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Changing Patterns of Trade in Processed Agricultural Products

Pete Liapis

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Abstract

CHANGING PATTERNS OF TRADE IN PROCESSED AGRICULTURAL PRODUCTS

by

Pete Liapis

Trade in processed products, such as chocolates, steaks or wines, is dominated by high income OECD countries, although it is slowing down between these countries while growing very fast between emerging economies. Low income countries, however, account for a small share of such trade. Countries with a revealed comparative advantage in the processed agricultural markets are mostly high income countries and capture the majority of the trade, while many low income countries have a comparative advantage for other agricultural products. This study describes the patterns of trade, examines which countries have a comparative advantage and how this may have changed over time, analyses the level of productivity of countries' export basket and its contribution to income, and determines whether trade has increased at the extensive or intensive margins. This study uses the gravity framework to gain a better understanding of the underlying factors for the international trade of products.

Keywords: Agricultural trade, processed agricultural products, comparative advantage, PRODY, EXPY, intensive margin, extensive margin, gravity framework, tariffs, trade facilitation.

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Executive Summary

This report examines agricultural trade flows with a focus on processed products, which represent the largest share of agricultural trade. Agricultural trade has expanded substantially over the 1995-2008 period reviewed in this report but not as fast as total merchandise trade, resulting in a diminishing share of total world trade.

High income OECD countries dominate trade in agricultural products, especially processed products. The value of trade is very much influenced by whether the data includes trade among the EU member states. EU countries are substantial traders of agricultural products and more specifically processed products. When intra-EU trade is excluded the value of overall agricultural trade and the share of processed products of that trade are lowered. Intra-EU trade is excluded when computing revealed comparative advantage and the intensive and extensive margins so results need to be interpreted with this in mind.

Many emerging economies, including the group of OECD enhanced engagement countries of Brazil, China, India, Indonesia and South Africa, are increasingly competitive in world markets. Trade is expanding much faster in these countries and their market share is increasing. The growing importance of emerging economies in world agricultural trade is also manifested through changing bilateral trade patterns. Trade among high income countries is slowing while trade among emerging economies is growing very fast. Agricultural exports from low income countries are also increasing rapidly but from a very low base. Low income countries account for a very small share of trade in agricultural and processed products.

In general, trade in processed products is highly concentrated with relatively few exporting countries capturing a dominant share of the market. For example in 2007, exports of processed products from 123 countries contributed less than 1% to the world total of those products while the 20 leading exporters contributed almost three-fourths of the total (81% if intra-EU trade is included). The countries that are most competitive vary by product. For example, there are relatively few, mostly high income countries and emerging economies from South America that have a comparative advantage in the export of fresh or chilled meats.

Import concentration is somewhat lower but again a relatively small number of countries account for most of the demand. At the product level, of the more than 250 traded processed product categories examined in this report, most of the demand was concentrated on a relatively small number of goods. Imports of processed products are growing fastest among emerging economies. Economic growth, rising incomes and growing populations, along with a shift towards more open markets, have contributed to expanded import demand across a wide spectrum of countries.

Those exporting countries capturing the bulk of market share have a revealed comparative advantage in processed products (as measured by the Balassa's index). However, individual firms can still find and exploit niche markets, exporting around the

world whether or not the industry, at the country level, has an overall comparative advantage. Comparative advantage at the individual product level is found across the whole spectrum of countries even those without an overall comparative advantage. But even though most countries export a sizeable number of products, they have comparative advantage in few and those products are responsible for the majority of their export earnings.

Countries with comparative advantage in processed products can be found across the whole income spectrum, but most of the countries with large market share are high income, developed countries. A large proportion of high income OECD countries have a comparative advantage in processed products. Countries with comparative advantage not only export greater volumes, they also export a greater variety of products offering their customers greater choice while also servicing more partners. There are many low income countries with a comparative advantage in agriculture but few have a comparative advantage with respect to processed products.

Comparative advantage is linked to the productivity level of a country's export basket. The results indicate that the productivity level of a country's export profile positively affects income growth. A 10% increase in productivity level of an export basket of processed products increases income by 0.04%. For lower income countries, this implies that policies promoting productivity gains while also developing an export profile resembling the export basket of wealthier countries promote growth.

A large number of enterprises around the world are engaged in the production of processed products (Food Beverages and Tobacco (FBT), employing millions of workers outside the agricultural sector. Even though trade in these products is expanding fast, most of the production is for local consumption. Many of the most productive enterprises with highly productive labour and most of the output however, are located in high income OECD countries contributing to their general comparative advantage. The average employee in high income OECD countries is at least three times more productive than workers in other countries. High income OECD countries are the world's largest net suppliers of these products. Most of the labour engaged in producing FBT is found in developing countries but their productivity is rather low.

Recently, empirical international trade literature has focused attention on export diversification and whether this is an additional means to generate increased export earnings and growth. Rather than focusing only on trade intensity - how much is exported - product innovation and export diversification, that is, the extensive margin and impacts on trade growth is becoming important. In this study three alternative methodologies to measure the intensive and extensive margin are used to provide robust results.

Using a particular definition of the intensive and extensive margin from Hummels and Klenow (2005) which is a relative measure, and is calculated for total exports rather than for bilateral trade, the results suggest that high income countries export relatively more than low income countries and most of the additional exports are at the intensive margin; that is, they export higher volumes. Exports from higher income countries are also generally more diverse, exporting a larger variety of goods to more trade partners, so exports at the extensive margin are also important. Economies with more productive agricultural labour force export higher volumes but also export higher quality goods, thus receiving a price premium even as they export greater volumes. For economies with a larger labour force, generally the emerging economies, export growth often comes with a slight price discount; that is, moving down the demand curve. Among countries within

the same income classification, those with an overall comparative advantage in processed products export, on average, a larger variety of goods to more partners in addition to larger volumes. They generally appear to export relatively more at the extensive margin. The significance of the extensive margins suggests that diversification, exporting a greater variety of products to more markets, is an important contributor to increasing export revenue of higher income countries.

Trade facilitation, fewer documents, speedier custom and other procedures and lower administrative and other fees to prepare a consignment to cross borders and lower corruption should improve firms export potential. Hummels and Klenow methodology was expanded to assess the impact of these variables on exports of processed products along the respective margins. For exporting processed products, the results indicate that except for time delays the other trade facilitation variables did not materially affect exports. That processed products are time sensitive may not be a surprise as the grouping includes items such as fresh dairy and meat products. The results suggest that time delays reduce exports, mostly at the extensive margin, reducing the variety of goods exported. At the intensive margin, time delays result in lower prices (14% to 20%) perhaps reflecting quality deterioration, without affecting the export volume. Clean governments enable firms to increase their exports almost equally along the intensive and extensive margin. A 10% increase in cleanliness expands exports from 8% to 21% depending on how economic size is measured and firms receive higher prices.

The second approach to measuring the intensive and extensive margin is more descriptive. The change in the export basket of each of the 55 largest exporters between 1997 and 2007 is distributed between growth in the intensive margin and growth in the extensive margin. Furthermore, the extensive margin is decomposed into four categories distinguishing growth in new products and partners. The results confirm those of the previous method that most of the growth is in the intensive margin. But the extensive margin contributed some 25% of overall export earnings while for some countries the extensive margin contributes an even greater share. For high income OECD countries that were exporting most products to most destinations in 1997, the bulk of the growth in exports is in the intensive margin. Within the extensive margin, most of the growth is from shipping existing products to traditional partners.

The gravity model among the most widely used frameworks in empirical international economics was also employed to examine the intensive and extensive margins and the determinants of bilateral trade. The gravity framework is a useful device to gain understanding why processed products trade across national borders. Employing various techniques, information is provided on trade intensity, how much is traded, and trade diversity why country pairs trade (or not) along with an empirical estimation of bilateral trade disaggregated into an intensive and extensive margin. Results are provided for aggregate bilateral trade in all merchandise, all agricultural and processed products. Results are also provided for estimates based on trade in individual processed products.

For the traditional gravity variables; incomes, distance, cultural and geographic characteristics, results conform to expectation and findings from other studies. Many of the factors that influence the amount traded and the probability of trading are outside policy-makers control however. Bilateral trade in processed products is anywhere from 88% to 184% higher for countries sharing borders and have a higher probability of trading more diverse export basket than others while firms from landlocked countries trade anywhere from 8% to 86% less and have a lower probability of establishing new trading relationships. Cultural ties whether through language or historical colonial

relationships boost bilateral trade anywhere from around 29% to more than 200%. In each case, most of the trade is in the intensive margin with the extensive margin contributing a small share, a result consistent with the other findings.

Policies that promote productivity gains that lower costs including for transport and policies that liberalise trade through lower tariffs also influence bilateral trade in processed products. A 10% decrease in transport costs (distance) expands trade from 2% to 18%. The trade facilitation variables examined have a mixed effect on the bilateral trade in processed products, a finding consistent with the Hummels and Klenow methodology. In the various specifications time delays provided the most robust results while differences among countries in the other variables did not provide consistent results on their effects on trade. With the gravity specification and for aggregate rather than trade of individual products, time delays in exporting countries significantly lower bilateral trade for all merchandise, all agricultural and all processed goods. In contrast, time delays in importing countries do not have significant effects on the bilateral trade of processed products. Policies that speed-up the clearance process expand trade. A one day reduction in time delays in the median country increases all merchandise exports by 9% (5%) when the reduction is in the exporting (importing) country. For processed products whether as a group or for individual products, time delays are more relevant when delays are reduced in exporting countries. The fragility of the trade facilitation variables other than time delays in explaining trade may be the result that they are not specific to any group of products; rather they are averages for all merchandise trade. Better governance through lower corruption also facilitates trade, and for processed products, it seems more relevant for the trade of specific products.

A country's applied tariffs directly affect bilateral trade and seem to also indirectly amplify the negative effects on trade through effects on transport cost (distance), corruption and time delays. Lowering applied tariffs as expected, increase trade, with a 10% reduction increasing bilateral trade by 4%. This may be a reflection of the liberalisation that has occurred following the full implementation of the URAA and the proliferation of preferential trade agreements both of which have lowered tariffs and these are reflected in the applied tariffs used for the analysis. It is difficult to judge the appropriate magnitude of the trade liberalising effect of lower tariffs. Some studies for agricultural products, none at this level of detail, report insignificant effects. Results also indicate that policies promoting productivity gains enabling firms to expand exports and lower prices expand trade. The results show that countries with export baskets containing goods with high productivity have higher income growth and countries with high income trade more and have a more diverse trade basket implying a virtuous cycle of higher income growth and trade.

The results are useful for at least two reasons. Countries, interested in export-led growth in addition to promoting policies fostering their comparative advantage may also want to pursue policies that facilitate product diversification and innovation. A diversified export basket may minimize variability of export earnings from external shocks. Creating new or higher quality products and developing new trading partners can spur productivity and economic growth. These results are also useful for determining types of models for policy analysis that correspond closer to the trade data. The extensive margin, contributes a sizeable share to overall exports of processed products. Models that exclude this avenue of trade growth will underestimate welfare impacts of trade reform. For exporting countries, they may be less vulnerable to deteriorating terms of trade if they are exporting higher quality products. For importing countries, welfare gains from greater variety may be understated.

Introduction

Until the recent financial crisis and the subsequent collapse in world merchandise trade, trade in agricultural products increased smartly, driven by increasing incomes, enlarged population, lower transport costs, and greater market access as the implementation of the Uruguay Round Agreement on Agriculture (URAA) opened markets. Between 1995 and 2008, agricultural exports more than doubled from USD 464 billion to somewhat more than USD 1 trillion[1]. A key driver is the trade expansion of higher valued processed products. International trade in agricultural products and food is increasingly shifting towards high-value products. Exports of processed agricultural products during the 1995 to 2008 period grew from USD 212 billion in 1995 to USD 492 billion in 2008. Processed products account for almost one-half of the value of international agricultural exports, even with the higher primary commodity prices that manifested in 2007-08. A country's ability to perform successfully as a participant in agricultural and food trade may depend more and more on the way it integrates into the processed product sectors. Furthermore, increasing exports of processed products has the potential to expand employment and income opportunities beyond the farm gate.

Firms that are engaged in exporting tend to be larger, more productive and more efficient than firms in the same industry that do not export. Exports can grow as firms export more and/or at higher prices for the products they've been producing to their existing partners (the intensive margin). Exports can also grow through market development as firms export their existing products to new partners or through innovation, developing new products and exporting them either to existing partners or to new markets (the extensive margin). At the intensive margin, higher volumes can be a reflection of higher prices evidencing higher quality, and/or by higher quantities. Increasing exports through higher volumes, at the intensive margin, can be an indication that a country is making the most of its comparative advantage and firms in those industries are exploiting economies of scale and are becoming more efficient. A potential downside is that overly relying on a fixed set of export goods may lead to declining export prices from the expanded supply along with increased volatility from exogenous shocks. In this light, a diversified export basket is presumed to minimize the variability of export earnings while reducing the potential for declining terms of trade while encouraging innovation. Creating new or higher quality products and developing new trading partners, can spur productivity and economic growth. But there is information and other learning costs to exporting as firms have to understand the various destination markets, tailor their products to satisfy local norms, ship over greater distances, and overcome custom and other administrative costs. The benefits are increased profitability for the firms and higher employment and other social benefits for the home country. For the importing countries, lower prices, additional availability and variety increase consumer welfare.

This distinction on how exports may grow has only recently received attention in the literature. In examining export patterns it is not only useful to identify the countries that have comparative advantage in producing and exporting processed products, but also to account whether export growth has occurred at the intensive margin (higher volumes of a given set of goods), or the extensive margin (exporting more products and developing new trading partners).

1. Trade data in this section of the report includes trade among EU members.

The distinction between specialisation and diversification is not an either or option. Literature suggests that diversification has an inverted U-shaped relationship with income. Diversification increases with income until income reaches a level comparable to the low-end of high income countries, after which diversification declines (Cadot, Carrère and Strauss-Kahn (2008). There is probably an optimum mix of specialisation and diversification for any country. This is beyond the scope of the paper. The project will shed light on how diversified (across the product and partner space) a country's export basket is, and which countries have comparative advantage (and try to look at the correlation between them), but will not attempt to identify the optimum mix.

This paper is divided into three parts. The first part focuses on monitoring recent trends in the trade of processed agricultural products and examines the leading exporting and importing countries of processed products and which products are most heavily traded. Information is also provided on the value of output, the number of firms and employment in processed products (food beverages and tobacco) sector. The second part examines which countries have a comparative advantage in exporting processed products along with the relevant products, and how these may have changed over time. Utilising information on comparative advantage and the methodology from Hausmann, Hwang and Rodrik (2007), the study assesses whether a country's export basket matters in generating growth. The third part examines trade decomposing into the intensive (more trade) and the extensive (more variety) margins using different methodologies. As in Liapis (2009), the first approach is cross sectional analysis utilizing Hummels and Klenow (2005) methodology to explain any differences in the export structure of processed products between small and large countries and quantify the relationship between a country's economic size and the contribution of the intensive and extensive margin to its overall exports of processed products. This is a follow-up to previous work that examined the contribution of the intensive and extensive margin to exports of all agricultural goods and will examine with a larger sample size and more recent trade data whether there is a difference between the contribution of the intensive and extensive margin for overall agricultural trade and trade in processed products. Furthermore, as in the earlier study (Liapis, 2009), the study will quantify the relationship between a country's size and whether its intensive margin consists of higher quality processed products (as manifested in higher prices), or larger volumes, or both or neither. In addition to the cross sectional, static, analysis, a dynamic analysis of each margin's contribution to overall export growth and for individual countries and products is examined. Finally, using a gravity specification, estimates of determinants of bilateral trade in processed products, including selected trade facilitation variables, along with corruption and tariffs are provided.

What agricultural products are considered processed?

Agricultural commodities consist of many different products, from very basic commodities requiring little if any modification for their consumption to highly complex and processed products. This distinction implies that agricultural products can be separated into those products that are closely dependant on climatic conditions for their production from those that are less dependent on climate and more on labour capital and innovation to transform raw agricultural products into processed (food beverages and tobacco) products that are closer to the consumer's kitchen table. Agricultural products therefore are often classified into raw and processed products. A country's overall competitiveness and ability to export different types of raw agricultural products depends upon its innate natural resources, as well as on land, labour capital and climatic conditions.

Products with a relatively high dependence on land availability and climatic conditions have been referred to by Regmi *et al.* (2005) as land-based agricultural products. Other agricultural products (with a higher degree of processing) termed "foot-loose" on the other hand can be produced almost anywhere with imported raw products, technological knowhow and competitive labour and capital.

In order to simplify the presentation, the commodity composition of agricultural trade has been segregated into four broad sub-sectors following Regmi *et al.* (2005). These categories are two land-based sectors; (1) bulk commodities such as wheat or coffee, (2) horticultural commodities such as bananas, tomatoes, or cut flowers, and two foot-loose sectors; (3) semi-processed commodities such as wheat gluten, oilseed cake or vegetable oils, and (4) processed products, i.e. goods that require extensive transformation and are much closer to the consumers kitchen table, such as chocolates, beverages, and fresh or chilled meats.[2] This classification is primarily based upon the relative dependence of production upon land and climatic conditions. While products in the first two categories depend disproportionately on land availability, geography and climatic conditions, those in categories 3 and 4 are less dependent upon those factors, undergo some transformation prior to their final use and in principle, can be produced almost anywhere. Some may question whether live animals belong to the semi processed category. This choice was made because live animals often require purchased feed which can be sourced from anywhere. Clearly the share of purchased feed depends on the animal and production technology across the various countries. The focus of this paper is on processed products as defined in Regmi *et al.* Although one can debate about the degree of transformation required to classify a product as processed rather than semi processed, there are no adjustments to the scheme proposed in Regmi *et al.*[3]

2. See the Appendix for the HS concordance of the four categories.

3. See Regmi *et al.* (2005) for more details on the rationale for the product classification scheme.

Data

Trade data for this report are from Centre d'Etudes Prospectives et d'Informations Internationales (CEPII). The International Trade Database at the Product Level (BACI) starts with the UNCOMTRADE data and then treats the data to reconcile the declarations of exporters and importers. It thus expands the country coverage reported in the original COMTRADE data, converts the data into common quantity units and calculates unit values from that data while providing a more complete picture of international trade (see Gaulier and Zignago (2009) for details).

An alternative source is the untreated data form UNCOMTRADE. Trade data in both sources include trade among EU members. As an example of the differences between the two data sources, in 1995, agricultural exports from UNCOMTRADE data accessed through the World Bank's World Trade Integrated Solution (WITS) software are based on 112 countries reporting their exports valued at USD 422 billion to 225 destinations. In contrast, agricultural exports in BACI are based on 214 countries reporting their agricultural exports valued USD 464 billion to 215 destinations.[4] Thus, agricultural exports in 1995 in the BACI data are some USD 42.6 billion (10% higher). Similar order of differences persists for the periods when both datasets are available. Since the BACI data are more complete and consistent than the raw untreated COMTRADE data, they are used for this analysis. Unfortunately, the BACI data at the time of this writing stop in 2007. In order to get a better sense of the relative importance of processed products in agricultural trade, the more recent data that captures the relatively high commodity prices of 2008 from UNCOMTRADE are also provided. These data are based on 147 reporting countries exporting to 236 destinations. When examining broad patterns over time, we include data for 2008 from UNCOMTRADE. This does not significantly introduce bias nor qualitatively change the relative rankings of major importing or exporting countries or the most traded products because the reporting countries in 2008 represent most trade in all years. For most detailed analysis of a single year however, we utilise the treated data from BACI[5]. In most instances in the first part of the report with the focus of changes over time, 2008 are included while for the rest of the report these are excluded.

Data on the value of output and number of firms producing processed products are from CEPII TradeProd database which is based on information from the World Bank's "Trade, Production and Protection", complemented by figures from OECD and United Nations Industrial Development Organization (UNIDO). Data on income, agricultural value added, labour force, and other country level data are from the World Bank's World Development Indicators. Data on country groupings based on income is from the World Bank's list of economies (July 2009). The Corruption Perception Index from

4. The number of reporters and their destinations in the BACI dataset are actually larger than indicated here because they include regional aggregates that are grouped into a single exporter for the purposes of this study.

5. For the years with data from both sources (1995-2007) reported agricultural trade in the BACI database on average is 9% greater than the untreated data from UNCOMPTRADE with a maximum difference of 11% for 1998-2000 and a minimum difference of 7% in the last two years. For total trade, on average, the data from BACI are on average 8% greater than the untreated data from UNCOMPTRADE with a maximum difference of 12% in 1995 and a minimum of 5% in 2006.

Transparency International is used to measure corruption. The corruption perception index measures the perceived level of public sector corruption. It is a "survey of surveys" based on 13 different expert and business surveys focusing on corruption in the public sector. The index ranges from ten representing least corrupt governments to 0 the most corrupt. Data on trade facilitation indicators (number of documents to export, time needed to export and transaction costs to export a standard 20-foot container are from the World Bank's Trading Across Borders database.[6] The measures provide international comparisons of direct and indirect border-related costs that exporters typically face. These indicators include the number of documents required to export and the average number of days required to clear hurdles to export products that are assumed to be in a standardised 20-foot container. The indicators also measure the cost, in United States dollars, to get a standardised 20-foot container ready to cross a border[7]. These include costs for documents, administrative fees for customs clearance and technical control; customs broker fees, terminal handling charges and inland transport. The cost measure does not include tariffs or trade taxes. Unfortunately, these measures are not specific to exporting agricultural products rather they represent averages for all merchandise exports. They may therefore, not be representative of the documents, time or cost to export processed products many of which may require additional documentation for food safety reason and also require refrigerated storage and transport or other special handling. Readers should bear this in mind in interpreting results presented below. Bilateral tariff information at the HS-6 digit level was obtained from UNCTAD's TRAINS database through the World Banks World Trade Solution System (WITS).

Often data from the various sources are merged. But, data for all countries in all years are not available from each source. Hence, when the various datasets are merged, a few countries drop out due to missing data. Consequently, reported totals may differ depending on the set of countries included in any particular aggregation and upon missing data.

6. Data prior to 2006, not available.

7. The number of document**s** needed to export or import includes the documents required for clearance by government ministries, customs authorities, port and container terminal authorities, health and technical control agencies and banks. All documents required by banks for the issuance or securing of a letter of credit are also taken into account. The time required to export or to import starts from the moment the procedure starts until it is completed. Procedures range from packing the goods at the warehouse to their departure from the port of exit. For imported goods, procedures range from the vessel's arrival at the port of entry to the cargo's delivery at the warehouse. The waiting time between procedures is included. Cost measures the fees levied on a 20-foot container in U.S. dollars. Fees include costs for documents, administrative fees for custom clearance and technical control; customs broker fees, terminal handling charges and inland transport. The cost does not include tariffs or trade taxes. For more details see Trading Across Borders Methodology: www.doingbusiness.org/MethodologySurveys/TradingAcrossBorders.aspx.

Part I. Trends in trade and production

Trends in agricultural trade[8]

Agricultural exports more than doubled between 1995 and 2008, increasing from more than USD 464 billion to more than USD 1 trillion (Figure 1) a growth rate of 5.8% per year.[9] At the same time, total merchandise trade expanded even faster, growing from a little more than USD 5 trillion to more than USD 13.7 trillion (Figure 1), an annual growth rate of 8.2%. Consequently, agricultural share of total trade mostly declined over the period from around 9% to around 7% of total trade (Figure 2).

Figure 1. Agricultural and total merchandise trade (1995-2008)

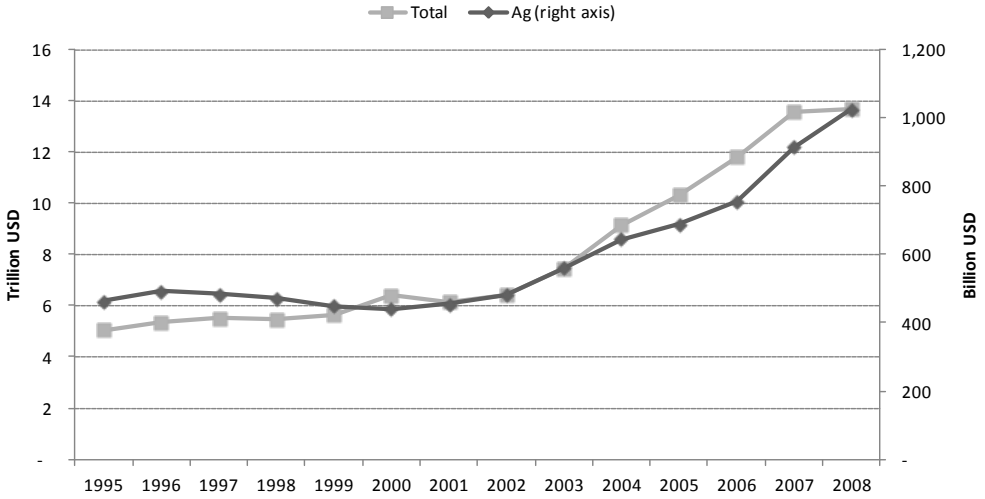
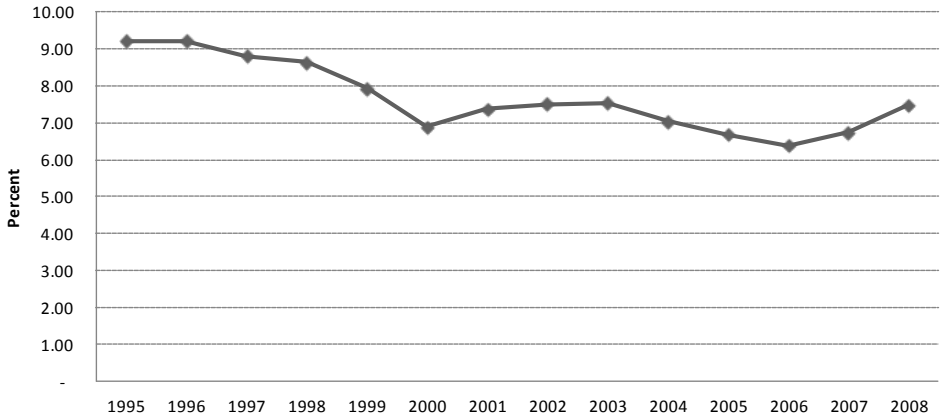


Figure 2. Share of agricultural trade in total merchandise trade)



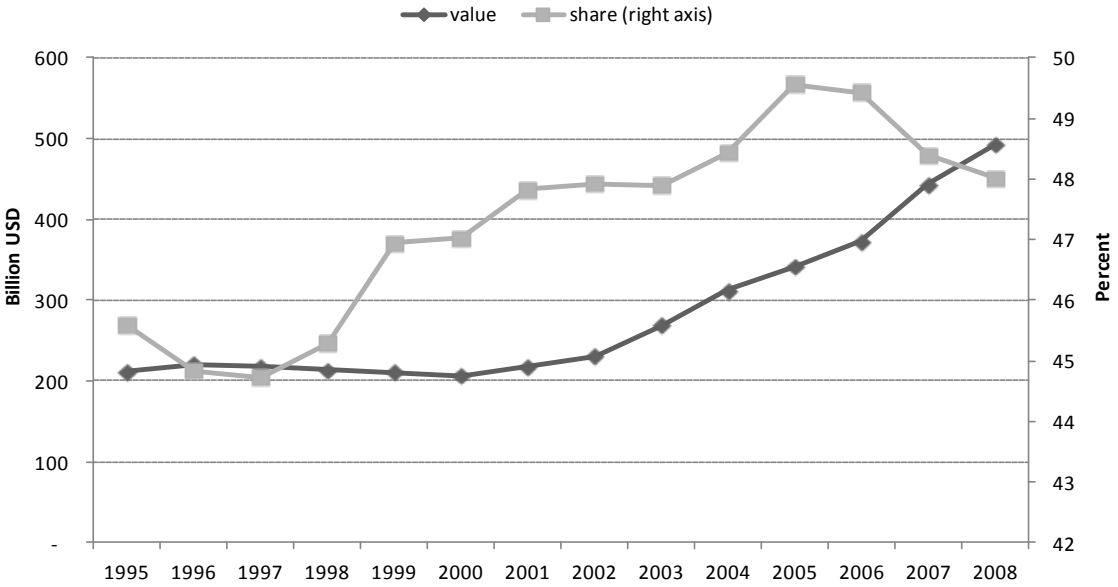
8. Data in this section includes intra-EU trade.

9. Growth rates are calculated by the least square method.

Trends in trade of processed agricultural products

Trade in processed agricultural products also more than doubled from 1995 to 2008 going from more than USD 211 billion to almost USD half a trillion. Trade in these products grew at a faster rate than overall agricultural goods, showing an annual growth rate of 6.5% (Figure 3). Hence, their share of total agricultural trade increased from a little more than 45% in 1995 to 48% in 2008 (Figure 3). Note the rapid rise in the trade of these products starting in 2000 and the increase share of total agricultural trade which seems to have been halted in 2007-08, the time that coincides with the relatively high commodity prices mostly for products that are not processed.

Figure 3. Trade in processed agricultural products and their share of total agricultural trade



What types of countries are mostly engaged in exporting processed products? The World Bank classifies countries into several income categories based on their per capita income. The categories used in this report are as of July 2009. The classification is: 1) high income OECD countries[10] (26), 2) high income non-OECD countries (39), 3) upper middle income countries (42), 4) lower middle income countries (54), and 5) low income countries (49) although the actual numbers used in this report varies by year based on data availability.

The data indicate that the vast majority of processed products exports are by high income OECD countries whose exports more than doubled, increasing from USD 169 billion in 1995 to USD 363 billion in 2008 (Table 1), an average growth rate of 5.9 % per year. But, exports from middle and low income countries increased even more dramatically tripling and even quadrupling their exports during this time[11] (Table 1).

10. Because trade data in the early years for Belgium and Luxembourg are grouped together, they are reported as one throughout the report.

11. Data for low income countries in 2008 may not be representative as the UNCOMPTRADE data includes fewer countries.

Table 1. Exports of processed products by income class

Year	High income: OECD	High income: nonOECD	Upper middle income	Lower middle income	Low income
			Thousand USD		
1995	168 992 848	8 656 676	18 352 216	12 899 694	902 285
1996	171 379 008	9 504 190	20 854 932	15 915 263	1 133 185
1997	169 440 976	7 872 706	21 572 700	15 410 980	917 526
1998	167 738 160	6 530 976	22 133 796	13 947 719	1 116 497
1999	166 744 496	5 686 829	21 053 974	14 047 010	955 438
2000	160 571 391	5 918 865	21 605 371	15 232 237	1 130 665
2001	167 911 634	6 488 318	23 216 565	16 436 403	1 141 400
2002	176 808 950	6 896 038	25 095 674	17 768 450	1 222 649
2003	207 672 562	6 842 890	29 901 607	20 536 255	1 409 200
2004	237 767 159	7 654 185	38 060 041	23 235 630	1 641 190
2005	252 859 209	8 452 356	46 840 473	27 369 678	2 441 819
2006	273 299 033	9 018 996	54 701 599	31 495 287	3 004 863
2007	321 949 900	11 756 578	66 180 070	38 162 233	3 154 350
2008	362 562 010	10 572 028	80 317 869	44 354 209	3 360 546
Least squares growth rate					
	5.85	2.19	10.89	8.86	10.54

It seems that lower income countries, especially upper middle income countries have become much more competitive in these products as their exports grew at an average annual rate of almost 11%. Exports of processed products from low income countries, even though starting from a much smaller base, also expanded substantially over this time period suggesting that they too have become more competitive. As illustrated in Figure 4, lower income countries have increased their market share considerably over this time period at the expense of high income countries. Upper middle income countries have been especially successful almost doubling their market share to 16% of the total, while high income OECD countries lost about 8 percentage points over this time period, albeit still exporting about 73% of the total. While for low income countries, it is evident from Table 1 and Figure 4 that despite the impressive growth rate, the absolute value of their exports of processed products hardly registers at the world level.

Comparing exports of processed products from the five enhanced engagement countries (EE) (Brazil, China, India, Indonesia and South Africa) to the OECD countries (not just those with high incomes) presents a similar picture as above. Exports of processed products from the OECD countries are significantly larger by an order of magnitude (Table 2). In 2008, the OECD countries exported some eight times more processed products than the EE countries, but exports of processed products are growing much faster in the EE countries ranging from Brazil's almost 12.6% per year (double the growth rate for the OECD members) to South Africa's 6.1% rate. Hence, while at the beginning of the period EE countries supplied about 6% of processed products exports, in the latest three years, they supplied 9% of total processed products. The four countries that become OECD members in 2010 (Chile, Estonia, Israel and Slovenia) and Russia (an OECD accession country), as a group are relatively small agricultural exporters supplying about 2% of total processed products to world markets during 2006-08.

Figure 4. Share of processed products exported by income classification

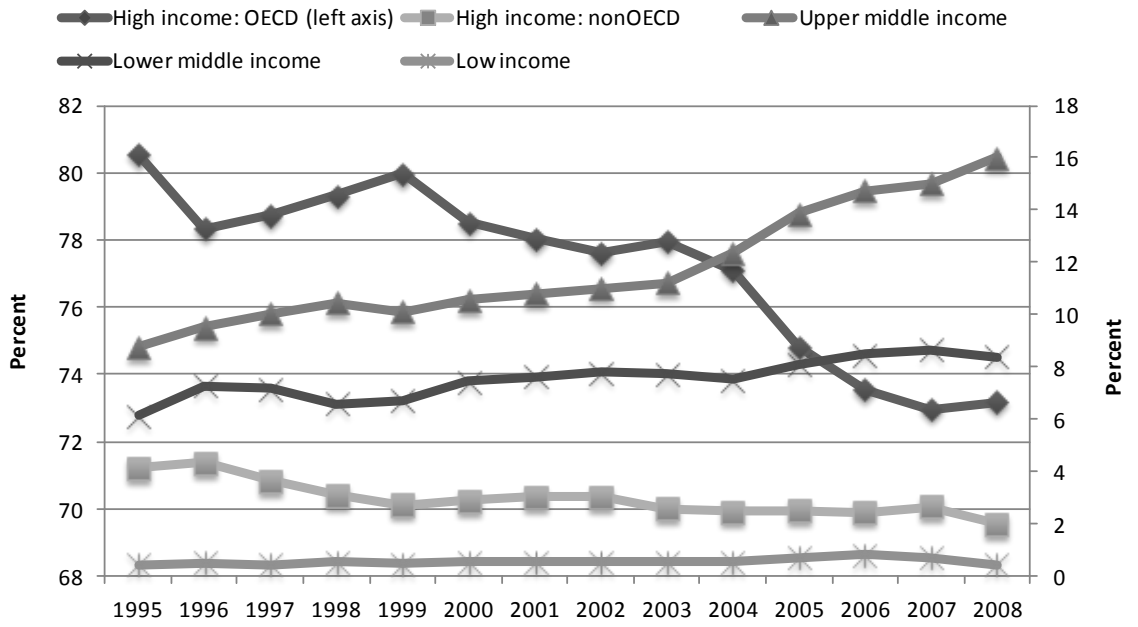


Table 2. Exports of processed products for OECD and Enhanced Engagement countries

Year	OECD	Brazil	China	India	Indonesia	South Africa
			Thousand USD			
1995	175 006 188	4 474 953	5 834 216	643 015	517 375	1 130 385
1996	178 057 883	4 950 802	5 975 916	942 661	576 942	1 220 496
1997	176 713 109	4 980 720	5 482 256	974 490	674 629	1 185 909
1998	175 566 195	5 577 256	5 315 667	738 113	642 649	1 171 008
1999	174 015 003	5 283 779	5 371 087	799 778	801 635	1 172 432
2000	168 267 192	5 035 988	5 911 306	1 041 050	834 118	1 284 999
2001	176 211 260	6 041 936	6 325 253	1 130 242	888 321	1 362 986
2002	186 019 109	6 664 495	6 705 248	1 205 839	899 073	1 551 549
2003	218 454 626	7 703 208	7 467 483	1 329 809	970 812	1 860 670
2004	250 999 892	10 385 275	8 671 514	1 410 681	1 132 795	1 932 457
2005	269 180 768	13 224 057	10 060 275	1 792 347	1 261 359	1 985 082
2006	291 280 244	15 783 665	11 880 643	2 726 109	1 363 936	2 048 774
2007	343 746 438	18 604 504	14 023 420	3 180 773	1 603 523	2 354 602
2008	387 420 480	23 449 338	14 947 748	3 668 788	2 289 133	2 098 103
	6.09	12.59	7.95	12.11	9.63	6.07

Least squares growth rate. OECD: 30 Members as of 2009

Direction of trade in processed products

The World Bank's income classification just discussed was used to identify whether bilateral trade was between high income countries (both OECD and non-OECD). This trade flow is classified as North-North trade (NN), that is both the exporting and importing countries have high income. When the exporting country has high income while the importing country does not, it is classified as North-South trade (NS). Conversely, when the exporting country is middle or low income while the importing

country is high income, the trade flow is classified as South-North (SN). Lastly, when both partners are not high income their trade is classified as South-South (SS).

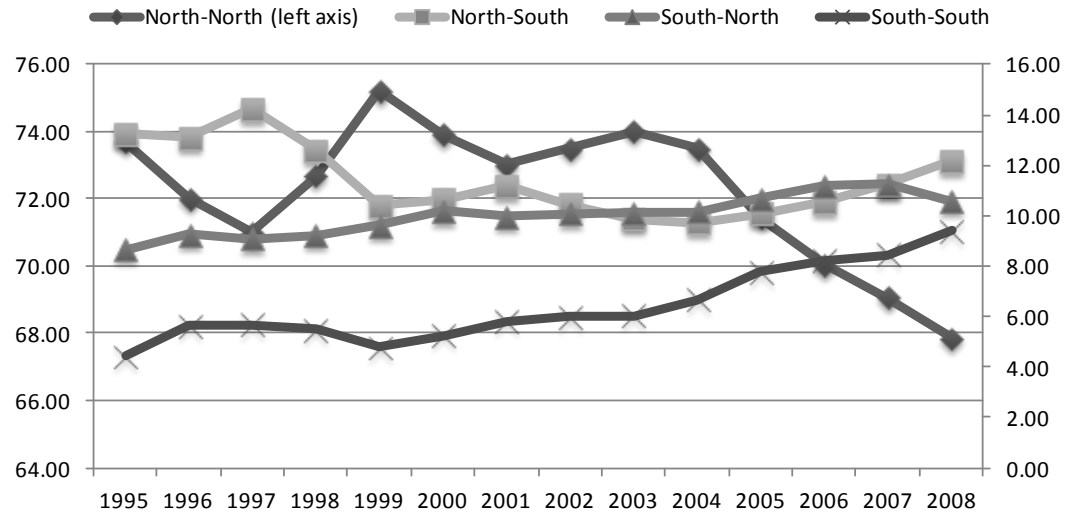
Data in Table 3 indicate that globalisation and the linking of countries through trade are well entrenched as each trade flow at least doubled during the time period while SS trade almost quintupled. Trade among rich countries grew at an average rate of 6.1% while trade among lower income countries grew at 11.6% annual rate. But, it is still the case that trade in processed products is mostly among rich countries. In 2008, NN trade was almost double the combined trade of the other flows suggesting perhaps that income is not only an important demand factor for these products but also an indicator of supply availability. Interestingly, exports from the south to the north (SN) have caught up with trade from the north to the south (NS) as SN trade is growing at a much faster rate. And, even though SS trade is growing very fast, to keep it in perspective, if NN trade remains constant at its 2008 level while SS trade continues at its current growth rate, it will take more than 18 years for SS trade to catch-up to current NN trade. Nonetheless, SS trade is growing representing a larger share of world trade in these goods while NN trade is becoming relatively less important. The data also seems to indicate that SS trade is replacing some NS trade as the share of exports from the north to the south has declined somewhat[12] (Figure 5).

Table 3. Bilateral direction of processed product trade

Year	North-North	North-South	South-North	South-South
	Thousand USD			
1995	154 617 711	27 772 550	18 155 749	9 257 707
1996	157 577 900	28 659 016	20 251 082	12 298 578
1997	152 815 102	30 635 231	19 529 171	12 235 389
1998	153 708 830	26 654 752	19 518 697	11 584 862
1999	156 800 833	21 670 156	20 029 680	9 987 073
2000	151 097 595	21 792 150	20 856 056	10 712 728
2001	157 168 148	24 045 354	21 465 958	12 514 861
2002	167 452 996	23 733 559	22 952 362	13 652 847
2003	197 125 565	26 312 140	26 918 584	16 006 226
2004	226 616 557	29 970 299	31 245 643	20 525 710
2005	241 451 972	34 108 118	36 138 098	26 265 349
2006	260 252 337	39 100 435	41 578 535	30 588 470
2007	304 710 952	49 588 410	49 594 982	37 308 787
2008	334 477 216	59 815 176	53 645 640	49 194 132
Least square	6.14	0.05	0.08	11.60

12. In this and other cases, the reader is reminded that data for lower income countries in 2008 may not be representative because of fewer reporting countries.

Figure 5. Directional share of trade in processed products



Major exporting countries[13]

Moving away from broad aggregates and looking at individual countries, which ones are exporting the most and how has this changed over the time period? In order to reduce the particularities of any one year, average exports for the three year period 1995 to 1997 and 2006 to 2008 are used. During the first period, The 15 EU members as a group on average exported almost USD 126 billion (58% of total) with France the largest individual exporter with almost USD 25 billion (11% of the total). The Unietd States with average exports of more than USD 22 billion (10%) was second with the Netherlands close behind while eight of the top nine exporting countries are members of the European Union (Table 4). Overall, the countries listed in Table 4 accounted for almost 83% of world's exports of processed products, with the OECD countries contributing three-quarters of the total. The two EE countries, China and Brazil on average exported about 5% of world's total. It is apparent from the table that processed products exports are very concentrated with only a handful of countries exporting the vast majority of the goods.

A decade later the picture hardly changed. The now enlarged European Union[14] as a block still exports more than half of all processed products traded in the world. Although the rankings changed somewhat, exports of processed products remain highly concentrated. The European Union plus the other countries listed in the table export some 81% of world's total (slightly lower level of concentration as in the previous period) leaving very little for the other 200 some countries. OECD countries also continue to dominate trade in these products as the OECD countries listed in the table export some 70% of the world's total. Furthermore, only two non-OECD Member countries remain among the leading exporters as Poland and Austria replaced Argentina and Thailand on

13. Although results reported below are based on three year averages, Table A2 lists individual countries and their exports of processed products in 2007. The list excludes countries/regions not identified in the World Bank's list of economies from July 2009.

14. Calculations for the EU are based on 25 members in 2006 and 27 members as of 2007.

the list of top exporters. However, the two EE countries increased their competitiveness in these products as their market share expanded somewhat over the time period.

Table 4. Top exporters of processed agricultural products

	1995-97			2006-08	
Country/region	Value of exports thousand USD	share per cent	Country/region	Value of exports thousand USD	share per cent
European Union*	125 708 728	58.07	European Union*	257 181 956	58.57
of which			*of which*		
France	*24 740 918*	*11.43*	*Germany*	43 359 214	*9.87*
Netherlands	*21 859 982*	*10.10*	*France*	39 385 767	*8.97*
Germany	*17 984 948*	*8.31*	*Netherlands*	35 590 161	*8.10*
United Kingdom	*13 431 819*	*6.20*	*Belgium/Luxemburg*	22 476 087	*5.12*
Belgium/Luxemburg	*11 238 900*	*5.19*	*Italy*	21 310 229	*4.85*
Italy	*9 705 717*	*4.48*	*United Kingdom*	17 709 705	*4.03*
Denmark	*7 809 000*	*3.61*	*Spain*	14 567 575	*3.32*
Ireland	*7 102 734*	*3.28*	*Denmark*	12 031 579	*2.74*
Spain	*5 406 559*	*2.50*	*Ireland*	11 596 631	*2.64*
United States	22 174 758	10.24	*Poland*	9 888 504	*2.25*
China	5 764 130	2.66	*Austria*	7 873 374	*1.79*
Australia	5 478 690	2.53	United States	31 562 760	*7.19*
Canada	5 094 185	2.35	Brazil	19 279 169	*4.39*
Brazil	4 802 158	2.22	China	13 617 270	*3.10*
New Zealand	4 776 600	2.21	Canada	12 315 316	*2.80*
Argentina	2 717 025	1.26	Australia	12 104 293	*2.76*
Thailand	2 657 371	1.23	New Zealand	11 185 094	*2.55*

** Calculations for the EU are based on15 members prior to 2004; 25 members 2004-06; 27 members as of 2007*

Which processed products are most traded?

