	15.4%	35.9%	33.3%
United Kingdom	8.0%	16.5%	2.2%	73.3%
United States	12.3%	14.1%	2.4%	71.2%
<b>Total OECD members</b>	<b>10.3%</b>	<b>19.1%</b>	<b>2.6%</b>	<b>68.0%</b>
Argentina	14.5%	20.9%	6.6%	58.0%
Brazil	12.3%	19.6%	3.5%	64.6%
China	18.1%	24.8%	9.2%	47.9%
Estonia	16.6%	12.8%	4.2%	66.4%
India	28.1%	15.7%	13.5%	42.7%
Indonesia	14.8%	7.4%	37.0%	40.7%
Israel	33.3%	0.0%	33.3%	33.3%
Russian Federation	6.4%	8.7%	4.4%	80.5%
Saudi Arabia	-	-	-	-
South Africa	14.1%	14.1%	5.1%	66.7%
<b>Total Other major economies</b>	<b>12.6%</b>	<b>16.6%</b>	<b>5.2%</b>	<b>65.7%</b>
Other countries	14.5%	18.2%	15.3%	51.9%
<b>Total</b>	<b>10.6%</b>	<b>18.9%</b>	<b>3.1%</b>	<b>67.4%</b>

Source: Authors' calculations using Bureau Van Dijk's ORBIS database.

The distribution of companies according to the type of FDI activity is influenced by the choice of the threshold for vertical links. To assume that two industries at the NAICS 6-digit level have vertical links



(i.e. to assume that one is providing an essential input for the production of the second one), we look at the total input requirements calculated by the Bureau of Economic Analysis in the 2002 Benchmark I-O table. This total input requirement indicates the direct and indirect value of the output of industry  $i$  used to produce one dollar of output in industry  $j$ , where  $i$  is an input supplier to  $j$ . A 1 percent threshold means that we consider  $i$  to be an input supplier of  $j$  only when at least 1% of the value of 1 dollar of output produced by  $j$  requires input  $i$ . If the value of the input of industry  $i$  in  $j$  is less than 0.01 dollars, then there is no vertical relationship between  $i$  and  $j$ .

Table 19 below shows how our results are sensitive to the minimum total requirement applied in the input-output table. For a 1 percent threshold, we have more vertical affiliates than for a 3 percent or 5 percent threshold. The lower the input requirement, the more vertical links are identified between the 6-digit codes and the higher the number of “vertical” affiliates in our dataset. The number of horizontal affiliates slightly diminishes when a lower threshold is applied because of “complex FDI” (affiliates with both horizontal and vertical links with the parent company). However, horizontal FDI is by definition less sensitive to the choice made regarding the input-output matrix.

**Table 19. Number of affiliates by type of FDI - Sensitivity analysis**

	Threshold = 0.01		Threshold = 0.03		Threshold = 0.05	
	Number of subsidiaries	Percent	Number of subsidiaries	Percent	Number of subsidiaries	Percent
Horizontal	14,417	10.6%	15,485	11.4%	15,787	11.6%
Vertical	25,688	18.9%	16,002	11.8%	12,473	9.2%
Complex	4,197	3.1%	3,617	2.7%	3,411	2.5%
Neither/not identified	91,377	67.3%	100,575	74.1%	104,008	76.7%
<b>Total</b>	<b>135,679</b>	<b>100.0%</b>	<b>135,679</b>	<b>100.0%</b>	<b>135,679</b>	<b>100.0%</b>

Source: Authors' calculations.

Another difference with the results from Alfaro and Charlton (2009) in our analysis is the high number of subsidiaries in the “neither category”. We have included in this category the cases where we lack some data on the ultimate owner or industry of the parent company and where the FDI motives cannot be identified. But these observations are few (about 6%). There are also cases where the vertical relationship between the parent company and the affiliate is not counted because the parent company has another affiliate in the country in a downstream industry (and it is assumed that the production of the first affiliate is sold to this second one). About 8% of the subsidiaries are in this category (for a threshold of 0.01). We are therefore left with about 50% of subsidiaries that are not in a vertical or horizontal relationship with their parent company.

There are several possible explanations for this. First, we work with only two industry codes per affiliate as opposed to up to six in the case of Alfaro and Charlton. Taking also into account that our industry codes are at the 6-digit level, this will naturally lead to fewer subsidiaries identified as being horizontal or vertical. For example, if a parent company is well diversified in several sub-sectors, we will capture only its primary or secondary activity while its affiliate can be in a vertical relationship for a third activity not reported. For robustness checks, we also carried out the analysis at the NAICS 4-digit level but did not observe a particularly strong decrease in the number of affiliates in the “neither” type. We have slightly more horizontal and vertical affiliates but the results are not significantly changed.

