Chapter 4

Changing patterns of trade in processed agricultural products

by
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This chapter is split into two 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. The second part examines which countries have a comparative advantage in exporting processed 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.

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. 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 a reflection of a country's comparative advantage and firms in those industries are exploiting economies of scale and are becoming more efficient. A potential downside is that relying on a fixed set of 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. Diversification, 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 of growing exports either through specialisation (intensive margin) or diversification (extensive margin) 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 of goods increase consumer welfare.

The various paths of export growth have 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 in those industries exhibiting a comparative advantage.

It is not necessarily the case that the various paths are mutually exclusive. 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 *et al.*, 2008). There is probably an optimum mix of specialisation and diversification for any country at any point in time. This is beyond the scope of this chapter. This chapter sheds light on

how diversified (across the product and partner space) a country's export basket is, which countries have comparative advantage, and examines the correlation between them.

This chapter is divided into two 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. The second part examines which countries have a comparative advantage in exporting processed 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.

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. For this chapter, 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] The focus of this chapter is on processed products as defined in Regmi *et al*.[3]

Data

Trade data for this chapter are from *Centre d'Études 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. 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 used. Trade data in both sources include trade among EU members.

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 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 10 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.[4] The measures provide international comparisons of direct and indirect border-related costs that exporters typically face[5]. Unfortunately, these measures are not specific to trading agricultural products rather they represent averages for all merchandise trade. 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.

Trends in trade and production

Trends in agricultural trade

Agricultural exports more than doubled between 1995 and 2008, increasing from more than USD 464 billion to more than USD 1 trillion (Figure 4.1) a growth rate of 5.8% per year.[6] 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 4.1), 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 4.2).

Figure 4.1. Agricultural and total merchandise trade

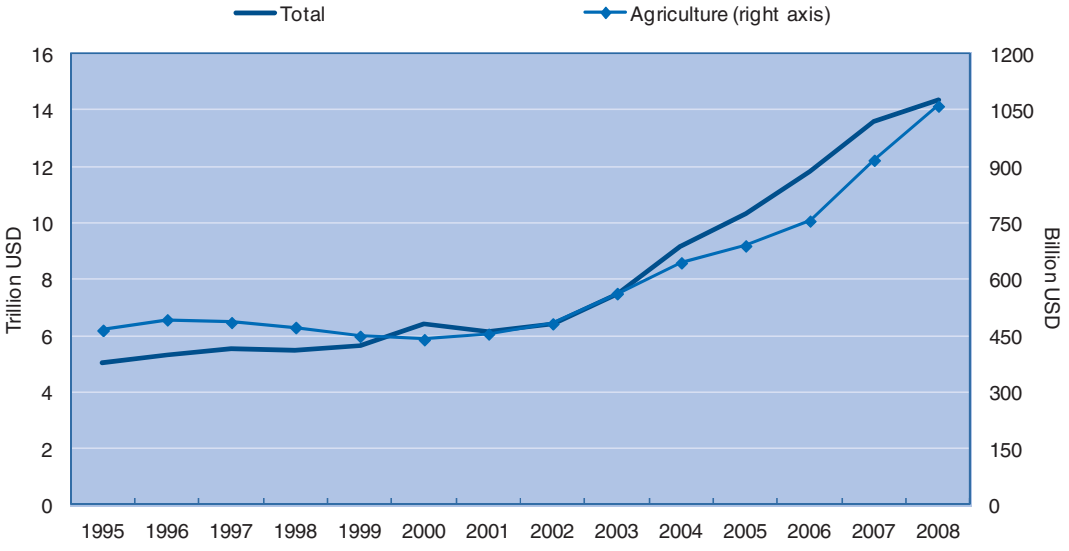
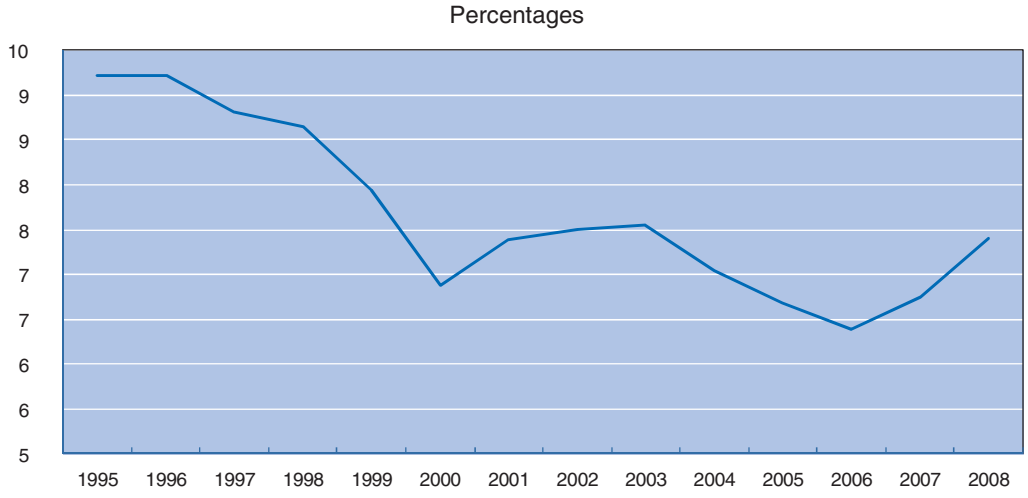


