Trade Flow Analysis Helps Define Opportunities For Regional Harmonization of Standards and Labeling

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ABSTRACT

Globalization of the appliance industry has proceeded apace with the growth in world trade from only 8% of world output in 1950 to 40% in 2001. Virtually every major residential appliance, including white goods, consumer electronics, and lighting, now has world-wide markets.

The release of the UN Commodity Trade Statistics permits deeper analysis of the nature of these appliance trade flows. The database provides the officially provided customs data of most countries measured both in volume and value terms, though only the value of trade in US dollars is standard for all countries. Imports, exports, and re-exports are provided, and commodities can be examined to a 6-digit trade code level.

This paper examines the cross-border trade patterns of refrigerators, air conditioners, televisions, and fax machines to determine the regional patterns of trade in each product. Strong intra- or inter-regional trade patterns may indicate a good potential for both increasing trade and lowering trade costs through harmonization of various aspects of minimum energy performance standards and energy efficiency labels. By adopting the same test procedures, by mutual recognition of test results, and by harmonizing performance standard levels and energy labeling criteria for each appliance, countries, companies, and consumers can avoid the costs of duplicative testing and non-comparable performance information, while benefiting from a reduction in non-tariff trade barriers and access to a wider market of goods. This paper analyzes the trade patterns described above and interprets them in terms of opportunities for regional cooperation.

Introduction

Globalization of the appliance industry has proceeded apace with the growth in world goods trade from only 8% of world output in 1950 to 40% in 2001 (World Bank 2003). In the appliance sector, this means that a resident of Khartoum may sit down in the evening to watch a Korean-made television, or that a resident of Munich will keep his beer cool in a Chinese-made refrigerator. Virtually every major residential appliance, including white goods, consumer electronics, and lighting, now has world-wide markets. Despite globalization of appliance markets, however, programs to regulate or influence the energy performance of these products remain decidedly national.

Energy Efficiency Standards and Labels

Four decades ago, some governments began to address the concern that consumers in general were paying unnecessarily large utility bills for the sake of buying appliances, equipment and lighting products at the lowest possible purchase price. This practice results in a large cost to society in economic inefficiency and environmental stress. There are many reasons why consumers behave this way, ranging from electricity and fuel prices that do not reflect true economic

costs to a lack of money and/or information. Since then, governments around the world have been increasingly implementing energy efficiency standard-setting and labeling programs to help create a more economically efficient and environmentally sustainable society. Today, over three dozen countries have initiated such programs and the number of countries participating and the number of products covered are expanding rapidly. (Wiel et. al. 2003a) As globalization advances, however, the way neighboring countries and strong trade partners implement these programs is affecting their impact. As exporting manufacturers face a variety of differing national programs, their costs of manufacturing and testing to meet each market's requirements rise as well. As the number of national programs grows, the opportunity arises to lower the cost impact of these standards and labeling programs through regional harmonization.

Regional Harmonization

Harmonization involves the adoption of the same test procedures, mutual recognition of test results, and/or alignment of performance standard levels and energy labeling criteria for particular appliances. Such an approach allows countries, companies, and consumers to avoid the costs of duplicative testing and non-comparable performance information, while benefiting from a reduction in non-tariff trade barriers and access to a wider market of goods.

Recognizing this, many countries are participating in regional activities directed at harmonizing energy efficiency standards and labels and the testing that underlies both these measures. Such activities are being undertaken by the Asia-Pacific Economic Cooperation (APEC), the South Asia Regional Initiative for Energy Cooperation and Development (SARI), the Pan American Standards Commission (COPANT), the Asia and South East Asia Network (ASEAN), and the North American Energy Working Group (NAEWG). The European Union (EU) has a rich history of regional coordination surrounding conversion from individual country standards and labels to a unified EU-wide program. In all these activities, the common interests of the participants are harmonized test facilities and protocols, mutual recognition of test results, common comparative energy label content, harmonized endorsement energy labels, harmonized minimum energy performance standards for some markets, shared learning of the labeling process, and shared learning of the standard-setting process. (Wiel et. al. 2003b)

By design, government standard-setting and labeling programs are targeted at influencing the way manufacturers of energy-consuming products produce and distribute their products. Harmonization not only facilitates economic globalization of appliance, equipment and lighting product markets, it offers governments the opportunity to make energy efficiency standard-setting and labeling programs more stringent and more effective.[1] Harmonization discussions are complex and slow because standards, harmonization, and trade regulations are negotiated on the basis of strategic advantages: reduction of trade barriers is not necessarily "beneficial" to all concerned. World bodies promoting these regional endeavors can target their resources most effectively by understanding and accounting for the trading patterns of the manufacturers they are trying to influence. The analysis below is intended to help provide that understanding.