In order to minimize the particularities of any one year, calculations are once again based on a three year average exports for the beginning period (1995-97) and ending period (2006-2008). For the first period, the most traded product, at the HS-6 digit level was *cigarettes containing tobacco* (HS 240220) with exports totalling more than USD 15 billion (7% of total processed product exports), followed by *other food preparations not elsewhere specified* (HS210690)[15] with a little more than USD 9 billion (4% of total) (Table 5). Most of the processed products are exported by a few mostly rich countries, while most of the value is also concentrated among relatively few products. Although 254 products classified as processed products were exported during this period, only 20 products averaged almost USD 105 billion or 48% of total exports. At the other extreme, the bottom 20 products exported averaged USD 441 million in each of the 3 years (0.2% of the total). The least traded processed product during this period with average exports valued at slightly more than USD 5 million was *sauerkraut* (HS 200030).

For the 2006-08 period, the most traded processed product was *other food preparations* with average exports of USD 20.8 billion, jumping from second place in the earlier period (4.7% of total), followed by *wine (not sparkling; grape must with alcohol* (HS 220421) with average exports valued at USD 19 billion (4.3% of total) jumping from fourth place in the earlier period (Table 5). Overall, exports of the top 20 products almost doubled to USD 203 billion but their share of total exports declined somewhat, capturing

15. Although this "product" is highly traded, as the name suggests, the HS code does not represent a single product but reflects a catch-all group of different products that may change over time.

46% of all processed product exports. This was also the case for the least traded products whose share fell. Exports of the 20 least traded processed products averaged about USD 379 million a year (0.1% of the total). *Sauerkraut* continued to be the least traded product, with exports averaging USD 24 thousand a year.

Although the relative rankings changed somewhat, consumer demand appears to be fairly constant over the period as 17 of the top 20 products were the same in both periods. The three products whose demand dropped relative to others were; *fresh or chilled unboned bovine meat excluding carcass*, (HS 020120) *milk and cream in solid form less than 1.5% fat* (HS 040210) and butter *and other fats and oils* (HS 040500). Replacing them in the top 20 with expanding demand were; *fresh or chilled other swine meat* (HS 020319), *waters (including mineral and aerated* (HS 220210) and *other non-alcoholic beverages* (HS 220290).

Which processed products are growing the fastest?

During this time period, the demand for several processed products expanded relatively fast with many exhibiting double digit growth rates. The top 20 products with the fastest growth rates are shown in Table 6. Several of these fast growing products are not heavily traded with exports in 2008 of less than USD half a billion while others such as *waters* and *other non alcoholic beverages* had exports of more than USD 6.5 billion. Overall the average annual growth rate for these 20 products with high growth in demand was 11.8% and their total exports in 2008 totalled some USD 41.4 billion about 8% of total exports.

Looking at the trade at a more aggregate level (at the HS-2 digit), in both periods, *meat and edible meat offals*, (average exports USD 80.5 billion in 2006-08) *beverages, spirits, vinegar* (average exports USD 79.2 billion in 2006-08) and *dairy products, birds eggs, natural honey, edible products not elsewhere classified,* (average exports USD 60.3 billion in 2006-08) were the products with the highest demand capturing half of all trade in processed products in each period.

Which countries are exporting the fastest growing products? Looking at all 20 products as a group, in the two three-year periods, Germany was the leading exporter of these fast growing products, followed by the Netherlands, France, the United States and Brazil. However, the countries with the fastest growth rate in exporting these fast-growing products, albeit from a small base, are developing countries. Rwanda with an annual growth rate of 40.9% is the leader, followed by Bosnia and Herzegovina (40.6% per annum), Belarus (39.7% per annum) and Suriname (39.5% per annum). Among the large exporters of these goods, Brazil's exports grew the fastest averaging 22.4% a year while exports from the Netherlands grew at an annual rate of 11.2%.

Not all countries were able to expand their exports of these fast growing products and they lost market share, while exports from some countries fell over this time period. Exports from Belize almost disappeared during this time showing a negative growth of 61% a year, while the average decline in exports from Macao was almost 34% a year.

Table 5. Top 20 exported processed products

		1995-97				2006-08	
HS	Description	Value 000 USD	share per cent	HS	Description	Value 000 USD	share per cent
240220	Cigarettes containing tobacco	15 326 312	7.08	210690	Other food preparations, nes	20 759 398	4.73
210690	Other food preparations, nes	9 079 994	4.19	220421	Wine (not sparkling); grape must with by alcoho	19 015 276	4.33
040690	Cheese, nes	7 935 400	3.67	240220	Cigarettes containing tobacco	16 881 640	3.84
220421	Wine (not sparkling); grape must with by alcohol	7 867 997	3.63	040690	Cheese, nes	15 215 422	3.46
170199	Cane or beet sugar, in solid form, nes	5 763 313	2.66	190590	Other bread, etc, nes; communion wafers, rice p	11 379 498	2.59
220300	Beer made from malt	4 884 414	2.26	020130	Fresh or chilled boneless bovine meat	10 452 762	2.38
020230	Frozen boneless bovine meat	4 827 616	2.23	020230	Frozen boneless bovine meat	10 275 702	2.34
220830	Whiskeys	4 770 052	2.20	220300	Beer made from malt	10 079 742	2.30
020130	Fresh or chilled boneless bovine meat	4 600 475	2.13	170199	Cane or beet sugar, in solid form, nes	10 030 039	2.28
020329	Frozen swine meat, nes	4 542 578	2.10	020329	Frozen swine meat, nes	8 383 145	1.91
020741	Frozen cuts and offal of chicken (excl. livers)	4 380 077	2.02	020741	Frozen cuts and offal of chicken (excl. livers)	8 031 852	1.83
190590	Other bread, etc, nes; communion wafers, rice p	4 031 788	1.86	220830	Whiskeys	7 856 824	1.79
040500	Butter and other fats and oils derived from mil	3 779 831	1.75	180690	Chocolate, etc, containing cocoa, not in blocks	7 816 589	1.78
040210	Milk and cream in solid forms of =<1.5% fat	3 541 776	1.64	220890	Other spirituous beverages, nes	7 459 457	1.70
040221	Milk and cream in solid forms of >1.5% fat, uns	3 510 809	1.62	190530	Sweet biscuits; waffles and wafers	7 239 083	1.65
180690	Chocolate, etc, containing cocoa, not in blocks	3 436 871	1.59	020319	Fresh or chilled swine meat, nes (unboned)	6 909 668	1.57
190530	Sweet biscuits; waffles and wafers	3 321 520	1.53	040221	Milk and cream in solid forms of >1.5% fat, uns	6 771 722	1.54
170490	Sugar confectionery (incl. white chocolate), no	3 293 918	1.52	170490	Sugar confectionery (incl. white chocolate), no	6 485 555	1.48
220890	Other spirituous beverages, nes	3 011 692	1.39	220210	Waters (incl. mineral and aerated), with added	6 117 270	1.39
020120	Fresh or chilled unboned bovine meat (excl. carcasses)	2 912 506	1.35	220290	Other non-alcoholic beverages, nes	5 748 705	1.31

Table 6. Top 20 fastest growing exported products

HS	Description	Value in 2008 thousand USD	Growth rate
021090	Other meat, nes, salted… or smoked; flours an	1 030 994	17.54
170191	Cane or beet sugar, containing added flavouring	293 686	14.34
040490	Products consisting of natural milk constituent	1 107 254	13.57
151790	Edible preparations of fats and oils, nes	3 998 498	13.56
220290	Other non-alcoholic beverages, nes	6 552 373	12.68
020900	Pig and poultry fat, fresh, chilled, frozen, sa	1 092 924	12.24
020422	Fresh or chilled unboned meat of sheep	876 870	12.02
190240	Couscous	123 606	11.97
200510	Homogenized vegetable, preserved other than by	86 915	11.93
020423	Fresh or chilled boneless meat of sheep	371 160	11.91
210120	Extracts, essences, concentrates and preparatio	886 120	11.89
200919	Unfrozen orange juice, unfermented, not contain	3 893 805	11.58
020649	Frozen edible swine offal (excl. livers)	1 921 671	11.31
190520	Gingerbread and the like	262 234	11.25
040410	Whey & modified whey, concentrated or not, or c	2 421 362	11.25
040310	Yogurt	2 174 988	11.19
220210	Waters (incl. mineral and aerated), with added	6 560 057	10.98
040390	Buttermilk, curdled milk and cream, etc (excl.	1 935 642	10.74
220710	Undenatured ethyl alcohol, of alcoholic strengt	5 480 824	10.59
110412	Rolled or flaked oat grains	308 651	10.59

Growth rates calculated as least square trends

Major importing countries[16]

Turning our attention to the other side of the ledger, which countries are large importers of processed products? Imports reported here are mirror statistics calculated from the export data discussed above. The advantage of this approach is that both exports and imports are valued on the same basis, that is, freight on board (fob) and thus excludes possible inconsistencies between import and export values. The disadvantage is that imports from some countries that do not appear as exporters are missing. This is not expected to be a major problem as most of the traders are included in the database, especially those accounting for the vast bulk of the trade.

Looking at a rather broad picture, not surprising given their ability to pay, high income countries import by far the majority of processed products. In the 2006-08 period, high income OECD countries imported on average almost USD 311 billion each of the three years (68% of the total). But, imports by middle and low income countries expanded significantly, more than doubling, and in the case of low income countries, tripling over the 13-year period (Table 7) possibly reflecting the high income growth of many of these countries especially in the latter part of the period.

Table 7. Average imports of processed products

Income grouping	1995-97	2006-08
	Average Imports Thousand USD	
High income: OECD	150 762 800	310 908 576
High income: nonOECD	19 930 762	36 425 048
Upper middle income	24 854 346	59 484 436
Lower middle income	14 518 825	37 729 204
Low income	4 535 004	13 766 772

Also not surprising, the top importers of processed products are dominated by high income and OECD countries, especially members of the European Union (Table 8). During 1995-97, only Russia and Brazil among the top importers is not a high income country and Brazil's imports during the second period are insufficient to maintain her among the leading importing countries. Interestingly, imports are less concentrated among the leaders relative to exports and the concentration ratio declined over time suggesting that other importing countries are becoming more engaged in trade. During 1995-97, the top importers shown in the table imported 77% of all processed products while by the 2006-08 period; their share had dropped to 73% (compared to a share of 81% for the top exporters). The relative worldwide prosperity and rising incomes over the last decade along with relatively more open markets, seems to have expanded import demand across a wide spectrum of countries.

Among countries with observations in each year of the two periods (1995-97 and 2006-08), the fastest growing import markets for processed products are not high income

16. Although results reported below are based on three year averages, Table A3 lists individual countries and their imports of processed products in 2007. The list excludes countries/regions not identified in the World Bank's list of economy's from July 2009.

countries, however. Two of the five fastest growing areas, Tokelau (average growth 29% a year) and French Southern and Antarctic Lands (average growth 28% a year), are small islands with small economies and populations. Their average imports during this period were USD 614 thousand and USD 2.4 million respectively, thus the economic importance of such high growth rates should not be overestimated. Iraq (average import growth rate 29% a year), Sudan (average growth rate 21% a year) and Afghanistan (average growth 19% a year), round out the top five fastest growing import markets. The appearance of these countries among the fastest growing markets is a surprise as two of them have been embroiled in war and all three have governance issues.

Table 8. Top importing countries of processed products

1995-97			2006-08		
Country/region	**Value of imports Thousand USD**	**Share per cent**	**Country/region**	**Value of imports Thousand USD**	**Share pe cent**
European Union*	101 784 312	47.02	European Union*	229 678 340	48.85
of which			*of which*		
Germany	*22 634 530*	*10.46*	*Germany*	*36 591 808*	*7.78*
France	*15 264 297*	*7.05*	*United Kingdom*	*32 353 308*	*6.88*
United Kingdom	*14 807 933*	*6.84*	*France*	*26 261 026*	*5.59*
Italy	*11 027 437*	*5.09*	*Italy*	*20 796 036*	*4.42*
Netherlands	*10 123 441*	*4.68*	*Netherlands*	*19 837 516*	*4.22*
Belgium/Luxembourg	*9 137 979*	*4.22*	*Belgium/Luxemburg*	*15 988 824*	*3.40*
Spain	*5 204 650*	*2.40*	*Spain*	*13 291 751*	*2.83*
Greece	*2 677 808*	*1.24*	*Austria*	*5 902 263*	*1.26*
Japan	19 053 062	8.80	*Sweden*	*5 886 795*	*1.25*
United States	15 650 202	7.23	United States	41 432 927	8.81
Russia	9 615 183	4.44	Japan	23 189 398	*4.93*
Hong Kong, China	5 534 853	2.56	Russia	17 622 998	3.75
Canada	4 405 950	2.04	Canada	12 904 644	2.74
Singapore	2 861 692	1.32	Mexico	8 162 048	1.74
Korea	2 736 651	1.26	Hong Kong, China	6 687 643	1.42
Brazil	2 683 543	1.24	Switzerland	6 537 248	1.39
Switzerland	2 662 060	1.23	Korea	5 648 837	1.20

* Calculations for the European Union are based on15 members prior to 2004; 25 members 2004-06; 27 members as of 2007.

Among OECD countries, only six members exhibited double digit growth. Hungary with an average growth rate of 18% a year was the leader, followed by Slovakia and Poland with a growth rate of 15% a year, the Czech Republic with a growth rate of 14% a year, Mexico with a growth rate of 12% a year and Australia with 10% a year.

As a group, the five EE countries averaged USD 6.2 billion a year from 1995-97 and these jumped to more than USD 12 billion per year in 2006-08. On average, imports by each of the EE countries more than doubled over the time period (except in Brazil), perhaps reflecting the dynamic income growth by these countries over the time period. Brazil's imports of processed products declined, exhibiting a negative growth rate of 4% a year perhaps because demand for these products is met through local production. Imports of processed products by the other EE countries grew between 8% a year (India) and 10% a year (South Africa). During the period 2006-08, China's average imports of processed products were USD 5.3 billion a year while Indonesia averaged USD 2.6

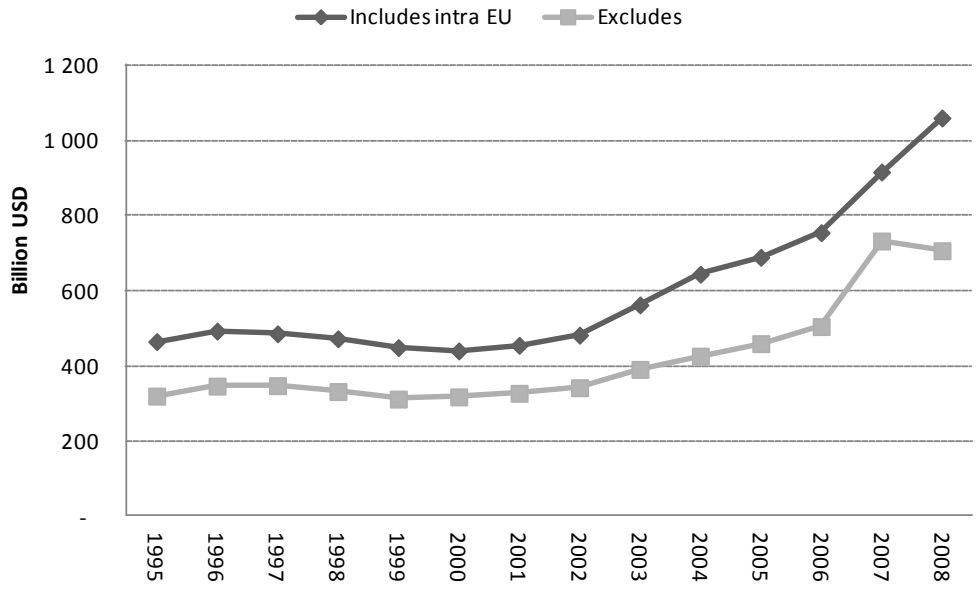
billion a year. In contrast, although India's imports of these products increased two and a half times, the level is fairly small, averaging USD 500 million a year.

Trade excluding intra-EU

The data presented thus far is based on data as normally reported by UNCOMPTRADE and others, which includes trade between members of the European Union. Many consider trade between EU members akin to trade between say California and Texas in the United States given that the European Union is a single market with a common trade policy and common currency within the euro zone. The single market for agricultural products was achieved earlier than in other goods as a result of the Common Agricultural Policy (CAP).

How does the world trade picture change if intra-EU trade is excluded? Figure 6 shows the evolution of agricultural trade (all products) with and without intra-EU trade. The difference between the two lines represents intra-EU trade. In 1995 world agricultural trade excluding intra-EU totalled USD 319 billion growing to USD 706 billion in 2008 compared to USD 464 billion and USD 1.1 trillion with intra-EU trade. As evidenced by the figure, intra-EU trade is substantial, averaging 30% of total agricultural trade during this period.

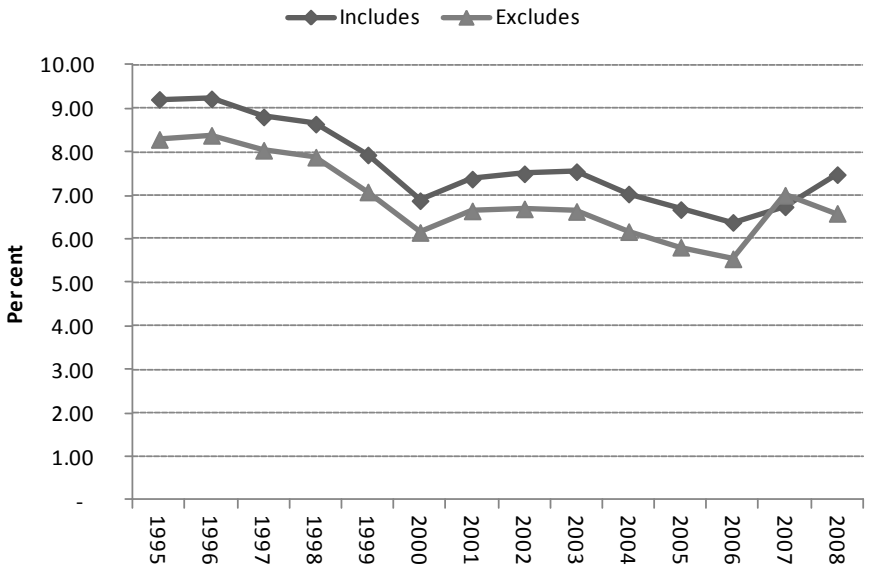
Figure 6. Agricultural trade with and without trade among members of the EU



15 EU members prior to 2004; 25 members 2004-2006; 27 members as of 2007.

EU Member States tend to trade among themselves relatively more in agricultural rather than non-agricultural products, perhaps due to the CAP. Consequently, when intra-EU trade is excluded from both series, agriculture's share of total trade falls (Figure 7). Agricultural trade share of the total without intra-EU trade fell to less than 6% of the total before rebounding in 2007.

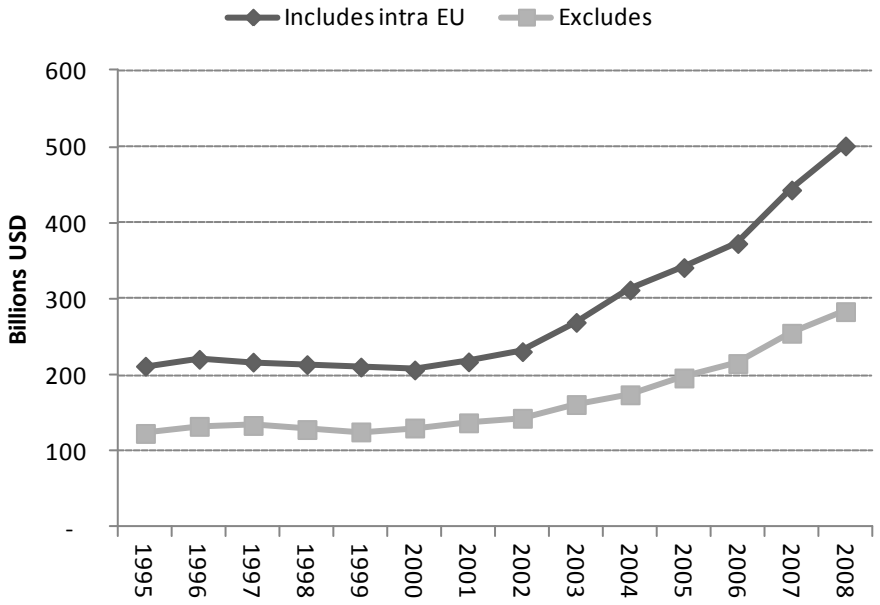
Figure 7. Agricultural trade share of total trade with and without intra-EU



15 EU members prior to 2004; 25 members 2004-2006; 27 members as of 2007.

The effect of intra-EU trade on the trade in processed agricultural goods is even more dramatic (Figure 8). The EU agricultural and food markets display a high degree of integration as a result of the CAP and the Common Market Organizations which were in place much ahead of the completion of the single market. Trade in processed products excluding trade among the EU Members increases from USD 123 billion in 1995 to USD 283 billion in contrast to USD 212 and USD 501 billion over the same period when that trade is included. Excluding intra-EU trade in processed products subtracts, on average, 41% of world trade in those goods. As the figure shows, the gap between the two lines has increased as more of world's trade is among EU Members since the EU enlarged to the current 27 members. As a result, the share of processed products in world agricultural trade also falls. Whereas trade in processed products over this time period averaged 47% of agricultural trade when intra-EU trade is included, it falls to 40% of the total when intra-EU trade is excluded. However, it is still the case that this group of products remains the most valuable.

Figure 8. Trade in processed agricultural goods including and excluding intra-EU trade

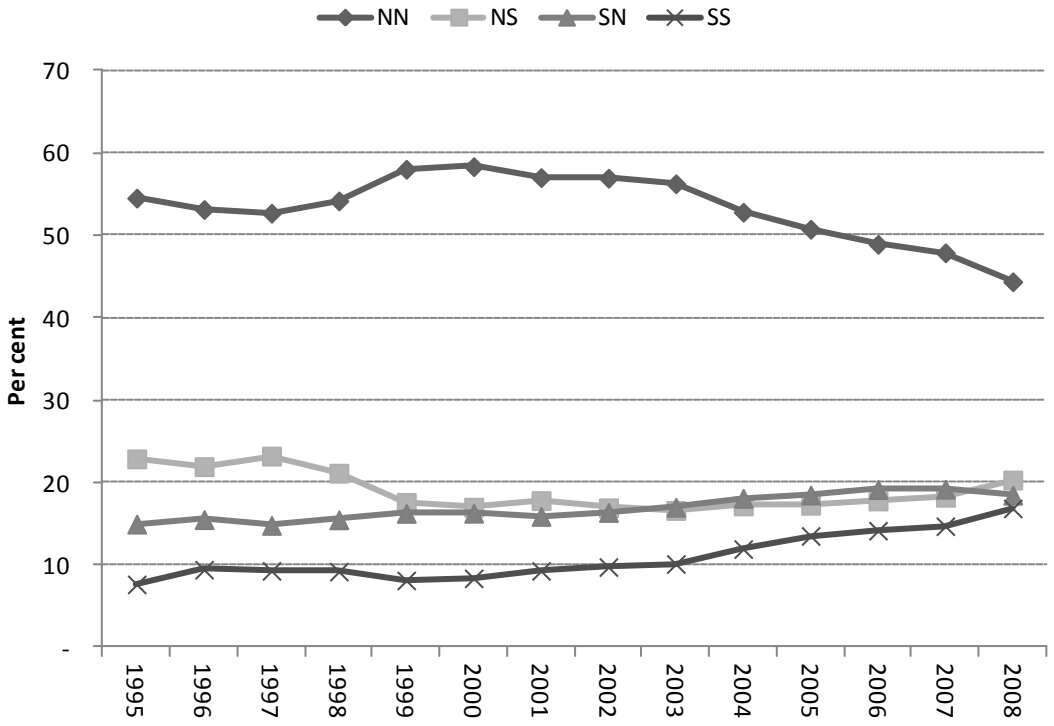


15 EU members prior to 2004; 25 members 2004-2006; 27 members as of 2007.

In terms of exports of processed products by countries in the various income categories, obviously excluding intra-EU trade substantially lowers the reported trade in processed products by the high income OECD countries. In 2008, exports from this group of countries are USD 206 billion lower at USD 157 billion, and the growth rate is more than one percentage lower at 4.8% a year. Because new members of the European Union were also among countries classified as high income non-OECD and upper middle income, trade from these two groups is also somewhat lower as is their respective growth rates, but not nearly as dramatically.

Excluding intra-EU trade also has significant impacts on the direction of trade flows discussed above. Whereas NN trade is more than USD 334 billion and more than double the combined trade of the other flows in 2008 when it includes trade among the EU members, it is only USD 119 billion without intra-EU trade and its growth rate is about 2 percentage points lower (average growth 4.7% a year). And, while NN trade between 1995 and 2008 averaged 73% of total trade in processed products, when intra-EU trade is excluded, the average drops to 53% almost 20 percentage points lower. But even though the levels have changed, the overall patterns have not. It is still the case that the share of NN trade is falling while that of SS is expanding (Figure 9). Interestingly, trade among countries in different income categories, (NS or SN) seems to be stable for most of the period at about 20% of trade.

Figure 9. Directional share of trade in processed products excluding intra-EU trade



15 EU members prior to 2004; 25 members 2004-2006; 27 members as of 2007.

Leading exporting countries when trade among EU Members is excluded

When looking at top exporting countries without intra-EU trade, it is still the case that as a group, the EU Members are formidable exporters with average exports during the 1995-97 period of slightly more than USD 39 billion (30% of world total) while the United States is second with average exports of USD 22 billion (17% of world total). Several members of the European Union are competitive in third markets with exports from France and United Kingdom placing them in second and third place respectively. But, Belgium/Luxembourg, Ireland and Spain drop from the list of top exporting countries and are replaced by Singapore, Mexico and Switzerland (Table 9).

Exports are much less concentrated under these circumstances with the countries listed in Table 9 capturing a little more than 76% of the world's trade in processed products compared to 83% when intra-EU trade is included.

Table 9. Leading exporting countries when trade among EU Members is excluded

	1995-97			2006-08	
Country/region	**Value of exports thousand USD**	**Share Per cent**	**Country/region**	**Value of exports thousand USD**	**Share Per cent**
European Union*	*39 116 179*	*30.11*	European Union*	*69 709 320*	*27.68*
of which			*of which*		
France	*8 117 971*	*6.25*	*France*	*12 651 800*	*5.02*
United Kingdom	*6 041 294*	*4.65*	*Germany*	*8 140 429*	*3.23*
Germany	5 220 697	4.02	*Netherlands*	7 977 232	3.17
Netherlands	*4 952 651*	*3.81*	*Italy*	*7 178 025*	*2.85*
Italy	3 391 438	2.61	*United Kingdom*	6 575 095	2.61
Denmark	*3 095 438*	*2.38*	*Denmark*	*4 240 228*	*1.68*
United States	22 174 758	17.07	United States	31 562 760	12.53
China	5 764 130	4.44	Brazil	19 279 168	7.65
Australia	5 478 690	4.22	China	13 617 270	5.41
Canada	5 094 185	3.92	Canada	12 315 316	4.89
Brazil	4 802 158	3.70	Australia	12 104 293	4.81
New Zealand	4 776 600	3.68	New Zealand	11 185 094	4.44
Argentina	2 717 025	2.09	Mexico	7 311 382	2.90
Thailand	2 657 371	2.05	Thailand	5 708 432	2.27
Singapore	2 324 464	1.79	Argentina	5 478 536	2.18
Mexico	2 112 531	1.63	Switzerland	4 606 825	1.83
Switzerland	2 103 834	1.62	Turkey	3 933 525	1.56

15 EU members prior to 2004; 25 members 2004-2006; 27 members as of 2007.

Over the time period the European Union as a whole and the individual members depicted here lost market share, as did the United States. The other countries shown in the table gained market share with Brazil the big winner doubling her market share over this time period to almost 8% of the world total coming in second place behind the United States among individual countries. Overall, exports of processed products became more concentrated during 2006-08 with the countries listed in the table increasing their market share by almost three percentage points to almost 79% of the total.

More detailed information on exports of processed products for individual countries in 2007 is provided in Table A2. This shows that in 2007 even with intra-EU trade excluded, OECD countries exported 62% of the world's total processed products. It is also evident from the data the specialization in processed products exhibited by OECD members with processed products representing more than 60% of the value of total agricultural exports in 18 of them. As a group in 2007, processed products represented more than 50% of the value of agricultural exports of OECD members. Non-OECD high income countries also specialize in exporting processed products with processed products accounting for more than 60% of the value of agricultural exports in 16 out of 31 countries. In contrast, few lower income countries specialize in exporting process products. Processed products represented about 10% of the value of agricultural exports of the low income countries in the data.

Although the level of trade differs depending on whether one includes or excludes trade among members of the EU, the general pattern remains constant. High income countries continue to dominate trade in agricultural products, especially processed products that require more value added before final consumption. This dominance however is declining as emerging economies are becoming more competitive and capture market share. But, even though total trade is increasing over time whether or not intra-EU trade is included and most countries benefit through expanding their exports, many are

losing market share and it is still the case that most of world's trade is undertaken by a relatively small number of countries.

Excluding intra-EU trade also has some effect on the relative importance in the trade of specific products. Although *cigarettes* and *other food preparations* remain the two most heavily traded products in the 1995-97 period, average trade in these goods is USD 11.3 and USD 5.3 billion respectively some USD 4 billion less than the figures reported in Table 5. The relative rankings of the other products listed in Table 5 change somewhat as does the average traded value, but the top traded products basically remain the same with the exception of *butter* and *fresh or chilled unboned bovine meat*, which are replaced by *spirits of distilled wine* and *frozen orange juice.* Additionally, removing intra-EU trade has increased the relative importance in the trade of the top 20 traded products as they now represent 51% of world trade (compared to 48%).

Although the two top traded products do not change, excluding intra-EU trade is relatively more important in the 2006-08 period. Four products are demanded relatively more outside the EU area landing them among the top 20 traded products; *sugar confectionary* (average trade USD 3.8 billion), *milk and cream in solid form less than or equal to 1.5% fat* (average trade USD 3.7 billion), *sauces and sauce preparations* (average trade USD 3.1 billion) and *undenatured ethyl alcohol* (average trade USD 3.1 billion). The products that are no longer among the top 20 traded products are; *butter*, *preparations of poultry excluding turkeys, extracts, essences…* and *fresh or chilled swine meat not elsewhere specified unboned.* In contrast to the previous period and to the results shown in Table 5, the relative importance of the top 20 traded products declined somewhat to 49% of total trade during this period.

Major importing countries of processed products when intra-EU trade is excluded

It seems that EU members import considerably less processed products from third countries. Whereas the EU as a block on average imported a little less than half of the world's total (Table 8), their imports from third countries averaged a little less than 12% of the total in 1995-97 ranking them second behind Japan (Table 10). Among individual EU members, four remain among the top importers but their market share is considerably reduced. When intra-EU trade is excluded, the dominance of OECD countries in the trade of these products appears diminished as seven non-OECD economies move up the rankings. Furthermore, the market share of the top importers is also diminished accounting for 64% of total imports (in contrast to 77%).

The relative importance of intra-EU trade in processed products becomes even more startling in the 2006-08 period as only three EU members import significant enough amounts from third countries to be among the top importers. In contrast, trade among the EU members is significant enough that 11 members were among the top importers (Table 8). As a group, the EU imports about 12% of world's total remaining in second place behind the United States' share of almost 17%. Although the relative importance of OECD countries appears diminished when intra-EU trade is excluded, it is still the case that most of the imports of processed products are mostly undertaken by countries that are considered high income. It is also still the case that these countries have increased their market share averaging 68% of world's imports in 2006-08.

Table 10. Major importers of processed products excluding intra-EU trade

1995-97			2006-08		
Country/region	Value of imports thousand USD	Share per cent	**Country/region**	Value of imports thousand USD	Share per cent
Japan	19 053 062	14.67	United States	41 432 928	16.59
European Union*	*15 191 761*	*11.70*	European Union*	*29 581 274*	*11.84*
of which			*of which*		
Germany	*3 847 916*	*2.96*	*United Kingdom*	*5 825 326*	*2.33*
United Kingdom	*2 911 756*	*2.24*	*Germany*	*5 331 628*	*2.13*
Netherlands	*2 188 861*	*1.69*	*Netherlands*	*4 771 784*	*1.91*
France	*1 702 870*	*1.31*	Japan	23 189 398	*9.28*
United States	15 650 202	12.05	Russia	17 622 998	*7.06*
Russia	9 615 183	7.40	Canada	12 904 644	*5.17*
Hong Kong, China	5 534 853	4.26	Mexico	8 162 048	*3.27*
Canada	4 405 950	3.39	Hong Kong, China	6 687 643	*2.68*
Singapore	2 861 692	2.20	Korea	5 648 837	*2.26*
Korea	2 736 651	2.11	Saudi Arabia	4 932 626	*1.97*
Brazil	2 683 543	2.07	Switzerland	4 897 331	*1.96*
Switzerland	2 662 060	2.05	China	4 815 258	*1.93*
Saudi Arabia	2 391 254	1.84	Australia	4 480 942	*1.79*
Taiwan (Chinese Taipei)	2 228 783	1.72	Singapore	4 199 828	*1.68*
Mexico	2 115 015	1.63	United Arab Emirates	3679554.5	*1.47*
China	1 938 750	1.49	Taiwan (Chinese Taipei)	3 135 906	*1.26*

* 15 members prior to 2004; 25 members 2004-06; 27 members as of 2007.

Trade balance in processed products

As evidenced by the data above, many of the top exporting countries are also substantial importers of processed products. Looking at the net trade position using data that excludes intra-EU trade, but staying at a relatively aggregate level, the data suggest that high income OECD countries are the net suppliers of these goods to the world. In 1995 to 1997, average net exports of processed products totalled almost USD 20 billion a year (Table 11). Only lower middle income countries were also net exporters averaging almost USD 144 million a year. High income non-OECD economies were the biggest net importers of processed products.

High income OECD countries continued their role as the dominant net supplier of processed products to world markets during 2006-08. The biggest change was among upper middle income countries that were able to switch their net trade position from net importers to net exporters of more than USD 9 billion per year. In contrast, higher demand for processed products from higher incomes and increased population were met through increased imports in high income non-OECD and low income countries as they became larger net importers of processed products.

The four new OECD members as of 2010 and Russia as a group, led by Russia, are major net importers of processed products. During 1995-97, net imports averaged USD 9.1 billion a year and this did not change materially for 2005-07. The net trade position of OECD economies (whether or not high income) is not materially different from the data shown in Table 11. The group of countries with the biggest change in their net trade position are the five EE countries. They are substantial net exporters of processed products and their position increased over time from net exports of USD 6.9 billion a year in 1995-97 to USD 8.9 billion in 2006-08.

Table 11. Trade balance in processed products (excludes intra-EU trade)

Income group	1995-97	Income group	2006-08
	Average Value		Average Value
High income: OECD	19 933 333	High income: OECD	17 966 842
High income: nonOECD	-11 200 000	High income: nonOECD	-20 889 616
Upper middle income	-4 471 262	Upper middle income	10 768 523
Lower middle income	143 633	Lower middle income	2 862 569
Low income	-3 554 733	Low income	-9 647 728

Table A3 contains information on the net trade position of individual countries in 2007. The data indicate that most of the OECD countries in 2007 had a positive trade balance in processed products, and as a group, their net exports totalled USD 20.5 billion. Even though the United States is the single largest exporting country in 2007, it is also the largest single importer of these products with imports exceeding exports by around USD 9 billion. Japan's net imports of USD 21 billion are the largest, followed by Russia's almost USD 12 billion. Brazil was the largest net supplier with more than USD 17 billion followed by France and New Zealand.

As indicated, whether or not intra-EU trade is included in the trade statistics affects the overall magnitude of trade and the relative ranking of individual countries, although the overall trends are not altered. In the rest of the paper, the analysis uses trade data excluding intra-EU trade.

Which countries are major producers of processed products?

Data on production of processed agricultural products is much sparser than trade data. The data available to us, although covering many years and countries, does not contain information for all countries in all years. The most recent data with a relatively large number of observations is 2001. The data is based on International Standard Industrial Classification (ISIC-Rev2) nomenclature. At the three digit level, the industries that are associated with processed agricultural products are; Food (ISIC 311), Beverages (ISIC 313) and Tobacco (ISIC 314). The relevant data are the number of establishments and the value of their output (measured in current USD) with the data available for around 90 countries depending on the variable[17].

In 2001, there were more than 577 000 enterprises engaged in producing food beverages and tobacco (FBT), employing almost 20 million people with production valued at more than USD 2.1 trillion (Table 12). Combining with the trade data for the same set of countries suggests that most of the production is for local consumption, as on aggregate, about 10% of production was exported. The majority of the firms producing FBT are located in high income OECD countries where most of the world's production of those goods (77% in 2001) took place. Although a relatively high number of people in high income OECD countries are employed by the FBT sectors, the largest numbers of labourers are found in lower middle income countries (Table 12). But they are not very productive. Figures in Table 12 indicate that average labour productivity worldwide was

17. UNIDO data are reported at a more disaggregate level and although they include more recent years, the year with the largest country coverage is also 2001 and only for 61countries.

USD 107 000, with labour being more productive in high income OECD countries with an average productivity of USD 237 000 per year, more than three times the average productivity of employees in the other income groupings. Table 12 also suggests that average labour productivity is negatively related with income as employees in low income countries have the lowest productivity. Average productivity per firm, an indication of the average total factor productivity, (labour, capital, management and other variable inputs), is also the highest in high income OECD countries and lowest in low income countries (Table 12).

Table 12. Employment, number of firms and value of production of food beverages and tobacco in 2001.

	Observations	Firms	Employment	Value of Output	Average productivity per worker	Average productivity per firm
Income group	**Number**	**Number**	**Number**	**USD 000**	**USD 000**	**USD 000**
High income: OECD	24	344 891	6 834 732	1 618 227 875	237	4 692
High income: nonOECD	16	5 816	314 529	22 113 533	70	3 802
Upper middle income	22	109 249	4 264 912	240 834 946	56	2 204
Lower middle income	21	95 216	7 529 816	205 773 532	27	2 161
Low income	13	21 976	647 281	17 490 670	27	796
Total	**96**	**577 148**	**19 591 270**	**2 104 440 555**	**107**	**3 646**

Examining data of individual countries the largest concentration of firms engaged in FBT are in Italy, France, Japan, Germany, Spain, and the United States, all high income OECD countries. Not surprising, the United States, Japan and Germany, the three largest economies at the time are the leading producers of processed products, with the United States by far the largest accounting for 27% of world total. The three leading countries produced almost 47% of the world's total (Table A4). It is interesting that both the Untied States and Japan, even though they are the largest producers, are also large importers of these goods each one running a trade deficit in this category illustrating the role that trade plays in perhaps providing inputs and fulfilling demand for differentiated products.

In contrast, the two most populated countries, China and India have the most people employed in this sector with 3.8 and 1.8 million respectively. Four other countries, the United States, Russia Japan and Brazil have more than one million people employed in the sector. Average productivity varies widely with Denmark having the most productive labour force with an average labour product of more than USD 2 million per year followed surprisingly by Romania with an average labour product of USD 1.5 million per year. Average labour productivity drops quickly in the other countries. At the other end of the scale, the average labour product in Malawi was USD 3 000 per year (Table A4). Excluding Myanmar which only has three firms, the country with the most productive firms is Ireland where on average the 697 firms produce USD 24.6 million per firm, followed by firms in the United States with average productivity of USD 19 million, while firms in Yemen on average produced USD 44 000 per year.

Information on the production of FBT sectors may provide a partial explanation of the trading behaviour of small open economies such as Singapore. Singapore is a relatively small country with little agricultural land and therefore an agricultural sector with value added that contributes 0.1% to GDP and with population of 4.1 million in 2001. Nonetheless, it is among the leading importing and exporting countries of processed agricultural products. How can this be? The data in Table A4 suggests that Singapore has a significant FBT sector. Singapore had 309 firms engaged in FBT sector in 2001

employing more than 14 000 people and they produced USD 1.7 billion. Given its relatively small domestic agricultural sector, it may be the case that many of the imported goods are intermediate products that are transformed by the domestic sector into final goods which are then consumed domestically or exported. Assuming that processed products are basically FBT in the ISIC nomenclature, it would seem that most of the domestic production is exported as exports represent some 80% of production.

Summary

To summarize the results of this part of the report indicate that trade in processed products is highly concentrated with a handful of countries (often the same) exporting and importing the vast majority of the goods traded. The dominant players are high income OECD (whether or not intra-EU trade is included) and upper middle income countries. Although high income OECD countries dominate trade, the growth is occurring outside the OECD area with upper middle income and low income countries growing at almost twice the rate of high income OECD members. Thus, their market share is expanding but low income countries have a negligible share of the total.

Globalisation and market openness is influencing trade patterns. Trade in processed products is dominated by trade among high income countries, but trade among emerging economies is growing almost twice as fast. Interestingly, trade between the rich and developing world is growing at a much lower rate.

Trade is fairly concentrated at the individual product level as well with the top 20 processed products accounting for almost half of the total trade. And, demand seems to be fairly uniform across the world. The list of the top 20 traded products changed little between 1997 and 2008.

Production of processed products, (food, beverage and tobacco) is also concentrated among high income OECD countries where most of the firms are located employing the most productive workers. This may partly explain their dominance in world trade and even though they are large importers, as a group, they are the largest net suppliers of processed products to the world.

Part II. Revealed comparative advantage and growth

Revealed comparative advantage

The previous section described the evolution of the trade in processed products, which countries were the major exporters and importers and whether their share changed over time. Comparing market share over time is one indication of a country revealing an ability to "compete" or not by increasing or decreasing overall market share. But a country's market share is devoid of information of developments in other sectors of the economy. Several measures have been developed based on relatively easily available trade data as summary statistics encapsulating all the factors (market and non-market) leading to comparative advantage. In this section we use Balassa's revealed comparative advantage index, a popular index used to indicate products or sectors where a country has a comparative advantage.

The Balassa Index is the ratio of country's j share of exports in sector k relative to that country's exports in all sectors to the ratio of total world trade of sector k to the total world merchandise exports.[18]

$$RCA_{j,k} = (X_{j,k} / \sum_k X_{j,k}) / (\sum_j X_{j,k} / \sum_j \sum_k X_{j,k})$$

Where;

$RCA_{j,k}$ = revealed comparative advantage for country j in sector k

$X_{j,k}$ = country j exports of sector k.

A value greater than 1 "reveals" that the country has a comparative advantage in t that sector, values below 1 "reveal" that a country has a comparative disadvantage in that sector, while a value of 1 means that the country has neither advantage nor disadvantage. For this study, the sectors indexed by k are 1) all agriculture for an overview of the sector and 2) processed products subsector.

The Balassa Index was calculated for each year and for the EU members, their data exclude intra-EU trade. In most cases this does not make a difference. EU members that had (had not) comparative advantage when intra-EU trade is included also had (had not) comparative advantage when only trade with third countries is considered.

Other than indicating whether or not a country has comparative advantage, it is not clear whether the absolute level of the calculated RCA has economic meaning. For example comparing the calculated value of the RCA between sectors in a country or between countries may be misleading as it's a ratio and small trade flows of products not widely traded can generate large outliers. Hence, for this exercise, the focus is on whether the calculated RCA for each country in each sectors is greater than or less than 1.

Based on this criterion, in 1997, of the 26 high income OECD countries half (13) had a comparative advantage in agriculture (Table 13a) while only 5 of the 31 (16%) high income non-OECD economies had an RCA index above 1. In contrast of the 134 emerging economies in the database in 1997, at least 70% of the countries in each income group had a comparative advantage in agriculture.

18. The calculated RCA for any country should be interpreted with caution as the measure not only reflects fundamental economic factors but also domestic and trade policies.

Looking specifically at processed products, a somewhat different picture emerges. There are more high income (OECD or not) countries with comparative advantage compared to overall agriculture while there are fewer emerging economies (Table 13b). The results suggest that a total of 16 high income OECD countries had comparative advantage in processed products. Belgium-Luxembourg, the Czech Republic, United Kingdom and Italy appear to have comparative advantage in processed products while Canada does not in contrast to their standing in all agricultural products. The European Union as a single trader, (*i.e.* by aggregating the individual EU members into a single block) appears to have a comparative advantage in processed products but not in agriculture. Among the low income countries, only seven appear to have comparative advantage in processed products (compared to 38 in agriculture). Among lower middle income countries, there are 17 fewer with comparative advantage in processed products while five fewer upper middle income countries have comparative advantage. Among upper middle income countries that appear to have comparative advantage are three OECD countries, Mexico, Poland and Turkey.