Another explanation for the high number of subsidiaries that are neither horizontal nor vertical comes from the fact that the analysis assumes that the affiliate is in an upstream industry and provides an input to the parent company. In practice, the parent company is not always the final goods (or service) producer. Some parent companies can be input suppliers and have the final good/service produced by an affiliate. Many subsidiaries are also created for distribution purposes and the vertical relationship is the opposite, the affiliate provides retail services and is in the downstream industry. By inverting the input-output relationship, we can identify about 13% of subsidiaries as being vertical in a downstream industry.

For the remaining subsidiaries, there are still unanswered questions. We cannot rule out issues related to data collection and identification of industries. As different sources are used by Bureau Van Dijk to build the ORBIS dataset, different rules may be applied to determine the industry (not mentioning classification issues). An obvious explanation however is that by looking only at the ultimate owner and the affiliate, we miss the complexity of ownership structures in the organisation of multinational firms. MNEs resemble more like networks of companies, also influenced in their structure by tax laws and this is not clear that through information on the direct owner and ultimate owner we can fully capture the links between the different companies and accurately distinguish between vertical and horizontal FDI motives. FDI can also be motivated by the acquisition of strategic assets and “conglomerates” that invest in unrelated industries, thus creating a richer landscape of FDI motivations. In such cases, we clearly miss the nuances in the simple relationships assumed and investigated with the methodology presented in this annex.

Lastly, we can compare the estimates from ORBIS with the data from the Bureau of Economic Analysis for goods imported by US parent companies. Table 20 below shows that for total imports the range of intra-firm trade values estimated is consistent with the hard data. But a more careful look shows that this average result is achieved through a series of overestimation and underestimation of intra-firm trade flows according to the country of the affiliate. The following pattern can be observed: for countries where we were able to identify many affiliates and for which data are quite extensive in ORBIS (e.g., Germany, France, the Netherlands and the UK), the trend is to overestimate intra-firm trade flows. The assumption that all the sales of any vertical affiliate are shipped back to the parent company is certainly leading to this overestimation, as goods manufactured can also be sold to domestic producers (in the country of the affiliate) or shipped to a third-country where the US parent has another affiliate. For countries where few affiliates were identified because of a lack of ownership data (e.g., China, Japan and Switzerland), Table 20 shows on the contrary an underestimation of US imports.

As previously highlighted, the threshold for vertical links matters a great deal in the estimation of the intra-firm trade flows. In the case of US parents, the 3 percent threshold is the one that seems to lead to the most accurate estimation for total imports. And since we use US input-output data, the vertical links are also expected to match closely the imports measured. However, even with the lowest threshold (1 percent, used for the lower end estimation), we still observe an overestimation for countries such as Germany, France, the Netherlands or the UK. Thus, it does not seem that we can improve the methodology by fine-tuning this threshold. A better identification of industries where intra-firm trade is expected might be a better avenue for improvement, in particular to take into account some of the determinants of intra-firm trade described in Section 3. We can also expect better results using the next update of ORBIS with more information on ultimate owners and industries of foreign affiliates.

**Table 20. Comparison between BEA data and ORBIS estimates for intra-firm imports of US parents (2006)**

Country of the affiliate	<i>Goods shipped by affiliates to US parents (BEA)</i>	<i>Estimates from ORBIS</i>	
	(Mill. USD)	Low	High
<b>OECD members</b>			
Australia	2,198	1,845	3,235
Austria	242	78	78
Belgium	2,295	3,939	36,395
Canada	78,702	7,860	45,414
Chile	329	1,677	1,682
Czech Republic	219	1,290	1,818
Denmark	207	2,646	3,044
Finland	345	172	172
France	4,723	6,869	32,833
Germany	5,272	19,650	32,545
Greece	2	471	802
Hungary	Not disclosed	36	65
Ireland	18,497	287	11,312
Italy	1,777	7,429	13,496
Japan	1,402	85	298
Korea	2,225	1,271	2,927
Luxembourg	Not disclosed	-	-
Mexico	38,173	4,150	21,327
Netherlands	3,997	48,508	64,289
New Zealand	59	87	116
Norway	434	75	304
Poland	220	2,756	5,050
Portugal	97	1,493	1,558
Slovak Republic	Not disclosed	100	596
Slovenia	Not disclosed	9	9
Spain	658	15,711	19,776
Sweden	4,434	1,667	1,938
Switzerland	3,811	1,940	2,950
Turkey	76	-	-
United Kingdom	12,094	20,088	40,863
<b>Other major economies</b>			
Argentina	653	641	1,311
Brazil	2,027	9,232	12,818
China	4,605	1,383	3,260
Estonia	Not disclosed	5	5
India	415	151	496
Indonesia	192	-	-
Israel	Not disclosed	-	-
Russian Federation	1	142	1,602
South Africa	362	1	65
<b>Total</b>	<b>237,583</b>	<b>168,733</b>	<b>407,602</b>

Source: Bureau of Economic Analysis and authors' calculations from Bureau Van Dijk's ORBIS database.