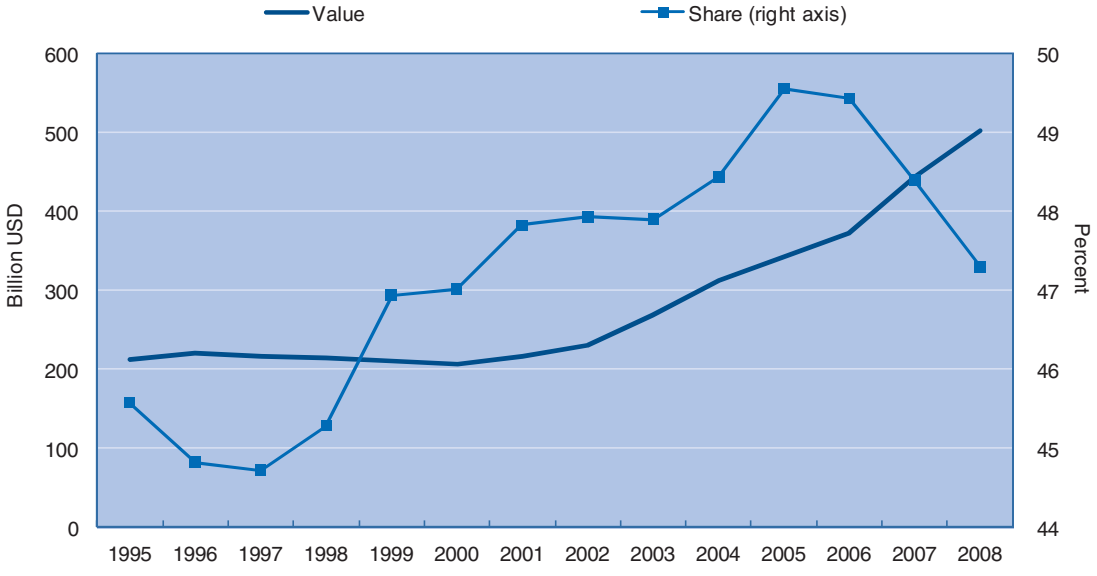
Figure 4.2. Share of agricultural trade in total merchandise trade



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 4.3). Hence, their share of total agricultural trade increased from a little more than 45% in 1995 to 48% in 2008 (Figure 4.3). 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.

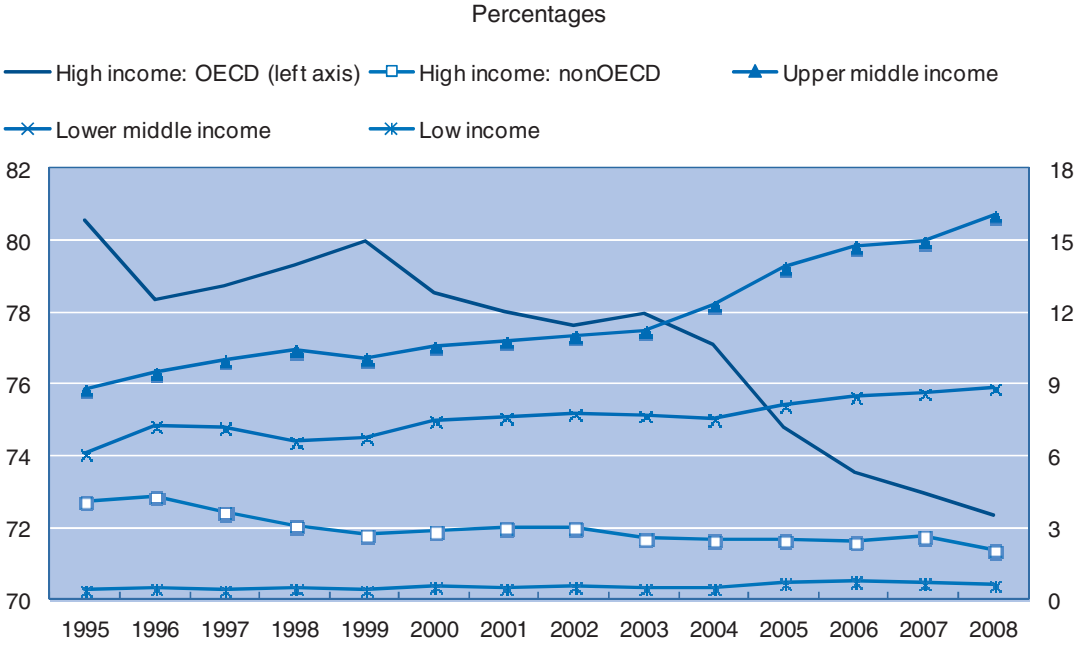
Figure 4.3. Trade in processed agricultural products and their share of total agricultural trade



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[7] (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). The actual numbers used in this report varies by year based on data availability.

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 4.4, 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 Figure 4.4 that despite the impressive growth rate, the absolute value of their exports of processed products hardly registers at the world level.

Figure 4.4. Share of processed products exported by income classification



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 4.1). 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.

