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How Rich Countries Became Rich and Why Poor Countries Remain Poor: It's the Economic Structure . . . *Duh!**

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ABSTRACT

Becoming a rich country requires the ability to produce and export commodities that embody certain characteristics. We classify 779 exported commodities according to two dimensions: (1) sophistication (measured by the income content of the products exported); and (2) connectivity to other products (a well-connected export basket is one that allows an easy jump to other potential exports). We identify 352 "good" products and 427 "bad" products. Based on this, we categorize 154 countries into four groups according to these two characteristics. There are 34 countries whose export basket contains a significant share of good products. We find 28 countries in a "middle product" trap. These are countries whose export baskets contain a significant share of products that are in the middle of the sophistication and connectivity spectra. We also find 17 countries that are in a "middle-low" product trap, and 75 countries that are in a difficult and precarious "low product" trap. These are countries whose export baskets contain a significant share of unsophisticated products that are poorly connected to other products. To escape this situation, these countries need to implement policies that would help them accumulate the capabilities needed to manufacture and export more sophisticated and better connected products.

Keywords: Bad Product; Capabilities; "Low Product" Trap; "Middle Product" Trap; Proximity; Sophistication; Structural Transformation

JEL Classifications: O14, O25, O57

1. INTRODUCTION

The study of the reasons why some countries achieve sustained growth that allows them to develop while many others cannot do it and seem not to be able to progress has been at the core of economics since the days of the founding fathers of the discipline (i.e., Smith, Ricardo, Malthus, and their critic, Marx), whose concern was the study of the determinants of the wealth of nations. Later on, after WWII, with the birth of development economics as a field, this has been, and continues to be, the central question of the discipline. In the words of Lucas (1988): "The consequences for human welfare involved in questions like these are simply staggering: Once one starts to think about them, it is hard to think about anything else" (Lucas 1988: 5).[1]

Explaining why *most* countries in the world are in some sort of economic trap is not easy. Standard growth models like the Harrod (1939), Domar (1946), Solow (1956), or the myriad of endogenous growth models developed since the 1980s (see Barro and Sala-i-Martin [1995] or Aghion and Howitt [1998] for expositions) somehow address the question of why some countries achieve sustained growth while some others cannot do it, but they were not conceived with the objective of explaining differences between developed and developing countries, and much less explaining why so many countries in the world are trapped.

Arthur Lewis (1955: 208) argued that the central fact of economic development is rapid capital accumulation. Development requires increasing the annual rate of net investment from 5 percent or less to 12 percent or more. "This is what we mean by an Industrial Revolution." The evidence of the last fifty five years seems to indicate that while investment does matter for growth and development, developing takes much more than increasing the rate of investment to at least 12 percent.

The reality is that the world has been divided for quite some time among three groups: (i) the club of rich nations, with income per capita above $12,000, according to

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[1] The questions Lucas refers to are in the previous sentence of his paper: "Is there some action a Government of India could take that would lead the Indian economy to grow like Indonesia's or Egypt's? If so, *what* exactly? If not, what is it about the 'nature of India' that makes it so?" (Lucas 1988: 5).

the World Bank, using 2007 data; (ii) a very large group of poor countries with income per capita below $1,000; and (iii) a group of countries that falls in between these two. These countries seem to move forward, but slowly, with the consequence that very few graduate and make it to the club of rich countries. Some of these nations are Brazil, Mexico, Argentina, Malaysia, or Thailand. They are referred to as being in a "middle income trap." However, most countries in the world have not even reached this stage. Is it because the rate of investment is below 12 percent? No, today we know that their problem is much more complex. [2]

In this paper, we attempt to provide empirical content to the traps that many countries face in order to develop. To this purpose, we study the characteristics of their export basket. We classify 154 countries according to two dimensions of an export basket comprising 779 products: (i) sophistication (measured by the income content); and (ii) connectivity to other products (a well-connected export basket is one that allows an easy jump to other potential exports). There are only 34 countries in the world that export mostly sophisticated and well-connected products. We identify 28 countries in the world that are in a "middle product trap," 17 countries that are in a "middle-low" product trap, and 75 countries that are in a difficult and precarious "low product trap." To solve this fundamental development problem requires, first, an understanding of the relationship between poverty and the structure of production, i.e., what countries produce and export determines who they are in the world; and second, implementation of appropriate and realistic economic policies. Specifically, we argue that what allows countries to become rich has to do with the type of economic activities they engage in (i.e., the type of goods they end up producing and exporting), and with the policies that they implement to promote and develop certain types of industries.

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[2] The role of investment in development is neither well understood nor even agreed upon by economists. While the proposition that investment is key for growth seems obvious, the empirical evidence is not conclusive. For example, Easterly (2002: 39–42) and Oulton and O'Mahony (1994) claim that capital does not play any special role; while Prichett (2003: 217–21) claims that "except for the causality issue, the role of physical investment in growth is well understood." On the issue of causality, Blomstrom, Lipsey, and Zejan (1996) used causality tests and found that a faster rate of GDP growth causes a higher investment-output ratio and not vice versa. If this is true, the implication is that investment is not a key determining exogenous variable in the growth process. Once growth is underway, the resulting profits will cause the investment rate to increase in a Keynesian fashion. As Kaldor (1970) pointed out, Henry Ford did not build up his automobile business from high initial savings, but from the profits his factory generated.

There are three strands of the development literature that are extremely relevant if one wants to explain why some countries make it while many others do not. They run parallel and complement each other. First, there are models that specifically deal with the question of why some countries get into "traps" that do not allow them to maintain sustained growth. Perhaps the oldest trap model, at least formalized in mathematical terms, is Nelson's (1956) low-level poverty trap, which intends to integrate population and development theory by recognizing the interdependence between population growth, per capita income, and national income growth.[3] This model demonstrates the difficulties that developing countries face in achieving a self-sustained rise in living standards. The low-level equilibrium trap refers to a situation where per capita income is permanently depressed as a consequence of a fast population growth, faster than the growth in national income. In dynamic terms, as long as this happens, per capita income is forced down to the subsistence level. Myrdal's (1957) model of "cumulative causation" is also part of the same tradition. Myrdal argued that economic and social forces produce tendencies toward disequilibrium, which tends to persist and even widen over time. Myrdal argued, for example, that following an exogenous shock that generates disequilibrium between two regions, a multiplier-accelerator mechanism produces increasing returns in the favored region such that the initial difference, instead of closing as a result of factor mobility, remains and even increases.[4]

Second, since the early days of development economics, it was recognized that development is about the transformation of the productive structure and the accumulation of the capabilities necessary to undertake this process. The structural transformation

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[3] The idea of traps was also present in the writings of the classical authors, who argued that, in the long run, the supply curve of labor was horizontal at the subsistence wage, i.e., the level of the real wage at which birth and death rates equalize. This rate is just high enough to reproduce the population and labor force without change. Malthus assumed that the labor supply would be closely related to population, so that a constant population would also mean a constant labor supply. In this model, if the wage rate were to rise above subsistence, the population would grow, and the increased supply of labor would tend to force the wage downward. If the wage rate were to fall below subsistence, high infant mortality would lead the population to shrink, and the resulting decline in the supply of labor would tend to force the wage upward. Over a period of time long enough to allow for these changes in population, the wage in this model will tend to remain close to the subsistence level.

[4] Myrdal also argued that, through trade, the developing countries have been forced into the production of goods with inelastic demand with respect to both price and income.

3

literature argues that economic development is a process in which new activities emerge, old ones disappear, and the weight of all economic activities and their patterns of interaction change. This is closely related to the notion of structural change—the growing importance of non-agricultural sectors in production and employment. This is the tradition of Kuznets (1966), Kaldor (1967), or Chenery, Robinson, and Syrquin (1986), among others. Specifically, structural change shows up in changes in the shares of labor of the different sectors, typically with a decline in that of agriculture and an increase in those of the nonagricultural sectors. For many years, development was equated with industrialization. The importance of manufacturing derives from its potential for strong productivity growth and the high income elasticity of demand for manufactures. As labor and capital move into these activities, average productivity in the economy increases. Today, it is believed that some services, based on new technologies and standardization of delivery, enable substantial productivity gains in some activities (Felipe et al. 2009). Examples of these sectors are transport services, financial operations, wholesale trade, and renting services.

The countries that have succeeded in this process are those that have managed to change the productive structure of the economy, and have been able to produce and export a more diversified and sophisticated product basket. This is the recent experience of some countries in Asia, e.g., Korea and Singapore. China is undergoing a deep process of structural transformation that, to a large extent, explains its rapid growth. On the other hand, the countries that have failed are those that are not able to engineer this process. They get stuck in the production and export of a relatively narrow range of goods that are often unsophisticated.

The recent work of Hidalgo et al. (2007) is a novel contribution to the structural transformation literature. These authors introduce the *product space*, an application of network theory that yields a graphical representation of all products exported in the world. Products are linked through lines that represent their proximity, defined as the conditional probability of exporting one product given that they also export the other one.

Using the product space, Hausmann and Klinger (2007) argue that countries change their export mix by jumping to products that are nearby, in the sense that these

other products use similar capabilities to those used by the products in which they excel (i.e., those products in which they have revealed comparative advantage [RCA]). According to this capabilities approach, comparative advantage depends more on the nation's ability (i.e., capability) to understand, master, and use technologies than on factor endowments (see also Lall 1992, 2000a, and 2000b).

Third is the literature on capabilities à la Sutton (2001, 2005). Becoming a rich country is about being able to earn higher real wages. In the same vein as Hidalgo et al. (2007), Sutton argues that some economic activities are more lucrative than others. Countries that specialize in such activities enjoy a higher level of real wages. But unlike the traditional neoclassical model, where higher real wages are the result of an increasing capital-labor ratio, Sutton argues that the primary driver of growth is the gradual build-up of firms' capabilities.

The rest of the paper is organized as follows. Section 2 discusses the concept of capabilities in the context of the product space and a country's growth prospects. Section 3 discusses the methodology and the various concepts used to classify products as well as countries. We define and identify "bad" products. These are products that have low sophistication and/or are not well-connected to other products. Based on this, we identify countries that are in the "low" and "middle" product traps. Our results indicate that many countries in the world (in fact, most of them) export bad products, i.e., the largest number of commodities exported with RCA fall into these groups. On the other hand, there are other countries that export some of all kinds of products, i.e., both "good" and "bad" products. Having capabilities to excel in products that are not bad gives these countries an opportunity to switch to other more sophisticated and better connected products. Specifically, we identify three groups of countries (comprising a total of 120 countries) that fall into the "low" or "middle product" trap, plus one group of 34 countries that produce "good" products, i.e., sophisticated and well-connected. Section 4 provides some policy recommendations for the various groups of countries identified. Section 5 concludes.

2. PRODUCT TRAPS AND DEVELOPMENT

A key challenge that most countries in the world face is how to upgrade and diversify their export basket. Many countries have been able to exploit their low-wage advantage to attract foreign direct investment into many industries. However, the challenges to deepen industrial capabilities, upgrade the skills of the local labor force, set up and build innovation, research, and development capacity in the domestic economy, and move to high-value added and more sophisticated products are significant.[5] Why upgrade and diversify? In recent research, Hidalgo et al. (2007) and Hausmann, Hwang, and Rodrik (2007) recognize the central role that structural transformation plays in development. Specifically, they argue that while growth and development are the result of structural transformation, not all activities have the same consequences for a country's growth prospects. The implication is that a sustainable growth trajectory must involve the introduction of new goods and not merely involve continual learning on a fixed set of goods. Hausmann, Hwang, and Rodrik (2007) show that, after controlling for other factors such as initial per capita income, countries with a more sophisticated export basket grow faster. In other words, what a country exports does matter for subsequent growth. De Ferranti et al. (2000) show that export diversification is associated with a higher GDP growth.