Table 13a. Countries with comparative advantage in agriculture (1997)

Agriculture				
High income: OECD	**High income: non-OECD**	**Upper middle income**	**Lower m iddle income**	**Low income**
Australia	Andorra	Argentina	Albania	Afghanistan
Canada	Barbados	Bulgaria	Armenia	Burundi
Denmark	Cyprus	Belize	Azerbaijan	Benin
Spain	Estonia	Brazil	Bosnia and Herzegovina	Burkina Faso
France	Trinidad and Tobago	Chile	Bolivia	Central African Republic
Greece		Costa Rica	Bhutan	Côte d'Ivoire
Hungary		Cuba	Cameroon	Comoros
Ireland		Dominica	Colombia	Eritrea
Iceland		Fiji	Djibouti	Ethiopia
Netherlands		Grenada	Dominican Republic	Ghana
New Zealand		Croatia	Ecuador	Guinea-Bissau
Portugal		Jamaica	Egypt, Arab Republic	Haiti
United States		Kazakhstan	Georgia	Kenya
		St. Kitts and Nevis	Guatemala	Kyrgyz Republic
		Lebanon	Guyana	Lao PDR
		St. Lucia	Honduras	Madagascar
		Lithuania	Indonesia	Mali
		Mauritius	India	Myanmar
		Panama	Jordan	Mozambique
		Poland	Kiribati	Malawi
		Suriname	Sri Lanka	Niger
		Turkey	Morocco	Nepal
		Uruguay	Moldova	Pakistan
		St. Vincent and the Grer	Marshall Islands	Papua New Guinea
		South Africa	Macedonia, FYR	Rwanda
			Mongolia	Senegal
			Nicaragua	Solomon Islands
			Peru	Somalia
			Paraguay	São Tomé and Principe
			Sudan	Chad
			El Salvador	Togo
			Syrian Arab Republic	Tajikistan
			Thailand	Tanzania
			Turkmenistan	Uganda
			Tonga	Uzbekistan
			Tunisia	Vietnam
			Ukraine	Zambia
			Vanuatu	Zimbabwe
			Samoa	

Table 13b. Countries with comparative advantage in processed products (1997)

Processed products				
High income: OECD	**High income: non-OECD**	**Upper middle income**	**Lower middle income**	**Low income**
Australia	Andorra	Argentina	Armenia	Côte d'Ivoire
Belgium-Luxembourg	Antigua and Barbuda	Bulgaria	Azerbaijan	Kenya
Czech Republic	Bahamas, The	Belize	Bosnia and Herzegovina	Kyrgyz Republic
Denmark	Barbados	Brazil	Bolivia	Madagascar
Spain	Cyprus	Chile	Colombia	Niger
France	Estonia	Costa Rica	Djibouti	Chad
United Kingdom	Trinidad and Tobago	Cuba	Dominican Republic	Zimbabwe
Greece		Dominica	Georgia	
Hungary		Grenada	Guatemala	
Ireland		Croatia	Honduras	
Iceland		Jamaica	Morocco	
Italy		St. Kitts and Nevis	Moldova	
Netherlands		Lebanon	Macedonia, FYR	
New Zealand		St. Lucia	Nicaragua	
Portugal		Lithuania	Peru	
United States		Latvia	Paraguay	
		Poland	Sudan	
		Turkey	El Salvador	
		Uruguay	Thailand	
		South Africa	Ukraine	
			Vanuatu	
			Samoa	

In 2007, among high income OECD countries, Belgium-Luxembourg joined the other 13 countries with a comparative advantage in agriculture (Table 14a). There were marginal changes to the composition of countries with revealed comparative advantage in agriculture in the other income groups as well. For example, among low income countries Gambia and Sierra Leone increased their comparative advantage to above 1 in 2007 while Chad's dropped to less than 1. Overall, the group of lower middle income countries had a net increase of five countries while there was a net gain of two among upper middle income countries with comparative advantage in agriculture.

In 2007 there were 16 high income OECD countries with comparative advantage in processed products, but the Czech Republic and Iceland were replaced by Austria and Canada. The EU, as a single exporter, also has a comparative advantage. There were marginal changes to the numbers and composition of countries with comparative advantage in the other income groupings. However a total of 12 low income countries (five more than in 1997) gained comparative advantage in agriculture (Table 14b).

Table 14a. Countries with a comparative advantage in agriculture (2007)

Agriculture				
High income: OECD	**High income: non-OECD**	**Upper middle income**	**Lower middle income**	**Low income**
Australia	Barbados	Argentina	Armenia	Afghanistan
Belgium-Luxembourg	Cyprus	American Samoa	Bolivia	Burundi
Canada	Estonia	Bulgaria	Bhutan	Benin
Denmark	French Polynesia	Belarus	Cameroon	Burkina Faso
Spain		Belize	Colombia	Central African Republic
France		Brazil	Cape Verde	Côte d'Ivoire
Greece		Chile	Djibouti	Comoros
Hungary		Costa Rica	Dominican Republic	Eritrea
Ireland		Cuba	Ecuador	Ethiopia
Iceland		Dominica	Egypt, Arab Rep.	Ghana
Netherlands		Fiji	Georgia	Gambia, The
New Zealand		Grenada	Guatemala	Guinea-Bissau
Portugal		Croatia	Guyana	Haiti
United States		Jamaica	Honduras	Kenya
		Lebanon	Indonesia	Kyrgyz Republic
		St. Lucia	India	Lao PDR
		Lithuania	Jordan	Madagascar
		Latvia	Kiribati	Mali
		Mauritius	Sri Lanka	Myanmar
		Malaysia	Morocco	Mozambique
		Panama	Moldova	Malawi
		Poland	Macedonia, FYR	Niger
		Suriname	Nicaragua	Nepal
		Turkey	Peru	Pakistan
		Uruguay	Paraguay	Papua New Guinea
		St. Vincent and the Grenadine	Sudan	Rwanda
		South Africa	El Salvador	Senegal
			Syrian Arab Republic	Solomon Islands
			Thailand	Sierra Leone
			Timor-Leste	Somalia
			Tonga	São Tomé and Principe
			Tunisia	Togo
			Ukraine	Tajikistan
			Vanuatu	Tanzania
				Uganda
				Uzbekistan
				Vietnam
				Zambia
				Zimbabwe

Table 14b. Countries with a comparative advantage in processed products (2007)

Processed products				
High income: OECD	**High income: non-OECD**	**Upper middle income**	**Lower middle income**	**Low income**
Australia	Bahamas, The	Argentina	Armenia	Benin
Austria	Barbados	Bulgaria	Bosnia and Herzegovina	Côte d'Ivoire
Belgium-Luxembourg	Cyprus	Belarus	Colombia	Kenya
Canada	Estonia	Belize	Dominican Republic	Kyrgyz Republic
Denmark	French Polynesia	Brazil	Ecuador	Niger
Spain	Slovenia	Chile	Egypt, Arab Republic	Nepal
France	Trinidad and Tobago	Costa Rica	Georgia	Senegal
Greece		Cuba	Guatemala	Somalia
Hungary		Dominica	Guyana	São Tomé and Principe
Ireland		Fiji	Honduras	Togo
Italy		Croatia	Jordan	Uganda
Netherlands		Jamaica	Morocco	Zimbabwe
New Zealand		St. Kitts and Nevis	Moldova	
Portugal		Lebanon	Macedonia, FYR	
United Kingdom		St. Lucia	Nicaragua	
United States		Lithuania	Peru	
		Latvia	Paraguay	
		Mexico	El Salvador	
		Poland	Syrian Arab Republic	
		Turkey	Thailand	
		Uruguay	Ukraine	
		South Africa	Samoa	

Segregating the EE countries from the income groupings, in 1997 each has a comparative advantage in agriculture except for China, while only Brazil and South Africa have a comparative advantage in processed products. This did not change over time. The same set of countries has a comparative advantage in agriculture and processed products in 2007 (Table A2).

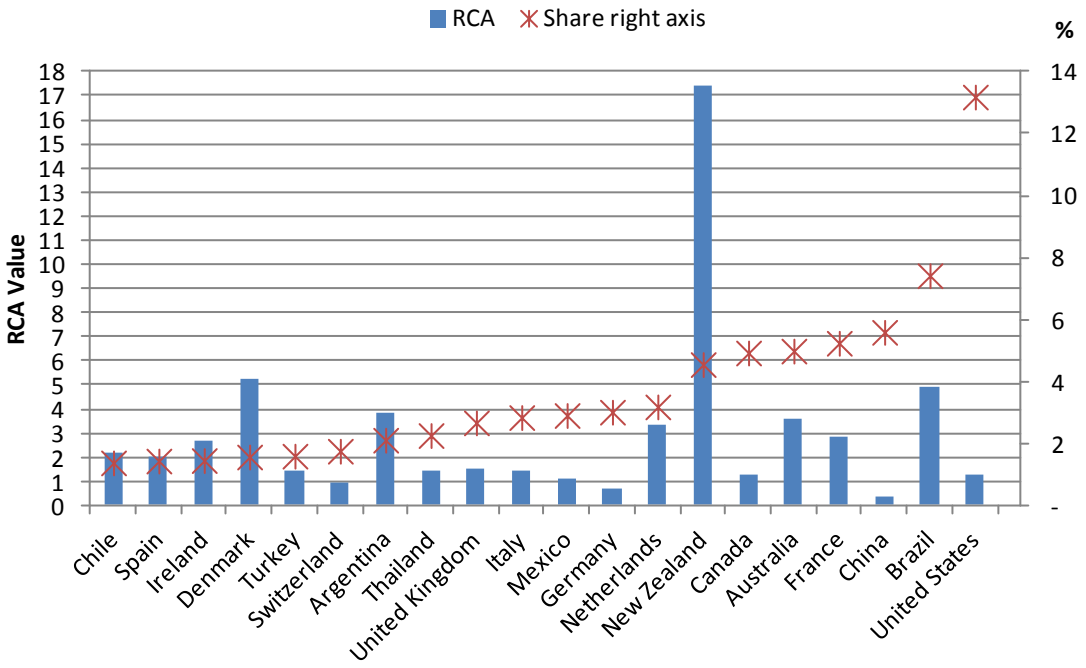
The information suggests that comparative advantage in processed products is concentrated relatively more among high income countries even as the number of emerging economies with a comparative advantage increased.[19] These are the products that comprise the largest share of agricultural trade, and they are the products with the greatest transformation or value added. Thus they potentially increase economic activity beyond the farm gate stimulating employment and economic growth along the food chain.

It also seems to be the case that even though there are many countries exporting a variety of products, trade is dominated by the few with a comparative advantage, especially among the high income OECD countries and the upper middle income countries with the most productive firms producing food beverages and tobacco. Almost 90% of the processed products exported by high income OECD countries in 2007 are from the 16 countries with an overall comparative advantage in those goods. For upper middle income countries the share exported by the 22 countries with a comparative advantage is even higher at 91% of the total from this group. In the other income categories, the countries with an overall comparative advantage are less dominant, accounting for less than half of each group's exports. A visual representation of country's export share of world processed products and its RCA value in 2007 is shown in

19. Table A2. contains the calculated RCA index in 2007 for most of the countries in the dataset.

Figure 10 for the top twenty exporters. The twenty leading exporting countries accounted for almost three quarters of world's total and only three of the top exporters had an RCA value below 1.

Figure 10. Export share of twenty top exporters of processed products and their RCA value in 2007



The information suggests that although a country's comparative advantage may change over time, tipping from having to not having or *vice versa*, comparative advantage, for the vast majority of countries, the pattern is fairly consistent. A country either has or has not comparative advantage whether due to its natural resource endowment, labour force, infrastructure, proximity to markets or a combination of factors. Domestic and trade policies undoubtedly also play a role although results for the EU members with same policies but different outcomes suggests that policies may be secondary to the other forces. The information also suggests that many emerging economies, including many low income countries have a comparative advantage in agriculture and this is manifested in an increasing share of world agricultural trade. But, low income countries share of agricultural trade is small and their comparative advantage may indicate an even smaller share of total merchandise trade.

Correlation between comparative advantage in agriculture and in processed products …

How are the values of revealed comparative advantage for agriculture and processed products related to each other and to some general indicators of factor endowment and trade facilitation? Simple correlations were run between RCA values for agriculture and processed products for all countries and time periods. The resulting correlation coefficient .38 indicates a positive but not very high relation. For the two selected years 1997 and

2007, the correlation coefficient of .26 and .38 suggest that the positive relationship has increased over time.

For each income group, the correlation between the calculated RCA in agriculture and processed products was positive and it increased between 1997 and 2007. The highest correlation coefficient was for high income OECD countries with a score of .94 in 1997 increasing somewhat to .96 in 2007 suggesting almost a one to one relationship; high RCA values for processed products are associated with high RCA values for agriculture. Interestingly, the correlation coefficient between high RCA values in agriculture with high RCA values in processed products diminishes as the income level falls. Low income countries have the lowest correlation coefficient with a 2007 value of .27. This confirms the finding that many more low income countries have comparative advantage in agriculture but not in processed products indicating that many have not yet made the transition to higher valued agricultural exports.

and with selected trade facilitation proxies

Recognizing the large diversity of countries in the sample, correlations coefficients were estimated for each of the selected years disaggregating the countries by income classification and adding selected variables to proxy endowments such as agricultural land as a percent of land area (to control for overall geographic size), agricultural value added (AVA), manufacturing value added (MANVA), gross domestic product (GDP) all measured in current USD) and to control for economic size, are expressed on a per capita basis. It may also be interesting to examine the correlation between border procedures in exporting countries and their RCA. What is the correlation between indicators of trade facilitation measures such as simplification of customs procedures and RCA values? Corruption or lack thereof, may also affect a country's export firms possibly increasing the trade costs and thus affecting a country's RCA. The correlation between RCA and Transparency's International corruption perception index is also examined.

For the more than 160 countries with data in 2007, an exporter in the average country needed to have almost seven different documents in order to export with a range of as few as three and as many as 13 while needing almost 26 days before the container could cross the border (ranging from a low of 5 days to as many as 102 days), facing an average cost to export the 20-foot container of USD 1 231 (with a range of USD 390 to USD 4 867). For the interested reader the results are reported in Table A5 (also broken out by the various income categories).

The addition of the proxy variables for endowments, trade facilitation and corruption restricts the observations to 130 countries and only for 2007 because data for the selected trade facilitation are not available prior to this time.[20] The results discussed below, due to the lower number of observations are not strictly comparable to the previous results presented above. For example the correlation between RCA values for agriculture and processed products for the 130 countries in the sample is .32 compared with .38 for the full sample.

20. Additional trade facilitation variables such as efficiency of custom clearance process or other measures of logistic performance from the World Bank could not be used nor indicators of public corruption because observations were not available for 2007. Hence the corruption perceptions index from Transparency International for 2007 is used.

The results present a mixed picture. For the high income OECD countries, high RCA values for agriculture or processed products are positively and strongly correlated with abundant agricultural land. The correlation with the other indicator variables is much weaker. There is a positive correlation with per capita value added in agriculture and with GDP, but a negative relationship to value added in manufacturing although the values are low indicating little relationship. The correlation between trade facilitation and the computed RCA index is also relatively weak. The number of documents and the cost of getting a 20-foot container ready to export are positively related with the RCA index which is not expected. In contrast, the number of days required to export is negatively related to the RCA index suggesting that speedier exports are associated with higher RCA values. One would expect that smoother trade facilitation, lower costs and fewer documents along with shorter duration to be associated with higher RCA values, i.e. a negative relationship. The reader is reminded that the trade facilitation indicators are for all exports and are not specific to exports of processed products and that there is no causation implied by the relationship. There may be something particular about exporting processed products such as health and sanitary standards that are correlated with more documents for high income countries high RCA values. This is something that probably requires further investigation. But, the fragility in the relationship of the selected trade facilitation variables and process products trade also shows up in the results reported below. Interestingly, the corruption perception index is positively correlated with the RCA index suggesting that good governance as indicated by perceived corruption is associated with higher RCA values (Table 15).

The results in Table 15 suggest that the correlation between RCA values in agriculture and processed products with the various variables examined is independent from income classification. In most cases, the correlation is very weak. The notable exception is the negative relationship between RCA values and the three trade facilitation variables for lower middle income countries. This is the only grouping of countries where higher RCA values are associated with fewer documents to export, lower costs and fewer delays which is what one would expect for all countries. For the grouping of low income countries, the group with relatively more countries with high RCA value in agriculture, a surprising finding is the negative relationship between AVA and RCA values. It seems that low income countries with high RCA values have relatively smaller agricultural sector much like the countries in the other income classifications. Interestingly, this is the only grouping of countries with a positive relationship between value added in manufacturing and RCA indicating that processed (food beverage and tobacco) products represent a larger share of the manufacturing sector of these countries.

Table 15. Correlation between revealed comparative advantage and selected proxy variables (2007)

	Year 2007	Revealed comparative advantage in agriculture	Revealed comparative advantage in processed products	Agricultural land as a percent of total land area	Per Capita Value added Agriculture: (current USD)	Per Capita Value added Manufacturing (current USD)	Per Capita Gross domestic product (current USD)	Number of documents	Number of days	Cost of 20-foot container (current USD)	Corruption Perception Index
High Income: OECD (obs=19)	Revealed comparative advantage in agriculture	1									
	Revealed comparative advantage in processed products	0.9443	1								
	Agricultural land as a percent of total land area	0.7252	0.7053	1							
	Per Capita Value added Agriculture: (current USD)	0.1991	0.1995	-0.2085	1						
	Per Capita Value added Manufacturing (current USD)	-0.338	-0.1448	-0.416	0.2433	1					
	Per Capita Gross domestic product (current USD)	0.0637	0.1769	-0.3119	0.4932	0.6846	1				
	Number of documents	0.2306	0.1177	0.3718	-0.0535	-0.6594	-0.5269	1			
	Number of days	-0.0875	-0.1773	0.2286	-0.2332	-0.6503	-0.7119	0.4716	1		
	Cost of 20-foot container (current USD)	0.2162	0.1729	0.5725	-0.2169	-0.3877	-0.3895	0.3005	0.4796	1	
	Corruption Perception Index	0.1309	0.2427	-0.3221	0.39	0.6386	0.7612	-0.3966	-0.8491	-0.5804	1
Upper Middle Income (obs=30)	Revealed comparative advantage in agriculture	1									
	Revealed comparative advantage in processed products	0.767	1								
	Agricultural land as a percent of total land area	0.1131	0.1912	1							
	Per Capita Value added Agriculture: (current USD)	0.1201	0.1087	0.1044	1						
	Per Capita Value added Manufacturing (current USD)	-0.255	-0.0946	0.0696	0.4739	1					
	Per Capita Gross domestic product (current USD)	-0.3472	-0.1054	-0.0833	0.3116	0.7181	1				
	Number of documents	0.2391	0.2361	0.2159	0.239	0.1005	-0.0897	1			
	Number of days	-0.1598	-0.1134	0.2991	-0.1225	-0.1161	-0.1224	0.6238	1		
	Cost of 20-foot container (current USD)	-0.015	0.0074	0.0411	-0.2424	-0.2668	-0.2205	0.4138	0.6637	1	
	Corruption Perception Index	0.2353	0.3084	0.0035	0.0491	-0.0086	0.1186	-0.1513	-0.3328	-0.4418	1
Lower Middle Income (obs=44)	Revealed comparative advantage in agriculture	1									
	Revealed comparative advantage in processed products	0.446	1								
	Agricultural land as a percent of total land area	0.199	0.2696	1							
	Per Capita Value added Agriculture: (current USD)	-0.002	0.0091	0.0745	1						
	Per Capita Value added Manufacturing (current USD)	-0.2585	0.1412	0.0944	0.2566	1					
	Per Capita Gross domestic product (current USD)	-0.3597	-0.0469	-0.0594	0.3859	0.6318	1				
	Number of documents	-0.0132	-0.1746	-0.0036	-0.1773	-0.2321	-0.0182	1			
	Number of days	-0.0958	-0.0435	0.1077	-0.0919	-0.3523	-0.0802	0.3995	1		
	Cost of 20-foot container (current USD)	-0.1933	-0.1029	0.1152	-0.1076	-0.4225	-0.0106	0.3532	0.7026	1	
	Corruption Perception Index	-0.218	0.013	-0.1486	-0.0336	0.279	0.2004	-0.298	-0.3002	-0.3207	1

Table 15. Correlation between revealed comparative advantage and selected proxy variables (2007) (*cont*.)

	Year 2007	Revealed comparative	Revealed comparative	Agricultural land as a	Per Capita Value added	Per Capita Value added	Per Capita Gross	Number of documents	Number of	Cost of 20-foot container	Corruption Perception
Low Income (obs=45)	Revealed comparative advantage in agriculture	1									
	Revealed comparative advantage in processed	0.2547	1								
	Agricultural land as a percent of total land area	0.3796	0.0733	1							
	Per Capita Value added Agriculture: (current USD)	-0.0348	-0.0353	-0.173	1						
	Per Capita Value added Manufacturing (current USD)	-0.218	0.2303	-0.1368	0.3023	1					
	Per Capita Gross domestic product	-0.2614	0.2393	-0.1788	0.6869	0.7327	1				
	Number of documents	0.1293	0.2709	-0.1061	0.1357	0.1343	0.0436	1			
	Number of days	-0.0315	-0.154	-0.0781	-0.1923	-0.141	-0.0619	0.2247	1		
	Cost of 20-foot container (current USD)	0.1094	0.0642	-0.0008	-0.2756	-0.1987	-0.0888	0.0544	0.7765	1	
	Corruption Perception Index	0.1235	0.2631	0.3249	-0.0478	-0.0146	0.014	-0.1536	-0.4105	-0.2847	1

Revealed comparative advantage at the individual product level

The discussion of comparative advantage to this point is as if processed products refers to one commodity that is exported to the "world" and countries either have or not comparative advantage in this one product. Of course, processed products as discussed comprise more than 250 products (at the HS-6 digit level) and there are more than 200 potential partners. It is the individual products that firms in a country export to specific destinations. How does comparative advantage at the individual product level compare to overall comparative advantage?

Focusing on 2007, the average high income OECD country exported 236 individual processed products to 167 partners, by far more than countries in the other groupings (Table 16). In contrast, the 16 high income OECD countries with a comparative advantage exported an average of 245 products to 184 partners. The average upper middle income country exported 151 individual processed products to 92 partners whereas those with a comparative advantage on average exported 178 products to 114 partners. At the other extreme, the average low income country exported 78 individual processed products to 37 partners whereas the average low income country with comparative advantage exported 108 products to 44 partners. The relative magnitude of average number of products and destinations pretty much follows that of the value of exports. High income OECD countries have a more diverse export basket and they export to more countries, although as Table 16 indicates, there is a large variation among countries. This diversity has the benefit of lowering the risk of large price variability from adverse effects in any one market. Low income countries may be more expose to such variability as they export fewer products to fewer markets. It seems that comparative advantage, regardless of a country's income classification, is associated with a more diverse export basket and more destinations. The dispersion of resources that may be associated with increased production diversity may not necessarily reduce a country's comparative advantage in processed products, rather it may strengthen it.[21]

21. The simple correlation between the RCA value for processed products and the number of varieties exported is .3 while for the number of partners is .31.

Table 16. Product and market diversification of an average country in different income classifications (2007)

	Number of observations	Average number of products	Average number of partners	Products		Partners	
				Minimum	Maximum	Minimum	Maximum
High income: OECD	26	236	167	137	252	85	206
High income: OECD with rca>1	16	245	184	230	252	128	206
High income: nonOECD	31	125	65	7	248	5	158
High income: nonOECD with rca>1	7	153	82	54	222	31	125
Upper middle income	37	151	92	3	250	2	193
Upper middle income with rca>1	22	178	114	43	250	24	193
Lower middle income	50	116	71	2	247	2	194
Lower middle income with rca>1	22	159	94	84	224	19	194
Low income	49	78	37	7	233	4	148
Low income with rca>1	12	108	44	15	233	8	107

Diversity in the number of products exported and markets serviced may be associated with comparative advantage but it's obviously not the whole story as not all high income OECD countries have a comparative advantage even though firms from those countries export many products to many partners. A whole gamut of goods are exported by various firms in different countries and even in sectors without an overall comparative advantage there are firms that are able to export to some markets. At a more disaggregate level, firms may have comparative advantage in individual products to specific markets but overall these may not be sufficient to render the sector with comparative advantage at the country level. At this more disaggregate level (HS-6), it may be interesting to see the share of products with a comparative advantage exported from a country to the overall number of products exported, as well as which countries have a comparative advantage in the most traded products or those with the fastest growth rates.

Share of products exported with revealed comparative advantage

As mentioned above, the average high income OECD country with an overall comparative advantage in processed products exported 245 goods. On average however, only 35% of the exported products had comparative advantage. This ranged from a high of 51% in the case of New Zealand to almost 16% in the case of United Kingdom. In contrast, from the ten high income OECD countries without an overall comparative advantage, only 12% of the individual processed products exported had a comparative advantage. This ranged from 18% in the case of the Czech Republic to 1% in Japan's case. Germany and Switzerland are the only high income OECD countries without an overall comparative advantage in processed products among the leading exporting countries depicted in Figure 10. But, Germany had comparative advantage in 41 of the 249 products exported in 2007 (16%) while Switzerland had comparative advantage in 43 of the 184 products exported in 2007 (23%).

Similarly, only 32% of the products exported by the 22 upper middle income countries with an overall comparative advantage were products with an RCA greater than 1. These range from 47% of the products exported by Poland to 21% exported by Cuba. For the 15 upper middle income countries without an overall comparative advantage in processed products an average of 15% of the goods exported had an RCA greater than 1. This ranged from 33% of the items exported by Palau to 4% exported by Libya. Of the products exported by the 22 lower middle income and the 12 low income countries with overall comparative advantage, 33% and 32% respectively had RCA

greater than 1. In contrast, 21% of the goods exported by the 28 lower middle income countries without comparative advantage had an RCA greater than 1 while 19% of the goods from the 37 low income countries without a comparative advantage had an RCA greater than 1. Table A2 contains for each country, segregated into various groupings, the total number of processed goods it exports at the HS-6 digit level, the total number of trading partners and the number of products, again at the HS-6 digit level with RCA index greater than 1 in 2007.

Although the number of exported products with comparative advantage is indicative, information on the whole distribution is lacking. A way to summarize the export basket of the various countries is to look at the distribution of their RCA's. But, the RCA, although bounded from below at zero, is not bounded from above which can generate values that make comparison of the distribution among various countries difficult. To overcome this problem a symmetric transformation of the original RCA index developed by Laursen (2000) is utilised. This is defined as:

$$SRCA_{j,k} = (RCA_{j,k} - 1)/(RCA_{j,k} + 1)$$

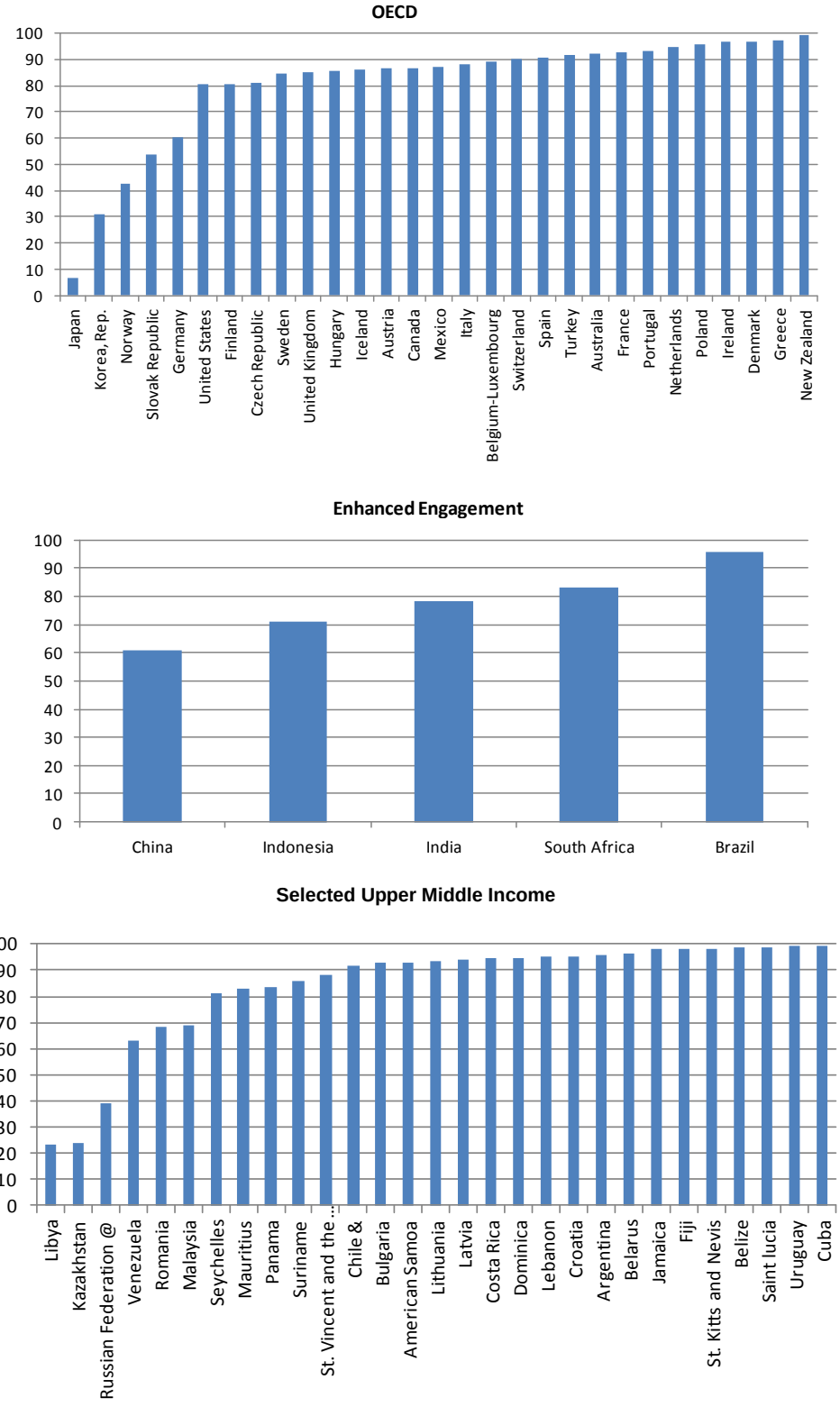
The SRCA index is bounded between -1 and 1 with a value of zero being equivalent to an RCA of one. Values below zero indicate comparative disadvantage while values above zero suggest comparative advantage. What does the distribution of the SRCA index look like, that is, how are the individual goods at the HS-6 digit level distributed across the comparative advantage and disadvantage spectrum? Histograms of the distribution for selected countries are given in Figure A1. Overall, an examination of Figure A1 reveals that the shape varies by country but in most cases, there is a relatively large concentration of products to the left of zero (the point with neither comparative advantage nor disadvantage). In countries with an overall comparative advantage in processed products however, there is also a relatively large concentration of goods at the right of zero. In contrast, countries without an overall comparative advantage although sharing the property of large mass of products on the left tail of the distribution these are not counterbalanced by a large mass on the right tail. Rather, the right tail is sparse, containing few products. Figure A1 shows the dispersion of the SRCA index for selected countries with and without an overall comparative advantage in processed products to illustrate the variety of distributions at the HS-6 digit level. The reader is reminded that the distribution for each country represents a different total number of exported products at the HS-6 digit level. This information, along with the total number of goods with an RCA index above 1 (that is the distribution to the right of 0 in Figure A1 is reported in Table A2.

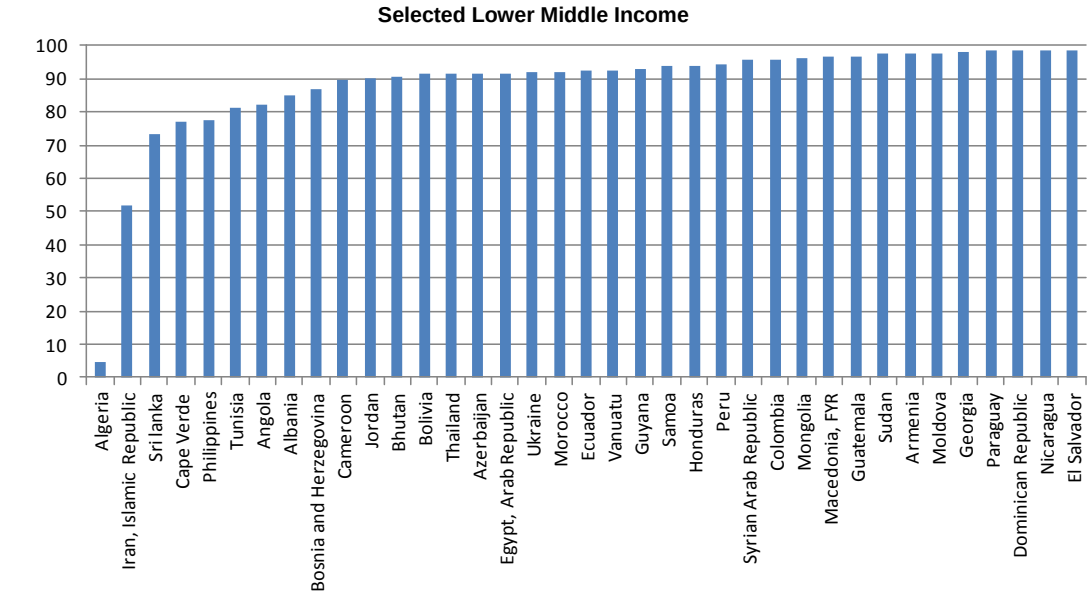
Even though products with RCA greater than one are a minority in the export basket of most countries, they represent the vast majority of each country's exports (Table A2). As can be seen in Figure 11, the value of exports of products with RCA greater than 1 in 12 OECD countries accounted for more than 90% of their total exports whereas in only three cases did these represent less than half of total exports (Japan, Korea and Norway). As indicated above, non-high income countries export fewer products to fewer markets. Nonetheless, Figure 11 shows that products with RCA greater than 1 represent more than 90% of the export value for the majority of the countries except in the case of the low income group where that was the case in only 20 out of 49 countries. In the case of the EE countries, Brazil's products with RCA greater than one accounted for more than 90% of her exports, while in each of the other EE countries, products with comparative advantage accounted for at least 60% of total exports (Figure 11).

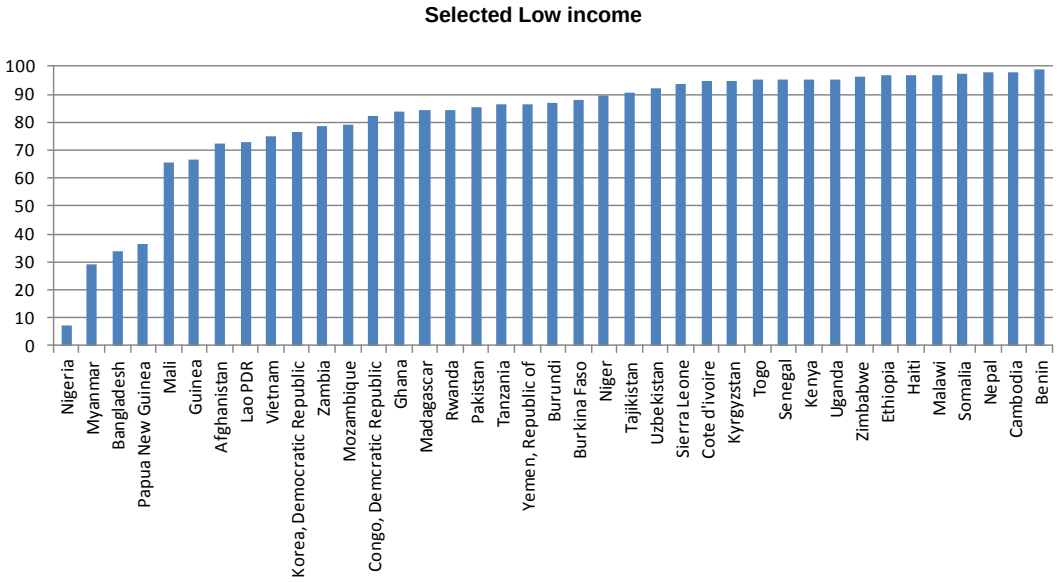
At the rather disaggregate HS-6 digit level, the results presented above indicate that the RCA index adequately identifies individual goods in which countries have a comparative advantage. The data also show that although countries with comparative advantage have a more diverse export basket and trade with more partners than others, it's the case that most of their export earnings are from exports of a smaller subset of products. However the data also reveal that many firms export goods that appear not to have a comparative advantage. Obviously, the fact that these goods are being imported implies that exporting firms are identifying niche markets satisfying a need for a given quality and price. An interesting question is what are the characteristics of such goods and do firms acquire sufficient scale overtime to transform them into goods with a comparative advantage?

Although not directly addressing this question, an examination of the SRCA distribution at different times may reveal changes in the distribution towards more or fewer products with comparative advantage. For this a kernel density method is used to estimate the density function. The method applied is called Epanechnikov kernel density estimation which provides a smooth estimation of the densities illustrated with histograms in Figure A1. This is because it's difficult to visually demonstrate changes over time with a histogram. The density is estimated at two points in time, 1997 and 2007 to see whether a country's overall distribution has changed. Figure A2 contains the kernel estimates for a large number of selected countries across the income spectrum. Below in Figure 12 the distribution for large grouping of countries based on their income classification is shown along with one comparing the distribution of the OECD and EE countries in 2007. Note that the distribution varies by income class but that there has not been a drastic change in the distribution over the two periods within each income class. Compared to the distributions of individual countries in Figure A2, aggregating the various countries seems to smooth out or mask changes occurring for individual countries. Differences in the distribution of the OECD and EE countries in 2007 are more apparent however especially to the right of zero showing the OECD countries with higher density of products with comparative advantage.

Figure 11. Share of exports accounted by HS-6 digit products with RCA index > 1



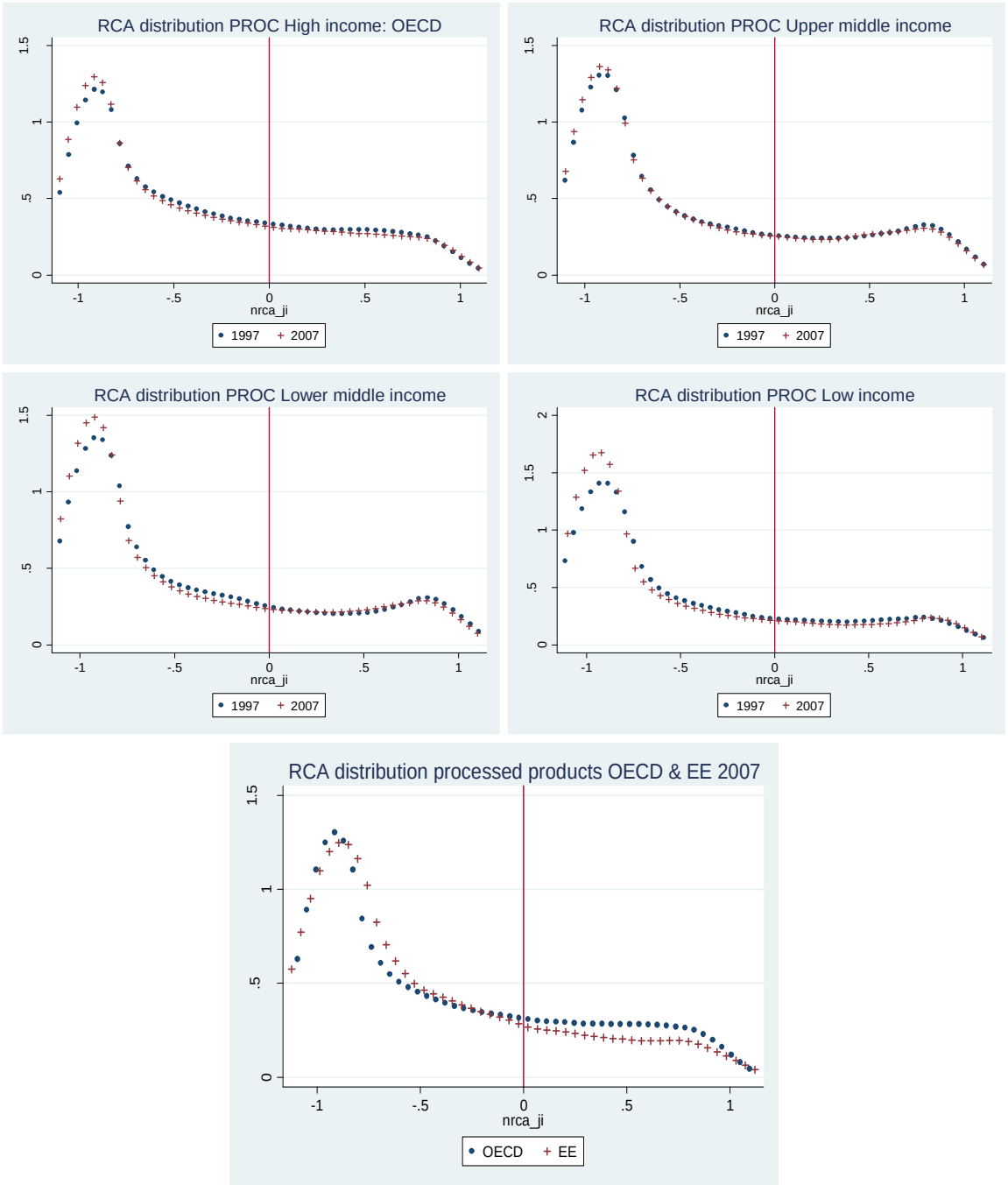




In the kernel density function for the various countries in 2007 depicted in Figure A2, one can readily see the histogram for that country in Figure A1. For countries with an overall comparative advantage in 2007 the proportion of products without comparative advantage seems to have declined relative to 1997 while the proportion of products with a comparative advantage has increased. This seems to be the case across the various income categories. But, the reader is reminded that the absolute number of goods included in these distributions differs across the income groups. For countries without an overall comparative advantage such as Germany and China the opposite shift has occurred. In Germany, there is a slight upward shift in the density function for products without a comparative advantage and a slight shift downwards in those with a comparative advantage. In China, the shift in the same direction is noticeably larger.

This does not speak as to whether individual products shift from being less to more competitive or vice versa over time. The mobility of individual products across the comparative advantage spectrum is beyond the scope of this paper. However, recent OECD work (OECD 2010) for a large number of products at the HS-4 digit level suggest that mobility is rather halting as most products remain within the same deciles over time.

Figure 12. Kernel density estimates in 1997 and 2007 by income classification



Focusing on the most traded products during 2006-08, it seems that although many countries participate in exporting these products, a much smaller number of countries have comparative advantage and these countries tend to capture most of the market. As mentioned above, *other food preparations* (HS 210690) was the most traded product with 189 exporting countries participating. Of these, 48 had a comparative advantage in 2007 and they exported almost 77% of the total, led by the United States with a market share of 22%. Nine of the top ten exporting countries with comparative advantage in this item are high income OECD countries with Thailand the only exception and the top ten exported 61% of the total. In general, countries across the whole income spectrum had a comparative advantage in this product with high income OECD countries the most numerous (16) and low income countries the fewest (4). Other top ten traded products with large number of countries with comparative advantage are *cigarettes*, *sugar* and *beer* with 56, 44 and 35 countries with comparative advantage and they come from across the income spectrum. There are fewer countries with comparative advantage among the animal products listed among the top traded and they tend to be either high income OECD or upper middle income countries (mostly from Latin America). In all cases, not surprising, the vast majority of the trade is by countries with comparative advantage. But even within this grouping, a few countries tend to be more dominant capturing a sizeable share of the market in each product.

Among the least traded products, there are fewer countries participating in exporting those goods and an even smaller number that have comparative advantage. For example only 11 countries exported, *rolled or flaked barley grains* (HS 110411) in 2007 and five of them had comparative advantage.

Does what you export matter?

The evidence suggests that countries produce and export a variety of processed products but specialize in a minority of these as evidenced by the RCA index. Focusing on total merchandise trade, Hausmann, Hwang and Rodrik (HHR) (2007) argue that specialization patterns are partly indeterminate and may be shaped by idiosyncratic elements. They argue that fundamentals such as endowments of physical capital, labour and natural resources along with the overall quality of institutions play an important role but do not uniquely determine what a country will produce and export. They argue that not all goods are alike in their impact on economic growth. Specializing in some products brings higher growth than specializing in others. This is related to the cost of discovering new products and the asymmetric information which turns successful products into social gains (through imitation by others) while product failures are private costs. In their setting, the range of goods that an economy produces and exports is not only determined by usual fundamentals but also by the number of entrepreneurs that are engaged in discovery. The larger the number, the closer the economy is to its productivity frontier. For agricultural products a case can be made that fundamentals such as land endowment and physical location play a critical role in determining what can be produced. Coffee, bananas, or olives for example, require special climatic conditions and cannot be produced everywhere. Processed products on the other hand share characteristics with other manufactured products.