Table 4.1. Exports of processed products for OECD and Enhanced Engagement countries

Million USD

	OECD	Brazil	China	India	Indonesia	South Africa
1995	175 006	4 475	5 834	643	517	1130.39
1996	178 058	4 951	5 976	943	577	1220.50
1997	176 713	4 981	5 482	974	675	1185.91
1998	175 566	5 577	5 316	738	643	1171.01
1999	174 015	5 284	5 371	800	802	1172.43
2000	168 267	5 036	5 911	1 041	834	1285.00
2001	176 211	6 042	6 325	1 130	888	1362.99
2002	186 019	6 664	6 705	1 206	899	1551.55
2003	218 455	7 703	7 467	1 330	971	1860.67
2004	251 000	10 385	8 672	1 411	1 133	1932.46
2005	269 181	13 224	10 060	1 792	1 261	1985.08
2006	291 280	15 784	11 881	2 726	1 364	2048.77
2007	343 746	18 605	14 023	3 181	1 604	2354.60
2008	387 420	23 449	14 948	3 669	2 289	2098.10
Least squares growth rate						
	6.09	12.59	7.95	12.11	9.63	6.07

OECD: 30 Members in 2008.

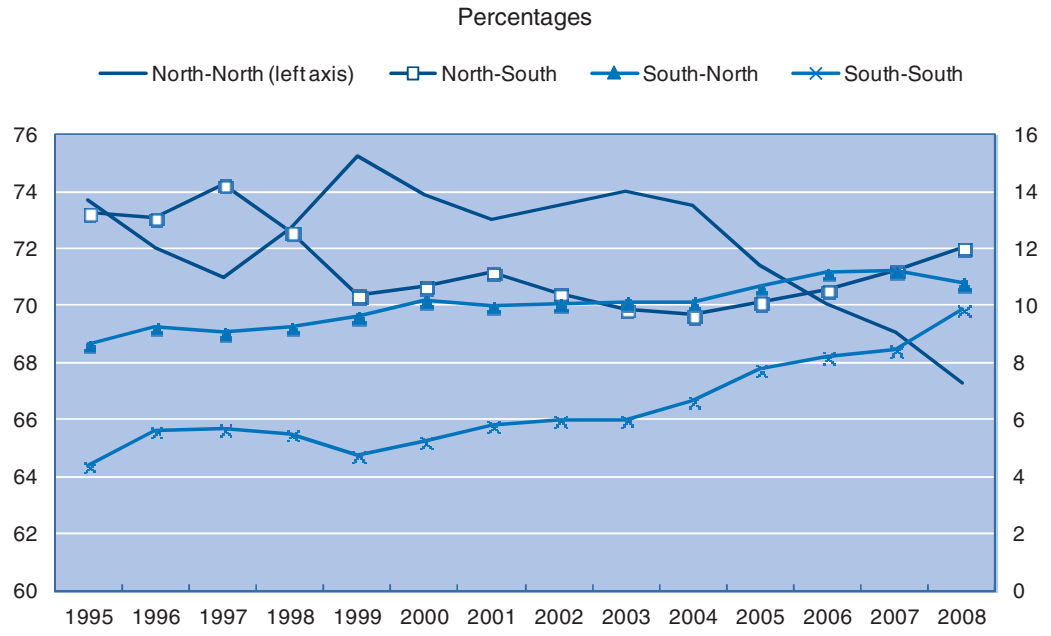
Direction of trade in processed products

Using the World Bank's income classification, trade flow are classified as North-North trade (NN) when both the exporting and importing countries have high income; North-South trade (NS) when the exporting country has high income while the importing country does not; it is classified as South-North (SN) when the exporting country is middle or low income while the importing country is high income, and lastly, when both partners are not high income their trade is classified as South-South (SS).

Data 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. It is still the case, however, 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. 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[8] (Figure 4.5).

Figure 4.5. Directional share of trade in processed products



Major exporting countries

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 United 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 4.2). Overall, the countries listed in Table 4.2 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[9] 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 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 4.2. Top exporters of processed agricultural products

	1995-97			2006-08	
	Value of exports Million USD	Share per cent		Value of exports Million USD	Share per cent
European Union[a]	125 709	58.07	European Union[a]	257 182	58.57
of which			*of which*		
France	*24 741*	*11.43*	*Germany*	*43 359*	*9.87*
Netherlands	*21 860*	*10.10*	*France*	*39 386*	*8.97*
Germany	*17 985*	*8.31*	*Netherlands*	*35 590*	*8.10*
United Kingdom	*13 432*	*6.20*	*Belgium/Luxemburg*	*22 476*	*5.12*
Belgium/Luxemburg	*11 239*	*5.19*	*Italy*	*21 310*	*4.85*
Italy	*9 706*	*4.48*	*United Kingdom*	*17 710*	*4.03*
Denmark	*7 809*	*3.61*	*Spain*	*14 568*	*3.32*
Ireland	*7 103*	*3.28*	*Denmark*	*12 032*	*2.74*
Spain	*5 407*	*2.50*	*Ireland*	*11 597*	*2.64*
United States	22 175	10.24	*Poland*	*9 889*	*2.25*
China	5 764	2.66	*Austria*	*7 873*	*1.79*
Australia	5 479	2.53	United States	31 563	*7.19*
Canada	5 094	2.35	Brazil	19 279	*4.39*
Brazil	4 802	2.22	China	13 617	*3.10*
New Zealand	4 777	2.21	Canada	12 315	*2.80*
Argentina	2 717	1.26	Australia	12 104	*2.76*
Thailand	2 657	1.23	New Zealand	11 185	*2.55*

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

Major importing countries

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 4.3) possibly reflecting the high income growth of many of these countries especially in the latter part of the period.