Standard trade theory postulates that the main determinant of a country's comparative advantage, and therefore its trade pattern, is the relative factor endowment. Changes in a country's export basket are a result of the changing comparative advantage based on factor accumulation. The idea is to get the prices right for the various factors of production so that firms select the appropriate techniques of production. Factor accumulation leads to factor price changes, which induce changes in the technique of production. Countries grow by way of accumulating physical or human capital or by improving the way various factors of production are mixed (total factor productivity).

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[5] See, for example, Malaysia's *New Economic Model* (National Economic Advisory Council: http://www.neac.gov.my/content/download-option-new-economic-model-malaysia-2010), which stresses the need to upgrade from assembly to product development. Most developing countries have similar plans.

This brings about a change in the composition of the export basket. Thus, structural transformation is the result of changes in underlying fundamentals such as education, financial resources, and overall productivity.

However, export diversification and upgrading are not easy. This is because venturing into a new activity entails a significant amount of uncertainty about the profitability of the new venture. The first entrant into this new activity has to engage in some sort of "cost discovery" (Hausmann and Rodrik 2003). The new activity may have high social returns but the costs are all private. This is because if the venture fails, all the costs are borne by the entrant. However, if the venture succeeds, others on the margin will be quick to enter the activity.

Another possible reason why export diversification is not easy is that many new activities may require other large-scale investments that are critical to the profitability of the new activity itself. For example, agroprocessing industries may require well-developed cold storage transportation systems, logistics and transport networks, well-established regulatory bodies to provide phytosanitary clearances and permits, and marketing of a country abroad as a reputable source of agro-based products. All these complementary activities involving high fixed costs are unlikely to be provided by the private sector, or are unlikely to be developed by the firms themselves, given the public-good nature of many such services. As a result, the new activity may not find any takers. In other words, there is a coordination failure. As a result, the new activity may fail to develop.

Export diversification and upgrading involves venturing into new activities, which may involve information and coordination externalities. In some activities and in some countries there may be a long learning phase with a considerable amount of risk and uncertainty. In other activities and countries the learning phase might be shorter. The extent of policy response will therefore vary.

Hausmann and Klinger (2007) investigate the process by which countries are able to diversify their export mix. They argue that countries change their export mix by moving to products "nearby" to the products in which they already excel (i.e., those products that they export with RCA). This is based on the idea that each product requires

a specific set of capabilities, and if a country has RCA in that product, then that country has accumulated the product-specific capabilities. What are these capabilities? They are: (i) human and physical capital, the legal system, institutions, etc. that are needed to produce a product (hence, they are product-specific, not just a set of amorphous factor inputs); (ii) at the firm level, they are the "know-how" and working practices held collectively by the group of individuals comprising the firm; and (iii) the organizational abilities that provide the capacity to form, manage, and operate activities that involve large numbers of people. According to Sutton (2001, 2005), capabilities manifest themselves as a quality-productivity combination. A given capability is embodied in the tacit knowledge of the individuals who comprise the firm's workforce. The quality-productivity combinations are not a continuum from zero; rather, there is a window with a "minimum threshold" below which the firm would be excluded from the market. Therefore, capabilities are largely nontradable inputs.

A country's ability to foray into new products depends on whether the set of existing capabilities can be easily redeployed for the production and export of new products. This idea implies that it is probably easier for a country that exports T-shirts, for example, to add shorts rather than smart phones to its export basket. On the other hand, it is very likely that a country that exports basic cell phones has the capabilities to add smart phones to its export basket. The implication is that it is easier to start producing a "nearby" product (in terms of required capabilities to export it successfully) than a product that is "far away" and requires capabilities that the country probably does not possess.

Hidalgo et al. (2007) conceptualize these ideas in the newly developed product space. The rationale behind the product space is that if two goods need similar capabilities, a country should show a high probability of exporting both with comparative advantage. Thus, the barriers preventing entry into new products are less binding for products that use similar capabilities.

The product space is highly heterogeneous. Some products are close-by to others (because they require similar capabilities), while some others are in a sparse area of the product space. In the first case, it easy to jump from one product into another one (and

therefore export the new one with comparative advantage), while in the second case, it is difficult. The core of the product space, the area with many products close by, comprises chemicals, machinery, and metal products. The periphery consists of petroleum, raw materials, tropical agriculture, animal products, cereals, labor-intensive goods, and capital-intensive goods (excluding metal products). Core products also tend to be more sophisticated than those in the periphery.

The heterogeneous structure of the product space has important implications for structural change. If a country exports goods located in a dense part of the product space, then expanding to other products is much easier because the set of already acquired capabilities can be easily redeployed for the production of other nearby products. This is likely to be the case of different types of machinery or of electronic goods. However, if a country specializes in the peripheral products, this redeployment is more challenging as no other set of products requires similar capabilities. This is the case of natural resources such as oil.

A country's position within the product space, therefore, signals its capacity to expand to more sophisticated products, thereby laying the groundwork for future growth. Countries that export products that have few linkages with other products (i.e., countries that have accumulated capabilities that are hard to redeploy) or countries that have not accumulated sufficient capabilities to jump to other products cannot generate sustained long-term growth.

We use a country's position in the product space to classify it according to two product characteristics, sophistication (PRODY) and connectivity to other products (PATH). This, in turn, informs us on the extent of policy interventions that might be required to get these countries out of "unsophisticated" and "unconnected" products so that they can undertake structural transformation.

3. METHODOLOGY

As argued above, accumulated capabilities are critical for a country's development prospects. Under the capabilities approach, the shift of a country's output and employment structure away from low value-added activities into high value-added activities might not be an easy task because venturing into new activities is dependent on the capabilities already accumulated, i.e., the process is path dependent. This is not to say that output and employment structures are rigid and cannot be changed. What it means is that the accumulation of new capabilities, and therefore the ability to venture into new products, is the result of a long and a cumulative process, one that involves a mix of learning, building institutional capacity, and an appropriate business environment (Lall 2000a; Hausmann and Klinger 2006; Hausmann, Hwang, and Rodrik 2007; Hidalgo et al. 2007). Accumulating and developing capabilities may require specific and targeted government policy interventions.

Using a twofold criteria, we classify countries and examine the kind and the degree of policy interventions that they would need to implement in order to accumulate the capabilities that would allow them to bring about a significant change in their output and employment structure, i.e., induce faster structural process. Our discussion in the previous section has highlighted the role of the kind of products that a country exports with RCA. To this end, we classify products based on two characteristics: (i) product sophistication and (ii) path.

3.1 Product Classification

Following Hausmann, Hwang, and Rodrik (2007), we calculate the sophistication level of a product as the weighted average of the GDP per capita of the countries exporting that product.[6] Algebraically:

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[6] Lall, Weiss, and Zhang (2006) also develop a similar measure of product sophistication. Their measure is a weighted average of the mean income of ten groups of countries (countries are divided into ten groups according to income) and the weights are the share of the ten groups in the world exports of a product. While not exactly the same as that of Hausmann, Hwang, and Rodrik (2007), the two measures rely on income of countries exporting a product to capture product sophistication.

$$PRODY_i = \sum_c \left[\frac{xval_{ci} \Big/ \sum_i xval_{ci}}{\sum_c \left(xval_{ci} \Big/ \sum_i xval_{ci} \right)} \right] \times GDPpc_c \qquad (1)$$

where $xval_{ci}$ is the value of country c's export of commodity i and $GDPpc_c$ is country c's per capita GDP. We calculate PRODY for 779 products using highly disaggregated trade data (SITC-Rev.2 4-digit level, UNCOMTRADE Database) for 2003–07, and use the average of the five years. GDP per capita (measured in 2005 PPP$) is from the *World Development Indicators*. PRODY is measured in 2005 PPP$. It varies from a low of $1,182 for "fabrics, woven of jute or other textile bast fibers of heading 2640" to a high of $35,885 for "halogenated derivatives of hydrocarbons."

The rationale that underlies PRODY is that, absent any trade interventions, high-income countries are able to export despite higher wages because of the characteristics of the products. One such characteristic is the level of technology embedded in their products. However, this is not the only reason. Other reasons why activities are located in high per capita income countries include the availability of natural resources, the quality of infrastructure, intellectual property rights, the degree of divisibility of the production process, transportation costs, and possibilities of knowledge spillovers from agglomeration, especially in the case of research- and development-intensive activities.[7] Thus, PRODY, not only reflects technological sophistication, but also incorporates these other factors.

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[7] The location of activities, especially in recent times with the advancements in supply-chain management, logistics, and information technology, could also be a reflection of the extent to which production processes can be fragmented and located in different places to take advantage of low labor costs. Lall, Albaladejo, and Zhang (2004) note that industries with discrete production processes see greater fragmentation compared to those with continuous production processes. They further note that within the former, products with high value-to-weight ratios and some processes with high labor intensity and relatively simple skill needs are easier to fragment. Thus, production processes in some industries such as electronics are highly divisible, less so in the case of automotive industry, and least in the case of aerospace industry.

The second criterion segregates products according to how easily the capabilities that they embody can be redeployed and used to export other products. Recall that we have argued that development is a path-dependent process, and whether or not a country is able to venture into new activities is determined by the existing set of capabilities. In simple terms, we want to know whether the capabilities that allow a country to export basic mobile phones, for example, can be redeployed to export another product, for example smart phones or luxury cars.

Hidalgo et al. (2007) introduce the notion of "proximity." It is a measure of whether a country that exports a product will be able to export another one. Proximity between two products i and j, denoted φ_{ij}, is the minimum of the pairwise conditional probabilities that a country exports a good given that it exports another one. Algebraically:

$$\varphi_{ij} = \min\left\{P\left(RCA_i \mid RCA_j\right), P\left(RCA_j \mid RCA_i\right)\right\}, \quad 0 \leq \varphi_{ij} \leq 1 \tag{2}$$

where, $P\left(RCA_i \mid RCA_j\right)$ is the conditional probability that a country exports good i with RCA (RCA_i) given that it already exports good j also with RCA (RCA_j).[8] Since the measure of proximity involves using the minimum of the pairwise conditional probabilities, the matrix of conditional probabilities is symmetric.

We use Balassa's (1965) measure of RCA. It is the ratio of the export share of a product in the country's export basket to the same share at a worldwide level. Algebraically:

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[8] The conditional probability that a country exports good i with RCA given that it exports good j also with RCA is calculated as the ratio of the number of countries that export *both* goods i and j with RCA to the number of countries that export good j with RCA. Then we choose the smaller of the two conditional probabilities, which implies (given that they only differ in the denominator) that we choose the one whose denominator is larger, i.e., the more ubiquitous product. Given that we have 779 products, we calculate a total of (779×778)/2=303,031 proximities.

$$RCA_{ci} = \frac{xval_{ci} \Big/ \sum_{i} xval_{ci}}{\sum_{c} xval_{ci} \Big/ \sum_{i} \sum_{c} xval_{ci}} \tag{3}$$

where $xval_{ci}$ is the value of country c's export of commodity i.[9] For purposes of our analysis, country c exports product i with RCA if $RCA_{ci}>1$.

Figure 1 shows the distribution of proximities in the product space. The figure reveals that this distribution is highly skewed, as most linkages (proximities) are very weak, below 0.4. Table 1 shows the average proximity *within* and *among* 11 product groups classified according to Leamer's (1984) classification.[10] "Within" proximities measure the easiness of jumping across products in a given group. On the other hand, "among" proximities measure the easiness of jumping from one group to the other one.[11] The former are significantly higher, reflecting the fact that moving within a group is, in general, easier than moving out.