For the empirical application of their model, HHR (2007) develop a quantitative index that ranks traded goods in terms of their implied productivity. This measure is constructed by taking a weighted average of the per-capita GDPs of the countries exporting a product where the weights reflect the revealed comparative advantage of each

country in that product. Using Balassa's RCA index and per capita income Y_j, an income/productivity level (coined PRODY by HHR) for each processed product (k) at the HS-6 digit level is generated.

$$PRODY_k = \sum_j RCA_{jk} * Y_j$$

Goods that are exported by "rich" countries (controlling for overall economic size) get ranked higher than goods exported by "poorer" countries. In addition, the income/productivity level corresponding to each country's export basket is generated by calculating the export-weighted average of the $PRODY_k$ for that country. This index coined EXPY by HHR, ranks traded goods in terms of their implied productivity level reflecting the income-productivity level corresponding to that country's export basket or specialisation pattern.

$$EXPY_j = \sum_k (x_{jk} / X_j) * PRODY_k$$

Where (x_{jk} / X_j) is product *k*'s share of country *j*'s total exports.

Using total merchandise trade data from 2001 to 2003 for a consistent set of reporting countries HHR calculated average PRODY for each product. This was then used to construct the EXPY variable for all countries reporting trade data from 1992 to 2003. They find that human capital and country size (proxy by population) are positively associated with EXPY and that EXPY increases growth; a 10% increase in EXPY boosts growth by half a percentage point.

Is there a similar relationship between the productivity level of processed products, the resulting EXPY and growth? In this section the HHR methodology is employed to ascertain the relationship between a country's export productivity basket and subsequent income growth.

In order to maximize the number of reporting countries (observations) in each year the average productivity level of the various goods is calculated for 2001-2003, a period when most countries reported trade and per capita income in all three years. HHR used the RCA index as an indication of the relative importance of a product in a country's export basket and to minimize the possibility of small trade flows biasing the calculations. The time period covered by their analysis is 1992 to 2003 and they calculated average PRODY for 1999 to 2001. But, as seen above, the RCA index at a disaggregated level can generate extreme values that can also bias the results. For example, even though the average RCA for processed products is a little more than three during 2001-2003, RCA values greater than 2 500 can be found. To reduce the bias from such extreme values, RCA values greater than 31 are excluded from the calculations (this eliminated 1 070 observations reducing the number of observations from 65 957 to 64 887) and lowering the variance from more than 1 000 to 12.

Table 17 contains the average productivity levels of non-agricultural products, all agricultural products and processed agricultural products with per capita income measured in current USD (as are the trade data) and constant 2000 USD. The results are not substantially different hence most of the discussion is based on per capita income measured in constant 2000 USD. As in HHR, we find a large variation in the calculated PRODY suggesting that the income level associated with each traded commodity varies widely and that specialisation patterns are dependent on per-capita income and this seems to hold for non-agricultural as well as agricultural products. The average productivity

level for processed products is the highest supporting prior findings that they are mostly exported from high income OECD countries, but they also exhibit the largest variation.

Table 17. Average Productivity level of individual products (2001-2003)

	Variable	Observations	Mean	Standard deviation	Minimum	Maximum
Non-Agricultural products	Mean prody, current USD	4341	12 359	15 533	467	626 364
	Mean prody, constant 2000 USD	4341	11 565	14 466	455	550 999
All-Agricultural products	Mean prody, current USD	668	12 837	17 148	890	316 906
	Mean prody, constant 2000 USD	668	12 073	16 429	794	305 995
Processed-Agricultural products	Mean prody, current USD	254	14 352	20 796	1 643	316 906
	Mean prody, constant 2000 USD	254	13 452	20 120	1 440	305 995

The ten processed products with the highest and lowest average PRODY values are shown in Table 18. The data in Table 18 show large variations in the average productivity of individual traded products even when confined to the relatively small group of processed products reflecting that specialisation patterns are dependent on income even within a relatively homogeneous group of products. Interestingly, the product with the highest average productivity level is *Sauerkraut*, which as the reader will recall, is also the least traded product. This is because during the period, this product was exported by two high income OECD countries, France and United Kingdom each with relatively high RCA values. Four out of the top ten are products from Chapter 2 (*meat and edible offal*) but not the type of products one normally associates with this category. Among the lowest productivity products are those that seem to require relatively little processing using fruits or vegetables such as strawberries, pineapples, asparagus, cucumbers or palm hearts as the primary input and they tend to be exported by a large number of countries with small RCA's. For example, the product with the lowest average productivity, *asparagus, preserved other than by vinegar* (HS 200560) was exported by about 60 countries, half of which were high income countries; but only three countries had an RCA above 1.

Table 18. The ten highest and ten lowest average productivity processed products (2001-2003)

Product	Mean PRODY	Product name
		Largest
200530	305 995	Sauerkraut, preserved other than by
220810	81 694	Compound alcoholic preparations
071210	59 276	Dried potatoes
020750	43 609	Frozen poultry livers
110411	31 251	Rolled or flaked barley grains
110720	30 440	Roasted malt
020900	29 946	Pig and poultry fat, fresh, chilled, frozen, sa
020731	28 440	Fresh or chilled fatty livers of geese or ducks
020680	28 156	Fresh or chilled edible offal of sheep, goats,
150410	27 749	Fish-liver oils and their fractions
		Smallest
081110	3 527	Strawberries, frozen
071029	3 499	Leguminous vegetables, shelled or unshelled, fr
200570	3 271	Olives, preserved other than by vinegar or acet
071230	3 050	Dried mushrooms and truffles
200891	2 748	Palm hearts, prepared or preserved (excl. those
020210	2 566	Frozen bovine carcasses and half carcasses
020820	2 537	Fresh, chilled or frozen frogs' legs
200820	1 955	Pineapples, prepared or preserved (excl. those
071140	1 840	Cucumbers and gherkins provisionally preserved
200560	1 440	Asparagus, preserved other than by vinegar or a

The average PRODY as indicated above was used to calculate the productivity level of each country's export basket (EXPY) for each year 1996 to 2007. The number of countries reporting both trade and income data ranged from 215 to 222 (with slightly fewer countries exporting processed products). The average productivity level based on all merchandise trade is reported in Table A6. The data indicate a rather stable productivity level with a slight increase over time. This may be an indication that the export baskets of each country remained relatively constant and of course the fact that the productivity level of the individual products is fixed as explained above. This result is somewhat different from HHR who found a decline in the productivity level. They attributed their finding to the fact that their sample increased over time with the addition mostly of countries with lower incomes that began reporting their trade statistics. Our sample is much bigger and stable with few countries jumping in and out of the sample and includes data up to 2007.

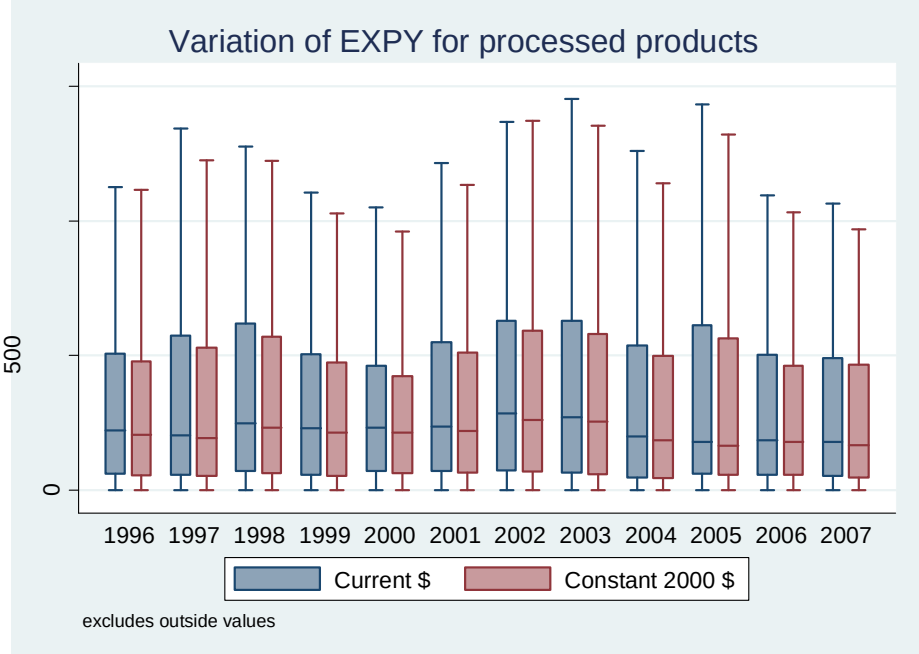
The productivity level of the export basket based only on processed products is given in Table 19 with a graphical representation calculated in current and constant USD in Figure 13. Even though the productivity level of individual processed products is high, the resulting productivity level of a country's export basket is low reflecting the relatively small share of processed products in the export basket of most wealthy countries. On average, EXPY increased over time reaching its maximum in 2002 but has declined since

that time. Since the productivity level is held constant as explained above, this implies that more processed products are exported by poorer countries a finding which is consistent with the trends described above. The minimum values close to zero reflect countries with trivial exports of processed products compared to their overall exports.

Table 19. Average EXPY for processed products (constant 2000 USD)

Year	Observations	Mean	Standard deviation	Minimum	Maximum
1996	209	421	644	0.5	4 527
1997	213	409	635	0.0	4 671
1998	210	468	823	0.2	7 967
1999	208	383	567	0.3	4 067
2000	214	387	586	0.2	4 008
2001	216	437	741	0.1	6 133
2002	215	490	964	0.1	9 081
2003	219	438	612	0.2	4 524
2004	218	377	535	0.0	4 655
2005	222	464	774	0.1	4 945
2006	217	405	679	0.0	4 938
2007	218	362	580	0.2	5 145

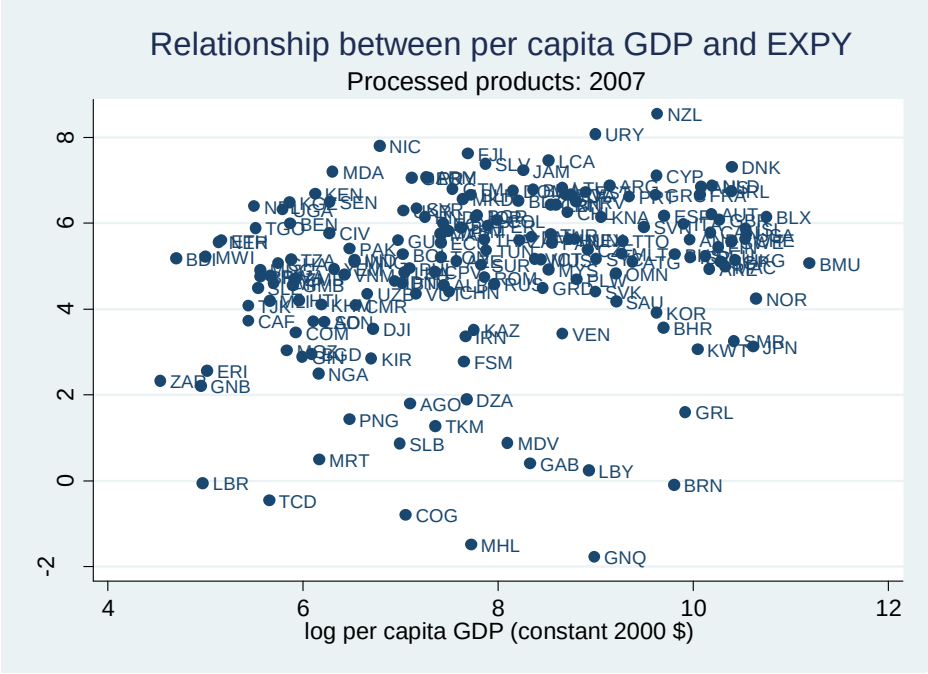
Figure 13. Variations of EXPY over time



How does EXPY vary across countries? Figure 14 shows a scatter plot of EXPY against per capita GDP in 2007. The graph illustrates a relatively weak correlation between these two variables, a finding very different from HHR. The correlation

coefficient between the two ranges from .21 to .34 depending on the year. Findings reported above indicate that the correlation between RCA and income is relatively low, while the results here suggest that the productivity or sophistication of a country's export basket and its income are also weakly correlated. Rich and poor countries tend to export similar products. This however may be a reflection of the data. Although the data are the most disaggregate on an internationally consistent basis they may still be too coarse to detect quality or sophistication differences that may be more apparent at a more disaggregate level.

Figure 14. Per capita income and EXPY in 2007



Which countries have the largest and smallest EXPY? In 2007, New Zealand was the leader followed by Uruguay (Table 20). The list of the leading EXPY countries in Table 20, countries with high productivity export baskets, is surprising since it consists mostly of small island states that are not major exporters. Among the leading EXPY countries, only New Zealand and Denmark are among the top 20 exporters in 2007 while Uruguay is the 37th largest exporter while Anguilla is number 137. The resulting rankings are a result of different circumstances in each case. For example, New Zealand's and Uruguay's export basket consist of a large variety of process products while in Anguilla's case, her export basket comprises of 24 different products, one of which represents a third of total exports. For each of these countries however, processed products are a large share of their total export basket—41% for New Zealand, 29% for Uruguay and 38% for Anguilla.

The list of countries with the lowest EXPY includes those countries with trivial amounts of exports of processed products as indicated above. As mentioned in the trade patterns section, few countries dominate exports. In 2007, exports from 123 countries contributed less than 1% of the world total with 100 of these countries exporting less than USD 100 000 while another 23 exported less than USD 100. Excluding those countries to reduce outliers, the calculated EXPY values at the bottom end of the spectrum are rather

low. Chinese Taipei has the lowest EXPY value, but the list of low value EXPY countries includes China, Japan and South Korea that are major exporting countries (Table 20). In the case of Chinese Taipei, even though her export basket consists of 207 products, many of which have high PRODY values, processed products are insignificant with a share of total exports of less than 0.2% resulting in very low EXPY. Similar results hold for China, Japan, and the other countries on the list. It seems that EXPY captures important differences in export composition of the various countries even among those exporting similar products at comparable overall levels.

Table 20. Highest and lowest EXPY in 2007 (constant USD 2000)

Country	EXPY	Country	EXPY
Ten largest	**USD**	**Ten lowest**	**USD**
New Zealand	5 144.94	China	81.37
Uruguay	3 206.77	Norway	69.87
Anguilla	2 858.15	Saudi Arabia	65.26
Nicaragua	2 456.31	Korea, Rep.	50.23
Fiji	2 037.02	Kazakhstan	33.39
St. Lucia	1 754.94	Venezuela, RB	30.72
Cuba	1 721.67	Iran, Islamic Rep.	28.91
El Salvador	1 607.69	Japan	22.68
Denmark	1 501.63	Kuwait	21.41
Barbados	1 461.92	Chinese Taipei	16.79

This is better reflected in the graphs in Figure A3 which show the income content of exports for selected countries grouped by income classification. This shows the change in the value of EXPY over time for any country and the relative level of the different countries. In many of the cases depicted, the income content is relatively flat or declining with only a few exceptions. Given that the productivity level of the goods is fixed as explained above, this reflects an export basket that is relatively static without much switching to higher productivity goods. Maybe there is not much innovation occurring in processed products or the time period is too short. But, it's evident that EXPY is picking up idiosyncratic patterns among countries. Countries across the various income groups seem to export products with similar productivity content as there are lower income countries with relatively high EXPY as well as high income countries with relatively low EXPY (Figure A3).

HHR suggest that the specialization patterns and economic growth is driven not only by fundamental factors such as size of labour force and human capital but also by diversification of investment into new products. They find that controlling for per capita GDP, a 10% increase in EXPY increases growth by half a percentage point. What is the relationship between the income content of processed products exports and growth? Controlling for per capita agricultural value added, we find that a 10% increase in EXPY increases growth by four-tenths of a percent (Table 21). Given that the agricultural sector (much less only processed products) is a relatively small share of most countries economies, the small order of magnitude is not surprising. The negative relationship between initial per capita AVA and growth probably reflects the fact that countries with relatively high per capita AVA were already exporting most products reducing the

number of opportunities to discover new products. This negative relationship is not just for processed products. HHR in their examination for all merchandise trade also found a negative relationship between initial per capita GDP and growth. Adding the land-labour ratio to account for factor endowments (among the fundamental contributions to growth) does not alter the results (column 2 Table 21). Although the estimated coefficient is not significant, its presence does not affect the other estimates which remain robust. HHR interpret this result as an indication that EXPY affects growth in its own right and is not a proxy for a country's factor endowments. However, the result should be considered carefully due to the relatively short time period covered.

Table 21. Income content of processed products exports (EXPY) and GDP growth

	(1)	(2)
Dependent variable: growth rate of GDP per capita 1996 to 2007		
Log of initial per capita AVA	-0.050**	-0.048**
	(0.022)	(0.024)
Log of initial EXPY	0.004***	0.004***
	(0.001)	(0.002)
Log of agriculture land to labour ratio		0.003
		(0.015)
Constant	0.073**	0.068*
	(0.030)	(0.036)
Observations	153	151
Adjusted R-squared	0.078	0.069

Robust standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

Summary

Countries with comparative advantage, regardless of their income classification, have more diversified export profile, exporting more goods to more destinations than the average country in their income group. At the individual product level, countries export many products but have comparative advantage in only a minority of them. Nonetheless, these are the products that generate the bulk of their export earnings. The majority of high income OECD countries have a comparative advantage in processed products perhaps reflecting their large and productive food beverages and tobacco sectors.

Correlations between revealed comparative advantage in processed products and proxy variables for factor endowments and trade facilitation were rather weak suggesting little relationship among the variables. The correlation between lack of corruption or cleanliness and RCA is positive and among the largest values found although still below .4 in all cases.

The profile of the products with comparative advantage is important for income growth. Using the methodology from HHR (2007), the productivity of individual processed products and countries were computed. The computed average productivity level of processed products was higher than other agricultural products and non-

agricultural goods. The country with the highest export productivity level was New Zealand followed by Uruguay. Of the top ten countries only Denmark is from the OECD area. The list of countries with the lowest export productivity level surprisingly is China while OECD members on the list include Norway, Korea and Japan. Countries with export profiles resembling the export profile of high income countries have higher growth.

Part III. Trade in processed products and the intensive and extensive margins

Intensive and extensive margin of processed products

The data shows that firms from many countries, across the whole income spectrum, export agricultural products, although the variety of their export basket, along with the number of trading partners varies. Analysis also shows that there are economically important differences in the specialisation patterns of otherwise similar countries. According to HHR model, the process is driven by entrepreneurship and discovering and investing in new activities. Countries that improve the productivity or "quality" level of their export basket perform better. That is countries can improve their performance by discovering new products or new markets thus expanding trade at the extensive margin. Although the data shows that much of the agricultural processed products are exported mostly by relatively high income countries; what is not clear is the relative contribution of higher volumes or more diverse export basket and partners to the overall export earnings. That is, are larger economies exporting more at the intensive margin (more volume) or the extensive margin (more goods and partners)?

In this section, the agricultural trade of processed products in 2007 is assessed and is decomposed it into the extensive and intensive margin. Utilising a country's bilateral export data the methodology proposed by Hummels and Klenow, (henceforth HK) is employed to compute for each exporter, their intensive and extensive margin. The methodology is based on incorporating new varieties into a country's price and quantity index. The price index is effectively lowered when the set of goods expand (HK). Of special interest is the extensive and quality margin. Larger exporters systematically selling large quantities at high prices may be an indication that these exporters produce higher quality goods. The methodology allows one to answer the question; do richer countries export more agricultural products at the intensive or extensive margin, and do they export higher quality goods?[22] In addition, we examine the impact of trade facilitation variables in exporting goods on the respective margins. Previous OECD work Liapis (2009) used similar methodology on all agricultural goods. In this report, the focus is on processed products. Comparing results with those from the previous study may help determine whether trade in processed products is similar to or different from other agricultural goods. Additionally, this report expands previous analysis by examining the effects, if any, of trade facilitation variables discussed above (the number of documents, the length of time and the cost to prepare a 20-foot container to cross a border) along with perceived corruption, on the exports of processed products and the respective margins

22. Although the data used is the most disaggregate internationally consistent trade data, it may still be the case that the HS-6 digit level is not sufficiently disaggregated to pick up all of the quality differences.

Measuring the Extensive and Intensive Margin

This study uses the methodology proposed by HK to measure the intensive and extensive margin. This is based on the assumption that consumers value variety and that expanding the set of goods effectively lowers the import price. Instead of comparing varieties imported over time, HK compare varieties imported from different sources at a point in time. This compares export prices for country *j* relative to a reference country *k.* For the case when *j*'s shipments to *m* are a subset of *k*'s shipments to *m*, the extensive margin is defined as

$$1)\ EM_{jm} = \frac{\sum_{i \in I_{jm}} p_{kmi} x_{kmi}}{\sum_{i \in I} p_{kmi} x_{kmi}}$$

where I_{jm} is the set of observable categories in which country *j* has positive exports to *m* and *I* is the set of all categories. Reference country *k* has positive exports to *m* in all *I* categories. The extensive margin EM_{jm} therefore is country *j*'s exports to country *m* in I_{jm} (the set of products exported by country j to country m) relative to country *k*'s exports to country *m* in all *I* categories (the set of all products imported by country m). In the empirical implementation, the reference country *k* is the rest-of-world (ROW), and the set *I* is the more than 250 HS-6 processed products. The extensive margin is basically a weighted count of country *j*'s products relative to country *k*'s products. If all products are of equal value, than the extensive margin is the fraction of categories that *j* exports to *m*.

The intensive margin compares nominal shipments for *j* and *k* in a common set of goods.

$$2)\ IM_{jm} = \frac{\sum_{i \in I_{jm}} p_{jmi} x_{jmi}}{\sum_{i \in I_{jm}} p_{kmi} x_{kmi}}$$

where x_{jmi} = nominal exports of country *j*, to country *m* in product category *i*, and $i \in I_{jm}$ = the set of products exported from country *j*. Essentially, the equation shows that the intensive margin is the exporting country *j's* share of market *m's* imports of all products exported by country *j*. The ratio of country *j* to country *k* exports to *m* equals the product of the two margins.

$$3)\ \frac{\sum_{i=1}^{I} p_{jmi} x_{jmi}}{\sum_{1=1}^{I} p_{kmi} x_{kmi}} = IM_{jm}\, EM_{jm}$$

HK also show how to derive a variety adjusted price and quantity index that are consistent with a Dixit-Stiglitz utility function. The essential idea is that a rise in the extensive margin is equivalent to a fall in price (HK). Expressions 1-3 above are specified for each import market. HK also demonstrate how to aggregate the various variables into a single indicator for each exporting country. These are not replicated here to conserve space.

The value added of this analysis is the application of the HK methodology to trade in processed products while also including trade facilitation proxies. HK relate each margin for total merchandise trade to a country's size, measured by its GDP as well as its components, workers and output per worker.

Empirical results

Following HK, for each exporter, we construct the relevant margins (using equations 1-3) along with their price and quantity index. Since the focus of the analysis is on processed agricultural products, rather than using GDP and total labour force as in HK, AVA and agricultural labour force are used as explanatory variables. The results presented below are based on three independent regressions for 1) overall exports, 2) the intensive margin and 3) the extensive margin. Depending on the specification, the independent or explanatory variables are either the exporters AVA or the exporters AVA per worker and the size of the agricultural labour force, each expressed relative to ROW. All variables are expressed in natural logs. These are estimated for 2007 using OLS[23].Because OLS is a linear estimator, the coefficients of the intensive and extensive margin sum to the coefficient of overall exports and one can compute the relative contribution of each margin to total exports.

In Table 22, the rows represent the dependent variable while the columns are the independent variables or summary statistics. The values in parenthesis below the estimated coefficients are the Huber-White Standard errors and the percentages report the relative contribution of each margin to total exports. The results reported in Table 22 are satisfactory with the relatively simply model explaining a fair amount of the variation in exports of processed products as evidenced by the relatively high R^2 given that it's cross sectional estimation and with each estimated coefficient statistically significant (p values below 1%). Focusing first on the results when only an exporter's AVA is the explanatory variable (column 1 Table 22), the adjusted R^2 suggests that in this simple model, AVA explains 48% of the variation in a country's processed products exports. The estimated coefficient suggests that economies with twice the size export 84% more processed products. The estimated coefficient for the intensive margin suggests that economies with twice the agricultural size export60% more volume while the estimated coefficient for the extensive margin indicates that wealthier countries export 24% more variety. That is, 29% of the additional exports by richer countries are at the extensive margin (more items to more markets) while more than 70% is from higher volumes of the items exported (Table 22 first column). This result differs from those of HK who found that most of merchandise trade of richer countries is at the extensive margin and from Liapis (2009) where for 2006, exports of agricultural products by richer countries, (as opposed to only processed proucts) was mostly at the extensive margin.

23. The results are broadly similar when GDP and total employment are used as right hand side variables, with the non agricultural specific variables containing slightly higher explanatory power as indicated by higher adjusted R^2.

Table 22. Estimates of exports of processed products and their intensive and extensive margin

Independent / Dependent	AVAj	Adjusted R^2	Number of observations	AVAj / L_j	L_j	Adjusted R^2	Number of observations
Overall exports	0.839***	0.482	139	1.288***	0.783***	0.599	138
Robust standard errors in parenthesis	(0.080)			(0.105)	(0.078)		
Intensive Margin	0.599***	0.498	139	0.797***	0.579***	0.551	138
Robust standard errors	(0.064)			(0.084)	(0.063)		
Relative contribution	71%			62%	74%		
Extensive Margin	0.240***	0.250	139	0.491***	0.204***	0.466	138
Robust standard errors	(0.033)			(0.044)	(0.032)		
Relative contribution	29%			38%	26%		

All variables are in natural logs. **AVA**j is agricultural value added for exporter *j* measured in constant 2000 dollars. **L**j is agricultural labor force in exporter *j*. Percentages describe the contribution of each margin to the overall export elasticity. Number of observations equals number of exporting countries.

* Coefficient is significant at the 10% level; ** significant at the 5% level; and *** at the 1% level.

Results for agricultural size measured by total labour force engaged in agriculture and average productivity are similar. Countries with twice the average productivity but same labour force export more than twice as much (129%). They export 80% more at the intensive margin (higher volume) and 49% more at the intensive margin (more variety to more partners). That is, the intensive margin contributes 62% of the larger countries additional exports, while the extensive margin contributes 38% of the additional exports. Countries with double the labour force but same average productivity export 78% more with almost three-fourths occurring at the intensive margin. Although the extensive margin is important determinant of processed products exports, larger economies export more at the intensive margin. Even though the data indicates that on average wealthier countries export a wider basket of products to more markets, most of their additional exports are from exporting higher volumes. Although this finding is consisting with the finding presented above, that richer countries, even though they export a larger variety of products to more markets, most of their export earnings are from selling relatively few products. The finding is also consistent with the results presented in the next section. But they differ from other cross sectional studies (HK and Liapis) that found that the extensive margin had the majority share of export earnings. Perhaps the finding here is due to the dataset used for this analysis that includes many more countries while excluding intra-EU trade, or to the relatively narrow set of products that make up the set of processed product that perhaps limit the possibilities of discovering new products or partners.

Turning our attention to the intensive margin, are the additional agricultural exports of larger economies of higher quality (do firms from rich countries receive higher prices) or do they export larger volumes? The intensive margin is broken into its price and quantity components as laid out in HK. The explanatory variables are the same as above and results are reported in Table 23. The results for the price component are not satisfactory explaining little of the variation. Nonetheless, with AVA as the explanatory variable (column 1), the results indicate that within varieties and to a given market, countries with twice the agricultural income export 62% more processed goods with a price penalty of about 3% (significant at the 10% level). That is, firms from richer

economies are exporting higher volumes compared to firms exporting the same set of goods from other countries, and despite the higher volumes prices are no different (based on the usual statistical significance level).

Table 23. Price and quantity component of the intensive margin

Independent / Dependent	AVA_j	Adjusted R^2	Number of observations	AVA_j/L_j	L_j	Adjusted R^2	Number of observations
Price component	-0.025*	0.022	139	0.040*	-0.035***	0.164	138
robust standard errors in parenthesis	(0.014)			(0.021)	(0.013)		
Quantity component	0.624***	0.503	139	0.758***	0.614***	0.529	138
robust standard errors in parenthesis	(0.067)			(0.091)	(0.067)		

All variables are in natural logs. **AVA**j is agricultural value added for exporter *j* measured in constant 2000 USD. **L**j is agricultural labor force in exporter *j*. Percentages describe the contribution of each margin to the overall export elasticity. Number of observations equals number of exporting countries.
* Coefficient is significant at the 10% level; ** significant at the 5% level; and *** at the 1% level.

For the second specification of an economy's size, the explanatory power is somewhat improved reflected in the higher adjusted R^2. The results in Table 23 suggest that economies with twice the AVA per worker, that is, with twice the average productivity (but with the same labour force) in a given market for the varieties they export, obtain prices that are 4% greater (significant at the 10% level) while also exporting 76% greater volume. This result suggests that more productive economies even as they export greater volumes neither receive higher prices nor suffer a price penalty (based on the usual statistical significance level). Countries with twice the labour force (but with the same output per worker) on the other hand, export about 60% greater volume with a price penalty of about 4%. Since it's generally the case that lower income countries have relatively more of their workforce in the agricultural sector and it's relatively less productive, the results indicate that lower income countries discount the price of their exports to expand production. Overall, the results suggest that the intensive margin is dominated by higher quantities with quality or product differentiation playing a secondary role except in economies with a large agricultural labour force.

Trade facilitation and the extensive margin

In Part II, the results indicated little correlation between the selected trade facilitation variables and comparative advantage in processed products. Perhaps trade facilitation variables are insufficient by themselves to bestow comparative advantage because other factors are more important, do they nonetheless boost exports and if so do they favour one margin over the other? What are the effects, if any, of the three trade facilitation variables on exports of processed products and on the respective margins? In addition to AVA and labour force, we add the average cost to export a 20-foot container, the average number of documents needed to export and the average number of days needed to export as explanatory variables. The results for cost and number of documents were not statistically significant and are not reported.[24] The average number of days needed for a

24. The effect of these variables on the bilateral trade of processed products with a gravity model is revisited below.

container to cross a border however is significant. The results are reported in Table 24. Controlling for the size of an economy's agricultural sector, doubling the number of days before a container can be exported reduces exports of processed products by almost 130%. At the intensive margin, the estimated coefficient suggests that doubling time delays reduces the volume exported by 53%, while also lowering the variety exported by 76%. Thus, most of the decline in trade (59%) occurs at the extensive margin. Controlling for an economy's average productivity and agricultural labour force, doubling time delays reduces exports almost 60% with most of the decline occurring at the extensive margin. That is economies with long delays, irrespective of how their economic size is measured, export fewer varieties to fewer markets. The relationship between exports and timeliness has only recently received attention in the literature. Findings in this report that time delays lower exports are consistent with previous findings (OECD 2006, Djankov *et al*. (2010) Yui and Wilson (2009). The novelty here is the disaggregation of the overall effect into the intensive and extensive margin with lower volumes coming mostly from lower exports of new varieties to new markets rather than lower volume of existing varieties. This is similar to the 2006 OECD report that found that time delays not only reduce trade volumes but also the probability that firms producing time-sensitive products will enter export markets which in our parlance implies a smaller extensive margin.

Table 24. Estimates of time delays on the exports of processed products and the intensive and extensive margin

Independent / Dependent	AVA_j	Time $delays_j$	Adjusted R2	Number of observations	AVA_j/L_j	L_j	Time $delays_j$	Adjusted R^2	Number of observations
Overall Exports	0.780***	-1.294***	0.567	137	1.136***	0.773***	-0.563*	0.600	136
Robust standard errors in parenthesis	(0.078)	(0.250)			(0.139)	(0.078)	(0.320)		
Intensive Margin	0.576***	-0.532***	0.522	137	0.765***	0.577***	-0.129	0.545	136
Robust standard errors	(0.066)	(0.192)			(0.106)	(0.065)	(0.231)		
	74%	41%			67%	75%	23%		
Extensive Margin	0.204***	-0.763***	0.451	137	0.371***	0.196***	-0.433***	0.491	136
Robust standard errors	(0.028)	(0.097)			(0.056)	(0.030)	(0.128)		
	26%	59%			33%	25%	77%		

All variables are in natural logs. **AVA_j** is agricultural value added for exporter *j* measuered in constant 2000 USD; Lj is agricultural labour force in exporter j. Percentages describe the contribution of each margin to the overall export elasticity. **Time to $Export_j$** is the number of days required to clear hurdles to export products that are assumed to be in standardized 20-foot container, Number of observations equals number of exporting countries.
* Coefficient is significant at the 10% level; ** significant at the 5% level; and *** at the 1% level.

Disaggregating the intensive margin into its price and quantity components the results suggest that time delays impacts the price or quality component. Economies with twice the delays can expect a drop in price of about 14% to 20% depending on how the size of the agricultural sector is measured (Table 25). Speeding up the export process does not seem to have an effect on the quantity component. The results suggest that processed products are time sensitive and delays appear to deteriorate quality leading to substantial price drops without affecting export volume.

Table 25. Price and quantity component of the intensive margin with time delays

Independent / Dependent	$AVAj$	Time to $Export_j$	Adjusted R^2	Number of observations	AVA_j/L_j	L_j	Time to $Export_j$	Adjusted R^2	Number of observations
Price component	-0.036***	-0.201***	0.182	137	-0.000	-0.038***	-0.135**	0.194	136
Robust standard errors in parenthesis	(0.013)	(0.040)			(0.026)	(0.013)	(0.055)		
Quantity component	0.612***	-0.331	0.509	137	0.766***	0.616***	0.006	0.526	136
Robust standard errors in parenthesis	(0.069)	(0.206)			(0.115)	(0.069)	(0.253)		

All variables are in natural logs. **AVA_j** is agricultural value added for exporter *j* measured in constant 2000 USD; Lj is agricultural labor force in exporter j. Percentages describe the contribution of each margin to the overall export elasticity. **Time to $Export_j$** is the number of days required to clear hurdles to export products that are assumed to be in standardized 20-foot container, Number of observations, 137, equals number of exporting countries.
* Coefficient is significant at the 10% level; ** significant at the 5% level; and *** at the 1% level.

Corruption and the extensive margin

Trade facilitation proxies discussed above most likely reflect the efficiency of a country's government; its ability to smooth and expedite commerce. Other ways government functioning affects firms ability to trade is corruption or lack thereof. Do firms need to bribe government officials to avoid unnecessary delays and other hindrance to trade? Here we utilize the Corruption Perception Index from Transparency International to assess the effect of this index on trade and the respective margins. The results reported in Table 26 suggest that while controlling the size of a country's agricultural sector, increasing cleanliness or reducing corruption has a very large effect on the exports of its processed agricultural sector. A 10% reduction in corruption (an increase in cleanliness) results in an 14% to 21% increase in exports depending on how size is measured. Controlling for the size of an economy's AVA, the additional exports from reducing corruption are almost equally spread between increasing volume of existing products to existing markets (intensive margin) and exporting new products to new markets (extensive margin). Exports expand relatively more at the intensive margin from lower corruption in cases where average productivity and the size of agricultural labour force are held constant.

Table 26. Estimates of corruption on exports of processed products and the intensive and extensive margin

Dependent	AVA_j	Corruption $Index_j$	Adjusted R2	Number of observations	AVA_j/L_j	L_j	Corruption $Index_j$	Adjusted R^2	Number of observations
Overall Exports	0.795***	2.119***	0.612	134	1.025***	0.775***	1.437***	0.627	133
robust standard errors in parenthesis	(0.080)	(0.274)			(0.136)	(0.082)	(0.424)		
Intensive Margin	0.558***	1.039***	0.535	134	0.641***	0.558***	0.779**	0.543	133
robust standard errors	(0.069)	(0.196)			(0.116)	(0.069)	(0.309)		
	70%	49%			63%	72%	54%		
Extensive Margin	0.237***	1.080***	0.511	134	0.384***	0.217***	0.658***	0.54	133
robust standard errors	(0.028)	(0.128)			(0.054)	(0.030)	(0.205)		
	30%	51%			37%	28%	46%		

All variables are in natural logs. **AVA_j** is agricultural value added for exporter *j* measured in constant 2000 USD; Lj is agricultural labor force in exporter j. **Corruption index** $_j$ is Transparency International's corruption perception index, ranging from 10, highly clean to 0 highly corrupt. Percentages describe the contribution of each margin to the overall export elasticity. Number of observations equals number of exporting countries.
* Coefficient is significant at the 10% level; ** significant at the 5% level; and *** at the 1% level.

Does corruption affect prices exporting firms receive? Breaking down the intensive margin into its price and quantity components, the results suggest that when controlling the size of the agricultural sector, lowering corruption or increasing cleanliness

significantly affects price with a 10% increase in cleanliness resulting in about a 30% price premium (Table 27). Interestingly, the higher price does not significantly affect the quantity component. It seems that better governance lowers inefficiencies and frees exporting firms to pursue business opportunities overseas without the burdens from bribes and other costs. It is beyond the scope of this paper to explore reasons that lower corruption leads to higher quality as reflected in higher prices, but it may be interesting to explore this in the future.

Table 27. Price and quantity component of the intensive margin with corruption

Independent Dependent	AVAj	Corruption Index$_j$	Adjusted R^2	Number of observations	AVA$_j$/L$_j$	L$_j$	Corruption Index$_j$	Adjusted R^2	Number of observations
Price component	-0.020	0.297***	0.23	134	-0.019	-0.020	0.294***	0.214	133
Robust standard errors in parenthesis	(0.014)	(0.053)			(0.027)	(0.014)	(0.079)		
Quantity component	0.578***	0.742***	0.494	134	0.660***	0.578***	0.486	0.501	133
Robust standard errors in parenthesis	(0.074)	(0.220)			(0.127)	(0.074)	(0.349)		

All variables are in natural logs. **AVA**$_j$ is agricultural value added for exporter *j* measuered in constant 2000 USD; Lj is agricultural labor force in exporter j. **Corruption index** $_j$ is Transparency International's corruption perception index, ranging from 10, highly clean to 0 highly corrupt. Percentages describe the contribution of each margin to the overall export elasticity. Number of observations equals number of exporting countries.
* Coefficient is significant at the 10% level; ** significant at the 5% level; and *** at the 1% level.

Contribution of export diversification to export growth

The section above explained the differences in the structure (the intensive and extensive margin) of exports between large and small agricultural economies in a given year. In this section, the relative contribution of the margins to overall growth in exports between 1997 and 2007 is examined in a comparative static setting to ascertain which margin dominates, whether development level matters and whether policymakers should focus attention on maintaining and improving comparative advantage thus expanding exports at the intensive margin or whether to invest in developing and promoting new products and locating new partners (the extensive margin).

Previous research examining changes over time has found that unlike cross sectional analysis, the intensive margin is the dominant contributor to growing exports for all products. For example, Brenton and Newfarmer (2007) find that 80% of total merchandise exports of 99 developing countries from 1995 to 2004 came at the intensive margin, while Amurgo-Pacheco and Pierola (2007) for a smaller set of countries but at greater product detail also find that the intensive margin is the dominant source of export growth. Focusing only on all agricultural product exports from 1996-2006 for 66 countries, Liapis (2009) finds that the intensive margin is dominant.

In this section we revisit the question whether the growth in processed product trade was predominantly at the intensive margin or the extensive margin to ascertain the role of export diversification in growing exports over the 1997 to 2007 period. In order to reduce the bias from small traders jumping in and out of markets, the sample size for this exercise consists of 55 largest traders that exported consistently in each year. In 2007, these 55 exporters accounted for about 95% of world trade in processed products and 95% of the growth in trade. Here, rather than computing an indicator variable as in the previous section, each bilateral trading relationship at the HS-6 digit level is utilised for each of the 55 exporters to compute the change in their exports. This descriptive analysis

abstracts from the reasons for the change such as policy, supply shortfalls, change in tastes and preferences or population and income growth.

The intensive margin for each exporter is calculated by identifying the set of commodity and partner combinations with exports at the beginning and ending periods and calculating the change in the exported value[25]. The extensive margin is calculated by identifying new products that were exported at the end of the period which were not exported at the beginning regardless of whether these new products were exported to totally new partners or to previously existing partners (new products to new markets or to old markets), plus identifying old products (those that existed in the beginning period) but are exported to new partners in the end. Decomposing the total growth in exports requires an additional category, products that were exported at the beginning of the period but are no longer exported. These disappearing or dead products are included in the intensive margin by Brenton and Newfarmer (2007), whereas they seem to be included in the extensive margin by Amurgo-Pacheco and Pierola (2008), and Felbermayr and Kohler (2006). Since our interest in the extensive margin is the establishment of new trading relationships, we include the disappearing or dead products in the intensive margin.

As reported above, exports of processed products almost doubled between 1997 and 2007 from USD 134 billion to USD 251 billion. For the 55 sample countries, the equivalent figures were USD 119 billion and USD 238 billion. Most of the growth was at the intensive margin (USD 96 billion) while the extensive margin contributed another USD 31 billion. In addition between 1997 and 2007, there was USD 8 billion in trade that ceased to exist resulting in net growth of USD 119 billion. This finding is consistent with the findings based on the HK method above and with those from (Brenton and Newfarmer (2007), Helpman, Melitz and Rubinstein (2008), and Amurgo-Pacheco and Pierola (2008)).

Table A7 contains the list of countries and the growth in their processed products exports listed in descending order of their overall increase. The table also shows the change in the value of the various margins for each country. Expired products column shows the value of the trade flows that existed in the beginning period but not at the end. The difference between gross and expired products is the net intensive margin or the intensive margin reported here. It seems that demand for the same set of goods by existing partners grew the most for products from the United States. At the intensive margin (trade flows for products and partners that existed in both periods), United States exporting firms increased their exports the most, growing some USD 9 billion. Other leading countries with substantive growth at the intensive margin are Brazil, China, Australia and Canada. Growth at the intensive margin of at least USD 1billion was recorded by 23 countries, 15 of which are OECD members plus Chile which became an OECD member in 2010. For two countries however, this flow was negative.

Turning our attention to the extensive margin, the development of new trading relationships either through new products or new partners, Brazilian firms seem the most successful with more than USD 6 billion in new trade. In general however, as reported by others, generating large new trade flows is a difficult proposition. Firms from only 6 countries were able to generate new trade flows of at least USD one billion. The results indicate that the average new trade flow was USD 567 million compared to an average value of almost USD 1.6 billion for established trade flows. Interestingly, there are no

25. Product definition is held constant throughout the time period by using the same nomenclature—HS 88/92-- for all years.

OECD members among the top 6 countries with the largest extensive margin, and only two among the top 14. This is probably because the average OECD member, as reported above, already exports more products to more destinations than other countries, leaving little scope to develop substantive large new trade flows.

In general, 74% of the growth in trade for the selected countries is at the intensive margin with 26% coming from the extensive margin. In contrast, Liapis (2009) for all agricultural products found that the intensive margin contributed 52% to export growth. It seems that trade in processed products, unlike in all agricultural goods, is even more reliant on established trading relationships. Nonetheless, the extensive margin with a contribution of more than one-fourth is consequential.

Are there cases where the extensive margin contributes more to trade growth than the intensive margin? In the sample countries reported in Table A7, there are 11 countries where the extensive margin contributes more than 50% to the overall export growth. In the case of Hong Kong China and Hungary, new trade flows (the extensive margin), are the only source of trade growth as their intensive margin is negative. For the 9 countries with positive growth in both margins, the United Arab Emirates, Belarus and Poland, almost all of the growth is at the extensive margin. At the other extreme, the extensive margin contributes less than 10% to overall export growth in 4 OECD countries. New trade flows contribute the least to Mexico's export growth, possibly reflecting Mexico's trade in established products with her NAFTA neighbours.