#### ANNEX 4 – DETERMINANTS OF INTRA-FIRM TRADE: THEORY, EMPIRICS AND ESTIMATION STRATEGY FOR REGRESSION ANALYSIS

##### *Theoretical models - Incomplete contracts and the hold-up problem*

Antràs (2003) assumes that the final goods producer and the supplier share the capital investment required for the production of an intermediate input, while the supplier provides additionally all of the labour required. If the production of the intermediate is capital-intensive, the final goods producer will therefore decide to produce it in-house, *i.e.* to integrate with the supplier, because he has to shoulder the burden of a large share of the investment. On the other hand, if the production of the intermediate is labour intensive, the final goods supplier will choose to outsource the production to the supplier, because the latter needs to be given incentives to invest. Antràs (2003) embeds this property rights approach in a factor proportions model in which production and trade are determined by comparative advantage in production factors, *i.e.* capital abundant countries will export relatively more in capital intensive industries. Hence, Antràs (2003) predicts that the share of intra-firm imports in total imports is higher for capital intensive industries (due to the hold-up problem) and from capital abundant countries (due to the comparative advantage pattern of trade).

In the model of Antràs and Helpman (2004), the production of a final good requires an intermediate input which is provided by a supplier and headquarter services which are provided by the final goods firm itself. Their model explains how final goods firms of different productivity levels choose between the four sourcing strategies of intermediate inputs outlined in Figure 1, *i.e.* domestic in-house production, domestic outsourcing, vertical FDI and offshore outsourcing.

In particular, they assume that final goods firms face two different trade-offs with respect to the supply of inputs. The first one is related to the location of the production of the input. Either the input is produced at home where variable costs are high but fixed costs are low, or the input is imported from a country where variable costs are lower (for example from a developing country with lower production costs) but fixed costs are higher (the costs associated with international offshoring). In particular, the model predicts that only firms with high productivity will offshore the production of the input to a foreign country because only these firms are able to overcome the higher fixed cost associated with offshore-outsourcing and vertical FDI compared to domestic in-house production and domestic outsourcing.<sup>27</sup>

The second trade-off deals with the integration or outsourcing decision. Once a final goods firm has decided to offshore the production of the input, it then has to choose whether to import the input from an independent supplier (offshore outsourcing) or from an affiliate (vertical FDI). Outsourcing entails lower fixed costs (setting up the relationship with the independent supplier) but a larger fraction of the revenue will be given to the supplier because his property rights over the input increase his bargaining power. On the other hand, integration leads to higher fixed costs (the investment costs) but now the final goods firm has more bargaining power and is able to capture a larger share of the revenue. The driving force for the decision between integration and outsourcing is the strength of the hold-up problem each party faces.

If sectors are component-intensive (inputs are more important for profits than headquarter services), the supplier needs to be given more incentives not to underinvest in the first place. Hence, final goods firms will choose outsourcing and firms will not vertically integrate. On the other hand, in a sector

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27 . Firms with higher productivity will be bigger and make higher profits allowing them to cover higher fixed costs

intensive in headquarter services<sup>28</sup>, the headquarter services of the final goods firm are more important for profits than the input of the supplier. Hence, efficiency dictates that more incentives to invest are given to the final goods firm than to the supplier. However, not all final goods firms will choose vertical FDI as compared to offshore outsourcing. In particular, only the most productive firms will choose vertical FDI because only they can face the high fixed costs implied by this choice.<sup>29</sup>

Summarising, Antràs (2003) and Antràs and Helpman (2004) provide predictions of intra-firm trade at the product (industry) level: integration and hence intra-firm trade will be more prevalent in capital and headquarter intensive industries<sup>30</sup>, because the relationship-specific investments of parent firms are higher in these industries.