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[9] One word of caution: the index of RCA can be problematic, especially if used for comparison of different products. For example, a country very well endowed with a specific natural resource can have an RCA in the thousands. However, the highest RCA in automobiles is about 3.6.

[10] Appendix table 1 shows Leamer's (1984) classification. Note that the original Leamer classification divides products into ten groups and does not classify some of the SITC (Rev. 2) 2-digit categories. These are categorized as in Hidalgo et al. (2007). Also, the Leamer (1984) category "capital-intensive products" is split into two: capital-intensive products (excluding metals) and metal products.

[11] Both within and between proximities are unweighted averages and, as discussed above, they are the average of the minimum of the two possible conditional probabilities.

Figure 1: Distribution of Proximities in the Product Space

Note: The total number of links for the 779 products is (779x778)/2=303,031.
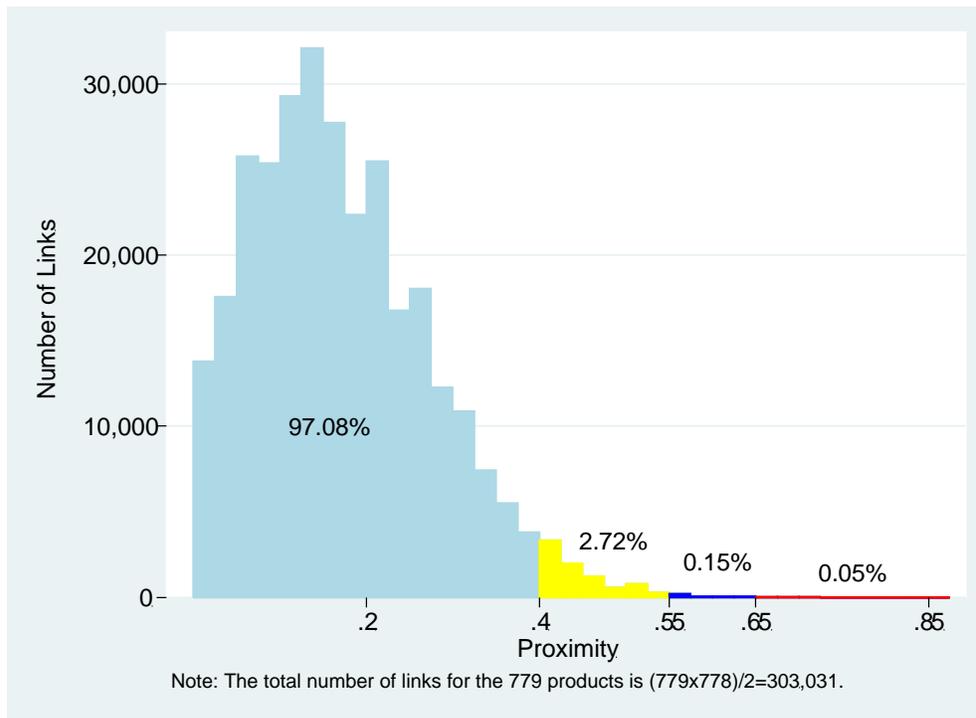
We interpret a high value of the proximity measure (φ_{ij}) as an indicator that the two goods require similar capabilities. The concept of proximity is based on trade outcomes and not physical characteristics of the products. The underlying assumption behind the notion of proximity is that if the capabilities needed to produce two different products are similar, then this would be revealed in the fact that countries that export one good also export the other one. For example, if all countries that export product x with RCA also export product y with RCA, then these two products, x and y, require similar capabilities. This is reflected in a high value of proximity (a high φ_{ij}), i.e., the two products are "nearby." If the two products are "nearby" (i.e., a high φ_{ij}), but a country currently exports only one of the two products with RCA, then this country has the required capabilities to potentially export the other product also with RCA. Conversely, if for a product w exported with RCA there is another product z that is not exported with

14

RCA by any country, then exporting these two products must involve different capabilities; this will be represented by a low proximity (φ_{ij}).

Table 1: Average Proximity *within* and *between* Leamer Groups

	PET	RAW	FOR	TRO	ANI	CER	LAB	CAP	MET	MAC	CHE
PET	**0.356**										
RAW	0.111	**0.335**									
FOR	0.106	0.157	**0.513**								
TRO	0.126	0.147	0.174	**0.454**							
ANI	0.119	0.146	0.183	0.198	**0.435**						
CER	0.105	0.127	0.141	0.163	0.160	**0.286**					
LAB	0.105	0.131	0.178	0.167	0.158	0.131	**0.434**				
CAP	0.116	0.133	0.171	0.169	0.160	0.144	0.212	**0.480**			
MET	0.135	0.170	0.221	0.175	0.169	0.149	0.204	0.223	**0.568**		
MAC	0.109	0.113	0.158	0.110	0.121	0.108	0.168	0.169	0.205	**0.447**	
CHE	0.145	0.140	0.162	0.147	0.160	0.141	0.157	0.166	0.204	0.198	**0.485**

Note: PET-Petroleum; RAW-Raw materials; FOR-Forest products;
     TRO-Troical agriculture; ANI-Animal products; CER-Cereals; LAB-Labor-intensive;
     CAP-Capital-intensive (exc. Metals); MET-Metals; MAC-Machiner; CHE-Chemicals.

For each product, we measure the proximity of that product to all other products. This measure is called PATH (Hausmann and Klinger 2006) and is simply the sum of all proximities of product *i* to each of the other products. Algebraically:

$$PATH_i = \sum_j \varphi_{ij}, \qquad 0 \leq PATH_i \leq 778 \text{ (No. of products -1)} \qquad (4)$$

Products with a high PATH are those that use capabilities that are similar to those used by many other products.

To calculate the proximities, we first calculate the RCA index for a country's exports of commodity *i* using equation (3) for each of the five years from 2003 to 2007. We then average the five values. If the averaged RCA is greater than one, then the country has RCA in commodity *i*. We then obtain the proximities (as in equation (2)) of

each product with respect to all the other 778 products. Finally, proximities are used to obtain the PATH of each product (equation (4)).

Based on the distribution of the products according to their sophistication (PRODY), we classify all products into high-PRODY, mid-PRODY, or low-PRODY, depending on whether they belong to the first, second, or third tercile of the PRODY scale. Similarly, we classify each product as being high-PATH, mid-PATH, or low-PATH. We then assign each product to one of the nine cells of the PRODY-PATH matrix. Table 2 shows this matrix, which provides a summary of the information of the products in each of the nine cells: the number of products in each cell, the average PRODY, and average PATH of the products in each cell. It can be seen that PATH increases as we move down across rows (but does not vary across columns for a given row), while PRODY increases as one moves to the right across columns (but does not vary across rows for a given column). Out of the 779 products that we work with, 352 (45 percent of the total) are in the four cells MPR_MPA, HPR_MPA, MPR_HPA, HPR_HPA ("good" products), and 427 (55 percent of the total) in the other five cells ("bad" products). It is worth noting that the LPR_LPA cell contains 93 products, most of them cereals and raw materials. On the other hand, the cell HPR_HPA at the other extreme contains 88 products, most of them machinery and chemicals.

Table 2: PRODY-PATH Distribution of the 779 Products

		PRODY		
		LOW PRODY (LPR)	**MID PRODY (MPR)**	**HIGH PRODY (HPR)**
PATH	**LOW PATH (LPA)**	**(LPR_LPA)** No. of Products: 93 Average PRODY: $5,480 Average PATH: 94	**(MPR_LPA)** No. of Products: 64 Average PRODY: $15,552 Average PATH: 98	**(HPR_LPA)** No. of Products: 103 Average PRODY: $23,434 Average PATH: 99
	MID PATH (MPA)	**(LPR_MPA)** No. of Products: 101 Average PRODY: $7,196 Average PATH: 138	**(MPR_MPA)** No. of Products: 91 Average PRODY: $15,027 Average PATH: 137	**(HPR_MPA)** No. of Products: 68 Average PRODY: $22,697 Average PATH: 137
	HIGH PATH (HPA)	**(LPR_HPA)** No. of Products: 66 Average PRODY: $9,132 Average PATH: 159	**(MPR_HPA)** No. of Products: 105 Average PRODY: $15,360 Average PATH: 167	**(HPR_HPA)** No. of Products: 88 Average PRODY: $21,227 Average PATH: 164

Note: Total number of products at the SITC (Rev. 2) 4-digit level is 779. PRODY is measured in 2005 PPP$.

Figure 2 shows the distribution of the 779 commodities, split into the nine cells. We present the distribution according to the 11 Leamer groups. Appendix table 1 shows the number of products, average PRODY, and average proximity, as well as the share of products in each of the nine cells in table 2 for the 11 Leamer groups and the SITC (Rev. 2) 2-digit code. The most sophisticated Leamer groups are machinery and chemicals, with an average PRODY close to $20,000. These products, together with metals, are also the best connected and they tend to be *man-made*. On the other hand, tropical agriculture and cereals are the least sophisticated groups and petroleum the worst connected. These products tend to be *nature made*.

Figure 2 indicates, for example, that raw materials and cereals account for the largest shares within the LPR_LPA cell as well as within the two respective Leamer groups. Tropical agriculture is largely a low-PRODY category, though it is equally distributed across the three PATH categories. Eighty percent of petroleum products are distributed across three cells: MPR_LPA (30 percent), HPR_LPA (20 percent), and MPR_MPA (30 percent). Metals are concentrated in the MPR _HPA (39 percent) and HPR_HPA (20 percent) cells. Machinery and chemicals are mostly in the mid- and high-

PRODY columns, but not exclusively in the high-PATH row, e.g., machinery represents 54 percent of the HPR_LPA cell and 31 percent of all machinery.

Although machinery products are present in all three PATH groups—low, mid, and high—the products in each of the cells mid- and high-PRODY crossed with each of the three PATH categories (six cells) are different. Power generating, metal working, and specialized and general industrial machinery dominate HPR_HPA and HPR_MPH cells. Electronic products, such as office and data processing, telecommunications, and electrical products, dominate the HPR_LPA and MPR_LPA cells.[12]

Metal products, machinery, and chemicals form the core of the product space (see Hidalgo et al. 2007) and will be collectively referred to as "core" products in the rest of the paper. Figure 2 shows that, on average, core products are the most sophisticated (high PRODY) and also provide the highest capabilities to be redeployed to export a large number of other products (high PATH).

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[12] This is not to say that there aren't any electronic products in the other cells. The two cells HPR_LPA and MPR_LPA contain 35 out of the 48 electronic products.