Appliance Trade

The release of the UN Commodity Trade Statistics has made it possible to look in greater

[1]For example, Mexico's participation in NAEWG appears to have accelerated the harmonization of its minimum energy performance standard for refrigerators with the U.S. and Canada.

depth at the nature of appliance trade flows. In 2003, the Statistics Division of the United Nations Department of Economic and Social Affairs (UNDESA) released the UN Commodity Trade Statistics Database (UN Comtrade), a detailed, interactive database of world trade by commodity. Commodity descriptions are provided at the 6-digit (out of 10 total) Harmonized System (HS) code level, permitting the distinction, for example, in air conditioner trade (8415) among wall/window-mounted single-package air conditioners (841510), vehicle air conditioners (841520), and air conditioners with reverse cycle refrigeration (841581). For each or multiple commodities selected, the reporter, partner, year, and nature of trade (import, export, re-export) can be queried.

The data in this report are based on the trade data of 2000 using the HS1996 coding system[2], for which 15.6 million records are available. Coverage is incomplete, but UN Comtrade estimates that the market share of reporting countries covers between 90% and 95% of world trade (Comtrade 2003). One notable exclusion to the dataset is Taiwan, which is not an official UN member state and thus does not report its trade statistics to the organization. However, trade data for Taiwan as a reporter partner (import source or export destination for another country) is included, but subsumed under a generic classification of "Asia Other, not elsewhere specified".

Trade volume is reported in both value (US dollar) and volume terms, but volume data are not comparable among countries, as some choose to report in units and others in weight or volumetric terms. China, for example, regularly reports its trade in refrigerators in unit terms, while Korea reports in kilograms. The lack of comparable unit data does not permit analysis of average value of unit exports or imports, so distinctions between trade in high value-added products and low-priced or ordinary products can not be made.

Even in terms of trade value, the reported value of an export commodity from one country does not usually match the reported value of the commodity in the importing country. The major source of this discrepancy is the f.o.b. (free on board) basis of export valuation, and the c.i.f (cost, insurance and freight) basis of import valuation. Further discrepancies can arise from changes in valuation by the import country, or the absence of a reported export destination as an import reporter in the dataset.

The paper does not include analysis of the relationship of trade to domestic production and sales, data for which are generally fragmentary, difficult to acquire, or expensive and proprietary. The analyses below are a step toward understanding the influences on a country's interest in participating in harmonization discussions. These cross-border trade flows, in the absence of their relation to domestic production, provide useful insights but do not reveal the full importance of trade to a country. Nonetheless, the example of China—a major appliance producer and consumer—provides an example of scale. In 2001, exports accounted for 51% of domestic production of televisions, 37% of refrigerators, and 32% of air conditioners. (Comtrade 2003; NBS 2003). It is not surprising, then, to observe the keen interest of many Chinese manufacturers in standards and labeling schemes in other countries.

Regional Groupings

For this analysis, the world was divided into eight regional groupings, largely following continental geographical groupings. These are North America (including Central America and

[2]Six trade classifications in total are provided in UN Comtrade. These include SITC (Standard International Trade Classification) revisions 1, 2, and 3, and the Harmonized System (HS) revisions of 1992, 1996, and 2002. The UN recommends that countries report their trade according to the HS codes.

the Caribbean), South America, Europe, Russia and Central Asia, the Middle East and North Africa, Sub-Saharan Africa, Asia/Indian Ocean, and Australia/New Zealand/Pacific Islands, covering 275 countries, regions, and trading entities. The Comtrade data are primarily composed of country-to-country trading data, but in some cases, countries report trading partners in less specific terms such as "Other Asia, not elsewhere specified" or "Free Zones". Where the geographical location of the trading partner is not clear, as in the case of "Free Zones", the data were omitted from the analysis.

Many of these regions include further economic subgroupings, such as the European Union in Europe, NAFTA in North America, ASEAN in Asia, and the Andean Common Market in South America. These are variously common markets, customs unions, or free-trade zones, which further shape the nature of trade within the larger geographical regions. One example of such an economic subgrouping—the Andean Common Market—was selected for a second analysis to judge the impact of a formal trade grouping on trade flows.