Also not surprising, the top importers of processed products are dominated by high income and OECD countries, especially members of the European Union (Table 4.4). 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.

Table 4.3. Average imports of processed products by income groups

Billion USD

	1995-97	2006-08
High income: OECD	150.763	310.909
High income: non-OECD	19.931	36.425
Upper middle income	24.854	59.484
Lower middle income	14.519	37.729
Low income	4.535	13.767

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 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 614 000 and USD 2.4 million respectively, thus the economic importance of such high growth rates should not be overestimated. Iraq (with an average import growth rate of 29% a year), Sudan (with an average growth rate of 21% a year) and Afghanistan (with an average growth rate of 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.

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 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.

Table 4.4. Top importing countries of processed products

Country/ region	1995-97 Value of imports Million USD	1995-97 Share per cent	Country/ region	2006-08 Value of imports Million USD	2006-08 Share per cent
European Union[a]	101 784	47.02	European Union[a]	229 678	48.85
of which			*of which*		
Germany	*22 635*	*10.46*	*Germany*	*36 592*	*7.78*
France	*15 264*	*7.05*	*United Kingdom*	*32 353*	*6.88*
United Kingdom	*14 808*	*6.84*	*France*	*26 261*	*5.59*
Italy	*11 027*	*5.09*	*Italy*	*20 796*	*4.42*
Netherlands	*10 123*	*4.68*	*Netherlands*	*19 838*	*4.22*
Belgium/Luxembourg	*9 138*	*4.22*	*Belgium/Luxemburg*	*15 989*	*3.40*
Spain	*5 205*	*2.40*	*Spain*	*13 292*	*2.83*
Greece	*2 678*	*1.24*	*Austria*	*5 902*	*1.26*
Japan	19 053	8.80	*Sweden*	*5 887*	*1.25*
United States	15 650	7.23	United States	41 433	8.81
Russia	9 615	4.44	Japan	23 189	*4.93*
Hong Kong, China	5 535	2.56	Russia	17 623	3.75
Canada	4 406	2.04	Canada	12 905	2.74
Singapore	2 862	1.32	Mexico	8 162	1.74
Korea	2 737	1.26	Hong Kong, China	6 688	1.42
Brazil	2 684	1.24	Switzerland	6 537	1.39
Switzerland	2 662	1.23	Korea	5 649	1.20

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

Revealed comparative advantage and growth

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.[10]

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

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 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 had a comparative advantage in agriculture (Table 4.5a) while only five of the 31 (16%) high income non-OECD economies had an RCA index above 1. In contrast to 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.

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 4.5b). 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.

In 2007, among high income OECD countries, Belgium-Luxembourg joined the other 13 countries with a comparative advantage in agriculture (Table 4.6a). 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.

Table 4.5a. Countries with comparative advantage in agriculture (1997)

Agriculture				
High income: OECD	**High income: nonOECD**	**Upper middle income**	**Lower middle 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 Rep.	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 Grenadines	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 4.5b. 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 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 (Table 4.6b). The European Union, 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.

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 (see OECD, 2011 for details).

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. 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 Figure 4.7 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.

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.

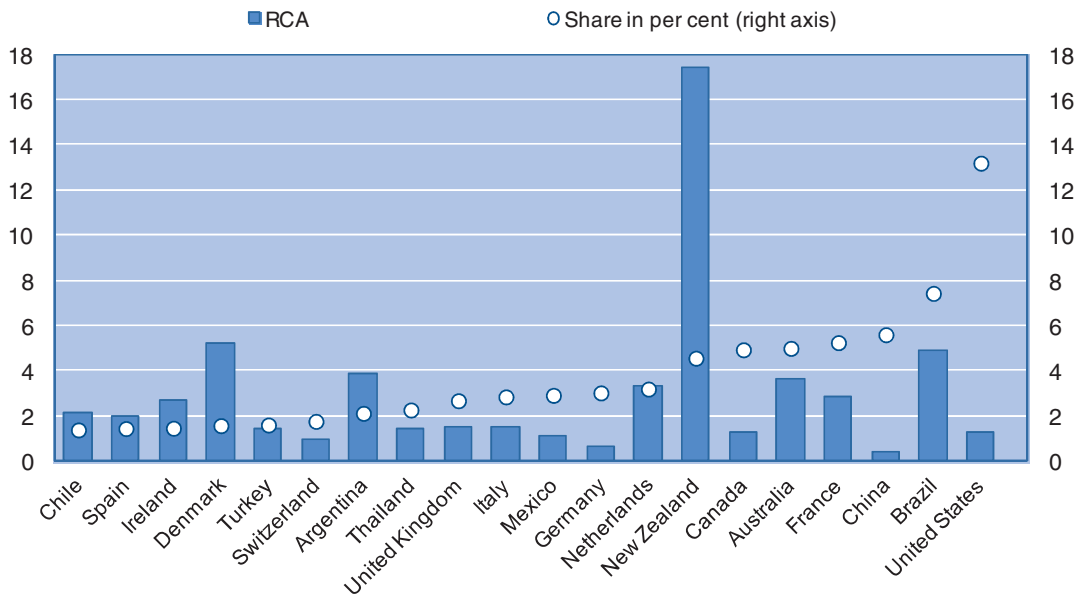
Table 4.6a. Countries with a comparative advantage in agriculture (2007)

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 Grenadines	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 4.6b. 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	

Figure 4.7. Export share of twenty top exporters of processed products and their RCA value in 2007



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.