Figure 2: Distribution of Products According to PRODY and PATH
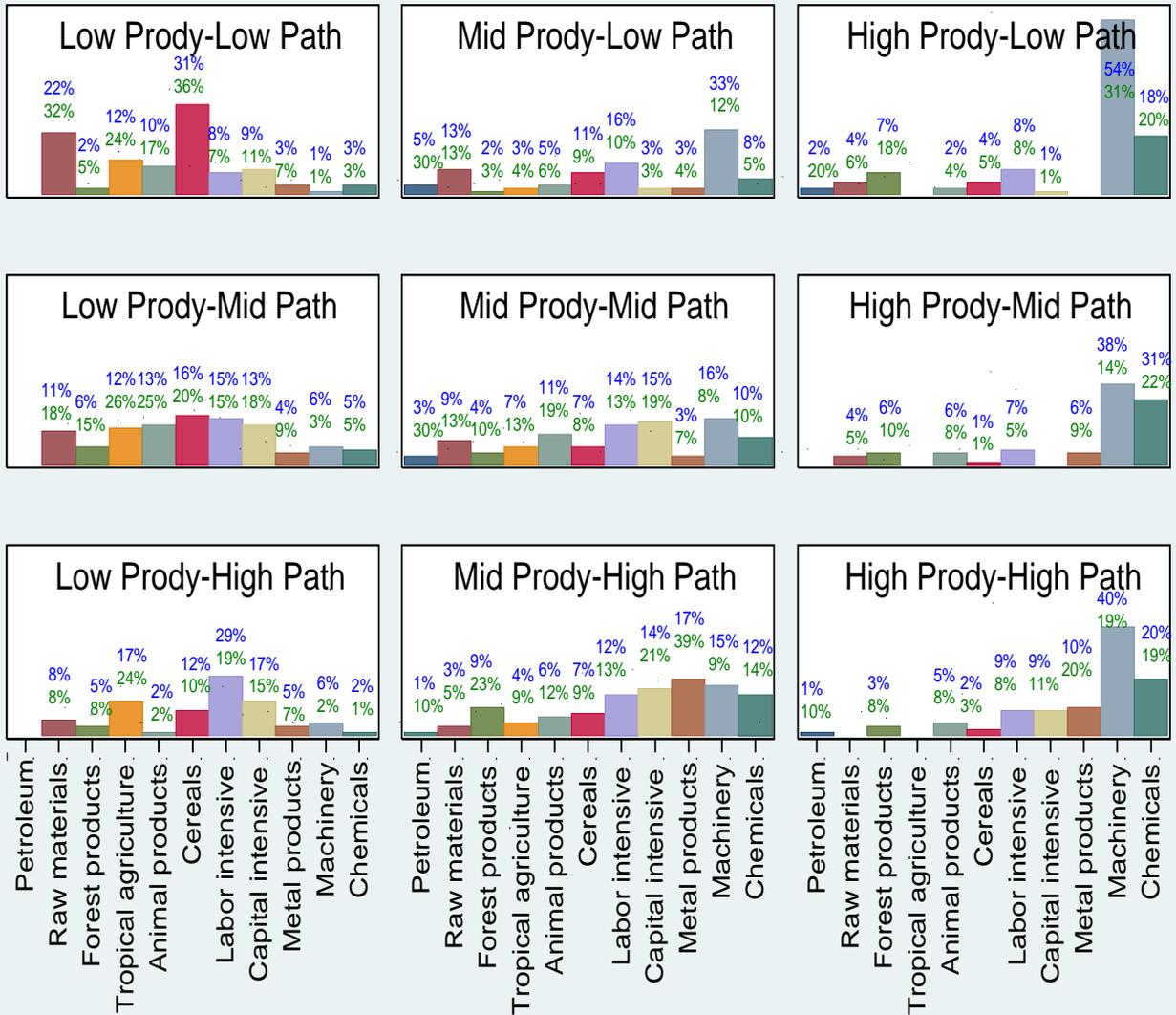
The first number above the bar is the share in the respective Prody-Path group

The second number above the bar is the share in the respective Leamer group

Leamer's Classification

Forest products are equally distributed across the nine cells. Given that PRODY is calculated using GDP per capita, and since some high-income countries such as Canada export forest products, the sophistication level of some these products can come out to be high.

Labor-intensive products are predominantly in four cells—low- and mid-PRODY products crossed with mid- and high-PATH categories. Labor-intensive products in the low-PRODY categories are mainly apparel, footwear, travel goods, and handbag products. Labor-intensive products in the mid-PRODY category are mainly nonmetallic mineral products and miscellaneous manufactures. Some of the nonmetallic minerals are also in the high-PATH cells crossed with high- and mid-PRODY. Lastly, textiles account for the presence of capital-intensive products in the four cells obtained from the cross of mid- and low-PRODY with mid- and high-PATH categories.

3.2 Country Classification

Next, we classify countries according to the kind of the products they export with RCA (an indicator of the kind of capabilities that a country has accumulated). To do so, we calculate for each country the share of products exported with RCA (as percentage of the country's total number of products exported with RCA) that belong to each of the nine cells in table 2. We assign each country to the cell with the largest share.

The LPR_MPH and MPR_HPA cells contain the largest number of countries, 86 and 25, respectively.[13] Closer inspection shows that there is considerable heterogeneity among countries within these two cells. For this reason, we split all countries into two groups according to the share of core commodities exported with RCA in the total number of commodities exported with RCA. "High-core" countries are those where the share of core commodities exported with RCA in the total number of commodities exported with RCA is above 30 percent.[14] "Low-core" countries are those where the share is less than 30 percent. As argued above, "core commodities" are, on average, the

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[13] The number of countries in the other cells is as follows: HPR_HPA, 9; HPR-MPA, 3; HPR_LPA, 2; MPR_MPA, 11; MPR_LPA, 0; LPR_HPA, 5; and LPR_LPA, 13.

[14] Of the 779 commodities at the 4-digit SITC (Rev. 2) level of disaggregation, 41.1 percent (i.e., 320) are core commodities.

most sophisticated and the ones with the highest PATH. Countries that export a significant share of core commodities face very different prospect from those of countries with a low presence in the core. Tables 3 and 4 show the results. Appendix tables 2 and 3 show, for each of the 154 countries, the percentage of products exported with RCA in each of the nine cells (of table 2), the total number of products exported with RCA, and the share of core products in the total number of products exported with RCA . This allows us to classify all 154 countries into four groups.

Table 3 (high-core countries, a total of 62) shows that there are no countries in the LPR_LPA and MPR_LPA cells. This is an expected result because these are high-core countries, i.e., countries where at least 30 percent of the commodities exported with RCA are core commodities. The 34 countries in the HPR_HPA, HPR_MPA, MPR_MPA, and MPR_HPA cells are mostly high-income countries. These countries are well-positioned. The 28 countries in the HPR_LPA (2 countries), LPR_MPA (24 countries), and LPR_HPA (2 countries) cells belong to what we refer to as the "middle product" trap. Countries like China, India, Brazil, Mexico, Russia, Thailand, and Malaysia fall into this group.

Table 4 (low-core countries, a total of 92) shows that there is no single country in the high PRODY column as well as in the MPR_LPA cell. This is to be expected as countries in this table are low core. Many of the oil-rich countries are in this table in the MPR_MPA cell (9 countries). These countries, together with those in the MPR_HPA (5 countries) and in the LPR_HPA (3 countries), also suffer from a "middle-low product" trap.[15] Finally, a large number of low-core countries are in the LPR_LPA and in the LPR_MPA cells (a total of 75 countries), i.e., their exports are concentrated in products with low sophistication and little or average linkages with the other products. These countries are in what we refer to as the "low product" trap. [16]

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[15] By "worse position" we mean from the point of view of structural transformation. The cell MPR_MPA in table 4 for the low-core countries contains relatively rich oil exporters.

[16] This simple criterion is not exempt of problems. While the classification of countries is easy, and in most cases the results were what one would expect *a priori*, it produced several cases difficult to explain. For example, high-income countries, like Australia and Iceland, are classified as LPR_MPA countries (table 4) alongside low-income countries. In contrast, Sierra Leone is classified as a MPR_HPA country along with high-income countries, such as France, the Netherlands, and Spain (table 3).

Collectively, we refer to the countries in the three traps as being in a "bad product" trap, as they mostly export unsophisticated and unconnected products.[17] Escaping the "bad product" trap is not straightforward or automatic. This will require policy interventions to address market failures, many of which are prevalent in developing countries.

Finally, appendix table 3 provides detailed information on 16 countries that we have selected to shed light on why countries are classified in a specific cell, and why they are in the trap. It shows the distribution of the total number of commodities exported with RCA across the nine cells (of table 2) for the 11 Leamer categories. These countries are:

(i) High-core countries in the middle-product trap: Brazil, China, India, Malaysia, and Thailand

All these are relatively advanced countries with a significant presence in core products, although they also export a significant share of not too sophisticated and not too well-connected commodities with comparative advantage.[18] China's presence in machinery is mostly in electrical, office, and data-processing products, as well as telecommunication products. India has significant presence in heavy machinery, and Brazil in heavy machinery and vehicles. Malaysia and Thailand also have a significant presence in core products largely due to the sophisticated goods they export in the machinery sector. However, as shown in appendix table 3, most of these products are low- or mid-PATH products.

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[17] We also tried an alternative classification of countries. In this alternative, we first classify countries according to sophistication (PRODY) and PATH, as above. However, PATH is now defined to include only linkages outside the product's SITC 2-digit code, instead of including linkages to all products (i.e., including those within the same SITC 2-digit code). We find that the distribution of commodities in the nine cells is very similar to the one shown in table 2 (figure 2): 709 out of the 779 products belong to the same cell as in table 2 (figure 2). Also, the classification of countries in tables 3 and 4 does not change.

[18] For detailed studies of China and India, see Felipe et al. (2010) and Felipe, Kumar, and Abdon (2010), respectively.

(ii) Low-core countries in the "low product" trap: Algeria, Australia, Bangladesh, Chile, Nigeria, and Rwanda

Algeria and Nigeria export very few products with RCA, 20 and 28, respectively, and they have very little presence in core products (6 and 4 commodities, respectively). Limited capabilities, as well as a limited presence in core products, indicate that the current economic structure of these two countries presents them with limited opportunities to escape the low-product trap.

Bangladesh and Rwanda are better off, as they export a significantly higher number of products, 81 and 69 products, respectively, with RCA, but only 6 and 12, respectively, are core products; moreover, they do not have a presence in the high-PRODY and high- and mid-PATH categories. Bangladesh's exports are mainly labor-intensive products (in Leamer's classification), 50 percent of which are in the low-PRODY–high-PATH cell. A closer inspection reveals that the high linkage of labor-intensive products (specifically, apparels) is with machinery (specifically, electronics).

Table 3: High-core Countries

HIGH CORE		PRODY				
		Low PRODY (LPR)		Mid PRODY(MPR)		High PRODY (HPR)
PATH	Low PATH (LPA)	———		———		Guinea-Bissau Malaysia
	Mid PATH (MPA)	Armenia Belize Brazil Burundi China Cyprus Gambia Georgia Hong Kong India Israel Jordan Lebanon	Liberia Mexico Niger Panama Philippines Russia Saint Kitts, Nevis and Anguilla Samoa Senegal South Africa Thailand	Malta Republic of Korea		Ireland Japan Singapore
	High PATH (HPA)	Bulgaria Ukraine		Barbados Belarus Belgium Bosnia Herzegovina Canada Costa Rica Croatia Czech Rep. France Hungary Italy	Netherlands Poland Portugal Romania Seychelles Sierra Leone Slovakia Slovenia Spain	Austria Denmark Finland Germany Norway Sweden Switzerland USA United Kingdom

Table 4: Low-core Countries

LOW CORE		PRODY					
		Low PRODY (LPR)				Mid PRODY (MPR)	High PRODY (HPR)
PATH	Low PATH (LPA)	Angola Central African Rep. Chad Congo	Côte d'Ivoire Dem. Rep. of the Congo Ecuador	Equatorial Guinea Guinea Mauritania	Nigeria Papua New Guinea Suriname	―――	―――
	Mid PATH (MPA)	Albania Algeria Argentina Australia Azerbaijan Bangladesh Benin Bolivia Burkina Faso Cambodia Cameroon Chile Djibouti Dominican Rep. Egypt El Salvador Ethiopia	Fiji Gabon Ghana Guyana Haiti Honduras Iceland Indonesia Iran Jamaica Kazakhstan Kenya Kiribati Kyrgyzstan Lao People's Dem. Rep. Lithuania	Madagascar Malawi Mali Mauritius Mongolia Morocco Mozambique Nepal Nicaragua Pakistan Paraguay Peru Rep. of Moldova Rwanda Sri Lanka Sudan Syria	TFYR of Macedonia Tajikistan Togo Tunisia Turkmenistan Uganda United Rep. of Tanzania Uruguay Uzbekistan Viet Nam Yemen Zambia	Bahrain Kuwait Libya Oman Qatar Saudi Arabia Trinidad and Tobago UAE Venezuela	―――
	High PATH (HPA)	China, Macao SAR Guatemala Latvia				Colombia New Estonia Zealand Greece Turkey	―――

Chile has been a regional powerhouse since the end of the nineteenth century and for decades it has had a history of industrial policy. Agosin, Larrain, and Grau (2009) note that the major thrust of the industrial policy framework in Chile is largely "horizontal," designed to resolve economy-wide market failures, improve productivity, and raise the technological content of the existing sector. Although Chile does not have a clear comparative advantage in manufactured goods, the industrial sector helped establish an alternative sector, and the success of the Chilean salmon industry is an example of how industrial policy can be used to resolve various market failures.