Appliance Trade Data

In this study, four commodities have been chosen for further investigation: refrigerators, air conditioners, televisions and fax machines. These products were chosen because of their high energy impact and large trade volumes (refrigerators and air conditioners), high saturation in the residential sector (televisions), and widespread commercial use (fax machines). (Table 1) Total reported export trade of these four products reached nearly $50 billion in 2000, of which nearly half is accounted for by the television trade alone. To put this trade volume in perspective, the total value of sales of *all* household appliances in the US in 2000 was $23.4 billion. (DOC 2001) Although the total value of world sales of these four products is not available, this comparison hints that trade may account for a large proportion of the value of sales for these four products.

Table 1. Total Cross-Border World Trade in Four Appliances, 2000
(US$)

Commodity	HS 1996 Code	Reported Exports	Reported Imports
Refrigerators	8418	14,605,278,913	12,993,750,942
Air Conditioners	8514	8,083,309,449	7,471,723,575
Televisions	8528	23,976,608,889	21,006,431,774
Fax Machines	851721	3,280,760,012	3,109,737,483
Total		$ 49,945,957,263	$ 44,581,643,774

Source: UN Commodity Trade Statistics Database (UN Comtrade) 2003

As noted earlier, import value would normally be higher than reported export value, but the lower import value here likely represents incomplete reporting and the absence of Taiwan as an import reporter. The discrepancy ranges from 5% in the case of fax machines to 12% in the case of televisions, or an average 11% in total.

For all four products, all regions reported trade with all other regions, allowing the tabulation of import and export matrices to show the degree of trade interdependence each region has with each other. By calculating the import and export dependency of each region to each other region, it is also possible to overlay the two matrices to see where high trade interdependence is occurring. It is these highly interdependent trade flows that we postulate should be considered as likely targets for harmonization efforts.

Refrigerators

World trade in refrigerators in 2000 totaled about $15 billion. The table below shows the matrices of trade between each region (Table 2). In the upper table, the exporting regions are shown along the top row, with the export destination shown along the left column. For any exporting region along the top row, the percentages shown in the column indicate the proportion of that region's total world exports directed to the region shown in the left row. Intraregional trade is shaded.

The bottom half of the table displays the matrix of reported import data, with importers along the top row, and import sources listed in the left column. By choosing an importing region along the top row, one can scan down the rows in that column to see the proportion of imports to that region from the regions in the left column. Again, intraregional trade is shaded.

Table 2. World Cross-Border Refrigerator Trade, 2000

(% of Regional Total)

Refrigerator Exports	**From**								
To	NAm	SAm	Eur	RU/CA	ME/NA	Af	Asia	Aus/NZ	World
NAm[3]	56.1%	12.0%	3.4%	0.0%	2.0%	2.4%	15.1%	2.8%	18.5%
SAm	4.2%	83.9%	1.3%	0.0%	0.3%	1.1%	2.5%	0.4%	4.4%
Eur	13.4%	2.3%	80.7%	44.5%	18.8%	9.6%	22.0%	2.8%	54.9%
RU/CA	0.1%	0.0%	2.7%	47.4%	2.3%	0.0%	0.5%	0.0%	0.8%
ME/NA	4.6%	0.7%	5.5%	0.8%	47.8%	1.4%	7.4%	3.8%	3.9%
Af	0.4%	0.6%	1.5%	0.4%	4.7%	82.8%	1.4%	0.3%	1.7%
Asia	19.2%	0.2%	4.0%	6.8%	9.1%	1.6%	46.7%	25.7%	13.7%
Aus/NZ	1.8%	0.1%	0.7%	0.0%	0.5%	0.9%	4.3%	64.0%	2.1%
Other	0.0%	0.0%	0.1%	0.0%	14.5%	0.1%	0.1%	0.2%	0.0%
Trade ($mill)	$3,096	$259	$8,324	$19	$40	$68	$2,704	$95	$14,605
Refrigerator Imports	**To**								
From	NAm	SAm	Eur	RU/CA	ME/NA	Af	Asia	Aus/NZ	World
NAm	68.5%	29.8%	6.5%	2.9%	23.0%	4.7%	31.1%	17.0%	21.2%
SAm	1.4%	36.8%	0.1%	0.0%	0.3%	0.5%	0.4%	0.1%	1.8%
Eur	13.6%	18.1%	84.8%	80.9%	46.3%	38.5%	13.3%	21.7%	57.0%
RU/CA	0.0%	0.0%	0.1%	8.7%	0.0%	0.0%	0.1%	0.0%	0.1%
ME/NA	0.2%	0.3%	0.2%	2.3%	5.2%	2.0%	0.1%	0.0%	0.3%
Af	0.0%	0.1%	0.1%	0.0%	0.2%	37.6%	0.1%	0.3%	0.5%
Asia	15.9%	14.7%	7.7%	5.3%	24.4%	16.4%	53.5%	31.9%	18.5%
Aus/NZ	0.1%	0.0%	0.1%	0.0%	0.3%	0.3%	1.2%	18.2%	0.7%
Other	0.3%	0.2%	0.5%	0.0%	0.3%	0.2%	0.1%	10.7%	0.0%
Trade ($mill)	$2,404	$573	$7,135	$108	$505	$221	$1,777	$270	$12,994