The contracting environment is crucial in these models since the hold-up problem arises only if it is not possible to specify all details in a contract or if contracts are not enforceable. If the writing of contracts is complete, there is no need for integration. Predictions regarding improvements in the contracting environment differ across models. For instance, Grossman and Helpman (2003) argue that a better contracting environment increases outsourcing relative to vertical integration since less investment tasks are left to the discretion of the supplier. On the other hand, in Antràs and Helpman (2008) an improvement in the contracting environment can increase either intra-firm or arm's length trade, depending on whether the investment undertaken by the final goods producer or by the supplier benefits more. If relatively more contractual details can be specified regarding the headquarter services provided by the final goods producer, then arm's length trade will increase because the final goods producer is affected less by the hold-up problem. On the other hand, if the input provided by the supplier experiences an increase in contractibility, the supplier needs fewer incentives compared to the final goods producer and hence integration and intra-firm trade will increase.

#### *Empirical findings on the determinants of intra-firm trade*

Given the scarcity of data on intra-firm trade, few empirical papers exist on the topic. Only recently some papers have used either firm level data (Jabbour, 2008; Corcos *et al.*, 2009; Marin, 2006) or trade data on intra-firm imports from the US Census Bureau (Bernard *et al.*, 2010; Nunn and Trefler, 2008; Costinot *et al.*, 2009; Lanz, 2010) to test the predictions of new trade models. Box 4 summarises the results of a survey based on French firm-level data.

Bernard *et al.* (2010) and Nunn and Trefler (2008) find that intra-firm imports are higher in both capital and skill intensive industries confirming predictions from Antràs (2003) and Antràs and Helpman (2004). Similarly, Yeaple (2006) finds that the R&D intensity of the industry increases the share of intra-firm imports of US parents in total US imports from emerging and developed countries and Marin (2006) shows that the R&D intensity of German parent firms increases the probability of integration relative to outsourcing as sourcing strategy from Eastern Europe.

Using a firm level dataset for French firms, Corcos *et al.* (2009) find that highly productive, capital-, skill- and headquarter-intensive firms are more likely to engage in intra-firm trade. However, in contrast to Bernard (2010) and Antràs (2003), Corcos *et al.* (2009) find that French firms are more likely to engage in intra-firm imports from capital-scarce countries. These different findings highlight that firms in different

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28 . In the model, only inputs can be offshored but not headquarter services.

29 . The model predicts the following order of sourcing strategies depending on the productivity of firms: domestic outsourcing (firms with lowest productivity), domestic in-house production, offshore-outsourcing and vertical FDI (firms with highest productivity).

30 . Headquarter intensity is typically proxied with skilled labour intensity.

countries do not necessarily follow the same patterns of intra-firm trade and that the firm and not the industry is the appropriate level of disaggregation to explain trade decisions.

Most of recent empirical research has shown that intra-firm trade increases if products (industries) are more complex or more difficult to contract. Building on the Rauch (1999) classification, Corcos *et al.* (2009) find that higher product complexity increases the likelihood of intra-firm sourcing. Costinot *et al.* (2009) find that the share of US intra-firm imports is higher in less routine sectors. Bernard *et al.* (2010) use a new index of revealed product contractibility based on the degree of a good being imported by wholesale traders. They find that the share of intra-firm imports is lower for products that are easy to contract and that this effect is more pronounced for countries with weak governance. In other words, if a product is difficult to contract, relatively more imports will be intra-firm, especially from countries with weak governance. In contrast, Nunn and Treffer (2008) find that intra-firm imports are higher in relationship-specific industries from countries with a strong rule of law. According to the property rights model of Antràs and Helpman (2008), this would imply that an improvement in the contracting environment affects primarily the investment undertaken by the supplier and that therefore more incentives need to be given to the final goods producer increasing integration.

Using intra-firm trade data of Austrian MNEs, Egger and Pfaffermayr (2005) find that market size and unit labour costs are significant determinants of intra-firm exports, as predicted by the Knowledge Capital Model (Markusen, 2002). Hanson *et al.* (2005) analyse vertical production networks by assessing the determinants of intra-firm exports of intermediate inputs from US parents to their foreign affiliates. They find that low trade costs, low wages for unskilled workers and a small host market increase the share of intra-firm trade in the revenues of affiliates. On the other hand, low wages for skilled workers decrease the share of intra-firm trade.

#### **Box 4. Firm-level evidence on intra-firm trade: the French intra-group trade survey**

In 1999, the French ministry of economy conducted a survey on the international activities of French firms and their intra-firm trade ("Enquête sur les échanges intra-groupe"). The survey covers 4,305 firms representing 55% of French imports and 61% of French exports. Firms had to report the share of their international transactions conducted with affiliates and partners (related parties) on the one hand, and independent suppliers on the other hand. The results were the following: 68% of the transactions of French firms are with third-parties (arm's length trade), while 32% are intra-firm. The 32% of intra-firm trade transactions can be further decomposed into 29.9% with affiliates in developed countries (mainly in the EU and the US) and 2.1% with affiliates in developing countries.