Australia is a rich country with a high income per capita. One key reason why Australia, despite its strong tilt towards the primary sector, is a rich country (like some other exporters of primary products) is that, aware of the dangers of specializing in the production of raw materials, long ago it developed a national manufacturing sector, even though it would never be able to compete with the industry of the advanced countries. It was argued that an industrial sector would provide an alternative source of employment and an alternative wage level that would signal that moving production to marginal lands was not profitable. In addition, the industrial sector would help mechanize the production of wool. This, of course, would not have happened without an active government support.

(iii) Low-core countries in the "middle-low product" trap: Saudi Arabia and the United Arab Emirates

Saudi Arabia and the United Arab Emirates (UAE) are, like Algeria and Nigeria, oil exporters. However, the former two countries have a much higher per capita income. One reason is that they have a certain presence in core products (chemicals), although not as significant as that of the middle-product countries. Also, in addition to natural resources, what makes Saudi Arabia and the UAE (and some other oil-rich countries) rich is that they have been able to develop the service sector.

(iv) High-core countries in the HPR_MPA cell: Ireland and Singapore

Both Singapore and Ireland export a significant number of core products with RCA, 37 (43 percent of the total) and 70 (62.5 percent of the total), respectively. Yet, a significant

share of their exports is not in the high-PATH cells. This makes it difficult for them to jump to other, better-connected, and more sophisticated products. The success of Singapore and Ireland must be understood in the context of the role played by industrial policy. For example, Ireland's take off in the 1980s had much to do with the government-led strategy to succeed in the IT sector, adopted under Prime Minister Charles Haughey. In the case of Singapore, industrial development has played a key role in the development of the island state during the last 50 years, and the wide range of capabilities acquired as a result of being a port has allowed it to venture into complex services.

(v) High-core countries in the HPR_HPA cell: Finland

In the 1950s, as much as 40 percent of Finland's employment and output were in the primary sector. The growth strategy adopted in the postwar period relied on government intervention alongside the private sector to set up a strong manufacturing sector. Today, Finland has a significant presence in core products. In the early 1990s, Nokia was a small company getting out of the production of rubber boots and cement for tiles into electronics. Nokia benefited enormously from Finland's industrial policy programs.

4. POLICIES TO ESCAPE THE "BAD PRODUCT" TRAP

The analysis in previous sections has allowed us to classify all 154 countries into four groups, depending on which export category (based on the PATH-PRODY analysis) is the most important one. Accordingly, we propose policies for each of them. Necessarily, the policies discussed are generic and, when made operational, they will have to become country-specific.

A. High-core Countries That Are Exporters of "Good" Products (34 countries)

These are countries (table 3) with a high share of exports of core products, and, moreover, these products are medium-high PRODY and medium-high PATH. Many of these products: (i) are subject increasing returns to scale; (ii) have a high income elasticity of export demand; and (iii) are produced under conditions of imperfect

competition. Our argument is that these countries became rich *because* they learned how to export these types of products. To do this, they had to accumulate more and more of the capabilities that are necessary to master these commodities. This was a path-dependent process that started in the Middle Ages in some cases (e.g., United Kingdom) and supported by a myriad of industrial policy actions, many of which would be illegal today (Chang 2002).[19] These countries need to continue upgrading through R&D and improvements in the quality of their tertiary education.

The next three groups, comprising 120 of the 154 countries that we have analyzed, are in need of different types of policies to move forward. These are the ones that suffer from the "middle" or "low product" traps.

B. High-core Countries in the "Middle Product" Trap (28 countries)

These countries (table 3) are well-positioned to continue doing well. At least 30 percent of the products that they export with RCA are core products. Many of the countries in the so-called middle-income trap are in this group. The policies these countries require are of two types, depending on the cell they lie in:

- Competitiveness policy for the two countries in the LPR_HPA cell: Focus on quality upgrading of the existing products instead of jumps to new products.
- Soft parsimonious industrial policy for the twenty-four countries in the LPR_MPA cell and for the two countries in the HPR_LPA cell:
    - Facilitate horizontal jumps to nearby products.
    - Develop a process whereby government, industry, and cluster-level private organizations can collaborate on interventions that can directly increase productivity.
    - Focus on interventions that deal directly with the coordination problems that keep productivity low in existing or raising sectors (e.g., programs

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[19] See Chang's (2002) analysis of the United Kingdom, the United States, Germany, France, Sweden, Belgium, The Netherlands, Switzerland, Japan, and the NIEs.

and grants to help particular clusters by increasing the supply of skilled workers; encourage technology adoption; improve regulation and infrastructure).

C. Low-core Countries in the "Middle-low Product" Trap (17 countries)

The difference between these countries (table 4) and those in the previous group is a matter of degree. Emphasis in these countries has to be toward increasing the number of core products exported with RCA:

- Hard parsimonious industrial policy:[20]
    - Facilitate horizontal jumps to far away products.
    - Tariff exemptions, subsidies for infrastructure, etc. to develop an industry. Back up all its public input needs plus some subsidies to get the private sector going.

D. Low-core Countries in the "Low-product" Trap (75 countries)

Sadly, most countries in the world lie in this group (table 4).

- Many of the products exported by these countries are nature-made and subject to decreasing returns. Only industrialization can create an effective agricultural sector. None of these countries will ever get rich without an industrial and an advanced service sector.
- In the traditional trap literature (à la Nelson and Myrdal) there were two ways to escape from the low-level equilibrium trap. First, per capita income must be raised, in one go, to the point where the trap would not force income per capita

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[20] These policies have to be consistent with World Trade Organization (WTO) rules. Amsden (2000) and Amsden and Hikino (2000) argue that the new rules of the WTO allow countries to promote their industries, including the manufacturing sector, in particular under the umbrella of advancing science and technology (e.g., by setting up technology parks). Subsidies in exchange for monitorable, results-oriented performance standards are acceptable. Countries can, for example, target national champions. The hurdles that developing countries face are the following: (i) informal political pressures by the developed countries in favor of market opening; (ii) the subjection of countries that make use of WTO rules to promote their industries to "reciprocal control mechanisms"; and (iii) their lack of "vision."

down again to the subsistence level. Second, the growth rate of population must decline (e.g., reduction in the birth rate or emigration), and/or that of national income increase (e.g., through technical progress or capital from abroad). Industrialization greatly increases a country's ability to sustain a large population.

- To a certain extent and under this view, some of these countries may need a "big push," that is, a planned large-scale expansion of a wide range of economic activities and achieve a "critical minimum effort" (investment requirements to raise per capita income to the level beyond which the further growth of per capita income will not be associated with income-depressing forces exceeding income-raising forces).

- The above will not be enough: simply "pumping money" will not help unless a critical mass in an increasing returns sector is created. These countries will need their governments to take "strategic bets" by getting directly involved in the development of new sectors (big leaps). This, however, will be difficult for many countries in this group, as, by definition, they lack the required capabilities, as defined in section 2.

- For this reason, it is imperative that these countries focus their efforts on accumulating new capabilities. This will require: (i) human capital to acquire skills, technology, and knowledge (in many cases, basic management, accounting, and record keeping); (ii) a higher drive to diversify and to increase sophistication by embracing a realistic industrial vision; and (iii) improvement in organizational abilities (e.g., firm-level organization).

Many of the problems that affect countries in groups B, C, and D (in particular those in the last group) above have been studied in the literature from different angles and provide complementary insights to the work on structural transformation developed by Hidalgo et al (2007). For example, Kremer's (1993) O-Ring theory of development is an attempt at explaining the large differences in income between developed and developing countries. Kremer argued that production is often the result of a series of tasks, for example, on an assembly line. These tasks can be performed at different levels of "skills," which refer to

the probability of successfully completing the task. For the final product or service to be successfully made or delivered, every single task must be completed correctly.[21] This implies that the value of each worker's efforts depends on the quality of all other workers' efforts. Kremer's theory explains why workers of similar skills have strong incentives to *match* together, i.e., highly skilled workers will attempt to work with other highly skilled workers, and low-skilled workers with other low-skilled workers. Highly skilled workers complement each other, giving rise to increasing returns to skills and even higher productivity; unskilled workers, when they match together, lower each others' productivity even more.[22]

O-ring effects also exist across firms. Suppose one firm builds roads and another one automobiles. The additional value to drivers of an improvement in the quality of cars most likely will be smaller if the roads happen to be of a poor quality, and vice versa. When tasks are performed sequentially (as in global value chains), highly skilled workers will perform the tasks at the later, more complex stages of production—which explains why poor countries have higher shares of primary output in GDP—and workers will be paid more in industries with high-value inputs. Also, under sequential production, countries with highly skilled workers specialize in products that require expensive intermediate goods, and countries with low-skill workers specialize in primary production. In other words, nothing is natural about the international pattern of specialization: comparative advantage in primary goods, manufactures, and services is itself endogenously determined, or, in the words of Easterly: "Comparative advantage in agriculture and manufactures is itself manufactured" (Easterly 2002: 161). The

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[21] An "o-ring" is a donut-shaped rubber seal. The malfunctioning of one such seal caused the explosion of the Challenger space shuttle in 1986. The shuttle had cost billions of dollars, required the cooperation of hundreds of teams, and combined a considerable number of components. All this joint effort was lost because one seal failed to function properly.

[22] Kremer's (1993) model explains why highly skilled workers, such as surgeons from India or the Philippines, want to migrate to the advanced countries, giving rise to brain drain. They will be much more productive after they have migrated, even though their individual skills remain the same. Migration allows them to match up with the skilled labor force of the developed country.[22] The matching story also offers an explanation of income differences among countries. A small difference in workers' skills leads to a proportionally larger difference in wages and output, so wages and productivity differentials between countries with different skill levels are enormous.

conclusion is that rich and skilled nations will produce "advanced" and "high-value" goods" (or the final stages of a process in a global value chain), while the poor nations will produce raw materials (primary production in general) and "low-value" goods.

Under these circumstances, the rich and skilled nations will produce "advanced" and "high-value" goods" (or the final stages of a process in a global value chain), while the poor nations will produce raw materials (primary production in general) and "low-value" goods. This is also consistent with Lall's (2000a) claim that export structures tend to be *path-dependent* and difficult to change, which has important implications for growth and development. Indeed, trade patterns are much less responsive to changing factor prices than is commonly assumed. Export structures and trade patterns in general are the outcome of a long, cumulative process of learning, agglomeration, increasing returns, institution building, and business culture. This means that the world's pattern of specialization and trade is, fundamentally, *arbitrary*—what each country produces is the result of history, accidents, and past government policies, and it is not dictated by comparative advantage given by tastes, resources, and technology (also, Thirlwall and Pacheco-López 2008).