Source: UN Commodity Trade Statistics Database (UN Comtrade) 2003

[3]NAm=North America; SAm=South America; Eur=Europe; RU/CA=Russia and Central Asia; ME/NA=Middle East and North Africa; Af=Sub-Saharan Africa; Asia=Asia and Indian Ocean; Aus/NZ=Australia, New Zealand, and Pacific Islands.

On the export side, the highest degree of intraregional trade of refrigerators is found in South America; nearly 84% of South American exports are sent to other South American countries. Both Europe and Africa both rank about 80% on this measure.

On the import side, however, South American intraregional import of refrigerators drops to just 37% of South America's total refrigerator imports, indicating that the region is a net importer of refrigerators. Similarly, Africa's low intraregional import ranking indicates that it is also a net importer, with most refrigerators coming from elsewhere (Europe). Europe, however, has an even higher intraregional import ranking than for exports (85%), indicating its net exporter status and the low degree of import dependency on other world regions. It is also the world's largest refrigerator exporting region, the source for 57% of world imports of refrigerators. North America, as Europe, is also a net exporter of refrigerators, but its world share is only 21% of the total.

Europe's dominance in refrigerator trade (55% of world exports and 57% of world imports) is also reflected in the "trade concentration" matrix shown in Table 3. The table was developed by overlaying the import and export share matrices and selecting only the trade relationships where both the reporter's share of imports from a region and the share of exports to a region were greater than or equal to 10% of a region's total. In this view, Europe is both a significant source of refrigerator imports and a significant export market for five of the world's eight reporting regions (including itself), compared to three for North America and two for Asia.

Table 3. Refrigerator Cross-Border Trade Concentration

	Reporter							
Partner	NAm	SAm	Eur	RU/CA	ME/NA	Af	Asia	Aus/NZ
NAm	1	1	-	-	-	-	1	-
SAm	-	1	-	-	-	-	-	-
Eur	1	-	1	1	1	-	1	-
RU/CA	-	-	-	-	-	-	-	-
ME/NA	-	-	-	-	-	-	-	-
Af	-	-	-	-	-	1	-	-
Asia	1	-	-	-	-	-	1	1
Aus/NZ	-	-	-	-	-	-	-	1

Key: 1=bilateral import/export share ≥ 10%.

However, the table is not symmetrical. The "1" in the North America column for the Europe row is not repeated in the Europe column for the North America row, while it is symmetrical in the case of North America and Asia. This may indicate that the bilateral trade between North America and Europe in refrigerators is of greater consequence to the North American manufacturers and marketers than for the Europeans.

Finally, this table highlights that refrigerator trade is predominantly intra-regional. In all regions except for Russia/Central Asia and the Middle East/North Africa, which account for just 0.3% and 0.1% of world exports, both import share and export shares of the market both exceed 10%—and in most cases much higher.

Air Conditioners

World trade in air conditioners totaled about $8 billion in 2000, of which 55% came from Asian producers. Europe was the primary importer, account for half of reported world imports (Table 4).

The trade in this appliance parallels that of refrigerators, the major difference being the predominance of Asia as a source for imports worldwide, and Asia's position as the only net exporting region, compared to three net exporters (North America, Europe, Asia) of refrigerators.