Correlation 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 per cent 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 five 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).[11]

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.[12] 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.

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 requires further investigation. 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.

The results 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

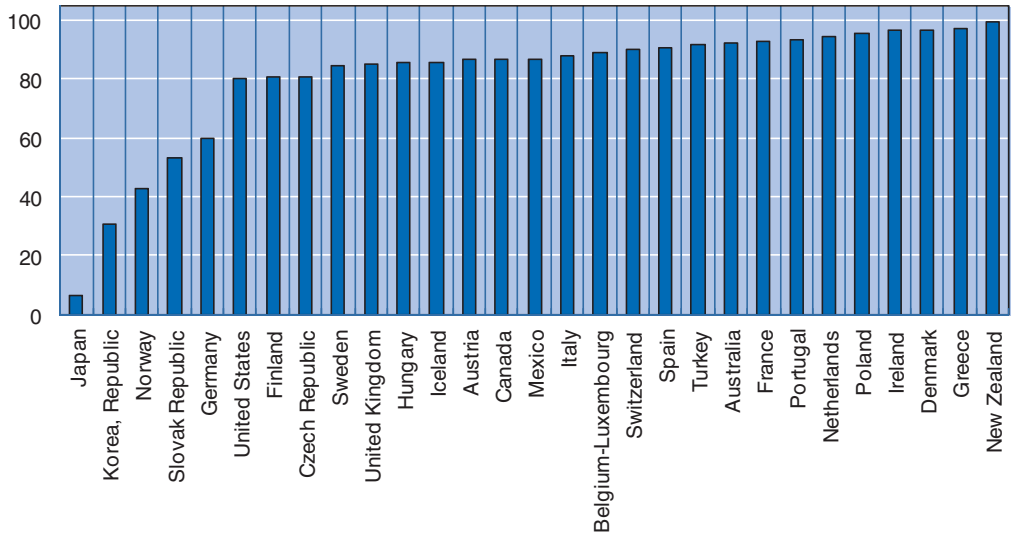
countries, the group with relatively more countries with high RCA value in agriculture, a surprising finding is the negative relationship between AVA and RCA values. It seems that low income countries with high RCA values have relatively smaller agricultural sector much like the countries in the other 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[13].

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 as can be seen in Figure 4.8, 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 4.8 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 4.8).

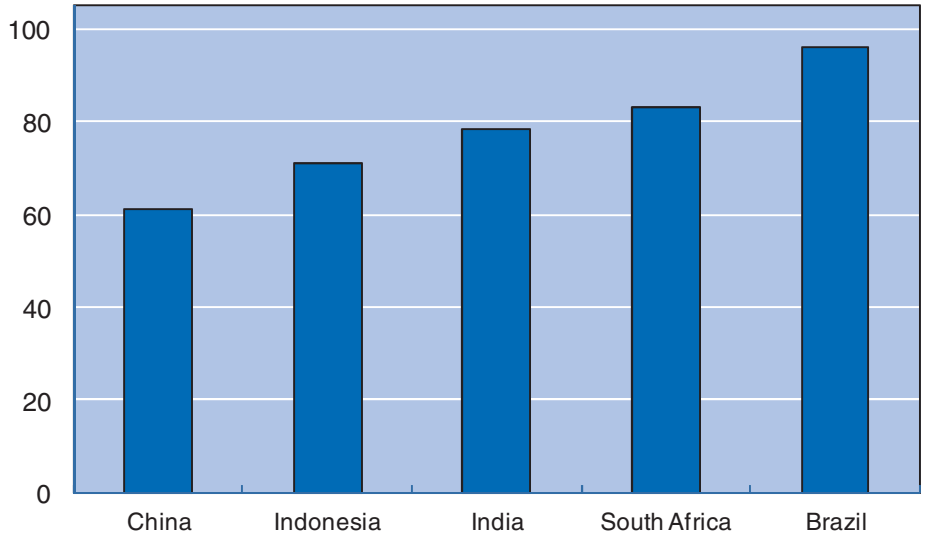
At the rather disaggregate HS-6 digit level, the results presented above indicate that the RCA index adequately identifies individual goods in which countries have a comparative advantage. The data also show that although countries with comparative advantage have a more diverse export basket and trade 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?