In related work, Snower (1996) has argued that countries that try to progress by exploiting low labor costs (e.g., by restricting wages or through devaluations) may end up stuck in a vicious circle of low productivity, deficient training, and a lack of skilled jobs, therefore preventing key sectors from competing effectively in the markets for skill-intensive products. This situation is referred to as a "low-skill, bad-job trap." "Bad jobs" are associated with low wages and few opportunities to accumulate human capital. "Good jobs" demand higher skills and command higher wages. Innovating is crucial for developing technological capabilities, but it requires well-trained workers. Economies can get caught in a vicious circle in which firms do not innovate because the labor force is insufficiently skilled, and workers do not have incentives to invest in knowledge because there is no demand for these skills. Snower (1996) argues that the relatively low demand for and supply of skills in a country derives from rational decisions made by both firms and individuals within the particular legal and institutional framework in which they operate. Countries with a less-skilled workforce have greater incentives to produce

nontraded services rather than tradables such as manufactured goods because the former are relatively protected from foreign competition. This pattern of specialization creates and perpetuates the demand for less-skilled labor.

One of the most important consequences of the deficiency in training is that a lack of skilled workers leads to the manufacture and export of relatively poor-quality and low-value products. The manufacture of high-quality products requires highly trained workers. But if the country does not generate enough of these workers, firms will be forced to produce low-quality goods; likewise, workers will acquire little training because few high-quality goods are produced, leading to a vicious circle. The choices made by employers reflect the availability of a skilled workforce. Different outputs require different types of training. Businesspeople aware that their workers are not highly skilled (and thus are more likely to make mistakes) will tend to specialize in the production of low-value products. Thus, the labor force will be more suited to the production of low-value than high-value products. Why can this happen? The reason is that the market does not lead to the best possible outcome because, as explained above, private and social returns to knowledge are different. Individuals are not fully rewarded for the social contribution they make when they invest in knowledge by increasing the stock of knowledge available to everyone. They get no reward for this spillover, and so contributions to social knowledge will be underprovided. In the end, firms' decisions about what type of products to manufacture depend on the availability of skilled labor. The result is that "in countries that offer little support for education and training and that contain a large proportion of unskilled workers, the market mechanism may reinforce the existing lack of skills by providing little incentive to acquire more; whereas in countries with well-functioning educational and training institutions and large bodies of skilled labor, the free market may do much more to induce people to become skilled" (Snower 1996: 112).

Finally, Sutton (2001, 2005) has argued that if two countries differ in their levels of capability, this will be reflected as a difference in their real wage levels. Low wages do not compensate for low quality, with the consequence that the low-quality firms will be excluded from the market. Indeed, one of the most important effects of globalization is

competition in "capability building." This will lead to a shakeout of firms in low-capability countries. Can capabilities be transferred? Maybe yes, but this is a slow, expensive, and painstaking process,[23] and from the point of view of a high-quality producer moving to a low-wage country need not be optimal; first because it operates in an environment where she relies on suppliers of intermediate inputs that probably are not present in the low-wage country and, second, because the firm's capabilities are embodied in the tact knowledge possessed jointly by those individuals who comprise the firm's workforce.

5. CONCLUSIONS: IT'S THE ECONOMIC STRUCTURE…*DUH!*

In this paper we have argued that what sets apart countries is their productive structure and the specific characteristics of the products that they export. These, in turn, depend on the capabilities that the firms possess. Development in this paradigm is a process of generating new activities and letting others disappear. The primary driver of growth is the gradual build-up in firms' capabilities, which raises the economy-wide real wage. Capital accumulation is a complementary effect: the higher real wage makes it profitable for each firm to shift to more capital-intensive techniques. As the firm makes that shift, the rise in its capital-labor ratio further raises the marginal revenue product of labor at the firm level, and so underpins the rising real wage.

Using measures of product sophistication and connectivity, we have shown that not all products are the same. Using the SITC 4-digit level containing 779 products, we have determined that 427 (about 55 percent) are not very sophisticated and/or not well-connected to the other products. This has allowed us to split the 154 countries in our analysis into four groups: (i) a group of 34 countries that export mostly "good" products. These are sophisticated and well-connected products, and in general, are man-made; (ii) a

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[23] Sutton (2005) argues that a good proxy for the cost of transferring a capability is given by counting the number of individuals that are needed to assemble in order to form a sufficient subset of employees who can carry the capability. The important things that must be transferred relate not so much to items that can be successfully reduced to a statement in a manual, but rather to complex and interrelated patterns of working practices that are extremely difficult and time-consuming to unravel and redesign.

group of 28 countries that export a significant share of core products, although not as sophisticated and well-connected as those exported by the countries in the previous group. These countries are in a "middle product" trap; (iii) a group of 17 countries that export few core products. They export products of that are in the middle of the sophistication and connectedness scale. They are in a "middle-low product trap"; and (iv) a large group of 75 countries that mostly export unsophisticated and poorly-connected products. They are in a "low-product" trap. Countries in these two groups specialize in nature-made products, subject to decreasing returns to scale.

The policies that the countries in the last three groups require range from competitiveness and soft parsimonious industrial policy to aggressive policies that lead to the rapid accumulation of relevant capabilities, as well as strategic bets with significant government intervention. Historically, it has been impossible to become a rich country without creating an industrial sector and an advanced service sector. Likewise, historically, no country has become rich without explicit government interventions that amount to industrial policy in different shapes and forms.

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Appendix Table 1: Average PRODY, Average Proximity, and Distribution (percentage of the total number of products) across the Nine Cells in Table 2 for Leamer Categories and for the 2-digit SITC (Rev. 2) Categories

SITC 2-digit	SITC Description	No. of products	Ave. PRODY	Ave. Proximity	HPR_HPA	HPR_MPA	HPR_LPA	MPR_HPA	MPR_MPA	MPR_LPA	LPR_HPA	LPR_MPA	LPR_LPA
PETROLEUM		**10**	**16,352**	**0.118**	**10.0**		**20.0**	**10.0**	**30.0**	**30.0**			
33	Petroleum and petroleum products	10	16,352	0.118	10.0		20.0	10.0	30.0	30.0			
RAW MATERIALS		**62**	**11,228**	**0.142**	**0.0**	**4.8**	**6.5**	**4.8**	**12.9**	**12.9**	**8.1**	**17.7**	**32.3**
27	Crude fertilizer and crude minerals	18	11,650	0.146		11.1	5.6	11.1	16.7	5.6	5.6	22.2	22.2
28	Metalliferous ores	16	7,784	0.118					6.3	18.8	6.3	25.0	43.8
32	Coal	6	11,497	0.128					16.7	33.3			50.0
34	Gas	3	16,362	0.085			33.3			33.3			33.3
35	Electric current	1	9,793	0.202							100.0		
68	Non-ferrous metals	17	13,487	0.155		5.9	11.8	5.9	17.6	5.9	11.8	17.6	23.5
97	Gold, non-monetary	1	4,769	0.122									100.0
FOREST PRODUCTS		**39**	**15,593**	**0.175**	**7.7**	**10.3**	**17.9**	**23.1**	**10.3**	**2.6**	**7.7**	**15.4**	**5.1**
24	Cork and wood	9	10,155	0.145					33.3	11.1		44.4	11.1
25	Pulp and waste paper	6	21,073	0.146		33.3	66.7						
63	Cork and wood, cork manufactures	11	13,186	0.171			18.2	36.4			18.2	18.2	9.1
64	Paper	13	18,867	0.204	23.1	15.4	7.7	38.5	7.7		7.7		
TROPICAL AGRICULTURE		**46**	**8,755**	**0.16**				**8.7**	**13.0**	**4.3**	**23.9**	**26.1**	**23.9**
5	Vegetables and fruit	22	9,042	0.162				4.5	13.6	4.5	27.3	40.9	9.1
6	Sugar	6	8,898	0.169				16.7			50.0	16.7	16.7
7	Coffee	10	5,941	0.134				10.0			10.0	20.0	60.0
11	Beverages	5	11,462	0.169					40.0	20.0	20.0		20.0
23	Crude rubber	3	11,226	0.152				33.3	33.3				33.3
ANIMAL PRODUCTS		**52**	**12,701**	**0.162**	**7.7**	**7.7**	**3.8**	**11.5**	**19.2**	**5.8**	**1.9**	**25.0**	**17.3**
0	Live animals	5	14,448	0.152		20.0	20.0	20.0				20.0	20.0
1	Meat	12	17,872	0.172	16.7	8.3	8.3	16.7	33.3	8.3		8.3	

40

SITC 2-digit	SITC Description	No. of products	Ave. PRODY	Ave. Proximity	HPR_HPA	HPR_MPA	HPR_LPA	MPR_HPA	MPR_MPA	MPR_LPA	LPR_HPA	LPR_MPA	LPR_LPA
2	Dairy products	6	17,661	0.195	33.3	16.7		33.3	16.7				
3	Fish	8	12,230	0.135				25.0	25.0			12.5	37.5
21	Hides, skins	7	8,905	0.145		14.3					14.3	42.9	28.6
29	Crude animal and vegetable materials	9	7,171	0.148					22.2			55.6	22.2
43	Animal and vegetable oils and fats	4	9,642	0.161				25.0	25.0			25.0	25.0
94	Animals, live (nes)	1	4,526	0.140								100.0	
CEREALS		**80**	**9,089**	**0.141**	**2.5**	**1.3**	**5.0**	**8.8**	**7.5**	**8.8**	**10.0**	**20.0**	**36.3**
4	Cereals	16	11,446	0.160			6.3	25.0	18.8		6.3	25.0	18.8
8	Feeds	5	11,413	0.140				20.0		40.0		40.0	
9	Miscellaneous edible products	3	16,452	0.194	33.3			33.3			33.3		
12	Tobacco	6	6,302	0.147							16.7	66.7	16.7
22	Oil seeds	12	6,048	0.112					8.3	8.3	16.7	8.3	58.3
26	Textile fibres	24	8,101	0.126		4.2	4.2	4.2	8.3	8.3	12.5	12.5	45.8
41	Animal oils and fats	2	19,495	0.152			100.0						
42	Fixed vegetable oils and fats	12	7,814	0.119	8.3					16.7		16.7	58.3
LABOR INTENSIVE		**98**	**13,691**	**0.183**	**8.2**	**5.1**	**8.2**	**13.3**	**13.3**	**10.2**	**19.4**	**15.3**	**7.1**
66	Non-metallic mineral	32	16,037	0.183	18.8	12.5	12.5	12.5	15.6	6.3	9.4	9.4	3.1
82	Furniture	3	14,019	0.215				100.0					
83	Travel goods, handbags	1	11,549	0.139									100.0
84	Articles of apparel	28	8,103	0.170					3.6		53.6	32.1	10.7
85	Footwear	1	9,793	0.175							100.0		
89	Miscellaneous manufacture	31	16,277	0.167	6.5	3.2	12.9	19.4	16.1	25.8	3.2	6.5	6.5
93	Special transactions, not classified	1	16,992	0.145					100.0				
96	Coin (other than gold coin)	1	16,680	0.156					100.0				
CAPITAL INTENSIVE		**72**	**12,693**	**0.185**	**11.1**	**0.0**	**1.4**	**20.8**	**19.4**	**2.8**	**15.3**	**18.1**	**11.1**
61	Leather	11	10,405	0.166	9.1			18.2	18.2		9.1	36.4	9.1