As is the case with refrigerators, most regions of the world exported half or more of their air conditioners to other countries within their same region, with the European concentration (83%) the highest of major markets. On the low end, Russia/Central Asia exported only 2% of their air conditioners intraregionally, 97% going instead to Europe.

Table 4. World Cross-Border Air Conditioner Trade, 2000

(% of Regional Total)

AC Exports	**From**								
To	NAm	SAm	Eur	RU/CA	ME/NA	Af	Asia	Aus/NZ	World
NAm	63.0%	53.7%	2.5%	0.0%	2.7%	1.5%	15.2%	1.9%	19.9%
SAm	6.5%	41.7%	0.8%	0.0%	2.5%	0.3%	2.6%	0.1%	2.9%
Eur	11.1%	2.7%	82.7%	97.2%	40.5%	5.0%	36.1%	4.7%	50.1%
RU/CA	0.3%	0.0%	1.8%	1.9%	2.9%	0.0%	0.4%	0.0%	0.6%
ME/NA	7.4%	1.4%	5.2%	0.0%	7.5%	2.2%	9.1%	7.1%	5.1%
Af	0.4%	0.4%	1.3%	0.1%	1.4%	86.6%	2.4%	2.5%	1.1%
Asia	9.9%	0.0%	4.8%	0.7%	38.6%	2.9%	29.9%	52.1%	16.9%
Aus/NZ	1.3%	0.1%	0.7%	0.0%	1.1%	1.5%	4.3%	31.6%	3.3%
Other	0.0%	0.0%	0.1%	0.0%	2.8%	0.1%	0.1%	0.0%	
Trade ($mill)	$1,161	$83	$2,309	$39	$10	$7	$4,443	$31	$8,083
AC Imports	**To**								
From	NAm	SAm	Eur	RU/CA	ME/NA	Af	Asia	Aus/NZ	World
NAm	44.7%	38.2%	2.7%	6.1%	12.7%	3.0%	7.3%	2.0%	14.4%
SAm	2.2%	18.7%	0.0%	0.0%	0.3%	0.0%	0.0%	0.0%	1.0%
Eur	3.5%	6.1%	43.1%	59.8%	19.1%	20.5%	8.8%	8.0%	28.6%
RU/CA	0.0%	0.0%	0.0%	1.8%	0.0%	0.0%	0.1%	0.0%	0.5%
ME/NA	0.7%	2.2%	2.2%	3.9%	22.0%	6.0%	0.2%	1.5%	0.1%
Af	0.0%	0.0%	0.0%	0.0%	0.3%	16.9%	0.0%	0.0%	0.1%
Asia	48.4%	34.3%	51.7%	28.3%	45.3%	52.1%	82.4%	84.3%	55.0%
Aus/NZ	0.2%	0.1%	0.1%	0.0%	0.0%	0.8%	1.3%	4.1%	0.4%
Other	0.4%	0.4%	0.1%	0.0%	0.2%	0.7%	0.0%	0.0%	
Trade ($mill)	$1,488	$220	$3,742	$45	$382	$85	$1,262	$246	$7,472

The much lower intraregional import ratios compared to exports is indicative of lower regional sufficiency in air conditioner production, resulting in higher import dependency. Indeed, Europe alone accounts for 50% of world air conditioner imports, with more than half of those coming from Asia. North America is similarly dependent on Asia for its imported products. However, unlike refrigerators, there are fewer significant bilateral trade relationships interregionally, and none of them symmetrical because of Asia's dominant exporter status and high

degree of intraregional self-sufficiency. In five of the eight regions, intra-regional trade ties predominate. (Table 5)

Table 5. Air Conditioner Cross-Border Trade Concentration

	Reporter							
Partner	NAm	SAm	Eur	RU/CA	ME/NA	Af	Asia	Aus/NZ
NAm	1	1	-	-	-	-	-	-
SAm	-	1	-	-	-	-	-	-
Eur	-	-	1	1	1	-	-	-
RU/CA	-	-	-	-	-	-	-	-
ME/NA	-	-	-	-	-	-	-	-
Af	-	-	-	-	-	1	-	-
Asia	-	-	-	-	1	-	1	1
Aus/NZ	-	-	-	-	-	-	-	-

Key: 1=bilateral import/export share ≥ 10%.

Televisions

The $24 billion trade in televisions in 2000 exhibits strong regionality, with the majority of exports in all regions except Asia and Australia/New Zealand, and Russia/Central Asia directed intraregionally. All regions except Asia, however, are net importers of televisions, and Asia has become the marginal supplier to the world, accounting for more than 10% of the market in every region and 94% of its own (Table 6).