As mentioned above, the extensive margin refers to establishing new trade flows through developing new products and/or cultivating new trading partners or by expanding the trading relationships with established partners. Within the extensive margin, which particular avenue has been more successful in increasing a county's exports? We have decomposed the extensive margin into four components to address this question. Type 1 extensive margin involves developing New Products or lowering the trade costs of products that have not been exported previously and marketing them to New Destinations (NPND). These are probably the most difficult trade flows for exporting firms in any country to develop since they involve products and markets that are totally new and require upfront investment to identify target consumers in unfamiliar markets. Type 2 extensive margin is similar to Type 1 extensive margin, but the New Products are marketed to familiar destinations (Old) Destinations (NPOD) in the sense that other exporting firms from the country of origin have exported Old Products to these partners in the past. It's not clear *a priori* the difficulty of establishing this trade flows. Although firms in the exporting country are familiar with the trading partners, the products are new requiring a certain amount of investment in market development and identifying target consumers. Type 3 extensive margin involves extending the market reach of established (Old) Products by exporting them to New Destinations (OPND). These trade flows are the flipside of Type 2 flows. In this case, firms are selling Old Products and presumably have experience in marketing them, but they are targeting unfamiliar, New Destinations. Type 4 extensive margin is similar to the intensive margin in that it involves exports of old products to old destinations but in order to make the distinction, these trade flows at the extensive margin are referred to as Existing Products to Traditional Destinations (EPTD). The distinction is that the intensive margin refers to trade flows that exist in both time periods, whereas for the extensive margin, these are new trade flows. The trade flows in this classification for any exporter are new even though the products were already exported to other destinations, and the partners imported other goods from this exporter but the product-partner combination did not exist in the past. Since firms in the

exporting country are familiar with the importing market and they have marketed the products in the past to other destinations, these trade flows may be easier to establish.[26]

Figure 15 decomposes the extensive margin into the four sources. This shows that the vast majority of the extensive margin USD 24 billion (78%) is derived from shipping established products to existing partners that had not imported that product previously (EPTD), while exporting new products whether or not the destination was previously established is the smallest contributor to the export growth. The results suggest that establishing branding and marketing new products may be difficult probably requiring large initial investments in cultivating, promoting, and targeting consumers whether in a familiar or in an unfamiliar environment. The relatively small contribution of new products to overall export growth illustrates that product innovation among processed products is relatively meagre. The reader is reminder that our measure probably underestimates new product development because we only have trade data at the HS-6 digit level which may mask new product developments at a more disaggregate level which is then reported as trade under existing headings. This would have been more obvious had we used trade data at an even more aggregate 4 digit or 2 digit levels.

Figure 15. Decomposition of the extensive margin

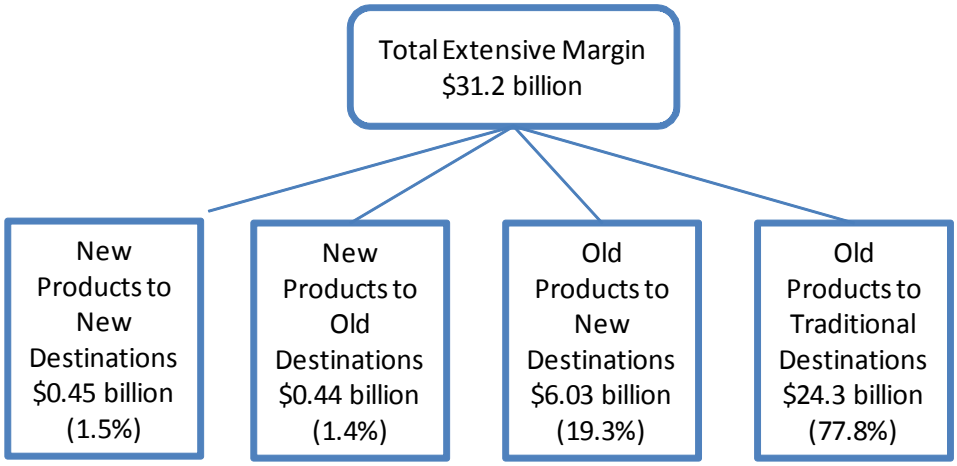


Figure 15 illustrates that developing and exporting to new trading partners seems much easier than developing and exporting new products. It seems that firms are savvy in marketing their products to new destinations. They seem to have developed the marketing strategies to identify and market their products to new markets. And, new trade flows with traditional partners (OPTD) which involves offering products that are new for that partner (expanding the variety of the export basket) in established partners has the largest share. This implies that firms that have established beachheads in other countries are able to utilise their knowledge of the local market to sell more products. These results, coupled with the results of exporting at the intensive margin seem to suggest that once firms from

26. Since we do not have access to firm level data and the relative costs of establishing new trade flows, reference to ease or difficulty of marketing various products to various destinations refers to the importance of the flows as revealed in their contribution to the overall extensive margin.

the country of origin are in a market, they can more readily expand exports. In contrast, developing new products imposes greater challenges.

Examining the contribution of each of the four modes to the extensive margin of the selected countries, in no case did developing new products (whether or not marketed to old or new partners (NPND or NPOD) lead to large contribution to export growth at the extensive margin (Table A8). Rather, in 23 countries export growth for NPND did not exist, and in 12 countries it contributed less than USD 20 000 to export growth. Only in the case of Belarus did this mode contribute more than USD 100 000 to export growth. Although the overall value from marketing new products to old partners (NPOD) was very similar to that from NPND, there are many more firms from various countries that engaged in this activity, although the contribution in each case is rather small. In no instance did this mode generate more than USD 70 million in new exports while it was not existent in three countries (Table A8). Mexican firms were the most successful totalling some USD 66 million followed by Uruguay, Vietnam and Turkey. The most successful marketers of existing products to new partners (OPND) were firms from the United Arab Emirates, Saudi Arabia and Belarus each with more than USD 1 billion in new exports. The total from firms in the remaining countries drops precipitously (Table A8). Finally, the largest contribution to growing exports at the extensive margin is from OPTD. In this case, firms from Brazil are by far the most successful in generating new exports worth more than USD 6 billion (20% of the total for this margin). Firms from China and Argentina also successfully utilized this mode to grow their exports by more than USD 1 billion.

To summarize, although growth at the extensive margin is relatively small, most of the growth at the extensive margin is from firms from non-OECD countries that have created new trading opportunities by developing and expanding into new products and markets, presumably expanding employment and increasing foreign earnings for their home country. This reinforces results reported above; countries with more diversified and productive export baskets resembling the export baskets of richer countries grow faster. Their success is evidenced in that the six countries with the largest growth in the extensive margin are not members of the OECD. This does not imply that firms in OECD countries are no longer innovative. Rather, the relatively low growth of the extensive margin may be a reflection of the time period under consideration when these firms were already exporting most products and were established in most markets. Firms from OECD countries continue to be formidable traders expanding the demand for their products overseas at the intensive margin as evidenced by the fact that eight of the top 10 countries with the highest growth in the intensive margin are from the OECD area. The distinction of export growth between the extensive or intensive margin has implications for questions related to whether government policy should encourage product development and diversification or improve competitiveness. The extensive margin, although not as important as the intensive margin is nonetheless an important contributor to growth, especially for lower income countries. It also has implications on how to model effects from trade liberalization. Models that exclude growth of the extensive margin may understate the benefits from freer trade.

Product decomposition of the extensive margin

What are the processed products that have contributed to the growing exports at the extensive margin? The same classification as above is used to decompose the extensive margin along the product dimension. The focus above was on firms located in specific

countries and how their exports grew regardless of the product. Here the focus is on the products that firms are producing and exporting regardless of their location.

Obviously since the total contribution of each mode is the same regardless whether the focus is on countries or products, NPND and NPOD contribute the least to the extensive margin. The top 20 products with the largest new trade flows (largest extensive margin) in descending order are listed in Table 28. The product with the most new trade flows from all modes, totalling almost USD 2 billion is *"bovine cuts boneless, frozen"* (HS 020230) followed by "*refined sugar, in solid form, nes, pure sucrose"* (HS 170199), *"cigarettes containing tobacco"* (HS 240220), *"swine cuts, frozen nes"* (HS 020329) and *"milk and cream powder unsweetened < 1.5% fat"* (HS 040221) each with more than USD 1 billion growth in new trade representing 24% of the total. Note that many of the products listed in Table 28 for having large extensive margin are also among the top traded products listed in Table 5 indicating that their growth at the intensive margin is also substantial.

Table 28. Decomposition of the extensive margin for the top 20 traded processed products

Product name	HS	NPND	NPOD	OPND	OPTD	Total
Bovine cuts boneless, frozen	020230	249	2 678	96 215	1 846 400	1 945 543
Refined sugar, in solid form, nes, pure sucrose	170199	105 912	20 778	468 145	1 285 012	1 879 847
Cigarettes containing tobacco	240220	0	1 093	403 478	923 468	1 328 039
Swine cuts, frozen nes	020329	51	183	50 969	1 246 328	1 297 530
Milk and cream powder unsweetened < 1.5% fat	040221	1 177	1 207	260 812	789 921	1 053 117
Fowl cuts & offal, domestic, except livers, frozen	020741	2 587	516	203 205	670 678	876 987
Milk powder < 1.5% fat	040210	.	24	324 133	473 521	797 678
Undenatured ethyl alcohol > 80% by volume	220710	.	0	5 481	647 969	653 450
Infant foods of cereals, flour, starch or milk, retai	190110	1 158	107	28 505	523 245	553 015
Fowls, domestic, whole, frozen	020721	11 405	1 246	191 274	340 216	544 141
Food preparations nes	210690	.	.	205 016	326 091	531 107
Cheese except fresh, grated, processed or blue-veined	040690	.	293	271 248	250 259	521 800
Non-alcoholic beverages nes, except fruit, veg juices	220290	.	.	118 723	378 483	497 205
Malt extract & limited cocoa pastrycooks products nes	190190	.	.	145 869	338 519	484 388
Meat and edible meat offal cured, flours, meals nes	021090	158	289	452	474 137	475 037
Beverage waters, sweetened or flavoured	220210	.	.	111 715	359 651	471 366
Butter and other fats and oils derived from milk	040500	175	1 259	188 710	207 493	397 637
Milk and cream powder sweetened < 1.5% fat	040229	2 029	209	26 973	333 746	362 956
Ethyl alcohol and other spirits, denatured	220720	5 214	12 900	377	343 646	362 137
Bovine cuts boneless, fresh or chilled	020130	526	379	3 390	342 511	346 806

As indicated above, NPND is among the most difficult avenue for expanding exports. There are 58 products that did not have any trade flows in this category which means that no new firms sprang up to export these products and no new demand in new partners were established. Rather, these products were produced and exported by the same firms to the same markets. New trade flows to new partners were established for 21 products but with rather meagre trade with each product generating USD 1 000 or less. The product whose trade grew the most along the NPND mode is "*refined sugar, in solid form, nes, pure sucrose"* (HS 170199) with exports valued at USD 106 million, representing 23% of total NPND trade flows

Establishing trade flows of new products to established markets (NPOD) is also difficult but in this case, firms seem to be able to introduce new products to established markets albeit at relatively modest levels. The product with the most trade in this mode with a total of USD 58.5 million is *"bovine cuts bone in fresh or chilled"* (HS 020120).

At the other end of the spectrum, 22 processed products did not have any trade in this mode while for each of 18 products total trade was USD 8 000 or less.

Marketing established products to new partners (OPND) as mentioned above seems to be easier than marketing new products and the trade flows per product are larger. For only 12 established goods were firms not able to identify and market the goods to new partners and one *"barley rolled or flaked grains"* was only marketed to established markets. Marketing "*refined sugar, in solid form, nes, pure sucrose"* (HS 170199) generated the largest new trade flows under this mode (USD 468 million) followed by *"cigarettes containing tobacco"* (HS 240220), with new trade flows of USD 403 million. At the lower end, marketing of *"peel of citrus fruits or melons"* generated the least new trade flows with USD 18 000.

Marketing old products to established markets (OPED) that is, selling products that were already exported to markets that already imported goods from that exporter (but the product market combination is new), is the largest contributor to the extensive margin. Increasing the variety of the export basket demanded by a trading partner seems to function more successfully. Firms that have established marketing strategies to sell goods to markets that were already receiving other goods from the origin country. There may be some spill over effects in the country of origin making it easier for firms from that country to enter markets where other firms from that country are already established. The product with the most new trade flows under this mode is *"bovine cuts boneless, frozen"* (HS 020230) value USD 1.8 billion. Other products with substantial new trade flows are "*refined sugar, in solid form, nes, pure sucrose"* (HS 170199), and *"swine cuts frozen nes"* (HS 020329) each with more than USD 1.2 billion. The product with the least new trade in this category is *"poultry livers, domestic frozen"* (HS 020750).

What determines trade in processed products?

To this point the paper discussed the evolution of trade in processed products in the recent past, which countries have a comparative advantage, whether the growth has been at the extensive or intensive margin and that product diversification leads to higher growth. In this section we turn our attention to the determinants of bilateral trade in processed products. As others that have looked into estimating trade flows, we employ an augmented gravity model for the analysis. The gravity framework is a useful devise to gain understanding why processed products trade across national frontiers. In our case, in addition to the traditional multilateral trade resistance variables such as distance representing transportation and other costs, and trade accommodation variables representing geographic and cultural proximity such as sharing borders, language similarities or colonial relationships we examine the effect of trade facilitation variables and corruption discussed above and more importantly we include bilateral tariffs and prices.

What influences bilateral trade in processed agricultural products? Estimating gravity models is now well established method to answer such a question. There is less agreement on the "proper" estimation method. Traditionally, ordinary least squares (OLS) were the dominant estimation technique. If the model and data exhibit certain properties, OLS estimates are best linear unbiased estimators. More recently, questions have arisen as to whether those properties are valid given the logarithmic transformation and increased awareness that trade data contains zero trade flows. The logarithmic transformation of the gravity equation implies that zero trade flows are ignored when

OLS is used potentially leading to econometric problems such as biased and inefficient estimators because of homoscedasticity and the way zero trade flows are handled.

There are several reasons for the presence of zero trade flows in trade data. One is simply a data problem. Trade occurred but the value was not recorded and appears as zero. Another reason is that trade data is usually valued in thousand dollar increments. Trade flows less than USD 500 is rounded to zero. These two types actually occur in the data and the severity expands the more disaggregated the data. For example in 2007 UNCOMTRADE data of exports of processed products contains 23 7217 observations of which 7 066 (3%) are recorded with a zero for the trade value. In contrast, the data from BACI used for this analysis does not contain trade flows with a value of zero.

Another reason for zero trade flows is even though trade can potentially take place between two partners, it does not because none of the firms in the exporting country are efficient enough to export to a potential partner at a profit or because a product has not yet been developed or because of insufficient demand from low incomes or imperfect information. Once the product is developed or trading costs fall or incomes in importing countries increase however, a previously non existing relationship evolves with positive trade flows. The trade data can be thought of consisting three parts, two of which contain zeros; 1) pairs of countries with exactly zero probability of trade, 2) pairs of countries with non-zero probability who are not trading in any one year, and 3) pairs of countries that are trading. Thus, the trade data is in fact censored with unobserved zero values. In examining the extensive margin or trade diversification, an essentially question is do zero trading relationships become positive, and why? That is, what variables are influencing the probability of country pairs starting to trade (the extensive margin), and what variables are influencing how much they trade (the intensive margin).

Several approaches have been proposed to handle problem with missing or zero trade flows.[27] One is an ad hoc approach of adding 1 or a small number to the recorded trade value. The log of one plus a large number is approximately the large number and this conserves zero trade in the observation set when estimating with OLS. A second approach is to use non-linear estimation techniques which are not easily implementable. Alternatively, there are several approaches that are easily implementable in most statistical routines that explicitly account for the zero flows directly including the Heckman selection procedure, the Zero Inflated Poisson and the Tobit. The first two provide estimates of the probability of a trading relationship existing (zero or not trade) and at the same time, conditional on that probability estimate the trade intensity between trading partners. The Tobit model in addition to explicitly accounting for the fact that the data are censored at zero, provides estimates of the contribution of each explanatory variable to the extensive and intensive margin.

For this section we posit a conventional gravity equation and employ various estimation techniques to examine robustness and also provide information on diversification or on the probability of country-pairs trading and the extensive margin. We first provide estimates of bilateral trade at a more aggregate level of processed products, agricultural products and merchandise trade for a baseline and then provide estimates of bilateral trade in processed products using detailed (HS-6 digit) data. The explanatory variables include the traditional gravity variables (bilateral distance measured

27. This is not a methods paper and detail discussion of the strengths and weaknesses of the various approaches are not discussed. Many papers have been published using each of the various approaches mentioned.

as simple distance between capitals in km), whether or not they share a common boarder importing and exporting country GDP, whether or not country pair were ever in colonial relationship and whether or not they share a common official language. Additionally, the trade facilitation variables described earlier are used both for the exporting and importing country along with corruption indicator to determine the impacts if any on bilateral trade. In this case, to facilitate the interpretation of the corruption coefficient, it is measured as 10 minus the original value. When trade in individual processed products (at the HS-6 digit level) is estimated, bilateral tariffs and prices are also included as explanatory variables. Tariffs are measured as 1 plus the ad valorem tariff while prices are bilateral unit values (price from exporter j to importer k) which can vary by country and product pair. Tariffs are not used when estimates are based on aggregate data to avoid disagreements over aggregation methods. The data sources were provided earlier.

Empirical results

We estimate traditional augmented gravity equation using OLS on the dataset before augmenting the data set to reflect potential trade flows. Starting with the naïve assumption that the trade data is "complete" in the sense that all relevant trading relationships are reported and that the OLS assumptions hold, we estimate three gravity equations one each for all merchandise trade, all agricultural products and processed products. Taking the log of trade in this case is not a problem as the trade data does not contain trade flows with zero value. Essentially the estimated results can be interpreted as being conditional on the trade relationship which currently exists i.e. the intensive margin.

Table 29 reports results for total merchandise trade (column 1) all agricultural goods (column 2) and processed products (column 3), all for 2007. Reported standard errors are robust and are adjusted for clustering by country-pair and each estimated equation contains exporter and importer dummies to capture unobserved effects. At the aggregate level, bilateral trading relationships with observations on all exogenous variables number 18 175 for total trade, 13 797 for total agricultural trade and 11 154 for trade in processed products. The explanatory power of each equation is reasonable as indicated by the adjusted R^2 with the equation for total merchandise trade slightly better compared to trade in agricultural products. For all merchandise trade, each of the standard gravity variables, income, distance geographic and cultural variables are highly significant with the expected sign. This is not the case for agricultural products where whether or not an exporter is landlocked seems to play a minor role in bilateral trade. As expected an increase in either an exporter or importer's income expands bilateral trade as does sharing a common border and having a common language. Distance, as expected lowers bilateral trade as does being landlocked and trying to import. Interestingly, income is more accommodating to trade in merchandise trade especially in exporting countries. Agricultural export supply seems less responsive to changes in income. A 10% income rise in an exporting country expands bilateral trade by an equivalent amount while increasing bilateral agricultural or processed product trade by around 5%. As expected, transportation and other trade costs proxy by distance strongly impairs bilateral trade regardless of the product. A 10% increase in the distance between countries reduces their bilateral trade by 16% to 18% depending on the product. On the other hand countries that share borders trade anywhere from 120% (agricultural) to 180% (processed) more than other country pairs, while having colonial ties also facilitates trade as those countries trade anywhere from 110% more (merchandise) to 200% more (processed) than other country pairs. Sharing a common official language boosts bilateral trade in all products

by around 150% and around 140% in agricultural products. Interestingly, importing countries that are landlocked face substantial hurdles while being landlocked is only a liability when exporting products other than agricultural (whether or not processed) products.

Table 29. Empirical results of bilateral trade: 2007

Variables	All products log of trade	All Agiculture log of trade	Processed products log of trade
Log Exporter GDP	1.027***	0.489***	0.505***
	(0.062)	(0.166)	(0.152)
Log Importer GDP	1.039***	0.766***	0.487***
	(0.076)	(0.104)	(0.068)
Log Bilateral distance	-1.656***	-1.611***	-1.756***
	(0.033)	(0.036)	(0.039)
Contiguous	0.875***	0.802***	1.043***
	(0.167)	(0.157)	(0.166)
colony	0.740***	1.032***	1.108***
	(0.133)	(0.150)	(0.154)
Landlocked exporter	-1.117**	-0.484	0.890
	(0.520)	(0.956)	(1.266)
Landlocked importer	-1.398***	-1.202*	-0.860**
	(0.480)	(0.646)	(0.357)
Same official language	0.923***	0.880***	0.862***
	(0.061)	(0.074)	(0.082)
Log of cost to export in exporter and import in importer a 20 ft container	0.808	1.083	0.082
	(0.581)	(0.700)	(0.376)
Log of exporter time	-1.837***	-0.957*	-1.729**
	(0.406)	(0.501)	(0.850)
Log of importer time	-1.151***	-2.154***	-0.086
	(0.440)	(0.718)	(0.351)
Log of corruption	-1.468***	-1.868**	0.298
	(0.416)	(0.852)	(0.551)
Constant	-28.691***	-16.683**	-2.907
	(5.471)	(6.790)	(7.686)
Exporter dummy	Yes	Yes	Yes
Importer dummy	Yes	Yes	Yes
Observations	18175	13797	11154
Adjusted R-squared	0.747	0.624	0.612

Robust standard errors (Huber/White) with clustering by country-pair in parentheses
*** p<0.01, ** p<0.05, * p<0.1

The bottom part of Table 29 contains results for the variables representing governance proxy by trade facilitation and corruption. How do the selected trade facilitation variables affect bilateral trade? The results indicate the fragility of the trade facilitation variables confirming findings in other parts of this report. Lowering the cost to ship a 20-foot container in an exporting country and the cost to import that container by the importing country does not seem to influence bilateral trade, regardless of the product. Time delays on the other hand are more relevant to bilateral trade. A 10% reduction in the time needed to export a 20-foot container expands bilateral merchandise trade by 18% while boosting bilateral trade in processed products by 17%. Equivalently, a one day reduction in the time to export in the median country is equivalent to about a 9% (8.6%) increase in merchandise (processed products) trade[28]. Improving time delays in importing countries boosts bilateral trade in merchandise and agricultural products but not the trade of processed products. A 10% improvement in the time needed to get a 20-foot container ready to enter the border expands merchandise bilateral trade by 12% while agricultural trade expands by a substantial 22%. Equivalently, a one day reduction in the time to import in the median country is equivalent to about a 5.2% (9.8%) increase in merchandise (agricultural products) trade. That time delays impede merchandise trade is a result consistent with findings from Djankov, Freund, and Pham (2010). That change in time delays in importing countries does not seem to influence bilateral trade in processed products is a surprise considering that the grouping contains many items such as fresh and frozen meats, fresh dairy products and frozen food items that should be time sensitive. Why should time delays be important when exporting but not for importing processed products is an interesting question, but beyond the purpose of this study. Finally, the results on the effects of perceived corruption on bilateral trade are somewhat surprising. As expected and consistent with the findings in Dutt and Traca (2010) corruption lowers bilateral trade and the effect is rather strong especially for agricultural products. A 10% increase in corruption in importing countries lowers bilateral agricultural trade by around 19%. The results however suggest that corruption is less of a hindrance to trade in processed products. This contrasts with findings in Volrath, Hallahan and Gehlhar (2006) that estimate a gravity model for processed food trade using OLS and find that in 2002, controlling corruption augments trade. The result here is surprising especially given the finding that corruption lowers overall agricultural trade. Why processed products are exempt from this is another interesting question but is also beyond the purpose of this paper.

Empirical results for processed products with product level data

To introduce the effects of tariffs on trade in processed products we estimate the model with data at the individual product level. Tariffs are applied to individual products affecting specific trade flows. Hence, we use the trade data at the most detailed internationally comparable level and merge them with bilateral applied tariff rates (at the same level of disaggregation) for a measure of effective border protection. The bilateral applied rates include the preferential rates countries apply to their partners with preferential (whether reciprocal or not) agreements while minimizing potential bias with aggregated data. Combining the trade and tariff data at this level of detail necessitated reducing the number of countries. In this case, we restrict the sample to the 55 largest

28. In our sample, the median number of days to export goods is 20 and median number of days to import is 22.

exporters and their trading partners which nonetheless leaves almost 250,000 observations for estimating the baseline model.

The results are reported in Table 30. The first column reproduces the OLS results from Table 29 as a basis of comparison. Column 2 shows the results for the same specification but with the disaggregated data. Note that the number of observations increases materially and that the explanatory power of the estimated equation is substantially reduced, leaving unexplained much of the changes in bilateral trade at the individual product level. Comparing the results in columns 1 and 2, most of the estimated coefficients remain significant but with lower values (in absolute value) indicating that trade in individual products is more inelastic. But, the effects of being landlocked have changed. With the disaggregate data, a landlocked exporting country trades less while a landlocked importing country trades no more or no less than others. Additionally, corruption in the importing country significantly reduces trade in individual processed products in contrast to the results for processed products as a group (column 1). For individual processed products, distance is much less trade restricting. A 10% increase in bilateral distance reduces trade for individual products by around 3.5% compared to about an 18% reduction for processed products as a group (compare column 1 and 2). This suggests that it may be easier to find substitute products from near-by partners for processed products as a group compared to finding substitutes for any one specific product. Cultural similarities are also less important when trading individual products. Countries sharing official language or having colonial ties trade 24% and 20% more (respectively) which is considerably below the almost 140% and 200% (respectively) additional trade when all processed products are grouped together than countries without such ties (compare columns 1 and 2).

Column 3 reports the results when tariffs are introduced. The number of observations falls as tariff information for all bilateral trade flows was not available, but the explanatory power of the equation improves. Including applied tariffs along with the other trade costs in the estimated equation renders exporter economic size immaterial to the bilateral trade of individual products suggesting perhaps that the 55 exporters face similar applied tariffs (compare column 3 with column 2). The estimated coefficient for importer size is smaller suggesting that trade in individual processed products is even more inelastic once tariffs are taken into account while bilateral distance has a bigger negative effect on trade suggesting that transport and other costs proxy by distance need to be lower to facilitate trade. Controlling for bilateral tariffs, landlocked importing countries trade 84% less than other countries while exporting countries that are landlocked trade neither more nor less than others. Another result that differs in this specification regards time delays. Controlling for tariffs, time delays in importing countries have large negative effects on trade while time delays in exporting country are less important (compare column 2 and 3). The cost to importers of time delays seems to magnify when tariffs are explicitly included in the estimation. Corruption in importing countries also has a large negative effect on trade when tariffs are taken into account, a result also reported in Dutt and Traca (2010). Of course tariffs themselves have a negative effect on bilateral trade. A 10% reduction in applied tariffs, holding everything else constant would increase bilateral trade in individual processed products by 4%[29]. But, a

29. In contrast, Volrath Gehlhar and Hallahan (2009) also using OLS but aggregate agricultural trade data find that tariffs had no effect on bilateral agricultural trade or on the trade of red-meat (which are included in our processed product classification) in 2005 while negatively affecting trade in rice and oilseeds.

bigger impediment to trade remains trade resistance represented by the distance between trading partners. A 10% reduction in trading costs represented by distance would improve bilateral trade by 6%. That distance is a larger impediment to trade than tariffs was also reported by Dutt and Traca (2010). Although the direct trade effects of lower applied tariffs may seem small (relative to the other factors), as suggested above, tariffs seem to reduce trade through its effects on income, distance, time delays and corruption in importing countries.

Do higher tariffs have a disproportion effect on trade? We examined this by doubling the value of each applied tariff rate and re-estimating the specification in column 3. The estimated coefficient for this term is positive and statistically significant (Table 30 column 4), implying that higher tariffs reduce trade at an increasing rate. The estimated coefficients of the other variables remain basically the same as reported in Table 30 column 3.

The effect of unit values, the bilateral price received by exporter *j* in importing country *i* is reported in the fifth column. Including prices does not materially alter the results for the other variables. The results suggest that a 10% reduction in bilateral unit prices would increase bilateral trade by 1.4% suggesting that productivity gains leading to lower export prices would expand trade. But a 10% reduction in bilateral applied tariffs would expand trade by 4%. A t-test of the hypothesis that the estimated coefficient for tariffs and prices are equal is rejected at the 5% level.

To summarize, results at the product level indicate that most of the gravity variables remain relevant albeit with lower impacts indicating that trade at this level is much less elastic. For processed products, changes in an importing country's GDP have a much bigger impact on trade than a comparable change in an exporting country's GDP suggesting that demand pull is relatively more important determinant of bilateral trade in processed products than supply push. Although applied tariffs hinder trade as expected, the relative magnitude is smaller than other trade cost impediments represented by distance. This finding may be a result of trade liberalisation that has already occurred following the full implementation of the Uruguay Round Agreement on Agriculture (URAA). Additionally, there has been an explosion of preferential agreements in the recent past and their reflection in the applied tariff rates may also contribute to the modest trade effects.

Table 30. Empirical results with disaggregate trade data

VARIABLES	(1) log of trade	(2) log of trade	(3) log of trade	(4) log of trade	(5) log of trade
Log Exporter GDP	0.505***	0.160***	0.090	0.088	0.093
	(0.152)	(0.018)	(0.086)	(0.086)	(0.084)
Log Importer GDP	0.487***	0.307***	0.231***	0.225***	0.227***
	(0.068)	(0.068)	(0.065)	(0.066)	(0.070)
Log Bilateral distance	-1.756***	-0.348***	-0.598***	-0.587***	-0.581***
	(0.039)	(0.031)	(0.042)	(0.043)	(0.042)
Contiguous	1.043***	0.914***	0.747***	0.730***	0.729***
	(0.166)	(0.130)	(0.160)	(0.158)	(0.158)
colony	1.108***	0.181**	0.389***	0.387***	0.376***
	(0.154)	(0.077)	(0.105)	(0.105)	(0.105)
Landlocked exporter	0.890	-0.562***	0.523*	0.545*	0.458
	(1.266)	(0.067)	(0.310)	(0.310)	(0.300)
Landlocked importer	-0.860**	0.182	-1.805***	-1.889***	-1.843***
	(0.357)	(0.931)	(0.370)	(0.371)	(0.356)
Same official language	0.862***	0.212***	0.174**	0.167**	0.176**
	(0.082)	(0.058)	(0.084)	(0.083)	(0.083)
Log of cost to export by exporter and import by importer a 20 ft container	0.082	0.078	0.218	0.256	0.076
	(0.376)	(0.057)	(0.435)	(0.435)	(0.449)
Log of exporter time	-1.729**	-0.243***	0.693*	0.647	0.710*
	(0.850)	(0.043)	(0.397)	(0.395)	(0.399)
Log of importer time	-0.086	-0.190	-1.331***	-1.298***	-1.246***
	(0.351)	(0.282)	(0.395)	(0.394)	(0.404)
Log of corruption	0.298	-1.077**	-3.765***	-3.812***	-3.740***
	(0.551)	(0.482)	(0.458)	(0.454)	(0.471)
Log of bilateral tariff rates			-0.420***	-1.482***	-0.409***
			(0.091)	(0.249)	(0.091)
Log of bilateral tariff square				0.794***	
				(0.154)	
Log of bilateral price					-0.144***
					(0.015)
Constant	-2.907	-4.320*	4.415	4.192	6.214
	(7.686)	(2.452)	(5.508)	(5.536)	(5.748)
Exporter dummy	Yes	No	Yes	Yes	Yes
Importer dummy	Yes	Yes	Yes	Yes	Yes
Observations	11,154	224,369	90,566	90,566	90,376
Adjusted R-squared	0.612	0.119	0.216	0.216	0.218

Robust standard errors (Huber/White) with clustering by country-pair in parentheses
*** p<0.01, ** p<0.05, * p<0.1

Results accounting for missing trade

As mentioned above, the trade data does not contain explicit zeros or missing trade flows at the HS-6 digit level that is, all partners are trading. However, when the individual processed products are aggregated there are implicit missing trade flows as some partners although trading in other products, do not exchange any processed product (in our data there are 7 021 such empty trade flows). Potentially missing or zero trade flows are much more prevalent with disaggregate trade data. In our sample, accounting for missing or potential trade in individual processed product explodes the number of observations to more than 2 million. Does accounting for these zero trade flows affect the

results? What possible insights can be gleaned about the factors influencing the probability of trade and how do they affect the intensive and extensive margin? Since there does not appear to be a consensus in the literature on estimation techniques for gravity models while accounting for the zero trade flows we employ each of the techniques discussed above to provide a range of results[30]. Unfortunately, because we only have tariff and price information for existing trade flows, the estimated models exclude these two variables.

To estimate the model with zero trade flows using OLS or Tobit, since the log of zero does not exist, we add 1 to the trade value only when it is missing. This is not necessary for the other estimation procedures. Compared to the baseline OLS estimates, the ad-hoc OLS results provide information on the effect on the estimated coefficients when missing trade is included. The ZIP Hechman and Tobit models, in addition to correcting for certain estimation problems with OLS also provide information on the intensity of trade (how much trade changes due to changes in exogenous variables) and on the propensity to trade (how the probability of having zero trade flows changes with changes in exogenous variables), giving information on trade diversification or the extensive margin as well as the intensive margin. Both the Hechman and ZIP methods include estimating a Probit[31] function to determine the probability of a zero trading relationship while the second step estimates bilateral trade flows conditional on the probability from the Probit. With the Tobit we can examine the intensive and extensive margins for trade explicitly. The Tobit is one of the most common estimation techniques used to deal with censored data. The Tobit model gives flexibility to disentangle what happens at both margins at the same time that it takes into account the censoring structure of the data. The advantage of explicitly accounting for the zero trade with the Tobit is that it naturally decomposes trade into the intensive and extensive margin with the intensive margin determined from the part of the distribution with positive trade and the extensive margin determined when the zero switches to non-zero.

The estimated raw coefficients from the Tobit do not have a particularly interesting economic meaning, because they are simply the effect of the independent variable on the "latent" (unobservable) dependent variable. These results are not reported. For interested readers they are available upon request. Our interest is in deriving from these parameters the intensive and extensive margin. As reported in Berndt (1991) and in Amurgo-Pacheco and Pierola (2008), McDonald and Moffitt in 1980 developed a formula to compute marginal effects from the estimated latent variables which have an economic interpretation. Their equation is.

$$\frac{\partial \mathrm{E}\left(y_i \mid x_i\right)}{\partial x_i} = \Pr\left(y_i > 0\right)\frac{\partial \mathrm{E}\left(y_i \mid x_i, y_i > 0\right)}{\partial x_i} + \mathrm{E}\left(y_i \mid x_i, y_i > 0\right)\frac{\partial \Pr\left(y_i > 0\right)}{\partial x_i}$$

30. When estimating with the Heckman procedure it's advisable to include additional variables in the propensity (probability) equation that are excluded from the trade intensity equation. Following Helpman et al (2008) we use start-up procedures to register a business from the World Bank's Development Indicators. This variable is not included in the results reported below but they are available on request.

31 One could also estimate a Logit probability function with the ZIP procedure.

The total effect is decomposed into two factors. The first part of the expression on the right hand side represents the change in the value of expected or average exports for the goods already traded, weighted by the probability that there is already positive trade (the intensive margin). The second part of the expression is the change in the probability of exporting weighted by the expected value of the products that are already traded (the extensive margin). The second part of the expression thus shows the probability of exporting a more diversified basket of goods. For our purposes, the equation shows the total effect on agricultural exports due to a change in say the importing country's GDP.

Column 1 of Table 31 replicates column 2 of Table 30, showing the OLS results (excluding zeros) as basis of comparison. Column 2 reports the OLS results when potential or zero trade flows are included. As indicated, more than 2 million observations are used to estimate bilateral trade. The results are basically similar to those that exclude observations with zero trade flows although the explanatory power of the equation is somewhat diminished and most of the estimated coefficients are lower (in absolute value). It seems that taking missing trade into account makes trade more inelastic. When accounting for potential or missing trade, results differ for landlocked importing countries as results show that they trade some 26% less than other country pairs (compare column 1 with 2) while trade for exporting countries that are landlocked is less affected (trading 8% less than other country pairs compared to 43% less when zeros are excluded). Results also differ for the impact of corruption in importing countries which is now insignificant and on the cost of a 20-foot container which reduces bilateral trade.

Columns 3 report results based on Heckman selection model one of the methods used to correct deficiencies with OLS estimates while taking zero trade flows into account. Focusing on the probability that country-pairs trade, the results in Table 31 indicate that the probability of trade in individual processed products increases with their incomes, if they share a border, had colonial ties, or share official language. The probability that they trade diminishes the further apart they are and if the importing partner is landlocked. The cost of a 20-foot container also reduces the probability of trade while time delays do not appear to affect the probability that a pair of countries trade. A surprising and counter intuitive result is that corruption in importing countries enhances the probability of trade. Given that countries trade, the results are mostly in agreement with those from OLS although the magnitude of the estimated coefficients is somewhat larger (in absolute value). The volume of trade increases with economic size, when countries share a border, had colonial relationship, or share official language while it decreases with distance. Interestingly, the volume of trade for exporters that are landlocked is lower while that for importers that are landlocked is not affected (at conventional significance level) which is the opposite result from the probability of trading. The cost of a 20-foot container does not seem to affect the volume of trade whereas time delays in exporting countries lowers trade volume. Interestingly, the intensity of trade is reduced when importing countries are more corrupt. Although corruption may enhance the probability of trade its presence reduces trade intensity.

The zero inflated Poisson for the most part generates comparable results to the Heckman method regarding the probability of trade. For the ZIP model the dependent variable is the probability of not trading. Hence income reduces the probability that country-pairs do not trade as does sharing a border, having colonial ties and sharing official language. Higher transport costs or being further apart and being landlocked as an importer enhances the probability that two countries do not trade. The ZIP model indicates that higher cost of a 20-foot container crossing a border lowers the probability of trade as does higher corruption in the importing country. As to the trade intensity, one

of the interesting results in this case is that trade costs represented by distance do not affect (at the customary level of significance) the volume of bilateral trade in processed products although the probability of starting new trading relationships diminishes with distance. Once a firm establishes trading relationships trade intensity is not sensitive to distance. Also with the ZIP colonial relationships or sharing common language do not affect the intensity of trade although country pairs with colonial ties and common language have a higher probability of having trading relationships. Being landlocked whether for importing or exporting countries lowers the volume of their trade. Time delays either in the country of origin or in the destination country do not affect the amount traded and neither does corruption in the importing country. That the various estimation methods provide conflicting findings regarding significance and even sign of certain variables based on estimation method is not unique to this study. Such results have been found in other studies especially at a more disaggregate level of analysis (for example Haq, Meilke and Cranfield 2010).

The Tobit results of the extensive and intensive margins are reported in column 5. All of the estimated coefficients are statistically significant and with the exception of corruption in importing countries, have the expected sign. At the disaggregate level where the possibility of developing new trading relationships can show up in the data much easier the results indicate that more of the trade is at the intensive margin a finding consistent with results reported above. Larger economies trade some 13 times more at the intensive compared to the extensive margin with a 10% increase in the GDP of the originating country expanding exports of the goods already traded by about 2.3% while only increasing trade in "new" goods or partners by about 0.03% while a similar increase in the GDP of the destination country increases trade in existing goods and with existing partners by a little more than 1% and only by about 0.01% in new goods. Distance continues to drag down trade with each 10% increase in transport and other trade costs reducing existing trade by 3.1% and trade diversity by 0.04%. The other traditional gravity variables although contributing to export diversification also have a larger impact on trade in existing rather than new products. Interestingly, at this level of disaggregation trade facilitation variables are statistically significant. Lowering the cost of a 20-foot container by 10% expands trade of existing products by around 1% while also expanding trade in new products by .01%. Time delays whether in exporting or importing countries reduce bilateral trade in products that are already traded and reduce new trading relationships with a bigger impact on existing trade especially if delays are in the importing country. A 10% improvement in the time required for a 20-foot container to enter the border expands trade in existing processed products by 0.6% while new trade expands by 0.01%. Similar improvements in time delays in exporting countries expand existing trade by 0.04% and new trade by almost a tenth of a percent. Equivalently, a one day improvement in the median country[32] in the amount of time needed to import (export) improves trade by about 0.26% (0.25%) at the intensive margin and by about 0.03% (0.03%) at the extensive margin.

32. In this sample, the median number of days to export goods is 15 days while the median number of days to import remains at 22.

Table 31. Estimation results with disaggregate data taking into account potential bilateral trade

VARIABLES	log of trade	log of trade	log of trade	Probability of trade	Trade	Probability of no trade	Intensive margin	Extensive margin
Log Exporter GDP	0.505***	0.627***	0.979***	0.413***	0.582***	-0.410***	0.789***	0.143***
	(0.152)	(0.041)	(0.016)	(0.008)	(0.025)	(0.008)	(0.009)	(0.002)
Log Importer GDP	0.487***	0.774***	0.537***	0.335***	0.657***	-0.323***	0.688***	0.124***
	(0.068)	(0.069)	(0.086)	(0.042)	(0.084)	(0.041)	(0.052)	(0.009)
Log Bilateral distance	-1.756***	-1.755***	-1.250***	-0.526***	-0.435***	0.522***	-1.000***	-0.181***
	(0.039)	(0.034)	(0.040)	(0.021)	(0.078)	(0.021)	(0.024)	(0.004)
Contiguous	1.043***	1.417***	1.825***	0.802***	1.348***	-0.818***	1.429***	0.174***
	(0.166)	(0.177)	(0.164)	(0.130)	(0.197)	(0.131)	(0.111)	(0.02)
colony	1.108***	1.158***	1.080***	0.372**	0.373**	-0.391**	0.645***	0.097***
	(0.154)	(0.191)	(0.156)	(0.163)	(0.189)	(0.164)	(0.121)	(0.022)
Landlocked exporter	0.890	0.365	-0.148*	0.052	-0.515***	-0.071**	-0.026	-0.005
	(1.266)	(0.290)	(0.086)	(0.035)	(0.111)	(0.035)	(0.051)	(0.009)
Landlocked importer	-0.860**	-1.447***	-2.266*	-0.398	-1.065*	0.380	-0.788**	-0.166***
	(0.357)	(0.530)	(1.311)	(0.287)	(0.626)	(0.281)	(0.371)	(0.067)
Same official language	0.862***	0.941***	1.031***	0.464***	0.440***	-0.460***	0.896***	0.134***
	(0.082)	(0.068)	(0.083)	(0.039)	(0.139)	(0.039)	(0.049)	(0.009)
Log of cost to export by exporter and import by importer a 20 ft container	0.082	0.727**	-0.380***	-0.263***	0.099	0.236***	-0.435***	-0.07***
	(0.376)	(0.334)	(0.069)	(0.035)	(0.113)	(0.034)	(0.045)	(0.008)
Log of exporter time	-1.729**	-3.220***	-0.587***	-0.342***	-0.188**	0.408***	-0.6***	-0.109***
	(0.850)	(0.224)	(0.054)	(0.032)	(0.091)	(0.028)	(0.036)	(0.007)
Log of importer time	-0.086	-1.624***	0.154	-0.519***	-0.741*	0.536***	-0.52**	0.263**
	(0.351)	(0.384)	(0.352)	(0.189)	(0.443)	(0.188)	(0.263)	(0.048)
Log of corruption in importing country	0.298	-2.223***	0.651	-0.945***	-1.470**	0.928***	-1.64***	-0.297***
	(0.551)	(0.476)	(0.666)	(0.271)	(0.581)	(0.267)	(0.354)	(0.06)
Constant	-2.907	-8.195**	-15.656***	-5.340***	-15.123***	5.350***		
	(7.686)	(3.810)	(2.643)	(1.364)	(3.099)	(1.353)		
Exporter dummy	Yes	Yes	No	No	No	No	No	No
Importer dummy	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Observations	11154	18175	18041	18041	18175	18175	18175	
Adjusted R-squared	0.612	0.688						

Robust (except for Tobit) standard errors (Huber/White) with clustering by country-pair in parentheses
*** p<0.01, ** p<0.05, * p<0.1

Summary

In empirical international economics, there is increased attention to potential contribution to export earnings through increase diversification of a county's exports differentiating between exports at the intensive margin—higher volumes of a given set of goods to established partners, and the extensive margin—trade in new goods to new destinations. Trade diversification may buffer variability in export earnings through reduced reliance in few products or markets while enabling export expansion without falling prices. Three different methodologies were used to disentangle export volume into the respective margins. The first, based on HK methodology collapses bilateral trade into indices that are used to determine the breakout of the two margins for big and small countries and differentiates between growth in volumes and changes in prices. The second is a descriptive analysis examining changes in the margins over time. This approach enables a finer distinction of the extensive margin. The third approach based on the gravity framework maintains bilateral trade observations and in addition to determining the effect of various variables on the intensity of trade, also provides information on the probability of new trading relationships and the contribution of each variable to the intensive and extensive margin.

Results from the first approach suggest that larger economies export about 80% more than smaller economies with most (about 70%) of that trade at the intensive margin (higher volumes to the same partners) with about 30% of the additional trade from new

products and partners. The intensive margin is mostly from higher volumes without a price discount. That is, wealthier countries export more without moving down the demand curve. Labour abundant countries, mostly from the developing world, on the other hand, export higher volumes but with about a 4% price discount. For these countries additional exports imply a movement down their demand curve. In this framework, trade facilitation, other than time delays, does not seem to affect trade or the margins. Long delays however negatively affect trade, mostly at the extensive margin reducing the variety of goods exported and destinations serviced. On the intensive margin, time delays do not affect the volume exported but lead to a sizeable price reduction indicating perhaps deteriorating quality. Perhaps it's not surprising that processed products are time sensitive given that the category includes fresh and frozen meats, fresh dairy products and other food preparation items. Corruption, or more precisely the lack thereof, also affects trade as countries with cleaner government export more with the additional exports split about equally between the two margins. Interestingly, firms from low corruption countries receive higher prices for their products.