SITC 2-digit	SITC Description	No. of products	Ave. PRODY	Ave. Proximity	HPR_HPA	HPR_MPA	HPR_LPA	MPR_HPA	MPR_MPA	MPR_LPA	LPR_HPA	LPR_MPA	LPR_LPA
62	Rubber	9	16,371	0.215	11.1			44.4	33.3		11.1		
65	Textile yarn, fabrics	49	12,316	0.177	10.2		2.0	18.4	18.4	2.0	16.3	18.4	14.3
81	Sanitary fixtures and fittings, nes	3	16,210	0.204	33.3					33.3	33.3		
METALS		**46**	**15,307**	**0.204**	**19.6**	**8.7**	**0.0**	**39.1**	**6.5**	**4.3**	**6.5**	**8.7**	**6.5**
67	Iron and steel	22	14,526	0.197	13.6			45.5	13.6	4.5	9.1	9.1	4.5
69	Manufactures of metals, nes	24	16,023	0.204	25.0	16.7		33.3		4.2	4.2	8.3	8.3
MACHINERY		**180**	**19,745**	**0.19**	**19.4**	**14.4**	**31.1**	**8.9**	**8.3**	**11.7**	**2.2**	**3.3**	**0.6**
71	Power generating	19	20,046	0.179	31.6	10.5	31.6	15.8		10.5			
72	Specialized for particular industries	28	21,157	0.179	17.9	21.4	28.6	17.9	7.1	3.6		3.6	
73	Metalworking	8	21,788	0.183	25.0	50.0	25.0						
74	General industrial	26	21,619	0.208	65.4	19.2	7.7	3.8		3.8			
75	Office and data processing	11	20,980	0.127		9.1	63.6		9.1	18.2			
76	Telecommunications	12	17,610	0.138			33.3			66.7			
77	Electrical	25	18,514	0.169	8.0	4.0	32.0	8.0	20.0	24.0	4.0		
78	Road vehicles	13	16,602	0.190	15.4	15.4	7.7	23.1	15.4	7.7	7.7	7.7	
79	Other transport equipment	16	15,513	0.156	6.3	12.5	12.5	6.3	25.0		6.3	25.0	6.3
87	Professional and scientific instruments	11	21,663	0.163		27.3	63.6	9.1					
88	Photographic equipment	10	22,746	0.117			90.0		10.0				
95	Armoured vehicles, firearms, and ammunition	1	9,641	0.181						100.0			
CHEMICALS		**94**	**19,872**	**0.188**	**19.1**	**22.3**	**20.2**	**13.8**	**9.6**	**5.3**	**1.1**	**5.3**	**3.2**
51	Organic	22	24,464	0.175	13.6	36.4	36.4	4.5	4.5	4.5			
52	Inorganic	11	13,478	0.168	9.1		9.1	9.1	27.3	18.2		9.1	18.2
53	Dyeing and tanning	8	18,677	0.195	25.0	50.0			12.5			12.5	
54	Medicinal and pharmaceutical	7	25,168	0.181	42.9	28.6	28.6						
55	Oils and perfume	6	13,756	0.185			16.7	50.0				33.3	

SITC 2-digit	SITC Description	No. of products	Ave. PRODY	Ave. Proximity	HPR_HPA	HPR_MPA	HPR_LPA	MPR_HPA	MPR_MPA	MPR_LPA	LPR_HPA	LPR_MPA	LPR_LPA
56	Fertilizers	4	10,867	0.151					25.0		25.0	25.0	25.0
57	Explosives	3	14,486	0.152				33.3	33.3	33.3			
58	Artificial resins and plastic	23	21,815	0.183	30.4	26.1	26.1	8.7	4.3	4.3			
59	Chemical materials, nes	10	18,473	0.189	20.0	10.0	10.0	50.0	10.0				

Note: HPR_HPA-High PRODY-High PATH; HPR_MPA-High PRODY-Mid PATH; HPR_LPA-High PRODY-Low PATH; MPR_HPA-Mid PRODY-High PATH; MPR_MPA-Mid PRODY-Mid PATH; MPR_LPA-Mid PRODY-Low PATH LPR_HPA-Low PRODY-High PATH; LPR_MPA-Low PRODY-Mid PATH; LPR_LPA-Low PRODY-Low PATH.

Appendix Table 2: Distribution of Exports across the Nine Cells: High-core Countries

	HPR_ HPA (%)	HPR_ MPA (%)	HPR_ LPA (%)	MPR_ HPA (%)	MPR_ MPA (%)	MPR_ LPA (%)	LPR_ HPA (%)	LPR_ MPA (%)	LPR_ LPA (%)	RCA_ total	share_ core (%)
Armenia	11.6	7.4	7.4	17.4	9.1	4.1	11.6	19.8	11.6	121	37.2
Austria	25.5	14.3	6.2	23.9	8.5	3.1	10.0	6.6	1.9	259	53.7
Barbados	12.5	3.9	13.3	19.5	12.5	9.4	10.2	11.7	7.0	128	39.8
Belarus	17.8	3.3	2.6	29.0	13.2	4.6	17.8	9.2	2.6	152	32.9
Belgium	18.4	11.5	6.8	22.3	13.3	4.3	9.7	9.4	4.3	278	42.1
Belize	10.8	11.8	5.4	14.0	9.7	6.5	8.6	21.5	11.8	93	35.5
Bosnia and Herzegovina	9.0	3.0	3.6	24.0	13.8	1.8	19.8	18.6	6.6	167	32.3
Brazil	8.0	5.5	8.0	16.9	13.4	4.5	9.5	17.4	16.9	201	38.8
Bulgaria	10.3	3.4	3.9	20.6	11.2	1.7	21.9	21.9	5.2	233	31.8
Burundi	8.9	6.3	3.8	16.5	10.1	3.8	10.1	20.3	20.3	79	39.2
Canada	13.2	7.8	9.3	22.0	15.1	5.4	6.3	13.2	7.8	205	29.8
China	6.6	4.7	9.3	13.6	11.2	13.2	14.3	17.4	9.7	258	35.7
Hong Kong, China	3.8	6.5	12.4	11.3	14.0	15.6	11.3	15.6	9.7	186	34.9
Costa Rica	1.1	3.2	5.3	25.3	10.5	6.3	15.8	20.0	12.6	95	29.5
Croatia	17.0	3.6	4.9	23.2	11.6	1.3	19.6	15.6	3.1	224	35.3
Cyprus	12.2	7.4	7.4	11.1	13.8	4.8	15.3	16.9	11.1	189	34.4
Czech Rep.	19.5	11.9	4.3	24.9	11.9	5.4	13.0	7.6	1.4	277	48.0
Denmark	23.7	11.4	8.3	21.1	11.8	4.4	7.9	8.8	2.6	228	46.5
Finland	26.7	14.0	13.4	16.3	11.1	2.3	7.6	6.4	2.3	172	59.3
France	19.8	10.8	10.8	23.3	12.7	2.2	8.6	8.6	3.2	314	51.0
Gambia	7.8	3.9	11.7	9.1	10.4	6.5	9.1	23.4	18.2	77	32.5
Georgia	4.4	3.6	8.0	9.4	15.9	8.0	14.5	22.5	13.8	138	34.8
Germany	24.3	16.3	12.8	21.4	11.3	4.2	5.6	3.0	1.2	337	62.6
Guinea-Bissau	4.0	5.0	18.8	11.9	5.0	8.9	15.8	16.8	13.9	101	45.5
Hungary	17.4	4.4	9.2	25.0	11.4	6.0	14.7	9.2	2.7	184	41.8
India	7.4	6.2	5.0	12.4	12.0	3.5	14.0	22.9	16.7	258	31.8
Ireland	11.6	12.8	24.4	10.5	11.6	8.1	4.7	9.3	7.0	86	43.0
Israel	11.7	11.0	14.1	13.5	11.0	4.9	8.6	16.6	8.6	163	50.3
Italy	20.7	11.6	6.7	21.3	10.1	3.1	11.6	11.3	3.7	328	49.7
Japan	19.4	18.4	22.9	11.4	11.0	9.0	3.0	3.0	2.0	201	75.1
Jordan	4.0	3.3	4.6	22.5	15.9	4.0	15.9	22.5	7.3	151	31.1
Lebanon	8.6	4.8	6.7	19.1	10.0	6.2	13.3	21.4	10.0	210	30.0
Liberia	10.3	3.5	0.0	3.5	13.8	6.9	13.8	20.7	27.6	29	41.4
Malaysia	4.7	1.9	19.8	11.3	11.3	17.9	7.6	11.3	14.2	106	46.2
Malta	8.2	6.9	16.4	17.8	17.8	9.6	8.2	8.2	6.9	73	47.9
Mexico	10.7	7.3	12.7	14.0	9.3	8.0	15.3	19.3	3.3	150	52.0
Netherlands	13.5	12.2	15.1	18.5	12.2	4.2	5.9	10.5	8.0	238	44.1
Niger	5.6	4.4	4.4	11.1	8.9	7.8	6.7	26.7	24.4	90	34.4

	HPR_ HPA (%)	HPR_ MPA (%)	HPR_ LPA (%)	MPR_ HPA (%)	MPR_ MPA (%)	MPR _LPA (%)	LPR_ HPA (%)	LPR_ MPA (%)	LPR_ LPA (%)	RCA_ total	share_ core (%)
Norway	16.8	10.5	14.7	11.6	16.8	6.3	5.3	9.5	8.4	95	46.3
Panama	5.2	3.3	6.5	13.1	13.7	13.1	13.1	22.2	9.8	153	30.7
Philippines	3.0	3.0	14.9	6.9	6.9	12.9	14.9	24.8	12.9	101	34.7
Poland	18.7	4.9	3.4	24.7	10.1	4.9	18.7	12.4	2.3	267	34.8
Portugal	12.4	6.2	6.2	23.0	9.6	4.3	19.1	13.4	5.7	209	31.1
Rep. of Korea	13.5	10.1	12.2	18.2	18.9	9.5	6.1	8.1	3.4	148	56.8
Romania	11.0	3.4	3.4	22.0	9.1	3.4	19.6	21.1	7.2	209	35.9
Russian Federation	3.8	5.7	8.6	13.3	15.2	11.4	8.6	15.2	18.1	105	41.0
Saint Kitts, Nevis and Anguilla	9.5	4.7	6.1	10.8	17.6	8.1	10.8	22.3	10.1	148	40.5
Samoa	5.2	5.2	17.2	6.9	13.8	10.3	12.1	19.0	10.3	58	37.9
Senegal	4.3	5.5	4.9	15.2	10.4	4.9	12.2	28.7	14.0	164	31.1
Seychelles	4.4	6.7	11.1	17.8	6.7	13.3	8.9	15.6	15.6	45	40.0
Sierra Leone	15.0	7.5	3.3	18.3	10.8	6.7	9.2	14.2	15.0	120	37.5
Singapore	10.7	14.3	28.6	7.1	11.6	9.8	1.8	8.0	8.0	112	62.5
Slovakia	20.3	7.0	1.6	34.2	9.1	3.2	12.8	10.2	1.6	187	43.9
Slovenia	22.6	11.1	4.5	26.3	9.1	2.5	12.4	9.5	2.1	243	48.6
South Africa	6.3	4.3	4.3	18.8	13.0	7.7	10.1	21.2	14.4	208	31.3
Spain	19.2	9.6	5.6	23.2	11.9	4.3	10.9	11.3	4.0	302	41.1
Sweden	23.4	12.9	15.9	21.4	11.0	4.5	6.5	3.0	1.5	201	59.2
Switzerland	22.8	17.5	16.5	15.1	7.8	3.9	6.8	6.8	2.9	206	64.6
Thailand	7.4	2.0	9.4	18.3	14.9	9.9	11.4	18.3	8.4	202	34.7
USA	20.0	13.1	18.4	15.6	10.0	5.0	5.0	9.4	3.4	320	56.9
Ukraine	9.4	3.7	3.7	17.8	16.2	6.3	17.8	15.7	9.4	191	37.2
United Kingdom	18.6	14.1	17.3	18.2	12.5	4.0	6.5	4.0	4.8	248	56.9

Note: Numbers reported in the first nine columns are the share of each of the nine cells of table 2 in the total number of products exported with RCA (Also see note to appendix table 1). RCA_total is the total number of products exported with RCA by each country. share_core is the share of the number of core products exported with RCA in the total number of products exported with RCA.