Figure 4.8. Share of exports accounted by HS-6 digit products with RCA index > 1

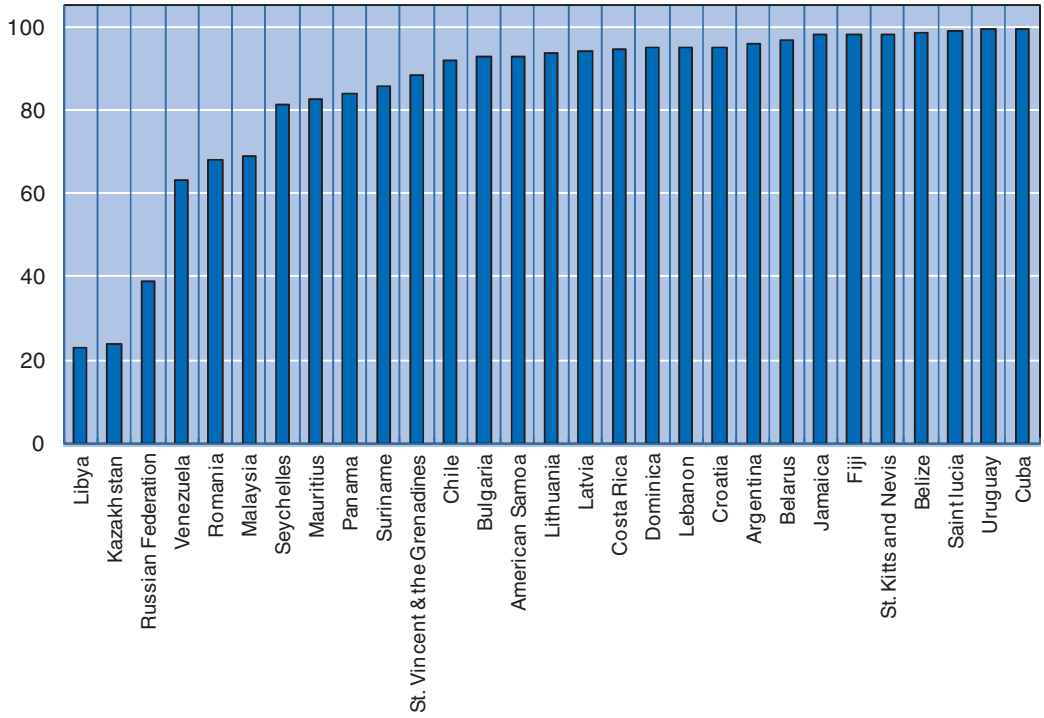
A. OECD countries

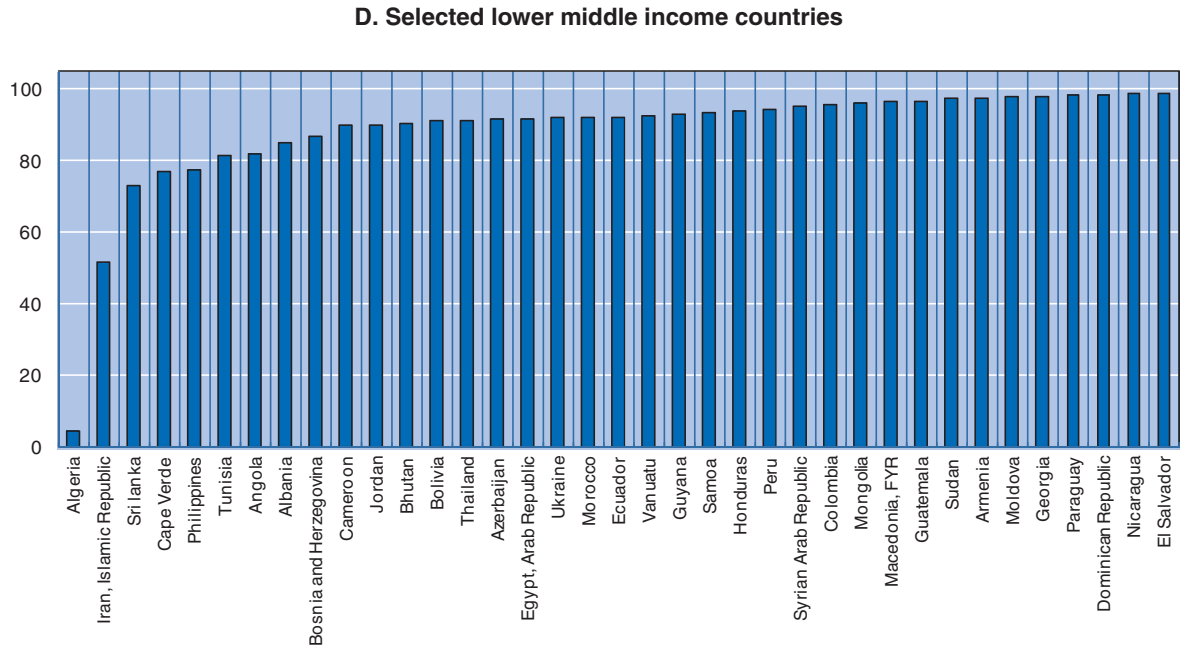


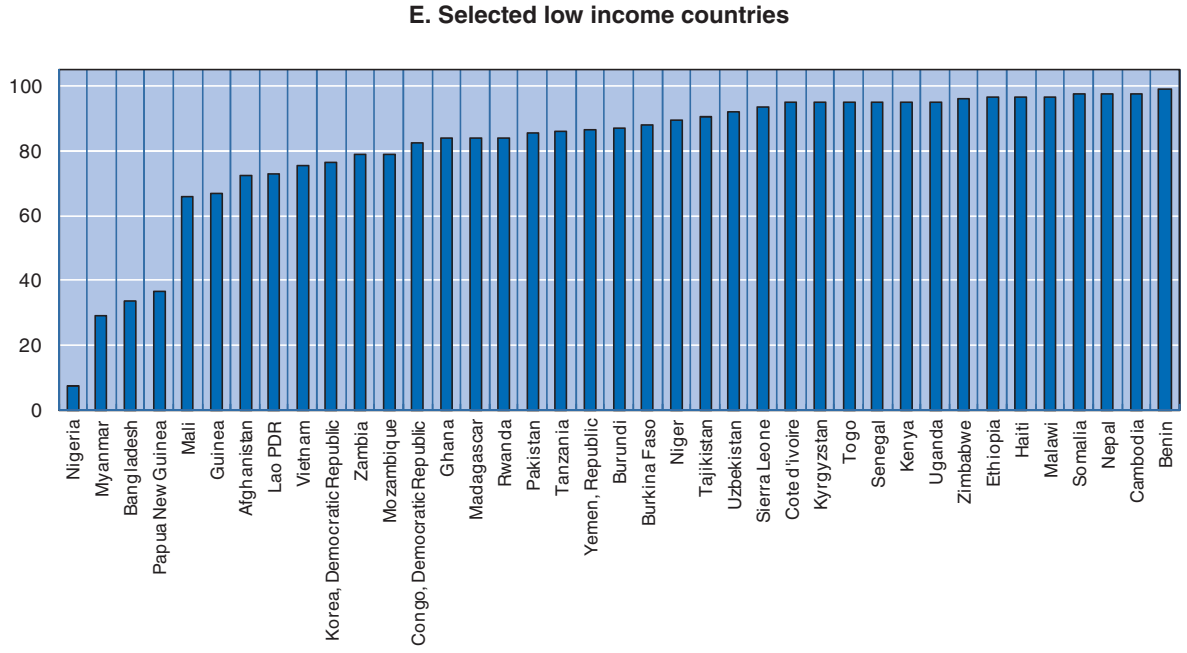
B. Enhanced Engagement countries



C. Selected upper middle income countries







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, we generate an income/productivity level (coined PRODY by HHR) for each processed product (k) at the HS-6 digit level.

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

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. But 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 4.7 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 USD 2000. The results are not substantially different hence most of the discussion is based on per capita income measured in constant USD 2000. 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 4.7. 