Table 6. World Cross-Border Television Trade, 2000

(% of Regional Total)

Television Exports	**From**								
To	NAm	SAm	Eur	RU/CA	ME/NA	Af	Asia	Aus/NZ	World
NAm	97%	22%	1%	0%	1%	0%	22%	1%	37%
SAm	2%	78%	0%	0%	1%	0%	2%	0%	2%
Eur	0%	0%	90%	91%	4%	3%	15%	15%	41%
RU/CA	0%	0%	1%	9%	0%	0%	1%	0%	0%
ME/NA	0%	0%	1%	0%	58%	10%	12%	2%	2%
Af	0%	0%	0%	0%	1%	85%	2%	0%	0%
Asia	1%	0%	1%	0%	7%	1%	42%	35%	14%
Aus/NZ	0%	0%	0%	0%	0%	0%	4%	46%	2%
Other	0%	0%	4%	0%	26%	0%	0%	0%	
Trade ($mill)	$7,472	$162	$8,468	$26	$19	$31	$7,794	$4	$23,977
Television Imports	**To**								
From	NAm	SAm	Eur	RU/CA	ME/NA	Af	Asia	Aus/NZ	World
NAm	74%	55%	1%	0%	1%	1%	1%	1%	31%
SAm	0%	26%	0%	0%	0%	0%	0%	0%	1%
Eur	1%	1%	87%	24%	22%	13%	3%	5%	35%
RU/CA	0%	0%	0%	6%	0%	0%	0%	0%	0%
ME/NA	0%	1%	0%	41%	3%	4%	0%	0%	0%
Af	0%	0%	0%	0%	0%	17%	0%	7%	0%
Asia	25%	16%	11%	28%	75%	63%	94%	78%	33%

Aus/NZ	0%	0%	0%	0%	0%	0%	0%	0%	0%
Other	0%	1%	0%	0%	0%	1%	1%	9%	
Trade ($mill)	$7,861	$450	$8,698	$52	$377	$84	$3,032	$453	$21,006

The high degree of intraregional trade and the role of Asia as a key supply region for the world results in very few strong inter-regional bilateral trading relationships (Table 7). Russian/Central Asian exports and imports are closely tied to the European market, while those of Australia, New Zealand and the Pacific Islands are closely linked with Asia. Bilateral trade with North America is important for the South American market.

Table 7. Television Cross-Border Trade Concentration

	Reporter							
Partner	NAm	SAm	Eur	RU/CA	ME/NA	Af	Asia	Aus/NZ
NAm	1	1	-	-	-	-	-	-
SAm	-	1	-	-	-	-	-	-
Eur	-	-	1	1	-	-	-	-
RU/CA	-	-	-	-	-	-	-	-
ME/NA	-	-	-	-	-	-	-	-
Af	-	-	-	-	-	1	-	-
Asia	-	-	-	-	-	-	1	1
Aus/NZ	-	-	-	-	-	-	-	-

Key: 1=bilateral import/export share ≥ 10%.

Fax Machines

World trade in fax machines, at $3 billion in 2000, is much smaller than for the other appliances under review here, though the trade value masks a relatively large trade volume owing to low unit prices compared to other appliances. As an appliance largely undifferentiated by custom, design, and regional tastes, fax machines differ from refrigerator and air conditioners in that trade is heavily dominated by one region, Asia, which alone accounts for 73% of world exports. (Table 8)

Table 8. World Cross-Border Fax Machine Trade, 2000

(% of Regional Total)

Fax Exports	**From**								
To	NAm	SAm	Eur	RU/CA	ME/NA	Af	Asia	Aus/NZ	World
NAm	21%	2%	10%	0%	98%	0%	8%	2%	22%
SAm	23%	95%	0%	0%	0%	0%	0%	0%	1%
Eur	18%	0%	66%	22%	0%	1%	9%	16%	48%
RU/CA	0%	0%	8%	74%	0%	0%	0%	0%	0%
ME/NA	2%	0%	5%	0%	0%	0%	0%	0%	1%
Af	0%	0%	4%	0%	0%	97%	0%	0%	1%
Asia	32%	0%	7%	3%	0%	1%	82%	74%	25%
Aus/NZ	3%	0%	0%	0%	0%	0%	0%	8%	2%
Other	0%	3%	0%	0%	1%	0%	0%	0%	0%
Trade ($mill)	$85	$0.1	$605	$0.08	$179	$0.6	$2,409	$1	$3,281
Fax Imports	**To**								
From	NAm	SAm	Eur	RU/CA	ME/NA	Af	Asia	Aus/NZ	World
NAm	7%	32%	3%	4%	9%	4%	1%	3%	3%