The descriptive analysis of changes in exports of 55 major exporters between 1997 and 2007 also finds that most of their export growth is at the intensive margin confirming the finding above. But, there is also a fair amount of product and market development with the extensive margin contributing about USD 31 billion to overall growth. And, for some countries, the extensive margin is the largest contributor to the growth in their export earnings.

Distinguishing four nodes of export diversification (extensive margin), the results suggest that product innovation, developing and marketing new products is difficult. Developing and marketing new products to new or existing destinations contributes about USD 1 billion or about 3% to the overall extensive margin. In contrast, marketing existing products whether or not to new markets is by far the major driver of the extensive margin. Marketing established products to traditional destinations generated USD 24 billion (78% of the total) while marketing of these products to new destinations generated another USD 6 billion (19%). It seems that firms are more adapt to marketing existing products perhaps through learning by doing or the development of human capital. Developing and marketing new products, as revealed through export earnings seems more problematic, perhaps due to additional costs to develop the identify target consumers and market the product.

The gravity framework, the dominant approach of empirical international trade, provides information on trade intensity and on the probability of establishing new trading relationships. The results suggest that the magnitude (economic significance) of the estimated coefficients, their statistical significance and even their sign, depend upon the aggregation level of the trade data and whether or not zero or potential trade with the necessary implications on the estimation method are taken into account. When the trade data are aggregated and potential trade is not considered, gravity works well, especially at the most aggregate level. That is, conditional that trade takes place, gravity explains much of the variation in trade and the estimated coefficients for the typical gravity variables are significant economically and statistically. For all merchandise trade, doubling economic size doubles existing bilateral trade suggesting an elastic trade response. But, the effect is almost halved for trade in processed products indicating that bilateral trade is much less elastic implying lower substitution among products and partners. Transportation and other trade costs proxy by distance reduce trade by about the same amount regardless of the product. Trade in processed products (and all agriculture) by exporting countries that are landlocked is not hampered whereas their total merchandise trade is some 67% lower. For

the non-traditional gravity variables included in this analysis, the cost to prepare a 20-foot container for export in the exporting country and the cost to prepare it to enter the partner does not materially impact trade, regardless of the product. This finding supports results reported above. Time delays to prepare a 20-foot container in exporting countries however do reduce trade. A one day improvement in time delays in the median country is equivalent to about a 9% increase in processed product trade. Time delays in importing countries however seem to not influence bilateral trade in processed products (as a group) in contrast to trade in other goods. Similarly, corruption, although reducing trade in other goods, does not directly affect bilateral trade in processed products. Reasons for these unexpected results are beyond the scope of the paper.

Results when gravity is estimated using disaggregated trade data to examine trade for individual processed products are broadly similar but with smaller (in absolute value) estimated coefficients indicating that trade in individual products is much more inelastic. As expected, bilateral tariffs constrain trade in processed products. A 10% reduction in applied tariffs expands trade by 4%. It's not clear whether this is the appropriate order of magnitude. For example for all merchandise trade, Dutt and Trace (2010) indicate that in most of their specifications, tariffs are not statistically significant at the conventional level while for all agriculture and for red-meats, Volrath, Gehlhar and Hallahan (2009) find that in 2005 (the closest year to ours) applied tariffs did not significantly affect trade. The response found in this study may be a reflection of the trade liberalisation that has already taken place following the full implementation of the URAA and the preferential rates imbedded in the tariff data. Not surprising bilateral prices significantly affect trade. Productivity gains that lower prices expand trade. A 10% price discount by productive firms increases bilateral trade in processed products by 1.4%.

Accounting for potential and not just actual trade also provides broadly similar results for trade that is already taking place. The findings broadly suggest that the same variables that influence trade intensity (the amount that firms trade) also influence the probability that they trade (export diversification) although the different estimation techniques generate slightly different results. When empirically disentangling trade into the intensive and extensive margin, the results suggest that most of the trade is in the intensive margin (more trade in existing products with current partners) but the extensive margin (trade diversification or trade in new goods with new partners), although small relative to the intensive margin, is important a finding consistent with the findings reported above.

In general the results broadly agree that countries that share borders or use a common language or were once colonies trade relatively more and have a higher probability of establishing new trading relationships. Countries that are landlocked trade relatively less but the evidence is less clear on the probability of establishing new trading relationships. Distance, in spite the improvements in transportation, continues to impede trade. Results for the non-traditional gravity variables are less consistent among type of goods traded and specification. Overall, the results from the gravity equation confirm earlier findings that trade is mostly at the intensive margin, more trade among the same partners in existing goods. Trade at the extensive margin although less important, contributes a sizeable share to overall export growth. But, it seems that developing new trading relationships is difficult.

Policy implications

Based on the gravity results, location something that is outside the control of policy-makers is important not only in determining the amount of processed products traded but also the probability of firms establishing new trade relationships or in their export diversification. Even though the trade data excludes trade within the EU where many countries share borders and are relatively close, the results suggest that firms in countries sharing borders trade anywhere from 88% to 184%[33] more and have a higher probability of trading more diverse export basket than others while those from landlocked countries trade anywhere from 8% to 86% less and have a lower probability of establishing new trading relationships. Cultural ties whether though language or historical colonial relationships boost bilateral trade anywhere from around 29% to more than 200%.

Distance, another location factor, also imposes trade costs. A 10% increase in transport costs (distance) drags trade in processed products down anywhere from 2% to 18%. Policies that promote cost saving measures in transportation, can expand trade. One of the explicit trade facilitation variables examined in this study, cost to prepare a 20-foot container to import and export has a problematic effect on trade intensity although it seems to influence the probability of trade. This finding suggests that administrative and other fees to export and import are viewed by firms as fixed costs and once they're able to overcome them and decide to trade, the fees do not constraint the amount exported or imported. It appears that time delays are a more important constraint to trade and they are more relevant for overall trade than in trade of specific processed products. This finding is consistent with findings reported above and perhaps is not surprising as the time required to either export or import a 20-foot container is not specific to particular goods but applies to all goods. A one day reduction in time delays in the median country expands bilateral trade in all goods by 9% (5%) when exporting (importing). Policies that speed-up the clearance process expand trade, and for individual processed products, this is more relevant when delays are reduced in exporting countries. Policy can also facilitate firms export (volume and diversity) through better governance and lower corruption.

A country's applied tariffs directly affects bilateral trade and seem to also indirectly amplify the negative effects on trade through corruption and time delays in the importing country. Lowering effective border protection (not just MFN rates) as expected expands trade. And, also as expected, policies that facilitate productivity gains that enable firms to reduce export price expand bilateral trade. The results also show that improved productivity of a country's export basket increases a country's income and countries with higher incomes trade more and have a more diverse trade basket implying a virtuous cycle of higher income growth and trade.

33 The ranges are based on estimated coefficients that are statistically significant at the traditional level in the various specifications.

References

Amurgo-Pacheco, Alberto, and Martha Denisse Pierola, "Patterns of Export Diversification in Developing Countries: Intensive and Extensive Margins, The World Bank International Trade Department, Policy Research Working Paper No. 4473, January 2008.

Berndt, Ernst R., The Practice of Econometrics Classic and Contemporary_Addison-Wesley Publishing Company, Reading Massachusetts, 1991.

Brenton, Paul, and Richard Newfarmer, "Watching More than the Discovery Channel: Export Cycles and Diversification in Development", The World Bank International Trade Department, Policy Research Working Paper No. 4302, August 2007.

Cadot, Olivier, Deline Carrère, and Vanessa Strauss-Kahn (2008), "Export Diversification: What's Behind the Hump?" CEPR Discussion Paper DP6590, Centre for Economic Policy Research, London.

Djankov, Simeon, Caroline Freund and Cong S. Pham (2010)."Trading on Time," Review of Economics and Statistics, 92(1): 166-173.

Dutt, Pushan and Daniel Traca, (2010). "Corruption and b=Bilateral Trade Flows: Extortion or Evasion?"The Review of Econ and Stat. Early access, posted on line July 7.

Felbermayr, Gabriel J., and Wilhelm Kohler (2006), "Exploring the Intensive and Extensive Margins of World Trade", Review of World Economics, Vol 142 (4), pp 642-674.

Gaulier Guillaume and Soledad Zignago, (2009), "BACI International Trade Database at the Product Level: The 1994-2007 Version.

Hausmann Ricardo, Jason Hwang and Dani Rodrik (2007), "What you Export Matters", J. Econ. Growth, 112:1-25.

Haq, Zahoor, Karl Meilke, and John Cranfield (2010), "Does the Gravity Model Suffer from Selection Bias?", CATPRN Working Paper 2010-01, January.

Helpman, Elhanan, Marc Melitz, and Yona Rubinstein (2008), "Estimating Trade Flows: Trading Partners and Trading Volumes", The Quarterly Journal of Economics, Vol CXXIII (2), May, pp 441-487.

Hummels David and Peter J. Klenow (2005), "The Variety and Quality of a Nation's Exports", American Economic Review, pp 704-723.

Laursen Keld (2000), "Do Export and Technological Specialisation Patterns Co-Evolve in Terms of Convergence or Divergence? Evidence from 19 OECD Countries, 1971-1991", J. Evol Econ 10: 415-436.

Liapis, P. (2009), "Extensive Margins in Agriculture", OECD Food, Agriculture and Fisheries Working Papers, No. 14, OECD publishing, © OECD. doi:10.1787/224422031753

Regmi, Anita, Mark Gehlhar, John Wainio, Thomas Volrath, Paul Johnston, and Nitin Dathuria (2005), "Market Access for High-Value Foods", Electronic Report from the Economic Research Service, USDA/ERS Report No. 840, February.

OECD (2010). "Comparative Advantage and Export Specialisation Mobility in OECD and Selected Emerging Market Economies", TAD/TC/WP(2010)16, June.

OECD (2006). "Logistics and Time as a Trade Barrier", TAD/TC/WP(2006)Final, May.

Volrath, Thomas L, Mark J. Gehlhar and Charles B. Hallahan, (2009) "Bilateral Import Protection, Free Trade Agreements, and Other Factors Influencing Trade Flows in Agriculture and Clothing", J. Agricultural Econ Vol 60, No. 2 , pp 298-317.

Volrath, Thomas L, Charles B. Hallahan and Mark J. Gehlhar (2006). "Consumer Demand and Cost Factors Shape the Global Network in Commodity and Manufactured Foods", Canadian J. Agricultural Econ. 54, pp 497-511.

Yui, Li and John S. Wilson (2009). "Time as a Determinant of Comparative Advantage", World Bank Policy Research Working Paper, No. 5128, November.

APPENDIX Table A1. Classification of agricultural products

Table A2. Exports of processed products and selected other statistics by income classification: 2007

OECD

Country name	export value includes intra EU	export value excludes intra EU	world rank	share of country's agricultural exports #	share of world total #	RCA	Number of products exported #	Number of partners #	Number of products with RCA above 1	Exports of products with RCA above 1 as a share of county's exports	Income classification *
	USD 1000	USD 1000	number	%	%	number	number	number	number	%	
Australia	12,507,026	12,507,026	5	55.81	4.94	3.60	244	192	99	92.37	High income: OECD
Austria	7,881,984	2,061,948	29	85.66	0.88	1.64	229	154	46	86.69	High income: OECD
Belgium-Luxembourg	21,241,839	3,359,131	21	62.89	1.36	1.56	246	181	82	89.31	High income: OECD
Canada	12,351,183	12,351,183	6	40.39	4.88	1.26	246	181	86	86.77	High income: OECD
Czech Republic	3,052,045	343,000	59	63.02	0.18	0.88	178	102	26	80.80	High income: OECD
Denmark	11,857,771	3,937,513	16	72.51	1.60	5.21	242	172	98	96.79	High income: OECD
Finland	1,449,095	648,914	51	60.49	0.26	0.64	196	112	32	80.72	High income: OECD
France	40,397,088	13,139,280	4	71.42	5.25	2.81	251	180	101	92.72	High income: OECD
Germany	43,080,294	7,564,818	9	61.22	3.16	0.66	249	170	41	60.15	High income: OECD
Greece	2,308,838	759,521	45	48.96	0.36	3.19	211	126	72	97.24	High income: OECD
Hungary	3,016,923	580,471	42	49.26	0.39	1.62	191	105	73	85.52	High income: OECD
Iceland	94,968	94,968	97	27.86	0.04	0.75	137	85	19	86.00	High income: OECD
Ireland	12,613,957	3,651,764	19	92.09	1.45	2.67	178	154	35	96.70	High income: OECD
Italy	21,192,901	7,128,752	10	67.40	2.88	1.47	246	169	66	87.91	High income: OECD
Japan	1,614,830	1,614,830	32	62.12	0.64	0.08	219	146	2	6.77	High income: OECD
Korea, Rep.	1,855,893	1,855,893	31	72.15	0.73	0.19	206	163	9	30.81	High income: OECD
Mexico	7,296,172	7,296,173	11	48.58	2.88	1.11	224	150	50	86.92	Upper middle income
Netherlands	36,236,697	7,990,960	8	58.03	3.28	3.33	250	174	118	94.73	High income: OECD
New Zealand	11,414,834	11,414,834	7	74.95	4.51	17.40	245	183	126	99.36	High income: OECD
Norway	637,538	637,538	52	56.23	0.25	0.20	219	123	9	42.56	High income: OECD
Poland	9,814,492	2,002,832	28	75.28	0.90	2.93	228	137	108	95.78	Upper middle income
Portugal	3,204,066	901,212	46	73.91	0.36	2.79	231	148	92	93.28	High income: OECD
Slovak Republic	1,326,601	58,830	90	64.67	0.05	0.48	125	67	17	53.53	High income: OECD
Spain	14,299,057	3,611,930	18	55.98	1.47	1.99	245	161	100	90.59	High income: OECD
Sweden	3,359,893	1,336,449	39	78.09	0.53	0.83	231	130	36	84.39	High income: OECD
Switzerland, Liechtenstein	4,407,514	4,407,514	15	73.56	1.74	0.94	234	184	43	90.24	High income: OECD
Turkey	4,007,166	4,007,166	17	42.03	1.58	1.42	222	174	69	91.55	Upper middle income
United Kingdom	18,172,290	6,699,773	12	81.59	2.66	1.54	244	179	39	85.05	High income: OECD
United States	33,053,486	33,053,486	1	33.68	13.05	1.26	252	206	104	80.41	High income: OECD
Total	**343,746,438**	**155,017,707**		**51.58**	**61.86**						

* Income classification from World Bank July 2009

For EU members excludes intra EU trade

Enhanced Engagement Countries

Country name	export value includes intra EU	export value excludes intra EU	world rank	share of country's agricultural exports #	share of world total #	RCA	Number of products exported	Number of partners	Number of products with RCA above 1	Exports of products with RCA above 1 as a share of county's exports	Income classification *
	USD 1000	USD 1000	number	%	%	number	number	number	number	%	
Brazil	18,604,504	18,604,504	2	40.49	7.35	4.90	243	193	77	95.84	Upper middle income
China	14,023,420	14,023,420	3	47.76	5.54	0.39	247	193	46	60.98	Lower middle income
India	3,180,773	3,180,773	22	20.57	1.26	0.78	238	187	49	78.42	Lower middle income
Indonesia	1,603,523	1,603,523	33	10.07	0.63	0.46	212	178	27	70.94	Lower middle income
South Africa	2,354,602	2,354,602	27	38.28	0.93	1.08	250	186	54	83.29	Upper middle income
Total	**39,766,821**	**39,766,821**		**35.24**	**15.70**						

* Income classification from World Bank July 2009

High Income Non-OECD

Country name	export value includes intra EU	export value excludes intra EU	world rank	share of country's agricultural exports #	share of world total #	RCA	Number of products exported	Number of partners	Number of products with RCA above 1	Exports of products with RCA above 1 as a share of county's exports	Income classification *
	USD 1000	USD 1000	number	%	%	number	number	number	number	%	
Andorra	3,662	3,662	149	72.70	0.00	0.98	78	25	15	89.53	High income: nonOECD
Antigua and Barbuda	3,869	3,869	148	33.27	0.00	0.59	63	46	14	80.01	High income: nonOECD
Aruba	11,198	11,198	132	8.14	0.00	0.11	32	15	3	89.79	High income: nonOECD
Bahamas	68,524	68,524	103	92.62	0.03	1.12	56	77	4	94.85	High income: nonOECD
Bahrain	49,012	49,012	110	84.30	0.02	0.13	132	48	13	51.74	High income: nonOECD
Barbados	70,023	70,023	102	71.22	0.03	6.02	119	72	45	98.58	High income: nonOECD
Bermuda	5,383	5,383	143	47.79	0.00	0.96	24	30	8	97.89	High income: nonOECD
Brunei Darussalam	704	704	172	63.07	0.00	0.00	21	15	0	0.00	High income: nonOECD
Cayman Islands	2,048	2,048	161	66.59	0.00	0.29	23	13	9	97.76	High income: nonOECD
Chinese Taipei	520,371	520,371	56	41.73	0.21	0.07	207	118	7	18.27	High income: nonOECD
Cyprus[1,2]	253,853	149,734	88	48.75	0.06	3.95	144	104	55	97.08	High income: nonOECD
Equatorial Guinea	62	62	202	1.32	0.00	0.00	7	6	0	0.00	High income: nonOECD
Estonia [&]	616,827	235,147	77	66.92	0.09	2.79	144	60	26	96.06	High income: nonOECD
French Polynesia	11,711	11,711	131	43.97	0.00	1.65	54	31	13	96.75	High income: nonOECD
Greenland	257	257	186	6.45	0.00	0.02	19	5	4	71.95	High income: nonOECD
Guam	82	82	197	8.96	0.00	0.05	22	9	2	46.52	High income: nonOECD
Hong Kong, China	1,582,398	1,582,398	34	53.20	0.62	0.70	229	157	24	72.96	High income: nonOECD
Israel [&]	998,811	998,811	41	31.55	0.39	0.73	211	116	50	69.70	High income: nonOECD
Kuwait	115,887	115,887	93	75.09	0.05	0.08	165	65	8	29.58	High income: nonOECD
Macau	41,804	41,804	113	85.31	0.02	0.58	122	25	10	89.16	High income: nonOECD
Malta	76,898	63,700	106	63.64	0.03	0.73	99	76	15	90.60	High income: nonOECD
Netherlands Antilles	61,644	61,644	107	83.02	0.02	0.70	189	47	25	86.14	High income: nonOECD
New Caledonia	3,054	3,054	155	38.53	0.00	0.07	140	17	4	67.43	High income: nonOECD
Oman	255,205	255,205	75	52.94	0.10	0.43	152	89	19	87.30	High income: nonOECD
Qatar	6,562	6,562	139	25.13	0.00	0.01	112	41	2	14.86	High income: nonOECD
San Marino	507	507	180	79.59	0.00	0.10	22	19	2	24.70	High income: nonOECD
Saudi Arabia	1,562,689	1,562,689	36	74.97	0.62	0.22	228	122	27	45.65	High income: nonOECD
Singapore	2,907,065	2,907,065	24	68.26	1.15	0.58	242	158	18	67.53	High income: nonOECD
Slovenia [&]	495,197	215,199	79	70.11	0.08	1.14	187	72	54	84.79	High income: nonOECD
Trinidad and Tobago	384,265	384,265	66	87.43	0.15	1.10	207	92	35	92.07	High income: nonOECD
United Arab Emirates	1,902,608	1,902,608	30	51.02	0.75	0.53	248	158	39	66.62	High income: nonOECD
Total/Average	**12,012,179**	**11,233,185**		**54.76**	**4.44**	**0.85**	**119**	**62**	**18**	**68.25**	

* Income classification from World Bank July 2009 except Chinese Taipei which is included by the author

For EU members share excludes intra EU trade

& Member of the OECD as of 2010 @ OECD accession candidate

1. Note by Turkey: The information in this document with reference to Cyprus relates to the southern part of the island. There is no single authority representing both Turkish and Greek Cypriot people on the Island. Turkey recognises the Turkish Republic of Nothern Cyprus(TRNC). Until a lasting and equitable solution is found within the context of the United Nations, Turkey shall preserve its position concerning the Cyprus issue.

2. Note by all the European Union Member States of the OECD and the European Commission: The Republic of Cyprus is recognised by all members of the United Nations with the exception Turkey. The information in this document relates to the area under the effective control of the Government of the Republic of Cyprus.

Upper Middle Income

Country name	export value includes intra EU	export value excludes intra EU	world rank	share of country's agricultural exports #	share of world total #	RCA	Number of products exported	Number of partners	Number of products with RCA above 1	Exports of products with RCA above 1 as a share of county's exports	Income classification *
	USD 1000	USD 1000	number	%	%	number	number	number	number	%	
American Samoa	1,448	1,448	167	6.96	0.00	0.86	92	22	19	92.75	Upper middle income
Argentina	5,298,180	5,298,181	14	18.50	2.09	3.85	233	169	102	95.89	Upper middle income
Belarus	1,574,369	1,574,369	35	87.01	0.62	2.67	179	73	52	96.55	Upper middle income
Belize	68,320	68,320	104	33.64	0.03	6.11	65	44	15	98.55	Upper middle income
Bulgaria	856,670	300,498	70	40.86	0.12	2.00	221	120	58	92.67	Upper middle income
Chile &	3,461,338	3,461,338	20	46.14	1.37	2.15	226	148	73	91.96	Upper middle income
Costa Rica	871,061	871,061	47	20.03	0.34	2.70	196	105	63	94.62	Upper middle income
Croatia	762,594	762,594	48	71.10	0.30	2.54	204	98	75	95.00	Upper middle income
Cuba	388,301	388,302	65	60.52	0.15	7.41	61	112	13	99.31	Upper middle income
Dominica	3,425	3,425	151	20.64	0.00	1.27	66	40	26	94.75	Upper middle income
Fiji	194,735	194,735	82	52.56	0.08	9.35	177	63	67	98.06	Upper middle income
Gabon	599	599	175	12.92	0.00	0.00	21	13	1	0.05	Upper middle income
Grenada	576	576	176	4.13	0.00	0.34	42	21	11	92.50	Upper middle income
Jamaica	383,008	383,008	67	66.55	0.15	6.24	148	93	39	97.84	Upper middle income
Kazakhstan	121,482	121,482	92	5.13	0.05	0.12	130	38	8	23.76	Upper middle income
Latvia	691,491	196,869	81	69.36	0.08	2.73	186	91	52	94.21	Upper middle income
Lebanon	232,037	232,037	78	51.80	0.09	2.68	212	139	97	94.92	Upper middle income
Libya	3,217	3,217	153	14.66	0.00	0.00	23	20	1	23.16	Upper middle income
Lithuania	1,427,212	428,925	61	43.91	0.17	2.98	178	88	59	93.46	Upper middle income
Malaysia	2,563,219	2,563,219	26	15.99	1.01	0.52	216	190	32	68.76	Upper middle income
Mauritius	42,306	42,306	112	10.04	0.02	0.76	161	72	25	82.66	Upper middle income
Palau	316	316	184	84.01	0.00	0.42	3	2	1	95.95	Upper middle income
Panama	130,458	130,458	89	17.13	0.05	0.90	153	80	32	83.79	Upper middle income
Romania	546,714	150,757	87	31.55	0.06	0.58	189	89	19	68.03	Upper middle income
Russian Federation @	2,940,914	2,940,914	23	31.12	1.16	0.34	219	134	22	38.88	Upper middle income
Saint lucia	19,522	19,522	128	50.72	0.01	6.87	66	31	25	99.00	Upper middle income
Seychelles	6,329	6,329	140	34.25	0.00	0.45	127	45	18	81.11	Upper middle income
St. Kitts and Nevis	3,180	3,180	154	82.67	0.00	1.79	43	24	13	98.10	Upper middle income
St. Vincent and the Grenadir	2,244	2,244	160	7.01	0.00	0.57	62	22	10	88.22	Upper middle income
Suriname	18,843	18,843	129	18.78	0.01	0.56	96	38	27	85.67	Upper middle income
Uruguay	1,562,452	1,562,452	37	58.95	0.62	12.03	171	135	68	99.28	Upper middle income
Venezuela	180,221	180,221	85	55.68	0.07	0.13	82	72	4	63.06	Upper middle income
Total	**24,356,779**	**21,911,741**		**27.21**	**8.65**						

* Income classification from World Bank July 2009

For EU members share excludes intra EU trade

& Member of the OECD as of 2010; @ OECD candidate country

Lower Middle Income

Country name	export value includes intra EU	export value excludes intra EU	world rank	share of country's agricultural exports #	share of world total #	RCA	Number of products exported	Number of partners	Number of products with RCA above 1	Exports of products with RCA above 1 as a share of county's exports	Income classification *
	USD 1000	USD 1000	number	%	%	number	number	number	number	%	
Albania	10,877	10,877	134	16.58	0.00	0.38	77	36	17	84.98	Lower middle income
Algeria	36,512	36,512	117	30.20	0.01	0.02	115	68	1	4.54	Lower middle income
Angola	20,045	20,045	127	84.90	0.01	0.02	23	12	1	81.93	Lower middle income
Armenia	155,724	155,724	86	88.93	0.06	4.65	136	66	47	97.73	Lower middle income
Azerbaijan	237,682	237,682	76	43.08	0.09	0.70	87	49	11	91.53	Lower middle income
Bhutan	2,601	2,601	159	5.77	0.00	0.35	14	7	7	90.58	Lower middle income
Bolivia	104,994	104,994	95	14.41	0.04	0.89	89	52	18	91.33	Lower middle income
Bosnia and Herzegovina	124,352	124,352	91	55.61	0.05	1.33	136	50	48	87.03	Lower middle income
Cameroon	37,151	37,151	115	4.56	0.01	0.35	60	35	6	89.77	Lower middle income
Cape Verde	1,793	1,793	165	13.81	0.00	0.54	135	18	24	77.03	Lower middle income
Colombia	1,434,446	1,434,446	38	23.76	0.57	1.76	198	145	49	95.88	Lower middle income
Congo, Rep.	340	340	183	0.83	0.00	0.00	26	14	0	0.00	Lower middle income
Djibouti	483	483	181	0.31	0.00	0.10	15	11	4	78.98	Lower middle income
Dominican Republic	538,192	538,192	54	47.97	0.21	3.54	142	96	39	98.52	Lower middle income
Ecuador	537,436	537,436	55	13.79	0.21	1.41	165	125	38	92.34	Lower middle income
Egypt, Arab Rep.	950,398	950,398	44	31.47	0.38	1.55	218	146	75	91.54	Lower middle income
El Salvador	462,714	462,714	58	54.21	0.18	6.80	141	43	61	98.73	Lower middle income
Georgia	212,541	212,541	80	64.29	0.08	4.47	101	75	33	97.81	Lower middle income
Guatemala	702,362	702,362	50	23.85	0.28	3.98	185	91	80	96.73	Lower middle income
Guyana	36,683	36,683	116	12.08	0.01	1.68	140	56	26	92.89	Lower middle income
Honduras	279,722	279,723	73	20.18	0.11	1.93	168	82	47	93.90	Lower middle income
Iran, Islamic Rep.	186,298	186,298	83	10.28	0.07	0.11	184	107	7	51.71	Lower middle income
Iraq	564	564	177	0.90	0.00	0.00	27	15	0	0.00	Lower middle income
Jordan	307,962	307,962	68	41.77	0.12	1.79	181	87	60	90.05	Lower middle income
Kiribati	12	12	210	0.40	0.00	0.06	2	2	1	62.69	Lower middle income
Macedonia, FYR	183,843	183,843	84	50.74	0.07	2.48	158	61	49	96.58	Lower middle income
Maldives	38	38	205	1.25	0.00	0.01	21	5	2	75.44	Lower middle income
Marshall Islands	9	9	211	0.14	0.00	0.00	2	2	0	0.00	Lower middle income
Micronesia, Fed. Sts.	37	37	206	11.66	0.00	0.06	3	3	3	100.00	Lower middle income
Moldova	274,459	274,459	74	47.87	0.11	5.72	128	67	69	97.80	Lower middle income
Mongolia	29,754	29,754	121	25.02	0.01	0.60	69	27	13	96.29	Lower middle income
Morocco	596,515	596,515	53	23.63	0.24	1.32	171	122	43	92.03	Lower middle income
Nicaragua	404,619	404,619	64	43.13	0.16	9.21	129	81	50	98.71	Lower middle income
Paraguay	428,307	428,307	62	17.45	0.17	5.34	118	98	33	98.43	Lower middle income
Peru	950,760	950,760	43	25.65	0.38	1.36	205	131	41	94.50	Lower middle income
Philippines	1,067,205	1,067,205	40	28.85	0.42	0.66	200	147	31	77.42	Lower middle income
Samoa	5,693	5,693	142	72.95	0.00	1.29	84	19	29	93.72	Lower middle income
Sri lanka	96,598	96,598	96	6.93	0.04	0.51	200	99	20	73.22	Lower middle income
Sudan	30,609	30,609	120	6.61	0.01	0.16	66	39	4	97.45	Lower middle income
Syrian Arab Republic	504,749	504,749	57	24.34	0.20	2.11	175	96	76	95.47	Lower middle income
Thailand	5,674,755	5,674,755	13	40.15	2.24	1.43	224	194	70	91.43	Lower middle income
Timor-Leste	257	257	187	4.47	0.00	0.38	13	4	7	97.92	Lower middle income
Tonga	278	278	185	2.97	0.00	0.77	15	12	8	96.41	Lower middle income
Tunisia	285,025	285,025	71	21.34	0.11	0.69	142	104	32	81.42	Lower middle income
Turkmenistan	1,742	1,742	166	0.78	0.00	0.01	12	10	0	0.00	Lower middle income
Ukraine	2,582,199	2,582,199	25	38.35	1.02	2.01	203	145	64	91.98	Lower middle income
Vanuatu	3,315	3,315	152	12.06	0.00	0.39	20	18	6	92.58	Lower middle income
Total	**19,502,650**	**19,502,649**		**29.43**	**7.70**						

* Income classification from World Bank July 2009

Low Income

Country name	export value includes intra EU	export value excludes intra EU	world rank	share of country's agricultural exports #	share of world total #	RCA	Number of products exported	Number of partners	Number of products with RCA above 1	Exports of products with RCA above 1 as a share of county's exports	Income classification *
	USD 1000	USD 1000	number	%	%	number	number	number	number	%	
Afghanistan	1,994	1,994	162	0.94	0.00	0.24	50	29	10	72.10	Low income
Bangladesh	30,946	30,946	119	18.39	0.01	0.08	130	79	8	33.62	Low income
Benin	26,308	26,308	124	11.05	0.01	1.54	49	15	6	98.89	Low income
Burkina Faso	4,697	4,697	144	1.33	0.00	0.47	59	20	16	87.79	Low income
Burundi	2,795	2,795	157	3.37	0.00	0.73	37	15	13	86.96	Low income
Cambodia	26,027	26,027	125	28.38	0.01	0.23	26	16	1	97.67	Low income
Central African Republic	556	556	178	1.75	0.00	0.17	19	13	5	67.12	Low income
Chad	112	112	195	0.14	0.00	0.00	10	5	0	0.00	Low income
Comoros	187	187	189	0.88	0.00	0.15	16	6	6	63.71	Low income
Congo, Dem. Rep.	1,986	1,986	163	4.41	0.00	0.04	43	15	3	82.42	Low income
Cote d'ivoire	282,175	282,175	72	7.31	0.11	1.27	165	71	24	94.77	Low income
Eritrea	117	117	194	1.72	0.00	0.06	11	12	2	60.57	Low income
Ethiopia	37,390	37,390	114	3.28	0.01	1.00	107	60	31	96.52	Low income
Gambia	602	602	174	2.42	0.00	0.49	29	22	16	93.92	Low income
Ghana	73,197	73,197	101	3.76	0.03	0.60	143	73	25	84.01	Low income
Guinea	3,967	3,967	147	4.53	0.00	0.07	50	31	7	66.64	Low income
Guinea-Bissau	73	73	199	0.10	0.00	0.04	9	4	4	96.80	Low income
Haiti	4,494	4,494	145	10.12	0.00	0.31	46	31	8	96.53	Low income
Kenya	405,328	405,328	63	18.01	0.16	3.68	233	107	76	95.08	Low income
Korea, Dem. Rep.	2,977	2,977	156	18.30	0.00	0.08	46	30	4	76.48	Low income
Kyrgyzstan	64,982	64,982	105	24.64	0.03	2.17	101	36	47	94.84	Low income
Lao PDR	4,454	4,454	146	6.39	0.00	0.16	41	22	8	72.98	Low income
Liberia	75	75	198	1.62	0.00	0.00	7	6	0	0.00	Low income
Madagascar	28,420	28,420	123	9.75	0.01	0.75	112	41	25	84.02	Low income
Malawi	25,757	25,757	126	2.92	0.01	1.00	78	42	21	96.75	Low income
Mali	8,841	8,841	136	2.80	0.00	0.24	78	33	13	65.68	Low income
Mauritania	248	248	188	1.08	0.00	0.01	34	17	0	0.00	Low income
Mozambique	9,082	9,082	135	2.11	0.00	0.11	94	38	4	78.94	Low income
Myanmar	6,063	6,063	141	0.81	0.00	0.05	75	21	8	29.06	Low income
Nepal	34,990	34,990	118	26.36	0.01	1.89	51	33	21	97.58	Low income
Niger	15,706	15,706	130	15.74	0.01	1.02	66	38	14	89.43	Low income
Nigeria	74,911	74,911	100	7.91	0.03	0.05	130	69	3	7.20	Low income
Pakistan	434,595	434,595	60	17.15	0.17	0.94	196	125	35	85.49	Low income
Papua New Guinea	1,867	1,867	164	0.30	0.00	0.02	29	16	2	36.38	Low income
Rwanda	2,794	2,794	158	2.43	0.00	0.41	49	17	16	84.15	Low income
São Tomé and Principe	545	545	179	9.55	0.00	1.74	15	8	11	98.46	Low income
Senegal	112,988	112,988	94	33.17	0.04	2.61	192	54	52	95.05	Low income
Sierra Leone	3,627	3,627	150	7.35	0.00	0.39	28	18	7	93.63	Low income
Solomon Islands	65	65	201	0.21	0.00	0.01	8	7	1	10.49	Low income
Somalia	11,163	11,163	133	10.12	0.00	1.99	31	11	15	97.45	Low income
Tajikistan	6,685	6,685	138	2.71	0.00	0.26	36	12	11	90.34	Low income
Tanzania	45,773	45,773	111	5.41	0.02	0.69	168	61	42	86.19	Low income
Togo	29,210	29,210	122	10.65	0.01	1.10	100	33	20	95.00	Low income
Uganda	87,592	87,592	99	10.40	0.03	2.18	139	62	35	95.14	Low income
Uzbekistan	49,949	49,949	109	2.94	0.02	0.36	80	22	18	92.08	Low income
Vietnam	753,187	753,187	49	12.51	0.30	0.57	206	148	45	75.12	Low income
Yemen, Rep.	93,450	93,450	98	40.17	0.04	0.52	134	61	19	86.38	Low income
Zambia	55,104	55,104	108	10.77	0.02	0.37	132	40	17	78.67	Low income
Zimbabwe	300,588	300,588	69	33.53	0.12	3.23	156	65	33	96.18	Low income
Total	**3,168,637**	**3,168,637**		**10.43**	**1.25**						

* Income classification from World Bank July 2009

Table A3. Imports of processed products

OECD

Country name	import value includes intra EU	import value excludes intra EU	world rank	share of country's agricultural imports #	share of world total #	Number of products imported #	Number of partners #	Net trade	Income classification *
	USD 1000	USD 1000	number	%	%	number	number		
Australia	4,703,015	4,703,015	13	65.91	1.86	140	230	7,804,011	High income: OECD
Austria	6,077,547	656,414	61	41.73	0.26	121	228	1,576,692	High income: OECD
Belgium-Luxembourg	16,071,345	1,441,181	38	19.79	0.57	119	228	2,007,762	High income: OECD
Canada	12,379,149	12,379,149	4	55.16	4.89	158	244	-27,966	High income: OECD
Czech Republic	3,800,437	338,150	91	53.83	0.13	102	191	-748,392	High income: OECD
Denmark	5,693,733	731,365	53	33.57	0.29	88	236	3,313,546	High income: OECD
Finland	2,488,621	386,967	83	42.09	0.15	83	201	264,904	High income: OECD
France	26,435,224	2,654,676	18	27.27	1.05	137	240	10,632,950	High income: OECD
Germany	36,010,576	5,821,648	8	31.03	2.30	125	248	2,191,433	High income: OECD
Greece	4,991,869	330,066	92	20.14	0.13	73	209	580,598	High income: OECD
Hungary	2,481,421	152,569	132	42.46	0.06	63	155	827,498	High income: OECD
Iceland	262,526	262,526	107	59.31	0.10	90	219	-167,559	High income: OECD
Ireland	5,401,238	450,963	79	35.56	0.18	127	203	3,222,674	High income: OECD
Italy	21,024,868	1,857,746	28	18.31	0.73	104	238	5,448,257	High income: OECD
Japan	22,658,082	22,658,082	2	52.12	8.95	139	246	-21,043,252	High income: OECD
Korea, Rep.	5,525,963	5,525,963	9	38.88	2.18	122	244	-3,670,070	High income: OECD
Mexico	8,827,840	8,827,840	5	46.65	3.49	107	243	-1,531,668	Upper middle income
Netherlands	19,334,174	4,607,886	14	25.56	1.82	124	239	3,688,734	High income: OECD
New Zealand	1,561,103	1,561,103	36	60.28	0.62	117	236	9,853,731	High income: OECD
Norway	2,512,125	2,512,125	20	49.66	0.99	104	241	-1,874,587	High income: OECD
Poland	4,503,333	727,954	54	27.20	0.29	98	207	1,563,040	Upper middle income
Portugal	3,876,351	142,670	137	7.39	0.06	69	194	760,662	High income: OECD
Slovak Republic	2,148,182	350,040	87	46.30	0.14	81	226	-225,686	High income: OECD
Spain	14,217,498	1,659,409	32	17.37	0.66	104	238	2,059,626	High income: OECD
Sweden	5,940,075	752,995	51	42.53	0.30	83	214	598,588	High income: OECD
Switzerland, Liechtenstein	4,999,144	4,999,144	12	53.83	1.97	146	245	-591,631	High income: OECD
Turkey	1,303,559	1,303,559	42	18.19	0.51	105	235	2,703,607	Upper middle income
United Kingdom	33,142,844	6,146,774	6	42.29	2.43	129	237	602,131	High income: OECD
United States	42,363,384	42,363,384	1	54.47	16.73	164	246	-9,309,898	High income: OECD
Total	**320,735,223**	**136,305,361**		**43.60**	**53.82**			**20,509,735**	

* Income classification from World Bank July 2009
\# For EU members excludes intra EU trade

Enhanced Engagement Countries

Country name	import value includes intra EU	import value excludes intra EU	world rank	share of country's agricultural imports #	share of world total #	Number of products imported #	Number of partners #	Net trade	Income classification *
	USD 1000	USD 1000	number	%	%	number	number		
Brazil	1,593,217	1,593,217	35	28.50	0.63	100	222	17,011,287	Upper middle income
China	5,270,101	5,270,101	11	14.58	2.08	127	243	8,753,319	Lower middle income
India	457,173	457,173	77	5.73	0.18	103	229	2,723,599	Lower middle income
Indonesia	2,387,732	2,387,732	21	26.61	0.94	76	244	-784,209	Lower middle income
South Africa	1,836,498	1,836,498	29	39.75	0.73	150	244	518,104	Upper middle income
Total	**11,544,721**	**11,544,721**		**18.23**	**4.56**			**28,222,100**	

* Income classification from World Bank July 2009

High Income Non-OECD

Country name	import value includes intra EU	import value excludes intra EU	world rank	share of country's agricultural imports #	share of world total #	Number of products imported #	Number of partners #	Net trade	Income classification *
	USD 1000	USD 1000	number	%	%	number	number		
Andorra	265,503	265,503	104	86.99	0.10	32	211	-261,841	High income: nonOECD
Antigua and Barbuda	84,583	84,583	160	76.28	0.03	78	243	-80,715	High income: nonOECD
Aruba	134,151	134,151	142	89.12	0.05	44	195	-122,952	High income: nonOECD
Bahamas	296,424	296,424	99	72.02	0.12	70	242	-227,901	High income: nonOECD
Bahrain	455,575	455,575	78	69.97	0.18	83	232	-406,564	High income: nonOECD
Barbados	182,947	182,947	122	72.46	0.07	80	236	-112,924	High income: nonOECD
Bermuda	106,751	106,751	152	79.52	0.04	34	179	-101,368	High income: nonOECD
Brunei Darussalam	178,602	178,602	125	66.96	0.07	36	194	-177,898	High income: nonOECD
Cayman Islands	61,804	61,804	166	25.55	0.02	35	169	-59,755	High income: nonOECD
Chinese Taipei	3,220,351	3,220,351	17	39.97	1.27	79	236	-2,699,980	High income: nonOECD
Cyprus[1]	829,912	217,403	115	57.93	0.09	66	203	-67,669	High income: nonOECD
Equatorial Guinea	130,473	130,473	143	89.66	0.05	41	176	-130,411	High income: nonOECD
Estonia &	921,345	69,251	164	38.96	0.03	45	125	165,896	High income: nonOECD
French Polynesia	259,486	259,486	108	81.73	0.10	90	233	-247,775	High income: nonOECD
Greenland	77,478	77,478	162	85.58	0.03	72	218	-77,221	High income: nonOECD
Guam	33,368	33,368	179	87.22	0.01	28	125	-33,285	High income: nonOECD
Hong Kong, China	6,057,060	6,057,060	7	58.15	2.39	103	243	-4,474,661	High income: nonOECD
Israel &	1,621,095	1,621,095	34	43.72	0.64	89	229	-622,285	High income: nonOECD
Kuwait	1,639,724	1,639,724	33	59.69	0.65	110	240	-1,523,837	High income: nonOECD
Macau	544,402	544,402	69	82.05	0.21	79	232	-502,598	High income: nonOECD
Malta	391,169	47,215	173	56.07	0.02	50	143	16,486	High income: nonOECD
Netherlands Antilles	248,831	248,831	109	79.21	0.10	60	221	-187,187	High income: nonOECD
New Caledonia	203,140	203,140	120	79.38	0.08	78	229	-200,086	High income: nonOECD
Oman	916,481	916,481	48	57.18	0.36	76	233	-661,276	High income: nonOECD
Qatar	717,454	717,454	55	61.39	0.28	105	234	-710,892	High income: nonOECD
San Marino	2,431	2,431	204	4.46	0.00	19	43	-1,925	High income: nonOECD
Saudi Arabia	5,301,521	5,301,521	10	47.29	2.09	121	234	-3,738,831	High income: nonOECD
Singapore	4,369,700	4,369,700	15	58.82	1.73	116	244	-1,462,635	High income: nonOECD
Slovenia &	1,058,289	130,445	144	30.43	0.05	53	164	84,754	High income: nonOECD
Trinidad and Tobago	436,018	436,018	80	61.39	0.17	85	236	-51,753	High income: nonOECD
United Arab Emirates	3,781,143	3,781,143	16	47.13	1.49	124	244	-1,878,535	High income: nonOECD
Total/Average	**34,527,210**	**31,790,809**		**52.51**	**12.55**	**70**	**206**	**-20,557,624**	

* Income classification from World Bank July 2009 except Chinese Taipei which is included by the author