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 USD 2000	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 USD 2000	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 USD 2000	254	13 452	20 120	1 440	305 995

The productivity level of the export basket based only on processed products is given in Table 4.8 with a graphical representation calculated in current and constant USD in Figure 4.9. 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 4.8. Average EXPY for processed products (constant USD 2000)

	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

How does EXPY vary across countries? Figure 4.10 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.

Which countries have the largest and smallest EXPY? In 2007, New Zealand was the leader followed by Uruguay (Table 4.9). The list of the leading EXPY countries in Table 4.9, 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.

Figure 4.9. Variations of EXPY over time

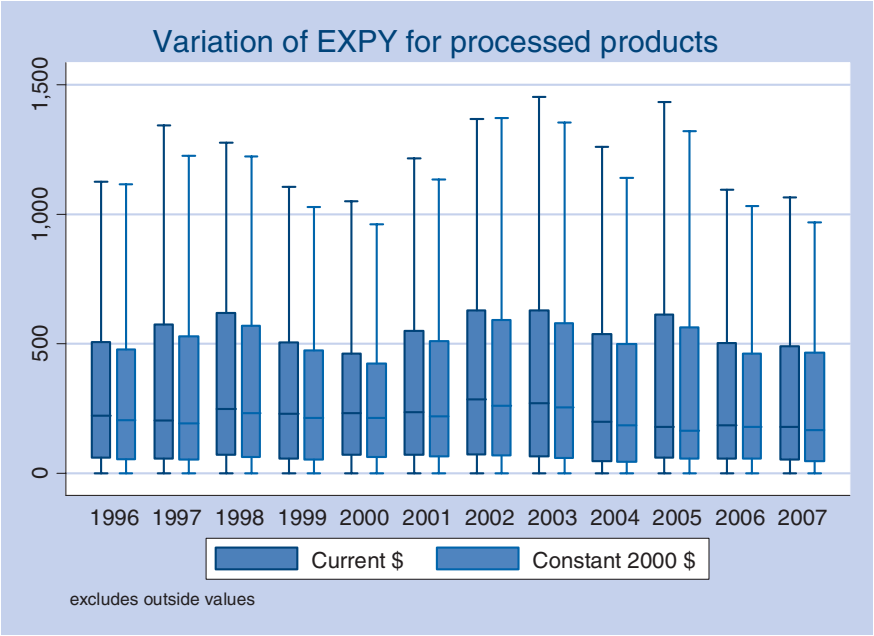
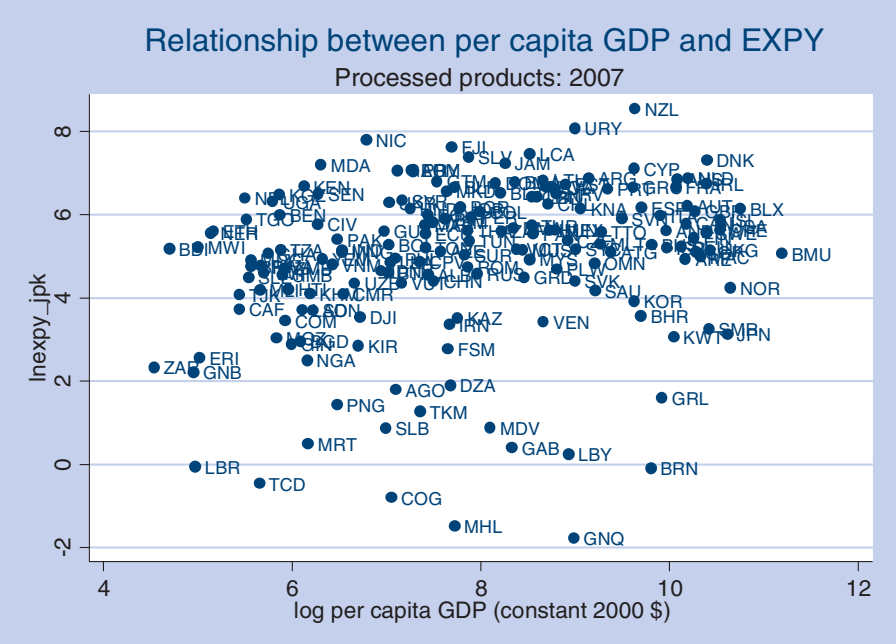