SAm	0%	0%	0%	0%	2%	0%	0%	0%	0%
Eur	1%	2%	30%	35%	50%	20%	2%	9%	18%
RU/CA	0%	0%	1%	4%	0%	0%	0%	0%	0%
ME/NA	0%	0%	0%	2%	3%	0%	0%	0%	5%
Af	0%	0%	0%	0%	0%	53%	0%	0%	0%
Asia	91%	59%	66%	55%	36%	20%	97%	89%	73%
Aus/NZ	0%	0%	0%	0%	0%	1%	0%	0%	0%
Other	1%	6%	0%	0%	0%	2%	0%	0%	0%
Trade ($mill)	$688	$33	$1,499	$2	$30	$27	$778	$52	$3,109

This predominance of a single region's exports is reflected in the absence of significant intraregional trade outside of Europe and Asia. Both North America and the Australian, New Zealand, Pacific Islands region do share strong bilateral trade with Asia, while Russian and Central Asia are closely tied in two-way trade with Europe (Table 9). Other regions, though, are primarily importers of Asian products, with market shares of Asia-sourced fax machines ranging from 20% in Africa to over 91% in North America.

Table 9. Fax Cross-Border Trade Concentration

	To							
From	NAm	SAm	Eur	RU&CA	ME/NAf	Af	Asia	Aus/NZ
NAm	-	-	-	-	-	-	-	-
SAm	-	-	-	-	-	-	-	-
Eur	-	-	1	1	-	-	-	-
RU/CA	-	-	-	-	-	-	-	-
ME/NA	-	-	-	-	-	-	-	-
Af	-	-	-	-	-	1	-	-
Asia	1	-	-	-	-	-	1	1
Aus/NZ	-	-	-	-	-	-	-	-

Key: 1=bilateral import/export share ≥ 10%.

Regional Appliance Trade

The summary above suggests that geography is one factor that determines trade flows of appliances, but a more detailed analysis needs to take into account the economic subregions that exist to shape trade flows, among other goals. The European Union, Mercosur, and the Andean Common Market are examples of economic grouping that apply a common external tariff to goods imported from other regions, but allow tariff-free trade among member countries.[4]

Such economic groupings exist to provide preferential trade among members, and their impact should show up in trade data broken down to the country level within the subregion. In South America, two such groupings exist: the Andean Common Market and Mercosur, both of which are customs unions. Here we test the case of refrigerator trade in the Andean Common Market to see if the customs union structure shapes trade patterns and supports a case for subregional harmonization.

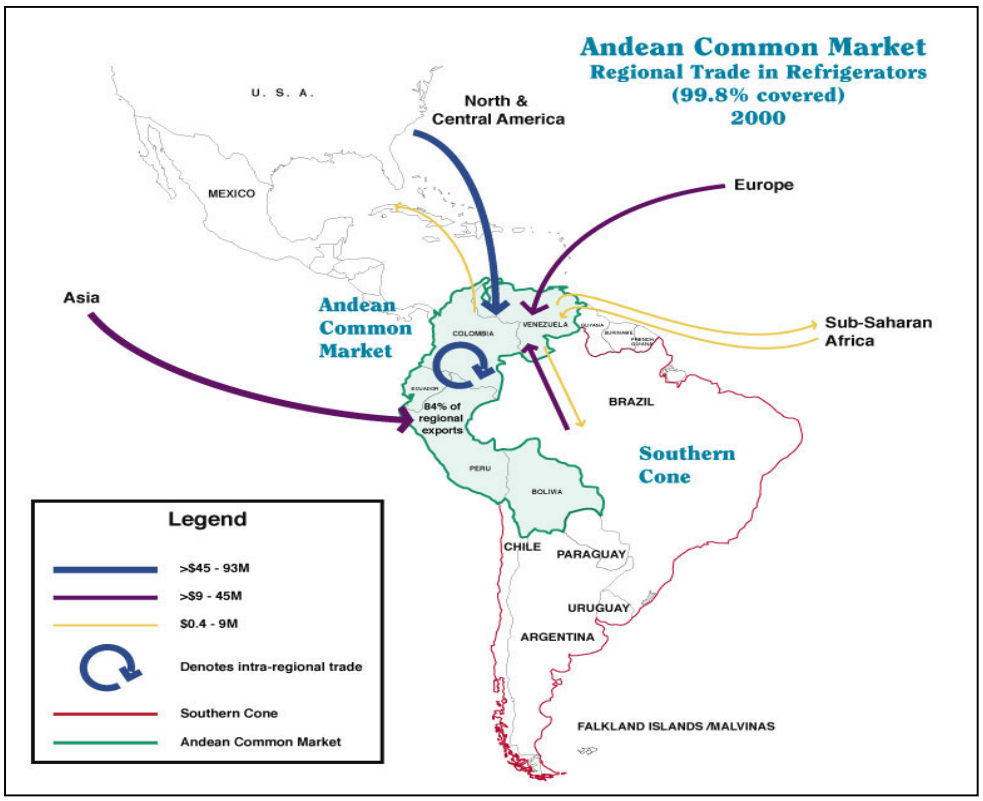
As shown in Figure 1, 84% of the refrigerator exports reported in the Andean Common Market are sourced from member countries. The region, however, is a net importer, with North