Answering questions on the motivations for intra-firm trade, French firms rank first quality control of the production process and second reduction in organizational costs. The third motivation is stability in supply at a lower cost. For 80% of intra-firm imports, the same products are not produced in France by the firm.

On the basis of these firm-level data, Jabbour (2008) provides an econometric analysis of the determinants of intra-firm trade. The results indicate that capital intensity at the firm level is positively associated with FDI over outsourcing, as predicted by theory. As in Antràs and Helpman (2004), the decision to outsource or vertically integrate depends on the hierarchy of fixed costs and firms heterogeneity. However, the survey finds that the organizational costs associated with FDI are lower and as a consequence the most productive firms engage in outsourcing rather than vertical integration. Moreover, the influence of relationship-specific investment on the organizational form of firms is confirmed, as well as the prevalence of vertical integration in activities intensive in headquarter services.

Source : Jabbour (2008).

*Estimation strategy and data used in regression analysis*

The estimation strategy that we use to assess the determinants of intra-firm trade follows closely Bernard *et al.* (2010). Probit regressions are used to assess the extensive margin of intra-firm trade, *i.e.* whether there is intra-firm trade or not. In probit regressions the dependent variable takes the form of a dummy  $D_{pi}$  that is one if there is intra-firm trade between the US and the exporting country  $i$  in HS6 product  $p$ . If no intra-firm trade is observed, the dummy is zero. The intensive margin of intra-firm imports relates to the volume of intra-firm trade relative to total trade and is assessed using OLS regressions. The dependent variable is the share  $S_{pi}$  of US intra-firm imports (exports) in total US imports (exports) of HS6 digit product  $p$  from country  $i$ . The estimation specification used for both Probit and OLS regressions is the following:

$$y_{pi} = c + \alpha_1 \text{intermediation}_k + \beta_1 \text{RuleofLaw}_i + \alpha_2 \text{capital}_k + \beta_2 K/L_i + \alpha_3 \text{skill}_k + \beta_3 H/L_i + \beta_4 \text{Population}_i + \beta_5 \text{TradeCosts}_{k,i} + \beta_6 \text{InvestmentCosts}_i + \gamma(X_k X_i) + \varepsilon_{pi}$$

The dependent variable  $y_{pi}$  denotes respectively either  $D_{pi}$  or  $S_{pi}$  for the year 2006 depending on whether Probit or OLS regressions are used.  $c$  is a constant;  $X_k X_i$  are interaction terms of industry  $k$  and country  $i$  characteristics and  $\varepsilon_{pi}$  denotes the error term. Following predictions of Antràs (2003) and Antràs and Helpman (2004), capital intensity  $\text{capital}_k$  and skilled labour intensity  $\text{skill}_k$  of industry  $k$  are included to proxy for headquarter intensity. Using data from the NBER-CES Manufacturing Industry Database for the year 2005,  $\text{capital}_k$  is the natural log of the total real capital stock per worker and  $\text{skill}_k$  is the share of non-production workers in total employment. While intra-firm trade shares are observed at the HS6 product level  $p$ , capital and skilled labour intensity are only available at the NAICS6 industry level  $k$ . To account for this difference in aggregation between dependent and explanatory variables, we estimate standard errors clustered at the NAICS6 level. The variable  $\text{intermediation}_k$  is the contractibility index of Bernard *et al.* (2010) at the HS2 level.  $\text{RuleofLaw}_i$  is an indicator taken from the World Bank Worldwide Governance Indicators 2009 and measures the quality of the rule of law, which comprises the quality of contract enforcement, of country  $i$  in the year 2006. Data on endowments of capital  $K/L_i$  and human capital  $H/L_i$  of country  $i$  are taken from Hall and Jones (1999) and are measured by the natural logs of the capital stock per worker and the human capital stock per worker for the year 1988. From the World Development Indicators 2010, the natural logarithm of the population of country  $i$  ( $\text{Population}_i$ ) is used to measure country size. To capture trade costs ( $\text{TradeCosts}_{k,i}$ ) and investment costs ( $\text{InvestmentCosts}_i$ ) two measures are used in each case. In one specification, following Bernard *et al.* (2010), restrictiveness indices of trade ( $\text{hfi\_trade}$ ) and investment ( $\text{hfi\_investment}$ ) taken from the Heritage Foundation Economic Freedom Indices are used. In the second specification, bilateral trade costs are calculated on the basis of the ratio of domestic to international trade using the methodology proposed by Novy (2010), while investment costs are captured using the OECD FDI regulatory restrictiveness index.