Figure 4.10. Per capita income and EXPY in 2007



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 4.9). 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.[14]

Table 4.9. Highest and lowest EXPY in 2007 (constant USD 2000)

Country	EXPY	Country	EXPY
Largest ten	**USD**	**Lowest ten**	**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, Republic	50.23
Fiji	2 037.02	Kazakhstan	33.39
St. Lucia	1 754.94	Venezuela, RB	30.72
Cuba	1 721.67	Iran, Islamic Republic	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

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 per cent (Table 4.10). 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 4.10). 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 4.10. 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.

Conclusions

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. Countries with comparative advantage in processed agricultural products not only export greater volumes, they also export a greater variety of products offering their customers greater choice while also servicing more partners.

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. Comparative advantage is linked to the productivity level of a country's export basket. The results indicate that a 10% increase in the productivity level of a country's processed products exports 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.

Notes

1. Senior Agricultural Policy Analyst, Trade and Agriculture Directorate, OECD, Paris. Material presented in this chapter is based on the work declassified by the Joint Working Party on Agriculture and Trade of the OECD and published as *OECD Food, Agriculture and Fisheries Working Papers No. 47*.
2. See OECD (2011) 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.
4. Data prior to 2006 is not available.
5. More details and some summary statistics are available in OECD (2010b).
6. Growth rates are calculated by the least square method.
7. Because trade data in the early years for Belgium and Luxembourg are grouped together, they are reported as one throughout the report.
8. 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.
9. Calculations for the European Union are based on 25 members in 2006 and 27 members as of 2007.
10. 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.
11. For the interested reader, details are reported in OECD (2011) Table 4.A5.
12. 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.
13. Details, including calculated RCA values at the individual product level and are available in OECD (2011).
14. More details can be found in OECD (2011) especially Figure A3 which shows that countries across the various income groups export products with similar productivity content with some lower income countries having relatively high EXPY and some high income countries having relatively low EXPY.

References

Amurgo-Pacheco, A., and M.D. Pierola (2008), "Patterns of export diversification in developing countries: intensive and extensive margins", The World Bank International Trade Department, *Policy Research Working Paper No. 4473*, 2008.

Berndt, E.R. (1991), *The practice of econometrics classic and contemporary*, Addison-Wesley Publishing Company, Reading Massachusetts.

Brenton, P. and R. Newfarmer (2007), "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.

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

Djankov, S., C. Freund and C.S. Pham (2010), "Trading on time", *Review of Economics and Statistics*, Vol. 92(1): 166-173.

Dutt, P. and E. Traca (2010), "Corruption and b=Bilateral Trade Flows: Extortion or Evasion?" *The Review of Economics and Statistics*, early access, posted on line July 7.

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

Gaulier, G. and S. Zignago, (2009), "*BACI International Trade Database at the Product Level: The 1994-2007 Version*, CEPII, Paris.

Hausmann R., J. Hwang and D. Rodrik (2007), "What you Export Matters", *Journal of Economic Growth*, Vol. 112, pp. 1-25.

Haq, Z., K. Meilke, and J. Cranfield (2010), "Does the Gravity Model Suffer from Selection Bias?" CATPRN *Working Paper 2010-01*, January.

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

Hummels, D. and P.J. Klenow (2005), "The variety and quality of a nation's exports", *American Economic Review*, Vol. 95, pp 704-723.

Laursen, K. (2000), "Do export and technological specialisation patterns co-evolve in terms of convergence or divergence? Evidence from 19 OECD countries, 1971-1991", *Journal of Evolutionary Economics*, Vol. 10: 415-436.

Liapis, P. (2011), "Changing patterns of trade in processed agricultural products", *OECD Food, Agriculture and Fisheries Working Paper* No. 47, OECD, Paris.

Liapis, P. (2009), "Extensive Margins in Agriculture", *OECD Food, Agriculture and Fisheries Working Paper* No. 14, OECD, Paris.

Regmi, A., M. Gehlhar, J. Wainio, T. Volrath, P. Johnston, and N. 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*, OECD internal document, June.

OECD (2006), "Logistics and time as a trade barrier", *OECD Trade Policy Working Paper* No. 35, OECD, Paris.

Volrath, T.L, M.J. Gehlhar and C.B. Hallahan (2009), "Bilateral import protection, free trade agreements, and other factors influencing trade flows in agriculture and clothing", *Journal of Agricultural Economics*, Vol 60, No. 2, pp. 298-317.

Volrath, T.L, C.B. Hallahan and M.J. Gehlhar (2006), "Consumer demand and cost factors shape the global network in commodity and manufactured foods", *Canadian Journal Agricultural Economics*, Vol 54, pp. 497-511.

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