[4]Common external tariffs are characteristic of common markets and customs unions; free trade zones such as NAFTA (North America Free Trade Association) do not necessarily apply a common external tariff, but allow free trade among member states. Free trade agreements rarely include a common external tariff.

America providing 44% of its total imports, compared to just 13% from the neighboring Mercosur region. Using the "trade concentration" index shown earlier, North America is the region's only substantial bilateral trade partner, with 14% of its exports headed north, compared to just 0.7% to the neighboring Mercosur region.

Figure 1. Andean Common Market Regional Trade in Refrigerators 2000

Value of trade in US$



Within the Andean Common Market itself Colombia dominates intraregional trade, providing 94% of the region's exports, and trade with Venezuela alone accounting for 76% of the total. The pattern suggests that Colombia may be a key country in the consideration of regional harmonization or the establishment of standard or labeling programs in the rest of the region.

Conclusion and Further Research

The trade analyses presented above confirm strong intra-regional trade patterns in refrigerators and air conditioners, and the export dominance of single regions for televisions and fax machines. This might have been expected given obvious differences in consumer tastes in design, color, and features that distinguish popular brands of refrigerators and air conditioners sold in Beijing from ones in Berlin or Boston. For televisions, differences in regional standards for scan rates may underlie the predominance of intraregional trade and the marginal reliance on Asian manufacturers. With few variations possible or needed in fax machines, the trade patterns seen here is likely driven by the siting of low-cost manufacturing more than other factors.

These results appear to have implications for harmonization. There are potential benefits for harmonization among close trading partners (lower manufacturer costs; avoid duplicative investment) and the analyses uncover these bilateral ties. The analyses also point to potential growth in trade among regions that currently use differing test procedures and standards (e.g. Europe is world's leading source of refrigerator exports, but accounts for only 14% of US imports. Similarly, Europe gets only 6% of its refrigerator imports from North America). The single-region dominance in inter-regional world trade in televisions and fax machines points to the

possibility of programs to influence the energy efficiency of production from the major manufacturers that could benefit all importing countries. The current program to develop minimum standards and efficiency criteria for external power supplies in China (50% of world production) in tandem with similar programs in the consuming countries of the US, Europe and Australia may provide a roadmap for how to address such issues with other appliances.

The analyses are incomplete in one important way. As noted earlier, the analyses do not include data on the volume of domestic production and sales and the assessment of the importance of trade to a domestic market. Further research in this area is clearly warranted.

Similarly, there are no summary data available on world sales, so trade as a proportion of world sales can not be assessed, though initial indications are that it may be substantial. This might also warrant further research. Also, to the degree that these analyses are useful, expansion to other products subject to standards and labeling programs around the world should be pursued. It might also be useful to look deeper into trade relationships to assess autonomous vs. "captive" trade (e.g. Japanese overseas investment in Thailand for refrigerator manufacturing determining the high percent of Japanese imports from Thailand). Cost-benefit analysis of harmonization is another needed research area.

Overall, the authors are encouraged by the initial results of these explorations and their potential application to development of regional harmonization programs.

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