For EU members share excludes intra EU trade

& Member of the OECD as of 2010

1. See note 1 and 2 Table A2.

Upper Middle Income

Country name	import value includes intra EU	import value excludes intra EU	world rank	share of country's agricultural imports #	share of world total #	Number of products imported #	Number of partners #	Net trade	Income classification *
	USD 1000	USD 1000	number	%	%	number	number		
American Samoa	17,301	17,301	188	88.04	0.01	21	116	-15,853	Upper middle income
Argentina	476,262	476,262	74	26.73	0.19	85	219	4,821,919	Upper middle income
Belarus	861,815	861,815	49	45.06	0.34	87	220	712,554	Upper middle income
Belize	70,628	70,628	163	66.12	0.03	60	209	-2,309	Upper middle income
Bulgaria	1,001,046	172,204	127	29.85	0.07	56	188	128,293	Upper middle income
Chile &	1,372,260	1,372,260	40	45.12	0.54	88	220	2,089,078	Upper middle income
Costa Rica	488,957	488,957	72	44.81	0.19	85	229	382,104	Upper middle income
Croatia	1,119,098	1,119,098	44	56.24	0.44	101	231	-356,503	Upper middle income
Cuba	543,883	543,883	70	37.79	0.21	53	196	-155,581	Upper middle income
Dominica	31,603	31,603	180	70.20	0.01	64	209	-28,178	Upper middle income
Fiji	124,170	124,170	147	49.03	0.05	63	224	70,565	Upper middle income
Gabon	225,240	225,240	114	75.03	0.09	59	189	-224,641	Upper middle income
Grenada	57,765	57,765	168	81.73	0.02	68	225	-57,189	Upper middle income
Jamaica	614,428	614,428	65	64.84	0.24	79	237	-231,420	Upper middle income
Kazakhstan	1,675,292	1,675,292	31	72.59	0.66	93	229	-1,553,810	Upper middle income
Latvia	1,088,826	148,874	133	51.40	0.06	50	139	47,995	Upper middle income
Lebanon	1,057,012	1,057,012	45	53.85	0.42	103	240	-824,976	Upper middle income
Libya	697,940	697,940	57	42.76	0.28	69	157	-694,723	Upper middle income
Lithuania	1,292,824	216,979	116	46.58	0.09	51	152	211,945	Upper middle income
Malaysia	2,591,347	2,591,347	19	30.86	1.02	109	242	-28,128	Upper middle income
Mauritius	301,254	301,254	96	53.85	0.12	103	235	-258,948	Upper middle income
Palau	9,214	9,214	195	87.59	0.00	8	102	-8,899	Upper middle income
Panama	606,687	606,687	67	64.66	0.24	79	233	-476,228	Upper middle income
Romania	2,243,550	611,714	66	35.25	0.24	68	227	-460,957	Upper middle income
Russian Federation @	14,704,965	14,704,965	3	55.77	5.81	116	246	-11,764,051	Upper middle income
Saint lucia	93,460	93,460	157	79.20	0.04	64	229	-73,938	Upper middle income
Seychelles	58,613	58,613	167	58.88	0.02	62	244	-52,284	Upper middle income
St. Kitts and Nevis	36,688	36,688	176	76.69	0.01	71	221	-33,509	Upper middle income
St. Vincent and the Grenadir	51,663	51,663	170	67.69	0.02	92	229	-49,419	Upper middle income
Suriname	115,208	115,208	150	69.72	0.05	66	193	-96,364	Upper middle income
Uruguay	233,329	233,329	111	40.96	0.09	62	208	1,329,123	Upper middle income
Venezuela	2,213,790	2,213,790	22	53.94	0.87	74	215	-2,033,568	Upper middle income
Total	**36,076,117**	**31,599,643**		**49.82**	**12.48**			**-9,687,901**	

* Income classification from World Bank July 2009

For EU members share excludes intra EU trade

& Member of the OECD as of 2010; @ OECD candidate country

Lower Middle Income

Country name	import value includes intra EU	import value excludes intra EU	world rank	share of country's agricultural imports #	share of world total #	Number of products imported #	Number of partners #	Net trade	Income classification *
	USD 1000	USD 1000	number	%	%	number	number		
Albania	355,440	355,440	86	56.26	0.14	67	225	-344,563	Lower middle income
Algeria	1,920,935	1,920,935	25	36.15	0.76	75	212	-1,884,422	Lower middle income
Angola	1,382,356	1,382,356	39	71.34	0.55	66	236	-1,362,311	Lower middle income
Armenia	300,413	300,413	97	49.82	0.12	78	192	-144,689	Lower middle income
Azerbaijan	617,792	617,792	64	57.55	0.24	74	213	-380,110	Lower middle income
Bhutan	4,029	4,029	201	43.71	0.00	10	46	-1,428	Lower middle income
Bolivia	192,370	192,370	121	50.11	0.08	67	189	-87,376	Lower middle income
Bosnia and Herzegovina	682,567	682,567	58	56.78	0.27	92	223	-558,215	Lower middle income
Cameroon	209,136	209,136	118	47.88	0.08	60	168	-171,985	Lower middle income
Cape Verde	130,053	130,053	145	66.94	0.05	49	229	-128,260	Lower middle income
Colombia	677,234	677,234	59	22.89	0.27	82	220	757,212	Lower middle income
Congo, Rep.	229,850	229,850	112	60.83	0.09	66	206	-229,510	Lower middle income
Djibouti	140,170	140,170	138	39.64	0.06	50	173	-139,687	Lower middle income
Dominican Republic	619,000	619,000	63	41.16	0.24	62	222	-80,809	Lower middle income
Ecuador	395,136	395,136	82	35.67	0.16	62	215	142,300	Lower middle income
Egypt, Arab Rep.	1,347,767	1,347,767	41	17.03	0.53	100	221	-397,369	Lower middle income
El Salvador	706,799	706,799	56	51.76	0.28	64	224	-244,085	Lower middle income
Georgia	459,135	459,135	76	51.25	0.18	77	229	-246,594	Lower middle income
Guatemala	746,848	746,848	52	47.68	0.29	73	229	-44,486	Lower middle income
Guyana	101,902	101,902	156	58.73	0.04	70	211	-65,219	Lower middle income
Honduras	532,635	532,635	71	52.99	0.21	76	232	-252,913	Lower middle income
Iran, Islamic Rep.	1,137,409	1,137,409	43	24.22	0.45	72	175	-951,111	Lower middle income
Iraq	1,754,994	1,754,994	30	51.93	0.69	63	207	-1,754,430	Lower middle income
Jordan	922,414	922,414	47	40.23	0.36	89	224	-614,452	Lower middle income
Kiribati	11,837	11,837	192	65.25	0.00	15	127	-11,825	Lower middle income
Macedonia, FYR	294,000	294,000	100	62.82	0.12	74	212	-110,157	Lower middle income
Maldives	119,061	119,061	148	61.18	0.05	64	218	-119,023	Lower middle income
Marshall Islands	10,772	10,772	193	85.68	0.00	24	123	-10,763	Lower middle income
Micronesia, Fed. Sts.	13,422	13,422	191	69.28	0.01	14	98	-13,385	Lower middle income
Moldova	342,625	342,625	89	61.10	0.14	88	203	-68,166	Lower middle income
Mongolia	174,284	174,284	126	65.22	0.07	62	196	-144,530	Lower middle income
Morocco	655,156	655,156	62	17.76	0.26	82	220	-58,641	Lower middle income
Nicaragua	292,562	292,562	102	49.58	0.12	69	220	112,057	Lower middle income
Paraguay	268,278	268,278	103	63.12	0.11	55	183	160,029	Lower middle income
Peru	588,159	588,159	68	27.39	0.23	78	220	362,601	Lower middle income
Philippines	2,083,413	2,083,413	23	43.85	0.82	79	237	-1,016,208	Lower middle income
Samoa	47,454	47,454	172	74.55	0.02	27	204	-41,760	Lower middle income
Sri lanka	483,559	483,559	73	33.18	0.19	51	197	-386,961	Lower middle income
Sudan	372,853	372,853	84	32.41	0.15	95	222	-342,244	Lower middle income
Syrian Arab Republic	841,409	841,409	50	38.91	0.33	80	192	-336,660	Lower middle income
Thailand	1,911,742	1,911,742	26	36.83	0.75	98	238	3,763,013	Lower middle income
Timor-Leste	7,078	7,078	197	23.60	0.00	14	99	-6,821	Lower middle income
Tonga	37,024	37,024	175	86.46	0.01	34	188	-36,746	Lower middle income
Tunisia	343,754	343,754	88	17.45	0.14	78	203	-58,729	Lower middle income
Turkmenistan	105,927	105,927	154	63.17	0.04	42	140	-104,185	Lower middle income
Ukraine	1,907,581	1,907,581	27	47.13	0.75	101	226	674,619	Lower middle income
Vanuatu	24,658	24,658	183	60.62	0.01	43	218	-21,343	Lower middle income
Total	**26,502,987**	**26,502,987**		**37.41**	**10.46**			**-7,000,338**	

* Income classification from World Bank July 2009

Low Income

Country name	export value includes intra EU	export value excludes intra EU	world rank	share of country's agricultural exports #	share of world total #	Number of products exported	Number of partners	Net trade	Income classification *
	USD 1000	USD 1000	number	%	%	number	number		
Afghanistan	317,408	317,408	94	42.75	0.13	53	188	-315,413	Low income
Bangladesh	340,261	340,261	90	7.16	0.13	93	199	-309,315	Low income
Benin	264,348	264,348	106	31.55	0.10	60	174	-238,039	Low income
Burkina Faso	137,437	137,437	141	62.27	0.05	42	129	-132,740	Low income
Burundi	28,140	28,140	182	41.05	0.01	35	154	-25,345	Low income
Cambodia	466,723	466,723	75	80.30	0.18	42	203	-440,697	Low income
Central African Republic	8,112	8,112	196	28.34	0.00	28	87	-7,556	Low income
Chad	30,026	30,026	181	48.37	0.01	27	107	-29,914	Low income
Comoros	103,234	103,234	155	70.23	0.04	83	233	-103,047	Low income
Congo, Dem. Rep.	357,291	357,291	85	53.97	0.14	53	230	-355,305	Low income
Cote d'ivoire	293,065	293,065	101	31.83	0.12	91	234	-10,891	Low income
Eritrea	23,824	23,824	184	33.53	0.01	27	97	-23,707	Low income
Ethiopia	106,678	106,678	153	25.08	0.04	84	214	-69,288	Low income
Gambia	155,921	155,921	130	55.99	0.06	71	201	-155,318	Low income
Ghana	661,533	661,533	60	57.07	0.26	116	238	-588,336	Low income
Guinea	155,585	155,585	131	47.71	0.06	86	183	-151,617	Low income
Guinea-Bissau	40,487	40,487	174	67.58	0.02	40	141	-40,415	Low income
Haiti	209,004	209,004	119	39.22	0.08	46	178	-204,510	Low income
Kenya	227,041	227,041	113	19.65	0.09	75	216	178,288	Low income
Korea, Dem. Rep.	124,408	124,408	146	30.22	0.05	38	145	-121,431	Low income
Kyrgyzstan	234,078	234,078	110	58.98	0.09	74	175	-169,096	Low income
Lao PDR	163,987	163,987	129	76.37	0.06	23	151	-159,533	Low income
Liberia	90,254	90,254	158	55.13	0.04	69	191	-90,179	Low income
Madagascar	84,907	84,907	159	24.80	0.03	76	206	-56,488	Low income
Malawi	52,849	52,849	169	30.44	0.02	47	199	-27,092	Low income
Mali	181,593	181,593	123	52.52	0.07	72	182	-172,753	Low income
Mauritania	320,583	320,583	93	55.47	0.13	70	180	-320,334	Low income
Mozambique	264,509	264,509	105	41.25	0.10	75	237	-255,427	Low income
Myanmar	299,458	299,458	98	44.73	0.12	31	191	-293,395	Low income
Nepal	47,770	47,770	171	17.80	0.02	40	190	-12,780	Low income
Niger	118,415	118,415	149	48.81	0.05	70	204	-102,709	Low income
Nigeria	1,983,422	1,983,422	24	41.91	0.78	96	223	-1,908,511	Low income
Pakistan	315,650	315,650	95	7.63	0.12	98	221	118,945	Low income
Papua New Guinea	147,895	147,895	136	56.94	0.06	32	197	-146,028	Low income
Rwanda	36,418	36,418	177	35.38	0.01	43	171	-33,624	Low income
São Tomé and Principe	15,216	15,216	190	57.88	0.01	35	188	-14,671	Low income
Senegal	428,767	428,767	81	35.12	0.17	90	228	-315,779	Low income
Sierra Leone	84,544	84,544	161	62.27	0.03	59	145	-80,917	Low income
Solomon Islands	15,498	15,498	189	66.85	0.01	23	137	-15,433	Low income
Somalia	180,385	180,385	124	40.39	0.07	32	153	-169,222	Low income
Tajikistan	148,208	148,208	135	45.62	0.06	47	151	-141,524	Low income
Tanzania	168,768	168,768	128	24.08	0.07	74	232	-122,995	Low income
Togo	213,194	213,194	117	55.95	0.08	80	179	-183,984	Low income
Uganda	148,717	148,717	134	34.52	0.06	70	211	-61,126	Low income
Uzbekistan	139,586	139,586	139	31.00	0.06	45	162	-89,637	Low income
Vietnam	1,489,439	1,489,439	37	31.89	0.59	84	242	-736,252	Low income
Yemen, Rep.	955,587	955,587	46	33.85	0.38	81	209	-862,137	Low income
Zambia	108,958	108,958	151	48.60	0.04	55	214	-53,854	Low income
Zimbabwe	66,810	66,810	165	14.17	0.03	45	221	233,778	Low income
Total	**12,555,988**	**12,555,988**		**32.16**	**4.96**			**-9,387,352**	

* Income classification from World Bank July 2009

Table A4. Production employment and number of firms i n the Food Beverages and Tobacco sector: 2001

	Firms Number	Employment Number	Value of Output USD 000	Average productivity of labour USD 000	Average productivity of firm USD 000
		high income: OECD			
Australia	3,794	189,603	28,827,856	152	7,598
Austria	4,260	73,662	11,338,071	154	2,662
Belgium/Luxembourg	8,698	91,366	24,237,128	265	2,787
Canada	6,058	266,010	51,961,288	195	8,577
Czech Republic	5,382	20,129	7,647,913	380	1,421
Denmark	1,861	7,464	15,735,390	2,108	8,455
Finland	1,960	39,590	7,085,663	179	3,615
France	66,936	605,710	119,863,143	198	1,791
Germany	35,554	797,140	128,770,791	162	3,622
Hungary	2,116	16,278	5,427,843	333	2,565
Iceland	-	-	1,743,331	NA	NA
Ireland	697	50,728	17,128,340	338	24,574
Italy	68,160	328,366	88,840,361	271	1,303
Japan	42,574	1,218,060	283,106,652	232	6,650
Korea, Rep.	6,997	176,980	33,689,275	190	4,815
Netherlands	5,100	145,881	35,295,692	242	6,921
New Zealand	1,461	64,715	1,666,015	26	1,140
Norway	1,561	48,745	12,307,640	252	7,884
Portugal	8,491	104,106	9,677,542	93	1,140
Slovak Republic	783	45,879	1,790,995	39	2,287
Spain	31,716	352,827	61,483,081	174	1,939
Sweden	2,987	6,243	1,462,844	234	490
United Kingdom	7,696	501,390	97,166,682	194	12,626
United States	30,049	1,683,860	571,974,340	340	19,035
Total	**344,891**	**6,834,732**	**1,618,227,875**	**237**	**4,692**
		high income: non-OECD			
Bahamas, The	50	1,167	0	NA	NA
Bermuda	18	309	0	NA	NA
Chinese Taipei	-	108,737	0	NA	NA
Cyprus[1]	1,119	11,424	969,203	85	866
Estonia [&]	477	19,800	617,745	31	1,295
Hong Kong SAR, China	667	27,800	1,990,575	72	2,984
Israel [&]	1,051	53,700	6,953,266	129	6,616
Kuwait	321	13,150	614,069	47	1,913
Macao SAR, China	132	1,451	45,421	31	344
Malta	547	3,901	353,185	91	646
Oman	169	6,902	447,277	65	2,647
Puerto Rico	-	19,200	5,794,500	302	NA
Qatar	257	2,450	87,967	36	342
Singapore	309	14,532	1,686,324	116	5,457
Slovenia [&]	377	20,291	1,583,829	78	4,201
Trinidad and Tobago	322	9,715	970,173	100	3,013
Total	**5,816**	**314,529**	**22,113,533**	**70**	**3,802**

	Firms Number	Employment Number	Value of Output USD 000	Average productivity of labour USD 000	Average productivity of firm USD 000
		Upper middle income			
Argentina	-	213,059	28,181,092	132	NA
Botswana	233	7,050	180,940	26	777
Brazil	24,610	1,053,352	56,459,606	54	2,294
Bulgaria	6,298	93,842	1,633,169	17	259
Chile	1,525	-	9,565,214	NA	6,272
Costa Rica	1,354	47,812	2,646,171	55	1,954
Croatia	2,483	44,663	-	NA	NA
Kazakhstan	5,198	76,100	1,048,584	14	202
Latvia	890	36,638	879,793	24	989
Lithuania	1,682	53,824	1,443,204	27	858
Malaysia	3,250	129,313	12,216,205	94	3,759
Mauritius	18	2,813	126,138	45	7,008
Mexico	-	-	43,087,520	NA	NA
Panama	391	22,138	1,372,562	62	3,510
Poland	17,761	390,719	24,614,702	63	1,386
Romania	10,382	5,300	8,078,615	1,524	778
Russian Federation [@]	26,580	1,606,263	25,673,552	16	966
Serbia and Montenegro	4,849	103,000	2,365,184	23	488
South Africa	-	185,369	3,550,443	19	NA
St. Vincent and the Grenadines	46	489	-	NA	NA
Turkey	1,699	165,545	15,167,077	92	8,927
Uruguay	-	27,623	2,545,176	92	NA
Total	**109,249**	**4,264,912**	**240,834,946**	**56**	**2,204**
		Lower middle income			
Albania	243	1,458	27,616	19	114
Armenia	608	12,147	212,608	18	350
Azerbaijan	524	17,969	833,759	46	1,591
Bolivia	329	16,482	1,206,399	73	3,667
Cameroon	94	11,934	510,550	43	5,431
China	18,571	3,767,000	111,689,762	30	6,014
Ecuador	411	55,961	3,111,015	56	7,569
Georgia	1,645	20,330	158,847	8	97
India	25,961	1,799,943	34,195,278	19	1,317
Indonesia	5,307	831,200	15,902,482	19	2,997
Iran, Islamic Rep.	1,916	136,934	14,761,140	108	7,704
Jordan	3,382	23,085	1,045,582	45	309
Moldova	385	46,138	426,861	9	1,109
Morocco	1,708	64,043	4,938,071	77	2,891
Paraguay	173	18,465	1,163,471	63	6,725
Philippines	123	34,900	2,184,750	63	17,762
Sri Lanka	4,328	89,004	1,269,252	14	293
Sudan	17,007	75,267	1,786,494	24	105
Syrian Arab Republic	506	11,889	-	NA	NA
Tunisia	2,916	36,667	3,814,737	104	1,308
Ukraine	9,079	459,000	6,534,857	14	720
Total	**95,216**	**7,529,816**	**205,773,532**	**27**	**2,161**

	Firms Number	Employment Number	Value of Output USD 000	Average productivity of labour USD 000	Average productivity of firm USD 000
		Low Income			
Afghanistan	25	47	-	NA	NA
Eritrea	72	3,921	69,532	18	966
Ethiopia	252	28,082	423,997	15	1,683
Kenya	1,040	81,602	7,546,026	92	7,256
Kyrgyz Republic	605	30,876	212,612	7	351
Madagascar	-	75,953	378,029	5	NA
Malawi	33	68,111	216,618	3	6,564
Myanmar	3	1,983	292,821	148	97,607
Niger	46	678	4,644	7	101
Senegal	114	11,819	636,023	54	5,579
Tajikistan	383	12,907	180,547	14	471
Vietnam	3,620	309,414	6,836,498	22	1,889
Yemen, Rep.	15,783	21,888	693,322	32	44
Total	**21,976**	**647,281**	**17,490,670**	**27**	**796**

& Member of the OECD as of 2010 @ OECD accession candidate

1. See note 1 and 2 Table A2.

Table A5. Number of documents, time required and cost to export a 20-foot container: 2007

	Variable	Obs	Mean	Std. Dev	Min	Max
High Income: OECD	Number of documents	25	4.5	0.9	3	7
	Cost	26	922.13	262.25	420	1446.49
	Number of days	26	10.8	4.9	5	22
High Income: non-OECD	Number of documents	13	5.5	1.9	3.0	10.0
	Cost	13	757.92	270.15	416	1403.00
	Number of days	13	15.1	7.5	5	29
Upper Middle Income	Number of documents	31	6.6	1.7	3.0	11.0
	Cost	31	1230.39	520.76	432	2730.00
	Number of days	31	22.1	14.4	9	89
Lower Middle Income	Number of documents	47	7.4	1.6	5.0	12.0
	Cost	47	1120.57	578.49	390	3400.00
	Number of days	47	26.4	15.2	12	102
Low Income	Number of documents	46	8.2	2.1	4.0	13.0
	Cost	46	1651.70	974.76	515	4867.00
	Number of days	46	39.5	16.8	19	82
World	Number of documents	162	6.9	2.1	3.0	13.0
	Cost	163	1230.77	715.72	390	4867.00
	Number of days	163	25.9	17.1	5	102

Table 1. Table A6. Average productivity (EXPY) per country for all merchandised exports

Year	Obs	Mean	Std. Dev.	Min	Max
1996	215	9,565	2,957	2,929	22,861
1997	215	9,575	3,061	3,263	21,437
1998	215	9,490	2,855	3,586	20,253
1999	215	9,519	2,697	4,847	20,750
2000	222	9,684	2,904	3,941	30,131
2001	222	9,642	2,495	3,309	17,823
2002	222	9,859	3,029	2,933	30,053
2003	222	9,770	2,853	3,846	20,669
2004	222	9,830	2,818	4,689	21,891
2005	222	9,902	2,585	1,947	19,014
2006	221	9,923	2,643	2,413	18,589
2007	221	9,899	2,389	2,313	17,134

Table A7. Growth in processed product exports and contributions from the intensive and extensive margins

Country	Total Growth	Gross Intensive Margin	Expired Products	Net Intensive Margin	Extensive Margin	Extensive Margin Share of Growth
	USD (000)	USD (000)	USD (000)	USD (000)	USD (000)	%
Brazil	13,717,731	8,110,415	507,330	7,603,085	6,114,646	44.57
United States	9,881,340	9,758,123	859,664	8,898,459	982,881	9.95
China	8,549,358	7,310,635	279,993	7,030,641	1,518,717	17.76
Australia	6,796,578	6,620,882	214,680	6,406,203	390,376	5.74
Canada	6,595,790	6,509,565	292,264	6,217,301	378,489	5.74
New Zealand	6,349,466	5,931,729	198,880	5,732,849	616,617	9.71
France	5,108,200	5,030,735	458,632	4,572,103	536,096	10.49
Mexico	4,776,051	4,748,265	218,268	4,529,997	246,054	5.15
Italy	3,947,871	3,817,794	119,319	3,698,475	249,396	6.32
Netherlands	3,649,549	3,506,016	362,384	3,143,632	505,917	13.86
Germany	3,255,199	3,039,848	297,188	2,742,660	512,539	15.75
Thailand	3,048,290	2,463,919	42,568	2,421,351	626,939	20.57
Argentina	2,693,102	1,794,626	162,232	1,632,394	1,060,708	39.39
Russian Federation	2,410,647	1,760,560	196,464	1,564,095	846,551	35.12
Switzerland	2,383,158	2,065,752	176,386	1,889,366	493,792	20.72
Chile	2,275,170	1,736,641	87,510	1,649,130	626,039	27.52
Turkey	2,262,293	1,704,939	159,729	1,545,209	717,084	31.70
India	2,207,724	1,381,639	150,348	1,231,290	976,433	44.23
Ireland	1,928,535	1,981,277	338,248	1,643,029	285,506	14.80
Spain	1,800,197	1,501,498	171,564	1,329,935	470,262	26.12
Austria	1,655,473	1,230,286	67,476	1,162,810	492,663	29.76
United Arab Emirates	1,566,626	37,343	24,735	12,608	1,554,019	99.20
Ukraine	1,542,759	1,081,447	253,268	828,179	714,580	46.32
Belgium/Luxembourg	1,529,240	1,389,060	282,103	1,106,957	422,284	27.61
Malaysia	1,490,893	1,122,544	56,570	1,065,973	424,920	28.50
Belarus	1,488,563	66,419	4,812	61,607	1,426,956	95.86
Saudi Arabia	1,414,535	244,147	79,173	164,974	1,249,561	88.34
South Africa	1,157,439	933,489	120,266	813,222	344,216	29.74
Denmark	1,116,696	928,095	236,591	691,503	425,193	38.08
Colombia	964,868	727,625	29,300	698,326	266,542	27.62
Indonesia	930,207	626,049	40,713	585,337	344,870	37.07
Poland	799,577	259,127	199,413	59,714	739,863	92.53
Egypt, Arab Rep.	794,817	397,132	22,511	374,622	420,195	52.87
Uruguay	786,982	435,782	82,749	353,033	433,949	55.14
Sweden	739,972	642,842	49,748	593,094	146,878	19.85
United Kingdom	679,582	894,704	396,737	497,967	181,615	26.72
Peru	673,248	442,758	39,463	403,295	269,953	40.10
Vietnam	618,903	239,237	17,355	221,882	397,021	64.15
Philippines	582,963	347,514	15,278	332,236	250,726	43.01
Portugal	573,648	494,251	16,565	477,687	95,961	16.73
Singapore	571,061	178,591	39,634	138,958	432,104	75.67
Costa Rica	568,916	458,839	17,261	441,577	127,339	22.38
Korea, Rep.	561,029	504,670	136,012	368,658	192,371	34.29
Croatia	473,225	270,228	28,651	241,578	231,648	48.95
Japan	468,244	433,550	38,315	395,235	73,009	15.59
Guatemala	406,917	307,483	47,789	259,694	147,223	36.18
Dominican Republic	372,034	353,117	23,966	329,151	42,883	11.53
Greece	371,981	274,975	78,679	196,296	175,685	47.23
Ecuador	364,467	291,640	15,631	276,009	88,458	24.27
Morocco	331,655	194,441	20,831	173,611	158,045	47.65
Israel	320,583	279,823	78,065	201,757	118,826	37.07
Norway	317,080	287,242	48,297	238,945	78,136	24.64
Finland	115,370	98,967	65,312	33,655	81,715	70.83
Hungary	-83,808	-113,095	143,560	-256,655	172,848	n.a
Hong Kong, China	-807,464	-1,059,521	81,299	-1,140,820	333,356	n.a
Total	**119,094,531**	**96,075,660**	**8,191,781**	**87,883,879**	**31,210,652**	**26.21**

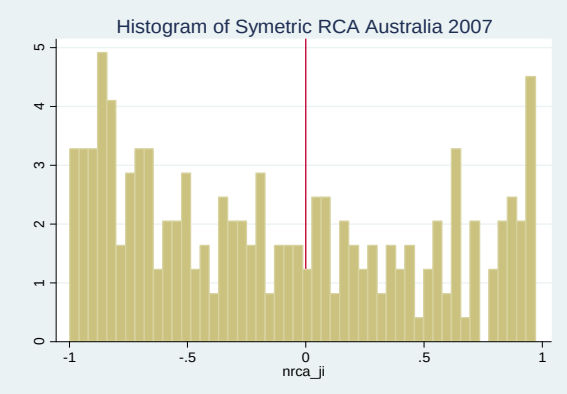
Table A8. Decomposition of the extensive margin for selected countries

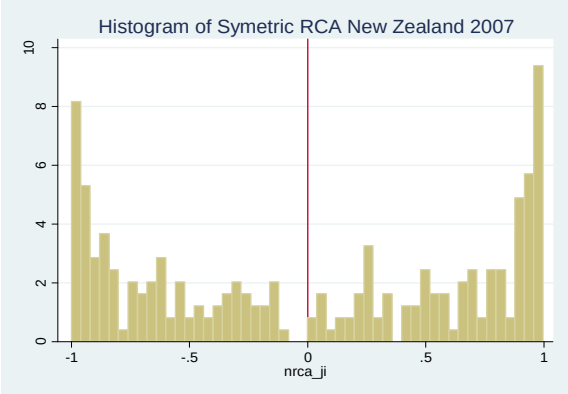
Country	NPND	NPOD	OPND	OPTD	Total
Brazil	191	21,960	475,374	5,617,120	6,114,646
United Arab Emirates	2,416	1,640	1,106,171	443,792	1,554,019
China	.	3,805	77,568	1,437,344	1,518,717
Belarus	356,153	26,360	1,009,397	35,046	1,426,956
Saudi Arabia	64,477	11,696	1,010,928	162,461	1,249,561
Argentina	308	4,501	45,004	1,010,895	1,060,708
United States	.	.	135,925	846,956	982,881
India	.	7,658	41,711	927,064	976,433
Russian Federation	433	421	468,673	377,024	846,551
Poland	21	587	113,295	625,961	739,863
Turkey	.	30,045	36,861	650,178	717,084
Ukraine	1,580	24,077	101,482	587,441	714,580
Thailand	3	1,281	47,353	578,302	626,939
Chile	0	4,722	32,101	589,216	626,039
New Zealand	0	392	164,365	451,860	616,617
France	.	.	17,503	518,593	536,096
Germany	.	22	68,635	443,882	512,539
Netherlands	.	.	42,918	462,999	505,917
Switzerland	.	911	9,276	483,605	493,792
Austria	92	6,868	92,254	393,449	492,663
Spain	.	282	12,278	457,702	470,262
Uruguay	1,757	56,642	78,339	297,209	433,949
Singapore	.	5	30,719	401,380	432,104
Denmark	.	1,811	10,204	413,178	425,193
Malaysia	.	1,013	29,103	394,803	424,920
Belgium/Luxembourg	.	15	10,222	412,047	422,284
Egypt, Arab Rep.	1,385	8,459	16,243	394,108	420,195
Vietnam	19,242	47,836	168,068	161,875	397,021
Australia	0	185	36,380	353,811	390,376
Canada	.	236	11,101	367,152	378,489
Indonesia	125	9,008	29,089	306,648	344,870
South Africa	.	13,067	10,570	320,580	344,216
Hong Kong, China	.	177	4,202	328,978	333,356
Ireland	522	8,365	36,988	239,631	285,506
Peru	961	8,232	67,868	192,891	269,953
Colombia	37	14,802	30,756	220,947	266,542
Philippines	11	1,536	13,572	235,608	250,726
Italy	5	340	41,975	207,075	249,396
Mexico	.	66,486	7,027	172,541	246,054
Croatia	140	733	93,091	137,684	231,648
Korea, Rep.	.	1,100	9,797	181,473	192,371
United Kingdom	.	1	15,852	165,762	181,615
Greece	9	1,735	52,809	121,133	175,685
Hungary	.	5,284	31,359	136,205	172,848
Morocco	962	5,277	11,583	140,223	158,045
Guatemala	8	12,112	4,899	130,204	147,223
Sweden	.	1,144	2,918	142,817	146,878
Costa Rica	2,274	5,218	14,817	105,031	127,339
Israel	18	4,463	7,600	106,745	118,826
Portugal	17	2,057	2,756	91,132	95,961
Ecuador	91	6,399	18,467	63,501	88,458
Finland	.	747	3,044	77,924	81,715
Norway	3	1,419	4,121	72,592	78,136
Japan	.	251	8,153	64,605	73,009
Dominican Republic	6	7,338	3,154	32,385	42,883
Total	453,247	440,722	6,025,917	24,290,766	31,210,652

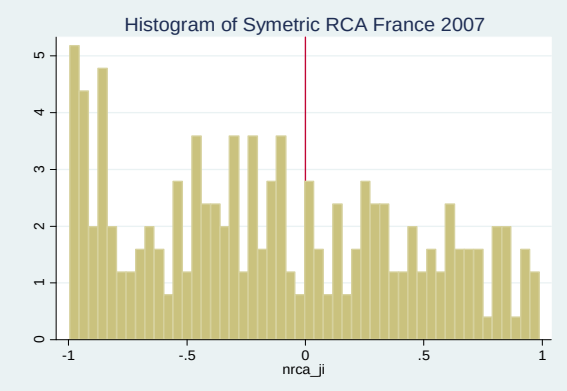
NPND: new products new destinations. NPOD: new products old (established) destinations
OPND: old (established) products new destinations. OPTD: Old (established) products traditional destinations

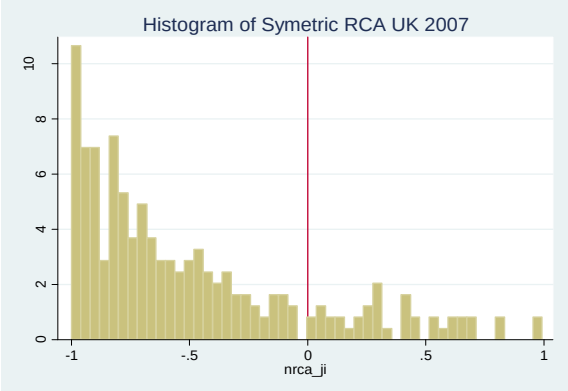
Figure A1. Histogram of SRCA index in 2007 for selected countries

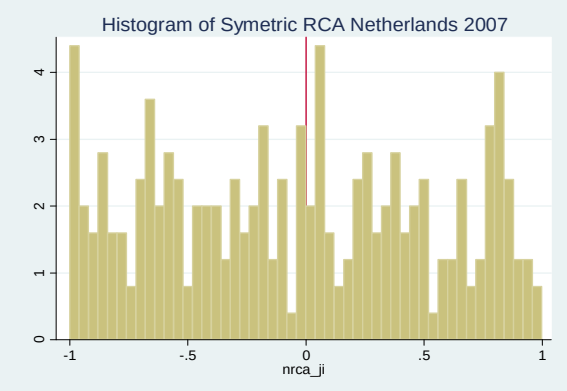
Panel A. Selected OECD countries with overall comparative advantage

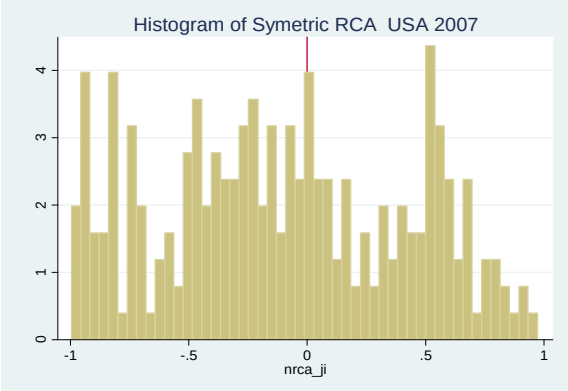




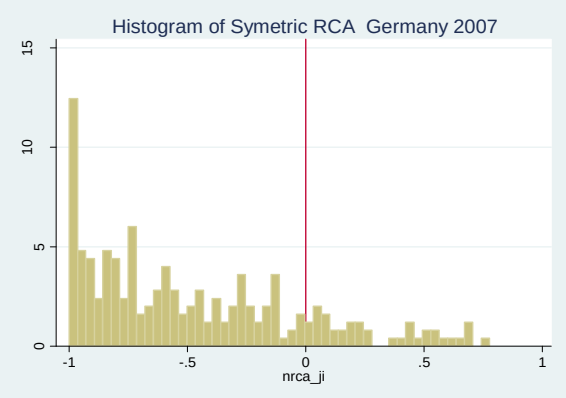


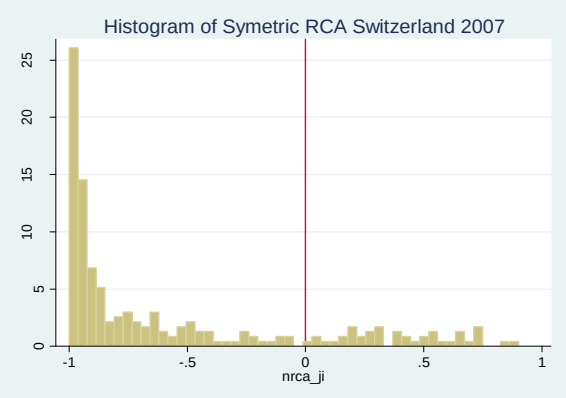


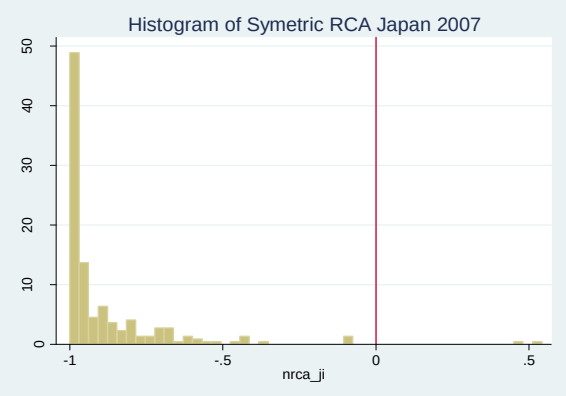


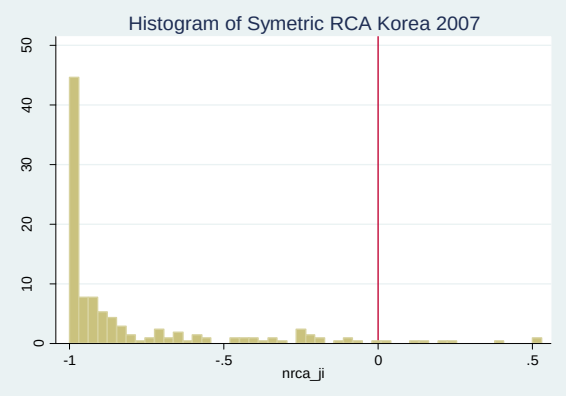


Panel B. Selected OECD countries without an overall comparative advantage

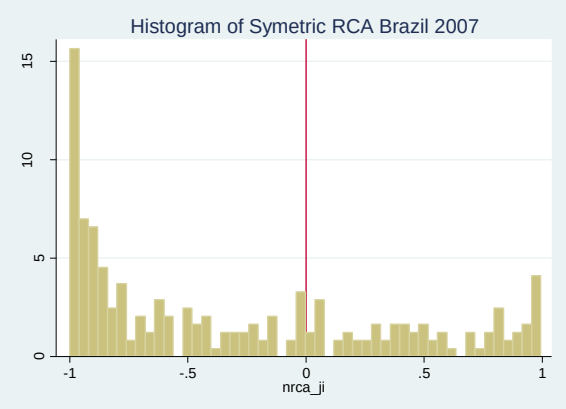


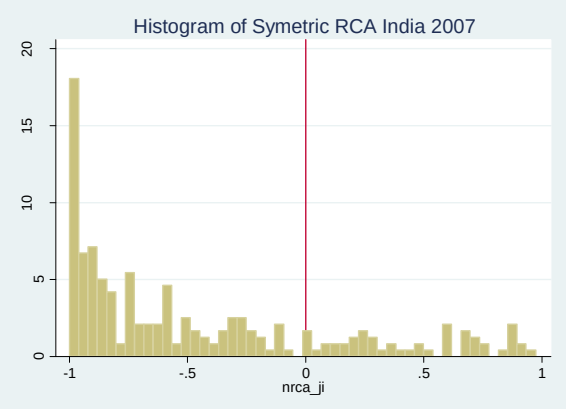


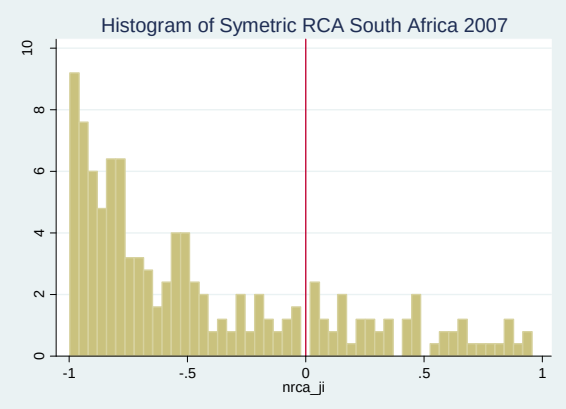


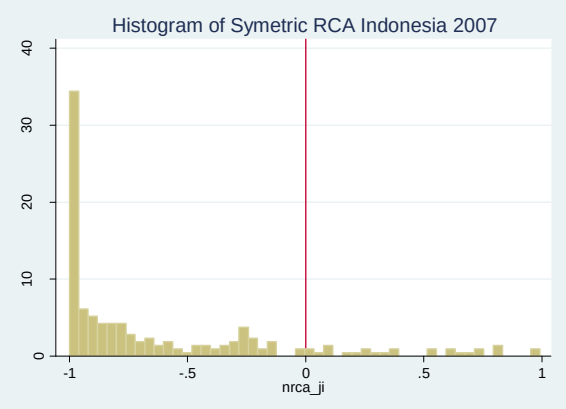


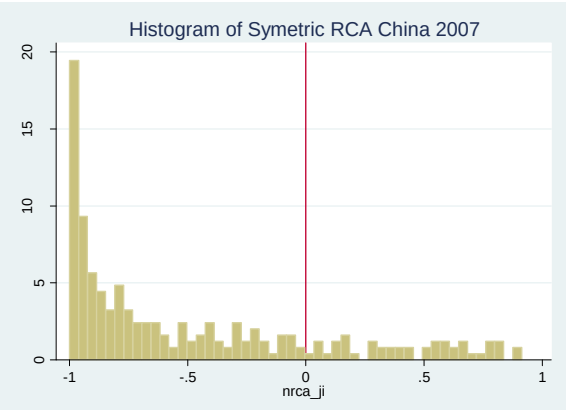
Panel C. Enhanced Engagement countries



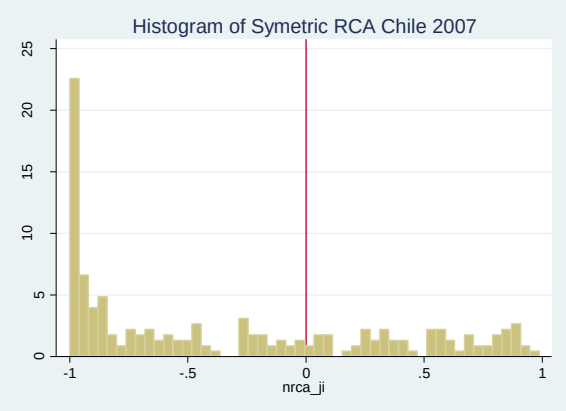


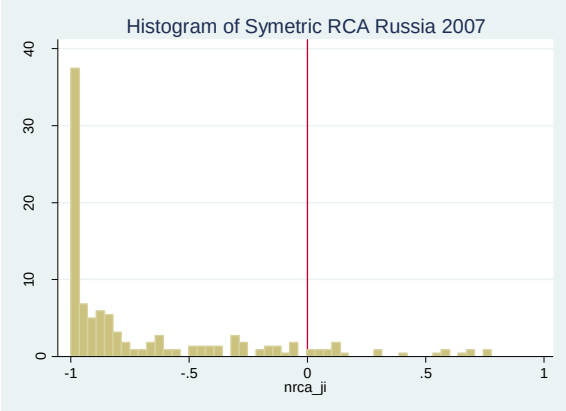


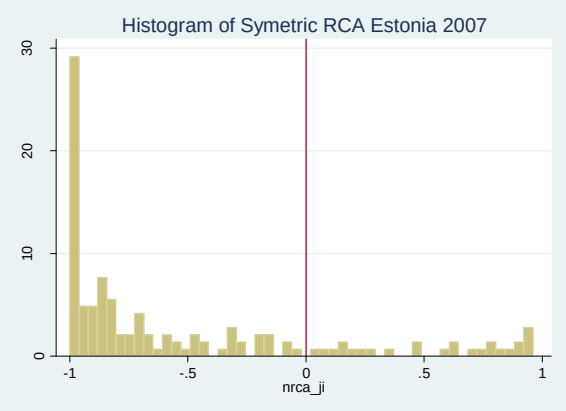


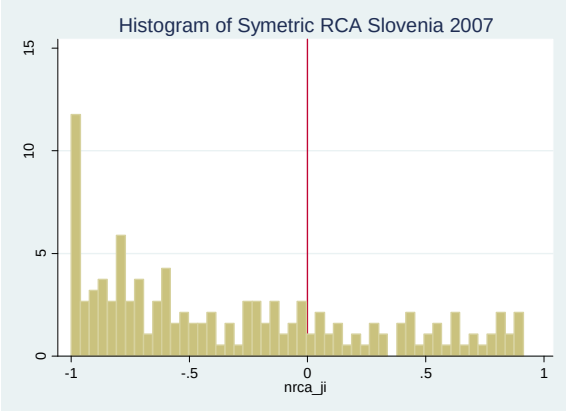


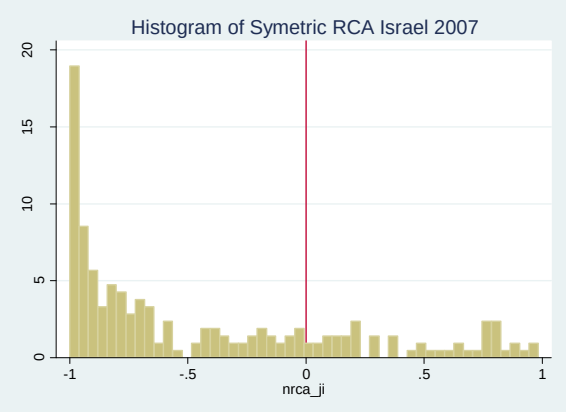
Panel D. New OECD members (as of 2010) and OECD Accession Countries



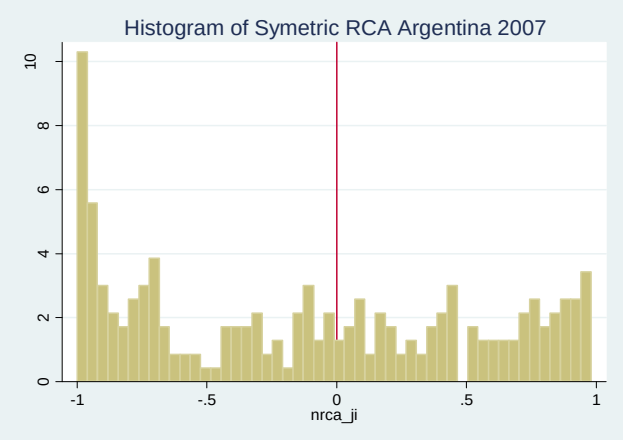


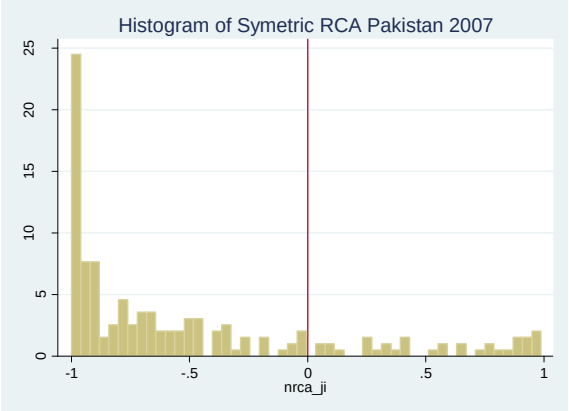


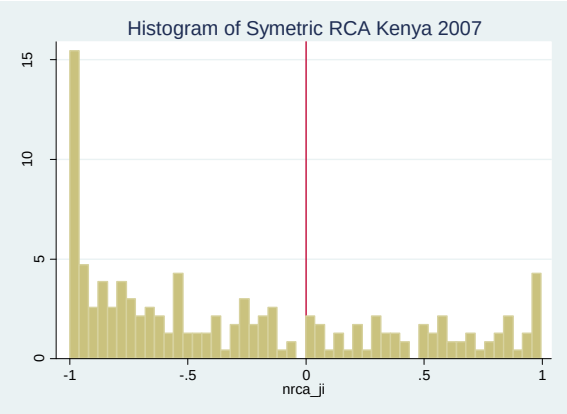


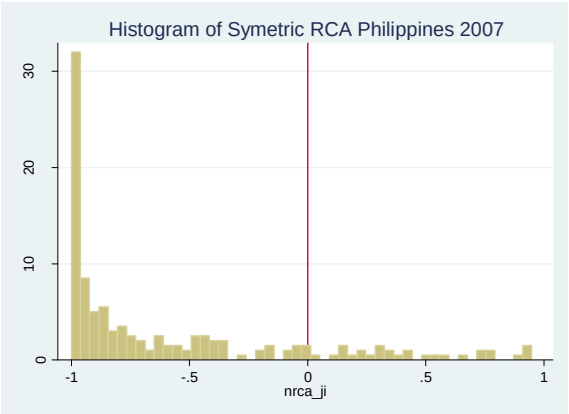


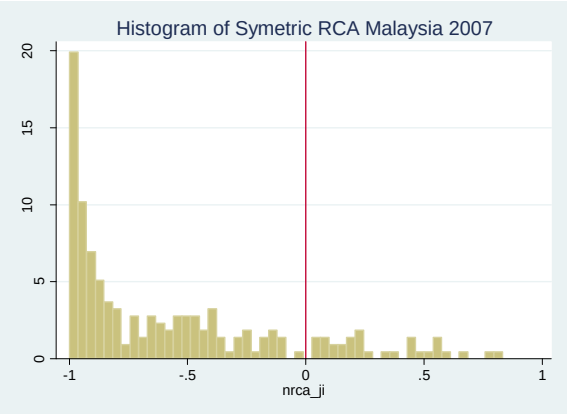
Panel E. Select other countries











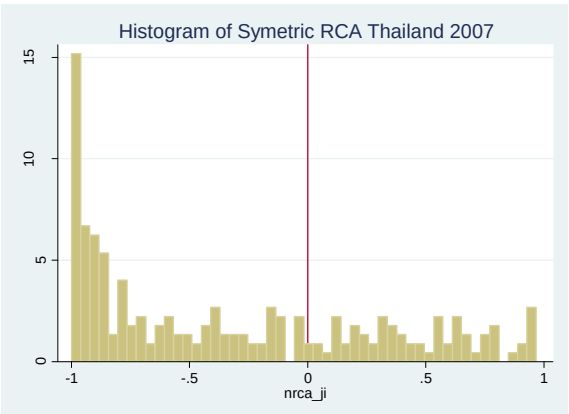
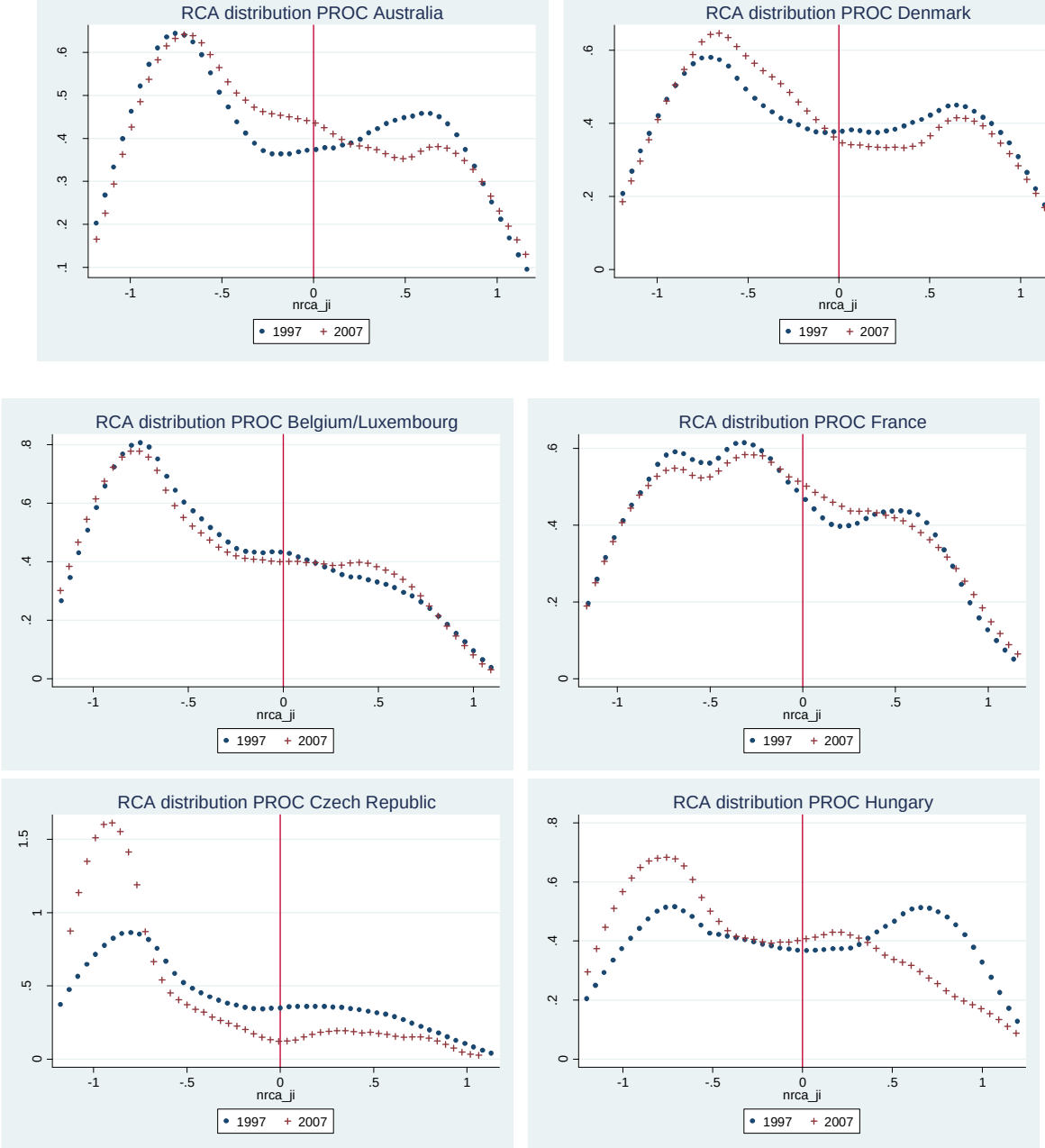
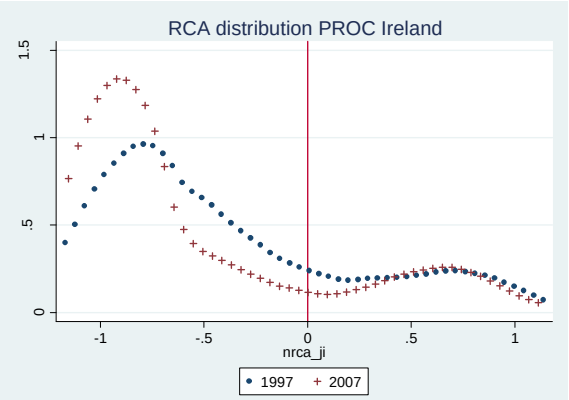
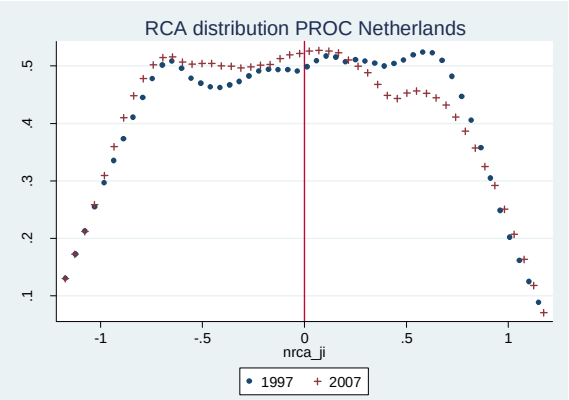


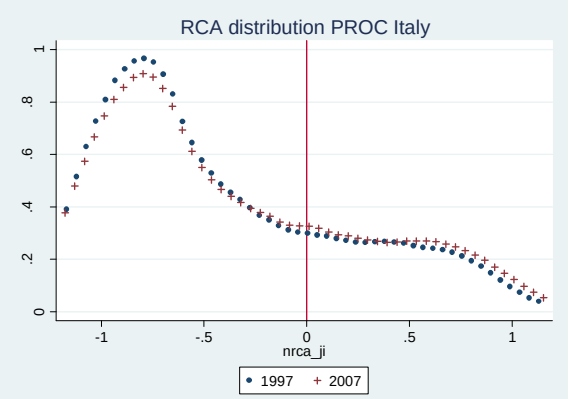
Figure A2. Kernel density estimates for selected countries in 1997 and 2007

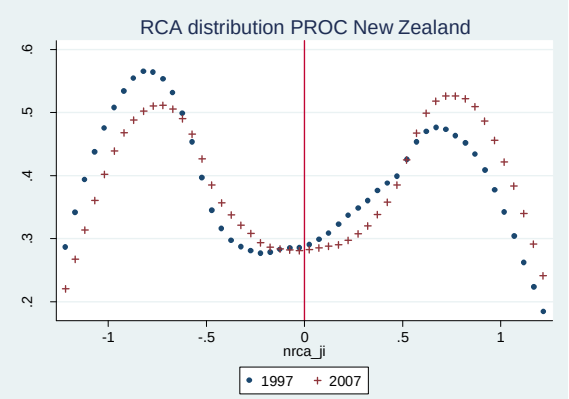
OECD




RCA distribution PROC Ireland
nrca_ji
1997
2007


RCA distribution PROC Netherlands
nrca_ji
1997
2007


RCA distribution PROC Italy
nrca_ji
1997
2007


RCA distribution PROC New Zealand
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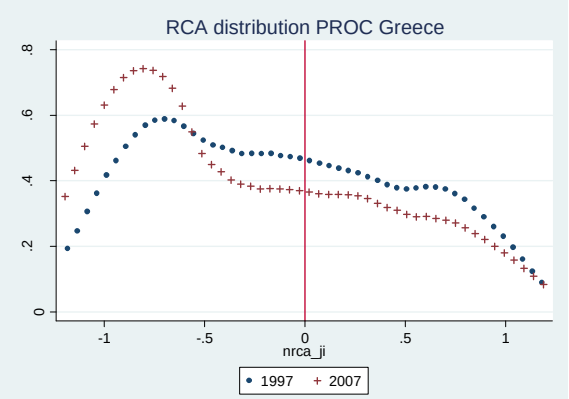
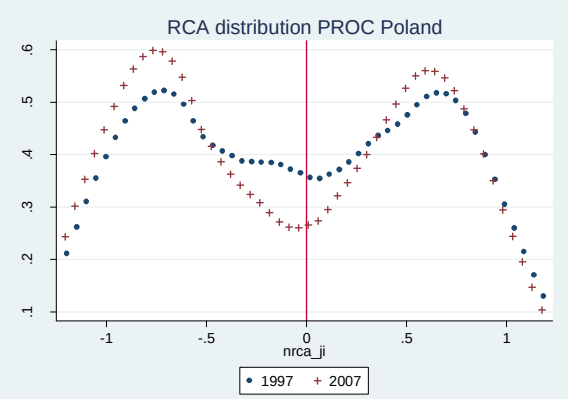
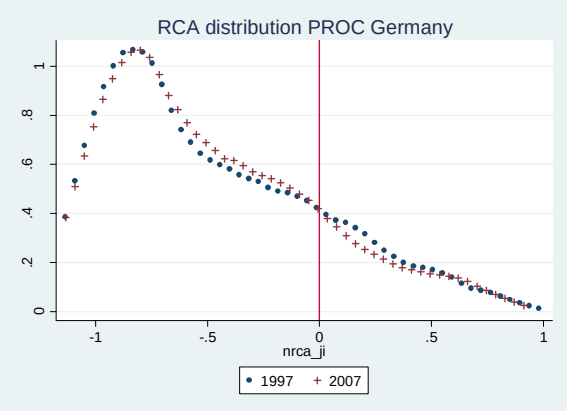
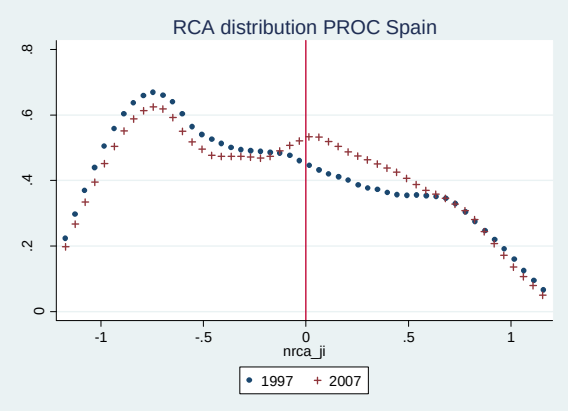
1997
2007


RCA distribution PROC Greece
nrca_ji
1997
2007


RCA distribution PROC Poland
nrca_ji
1997
2007


RCA distribution PROC Germany
0
.2
.4
.6
.8
1
-1
-.5
0
.5
1
nrca_ji
1997
2007


RCA distribution PROC Spain
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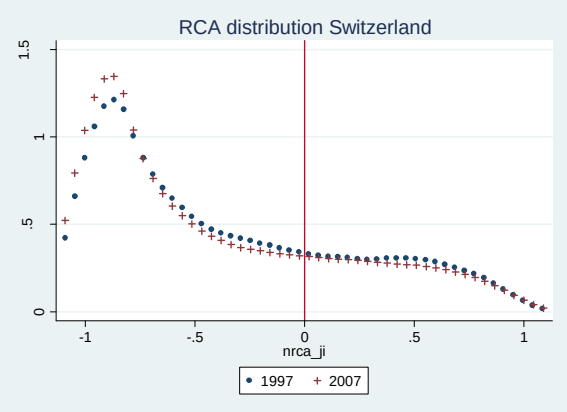
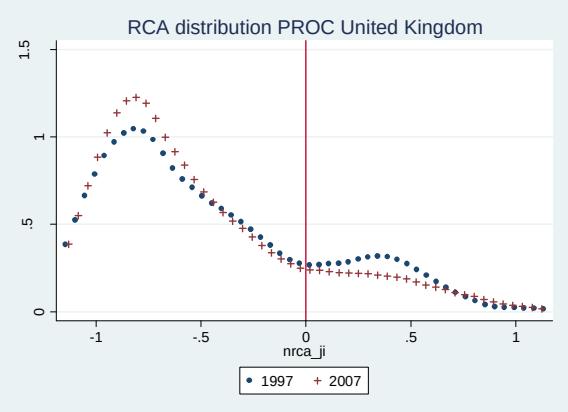
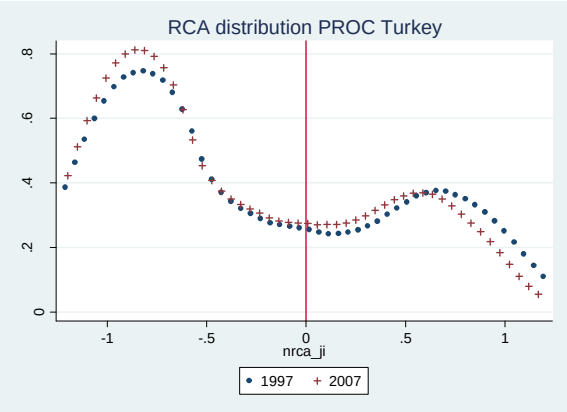
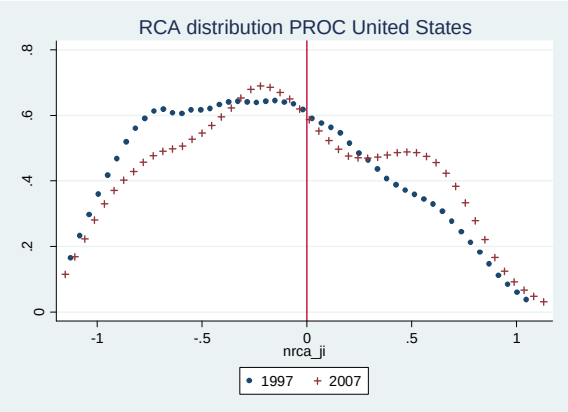
.2
.4
.6
.8
-1
-.5
0
.5
1
nrca_ji
1997
2007

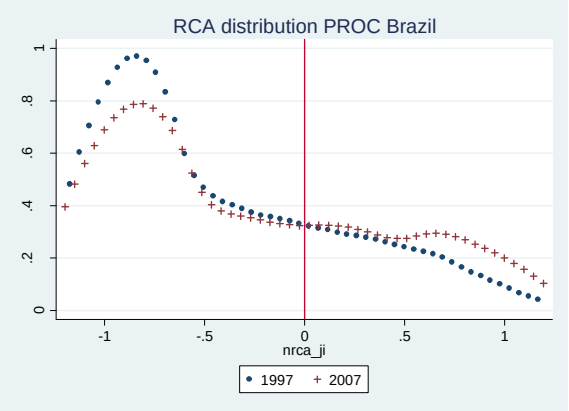

RCA distribution Switzerland
0
.5
1
1.5
-1
-.5
0
.5
1
nrca_ji
1997
2007

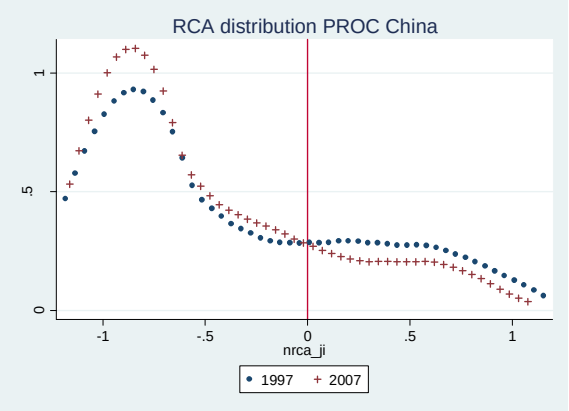

RCA distribution PROC United Kingdom
0
.5
1
1.5
-1
-.5
0
.5
1
nrca_ji
1997
2007

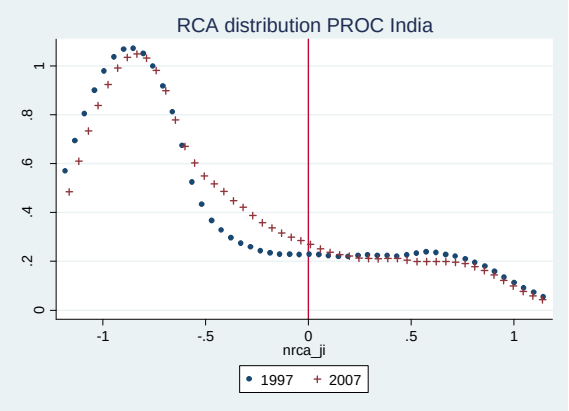

RCA distribution PROC Turkey
0
.2
.4
.6
.8
-1
-.5
0
.5
1
nrca_ji
1997
2007

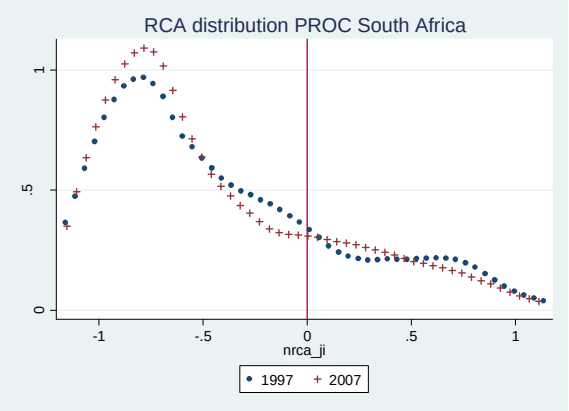

RCA distribution PROC United States
0
.2
.4
.6
.8
-1
-.5
0
.5
1
nrca_ji
1997
2007

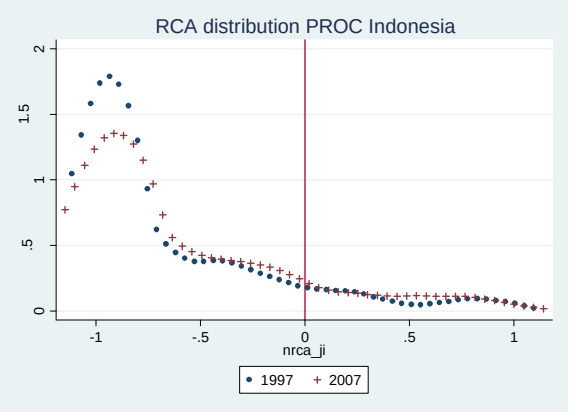
Enhanced engagement



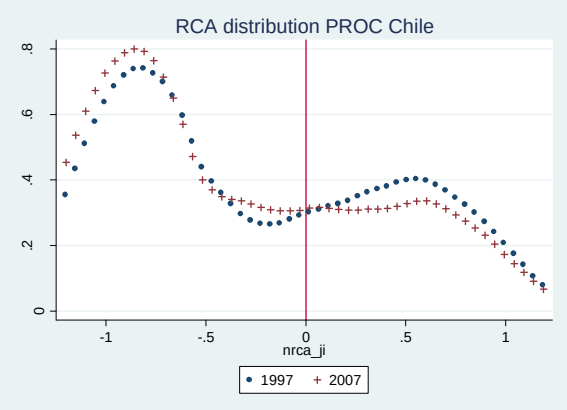


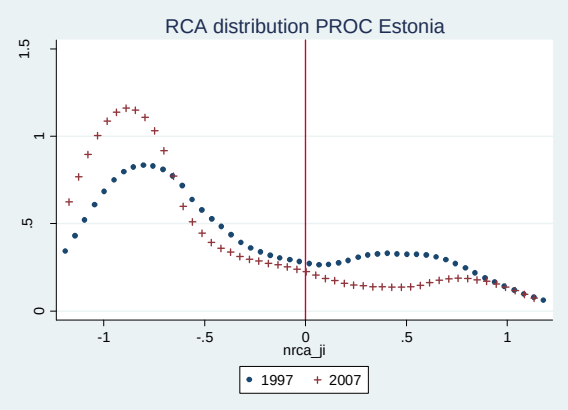


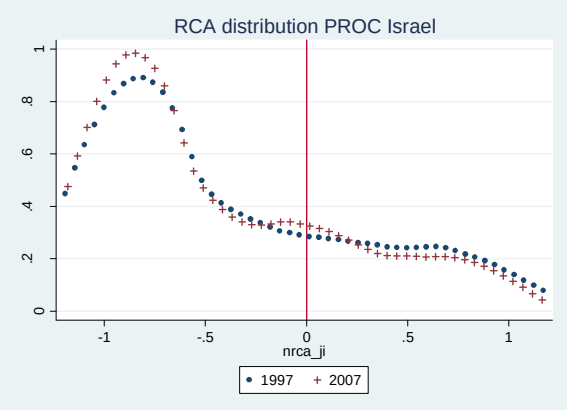


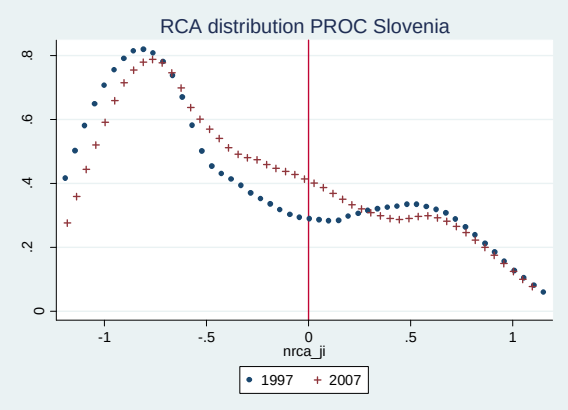


New OECD members and OECD accession countries

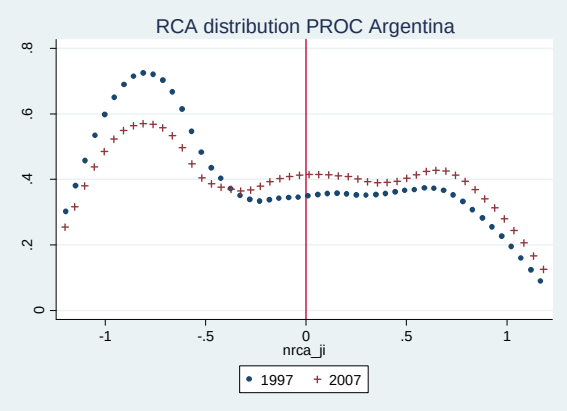


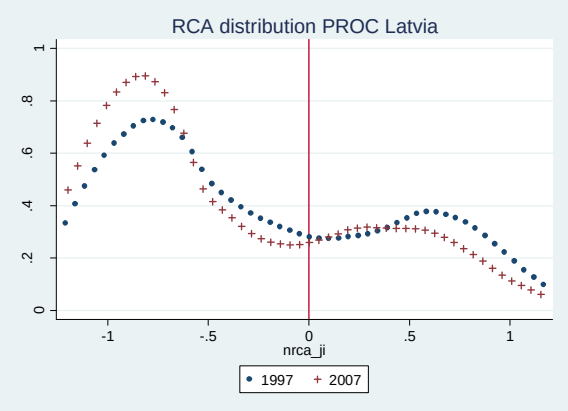


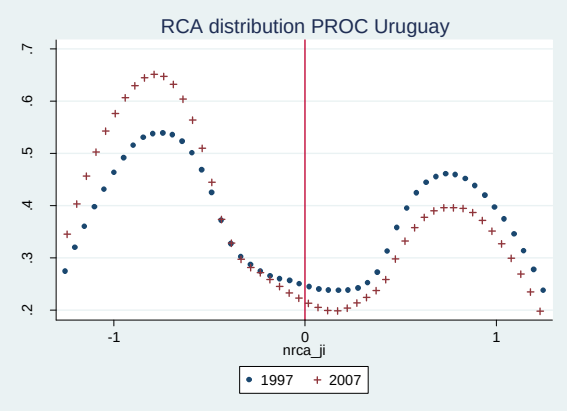


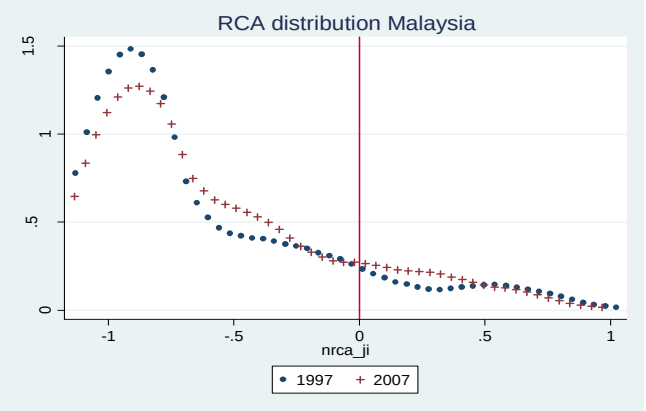


Upper middle income

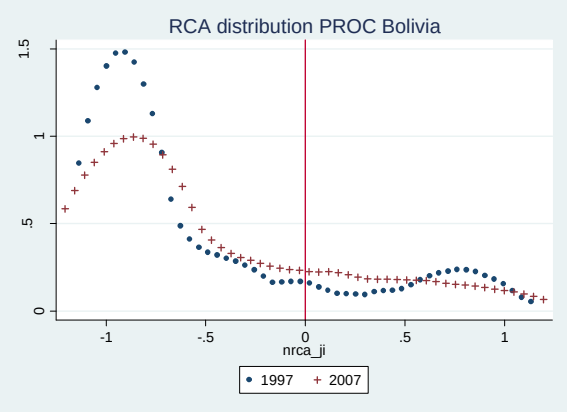


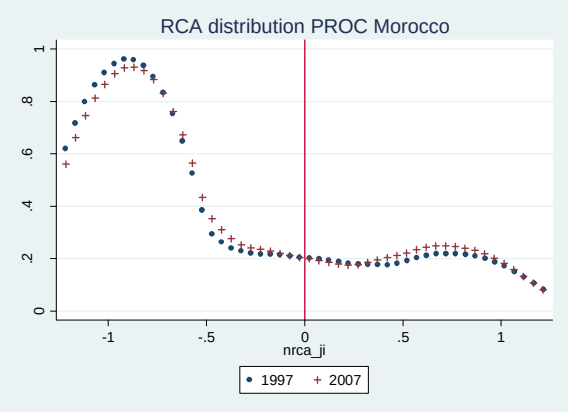


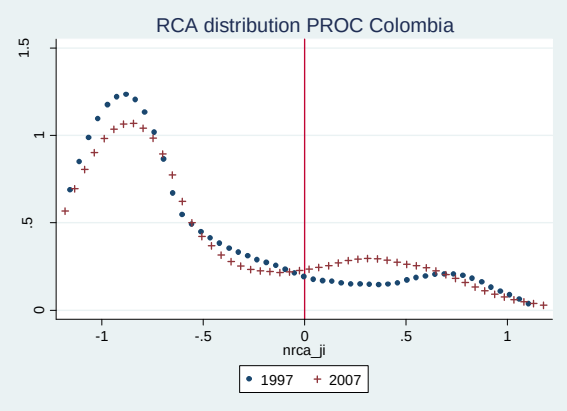


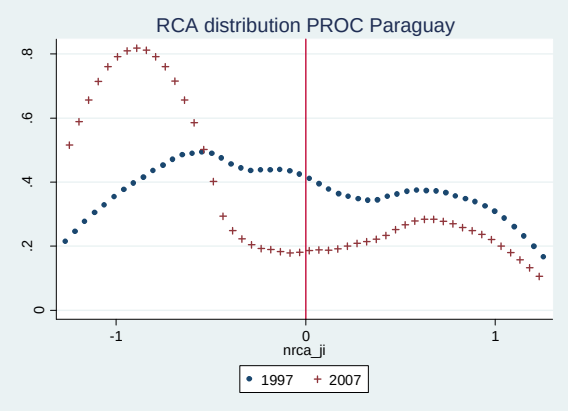


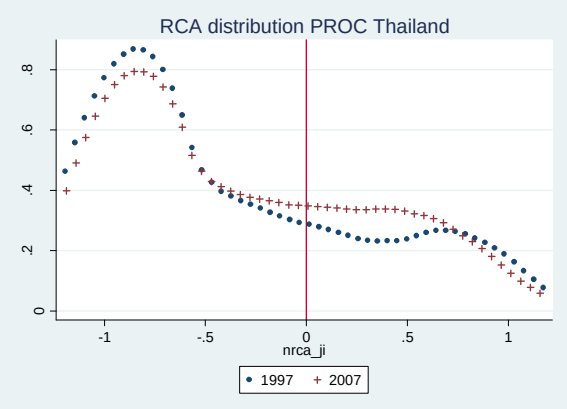
Lower middle income

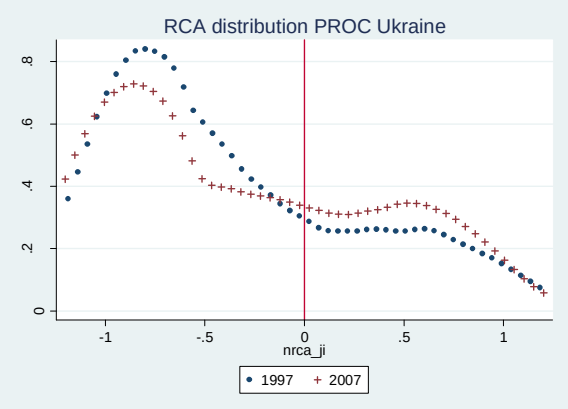












Examples of countries with overall RCA in processed products greater than 1 in 1997 but not in 2007 or vice versa

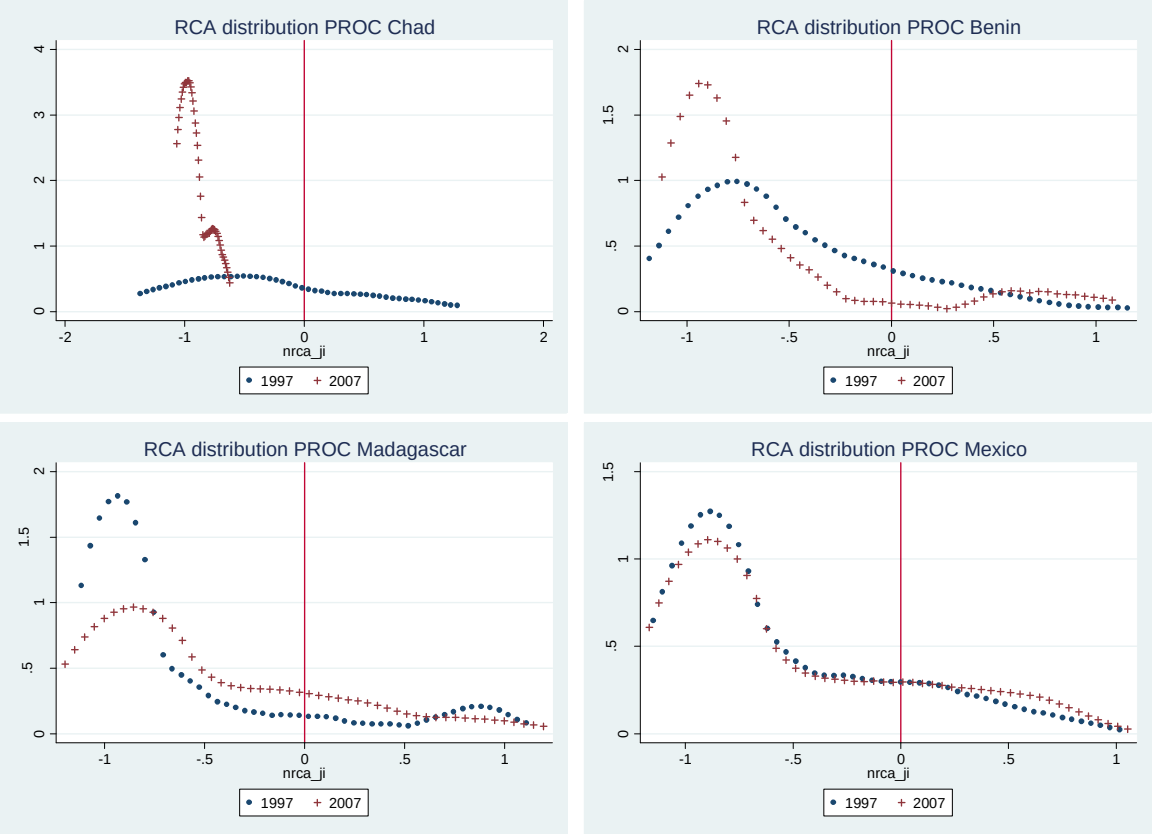
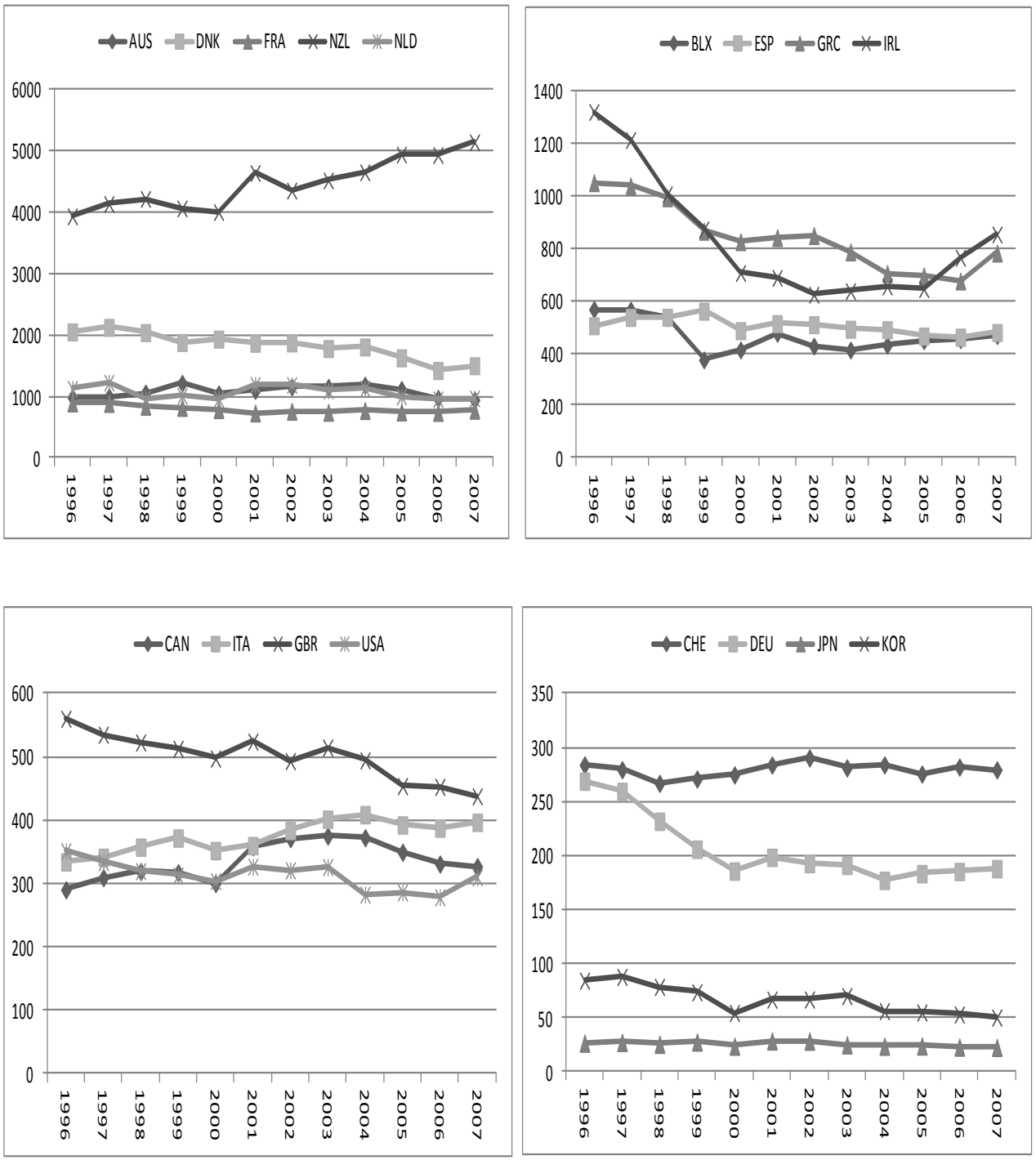
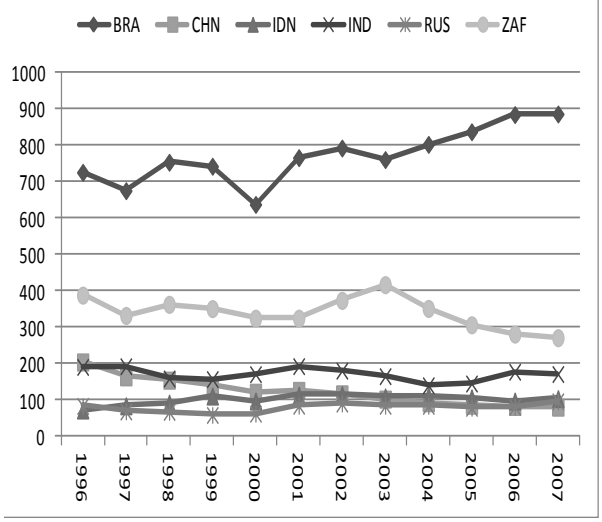


Figure A3. Productivity level (EXPY) of selected countries export basket over time

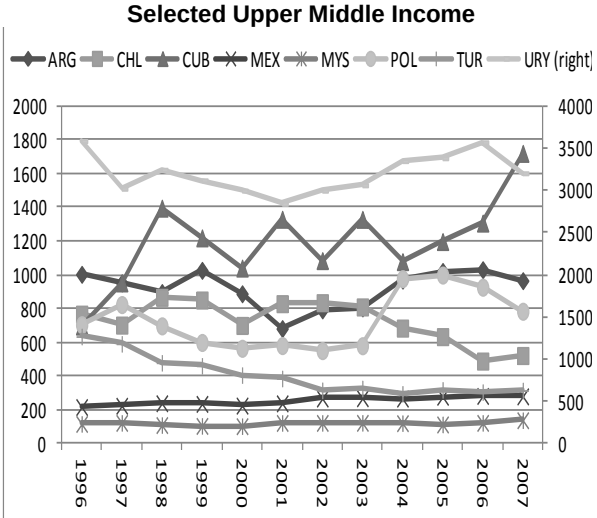
High Income OECD



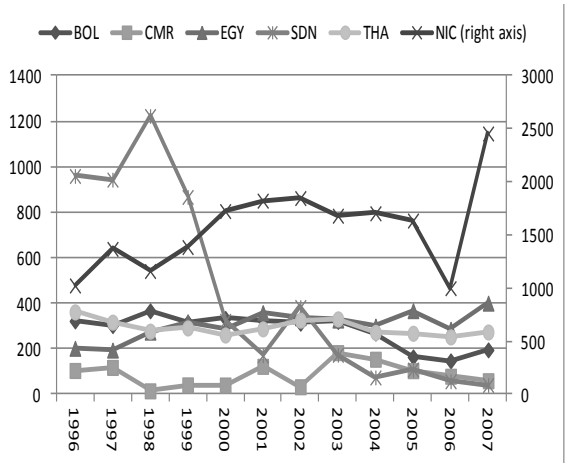
Enhanced Engagement and Russia



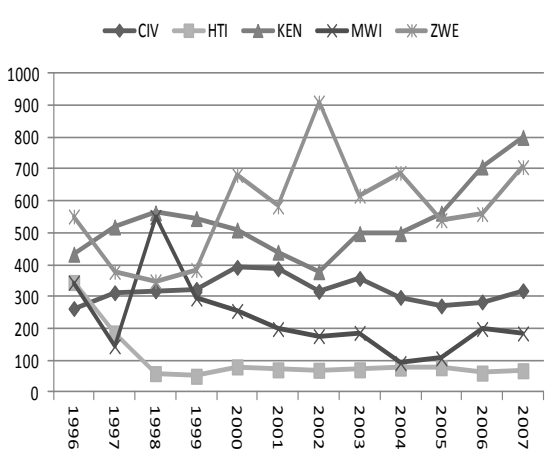
Selected Upper Middle Income



Selected Lower Middle Income



Selected Low Income



Selected Low Income (*cont*)