Appendix Table 2. Distribution of Exports across the Nine Cells: Low-core Countries

	HPR_ HPA (%)	HPR_ MPA (%)	HPR_ LPA (%)	MPR _HPA (%)	MPR_ MPA (%)	MPR_ LPA (%)	LPR_ HPA (%)	LPR_ MPA (%)	LPR_ LPA (%)	RCA_ total	share_ core (%)
Albania	7.3	2.4	4.2	14.6	9.7	3.6	18.8	33.3	6.1	165	22.4
Algeria	0.0	0.0	10.0	5.0	30.0	5.0	5.0	30.0	15.0	20	30.0
Angola	14.3	0.0	28.6	0.0	14.3	14.3	0.0	14.3	14.3	7	0.0
Argentina	6.4	2.9	7.0	21.6	12.9	5.3	9.9	21.6	12.3	171	25.1
Australia	2.9	5.0	6.4	10.7	18.6	7.1	7.1	22.9	19.3	140	15.0
Azerbaijan	1.5	4.4	10.1	1.5	11.6	4.4	14.5	33.3	18.8	69	23.2
Bahrain	4.3	6.4	8.5	21.3	18.1	6.4	11.7	13.8	9.6	94	30.8
Bangladesh	0.0	0.0	0.0	3.7	11.1	2.5	28.4	37.0	17.3	81	7.4
Benin	3.3	1.1	2.2	8.8	11.0	2.2	13.2	36.3	22.0	91	22.0
Bolivia	3.5	1.2	5.8	5.8	9.2	2.3	9.2	40.2	23.0	87	17.2
Burkina Faso	5.2	0.0	0.0	13.0	11.7	3.9	13.0	32.5	20.8	77	22.1
Cambodia	0.0	1.4	0.0	5.6	9.7	5.6	26.4	38.9	12.5	72	12.5
Cameroon	0.0	0.0	0.0	4.1	6.1	4.1	14.3	40.8	30.6	49	10.2
Central African Rep.	2.1	8.5	2.1	17.0	8.5	2.1	10.6	21.3	27.7	47	23.4
Chad	6.7	0.0	13.3	13.3	13.3	13.3	13.3	6.7	20.0	15	26.7
Chile	2.8	0.9	9.2	14.7	16.5	6.4	15.6	22.0	11.9	109	15.6
China, Macao SAR	5.6	2.8	7.0	9.9	11.3	8.5	25.4	22.5	7.0	71	15.5
Colombia	6.1	3.4	2.7	21.6	13.5	3.4	18.2	18.2	12.8	148	20.9
Congo	0.0	3.3	6.7	0.0	0.0	13.3	10.0	26.7	40.0	30	6.7
Côte d'Ivoire	2.5	0.0	3.7	11.1	3.7	4.9	16.1	27.2	30.9	81	18.5
Dem. Rep. of the Congo	4.4	2.2	2.2	2.2	4.4	8.9	6.7	28.9	40.0	45	17.8
Djibouti	7.9	5.0	3.6	17.9	6.4	5.0	11.4	25.7	17.1	140	27.1
Dominican Rep.	5.1	5.1	4.3	12.8	8.6	1.7	19.7	29.9	12.8	117	20.5
Ecuador	2.6	1.3	3.9	9.1	10.4	6.5	16.9	24.7	24.7	77	11.7
Egypt	4.5	2.3	2.3	18.0	12.9	4.5	18.5	25.8	11.2	178	24.2
El Salvador	2.5	2.5	4.1	24.0	9.1	3.3	22.3	24.8	7.4	121	22.3
Equatorial Guinea	0.0	0.0	28.6	0.0	0.0	14.3	14.3	14.3	28.6	7	14.3
Estonia	14.4	4.6	6.7	19.5	9.7	5.6	15.9	14.4	9.2	195	27.7
Ethiopia	2.0	0.0	4.0	8.0	10.0	4.0	13.0	35.0	24.0	100	9.0
Fiji	2.5	2.5	3.3	10.7	10.7	6.6	21.3	30.3	12.3	122	15.6
Gabon	0.0	4.2	8.3	0.0	8.3	8.3	20.8	29.2	20.8	24	20.8
Ghana	0.9	1.8	1.8	12.4	8.9	2.7	15.9	30.1	25.7	113	16.8
Greece	11.2	3.0	1.3	21.0	12.5	5.2	16.7	20.2	9.0	233	26.6
Guatemala	2.7	2.7	0.7	23.2	8.0	1.3	24.5	23.8	13.3	151	15.9
Guinea	0.0	0.0	2.1	10.4	10.4	8.3	8.3	22.9	37.5	48	20.8
Guyana	3.9	2.6	2.6	11.7	11.7	6.5	13.0	27.3	20.8	77	23.4
Haiti	0.0	1.5	1.5	7.6	7.6	4.6	24.2	37.9	15.2	66	10.6
Honduras	0.0	3.8	1.9	13.2	7.6	0.9	19.8	35.9	17.0	106	12.3

	HPR_HPA (%)	HPR_MPA (%)	HPR_LPA (%)	MPR_HPA (%)	MPR_MPA (%)	MPR_LPA (%)	LPR_HPA (%)	LPR_MPA (%)	LPR_LPA (%)	RCA_total	share_core (%)
Iceland	9.4	9.4	9.4	1.6	17.2	12.5	3.1	23.4	14.1	64	25.0
Indonesia	4.0	5.8	5.8	12.6	12.6	8.5	13.9	20.2	16.6	223	21.1
Iran	0.0	2.6	6.5	7.8	20.8	6.5	7.8	27.3	20.8	77	11.7
Jamaica	3.4	6.8	5.1	6.8	17.0	6.8	13.6	27.1	13.6	59	22.0
Kazakhstan	5.4	0.0	3.3	8.7	16.3	9.8	6.5	25.0	25.0	92	27.2
Kenya	1.2	2.4	3.0	18.3	9.5	3.6	14.8	30.2	17.2	169	16.6
Kiribati	1.8	3.6	3.6	7.1	17.9	8.9	10.7	32.1	14.3	56	23.2
Kuwait	8.3	8.3	20.8	8.3	20.8	12.5	4.2	8.3	8.3	24	25.0
Kyrgyzstan	4.3	3.1	4.9	12.8	12.2	3.1	21.3	26.2	12.2	164	23.2
Lao People's Dem. Rep.	3.2	1.1	1.1	5.4	12.9	1.1	19.4	35.5	20.4	93	12.9
Latvia	12.8	5.9	3.7	19.6	10.5	5.5	21.0	16.9	4.1	219	25.6
Libya	5.0	5.0	15.0	0.0	30.0	15.0	5.0	5.0	20.0	20	50.0
Lithuania	9.8	4.0	3.6	20.5	13.8	4.0	18.8	21.4	4.0	224	27.7
Madagascar	0.0	0.0	6.7	9.6	7.7	4.8	18.3	38.5	14.4	104	12.5
Malawi	3.7	1.2	0.0	6.1	11.0	3.7	23.2	37.8	13.4	82	19.5
Mali	4.1	6.8	2.7	8.1	12.2	5.4	5.4	31.1	24.3	74	28.4
Mauritania	3.6	0.0	3.6	0.0	14.3	17.9	0.0	21.4	39.3	28	10.7
Mauritius	5.1	3.4	7.6	11.0	7.6	11.0	16.1	27.1	11.0	118	24.6
Mongolia	1.9	1.0	2.9	6.8	16.5	2.9	23.3	30.1	14.6	103	12.6
Morocco	3.9	0.0	4.6	6.9	11.5	7.7	22.3	35.4	7.7	130	10.8
Mozambique	5.1	4.1	2.0	5.1	13.3	5.1	8.2	31.6	25.5	98	21.4
Nepal	2.4	3.5	3.5	19.4	9.4	4.1	20.6	24.1	12.9	170	18.8
New Zealand	10.6	5.6	8.1	19.9	13.0	5.6	11.8	17.4	8.1	161	23.0
Nicaragua	3.0	1.0	3.0	7.1	8.1	4.0	23.2	34.3	16.2	99	10.1
Nigeria	0.0	0.0	3.6	3.6	7.1	7.1	3.6	35.7	39.3	28	14.3
Oman	6.7	4.4	2.2	17.8	22.2	6.7	8.9	20.0	11.1	45	24.4
Pakistan	2.0	0.7	2.0	9.5	12.2	4.7	20.3	35.1	13.5	148	9.5
Papua New Guinea	0.0	0.0	2.0	2.0	12.2	10.2	8.2	32.7	32.7	49	8.2
Paraguay	1.1	1.1	3.2	13.8	6.4	2.1	13.8	36.2	22.3	94	10.6
Peru	1.5	3.8	3.0	12.0	15.0	5.3	14.3	27.8	17.3	133	18.0
Qatar	3.5	10.3	31.0	6.9	10.3	17.2	13.8	3.5	3.5	29	51.7
Rep. of Moldova	9.4	3.4	3.4	12.8	10.7	3.4	23.5	27.5	6.0	149	23.5
Rwanda	1.5	2.9	4.4	8.7	14.5	7.3	10.1	33.3	17.4	69	27.5
Saudi Arabia	3.6	10.7	14.3	12.5	19.6	10.7	8.9	10.7	8.9	56	30.4
Sri Lanka	2.3	3.0	1.5	11.4	9.1	5.3	20.5	28.0	18.9	132	9.1
Sudan	2.0	0.0	6.1	2.0	8.2	4.1	4.1	42.9	30.6	49	16.3
Suriname	2.4	4.9	0.0	2.4	17.1	7.3	2.4	31.7	31.7	41	19.5
Syria	2.7	0.7	4.1	14.2	13.5	4.1	19.6	27.0	14.2	148	11.5
Tajikistan	3.0	0.0	6.0	11.9	10.5	4.5	14.9	35.8	13.4	67	22.4
TFYR of Macedonia	6.5	0.0	0.7	18.2	11.7	2.0	26.0	28.6	6.5	154	22.1

	HPR_HPA (%)	HPR_MPA (%)	HPR_LPA (%)	MPR_HPA (%)	MPR_MPA (%)	MPR_LPA (%)	LPR_HPA (%)	LPR_MPA (%)	LPR_LPA (%)	RCA_total	share_core (%)
Togo	2.1	1.4	1.4	19.9	9.2	3.6	19.2	26.2	17.0	141	22.0
Trinidad and Tobago	5.8	3.9	7.7	13.5	19.2	13.5	15.4	13.5	7.7	52	34.6
Tunisia	2.0	2.6	4.6	16.5	9.2	5.3	25.0	27.6	7.2	152	23.7
Turkey	7.6	2.1	0.8	28.3	11.8	3.0	18.6	21.5	6.3	237	26.6
Turkmenistan	0.0	0.0	2.5	5.0	10.0	2.5	12.5	42.5	25.0	40	15.0
Uganda	2.9	3.7	1.5	13.2	7.4	5.2	12.5	31.6	22.1	136	26.5
United Arab Emirates	1.6	3.3	13.1	14.8	18.0	8.2	14.8	13.1	13.1	61	26.2
United Rep. of Tanzania	3.8	2.5	3.8	4.4	12.0	4.4	10.7	35.9	22.6	159	16.4
Uruguay	6.0	4.7	8.7	15.3	16.7	4.7	10.7	20.7	12.7	150	24.7
Uzbekistan	4.8	2.4	2.4	7.2	14.5	2.4	13.3	31.3	21.7	83	21.7
Venezuela	1.7	5.1	8.5	11.9	20.3	6.8	13.6	15.3	17.0	59	33.9
Viet Nam	2.5	0.0	3.8	10.1	10.7	6.9	21.4	22.6	22.0	159	13.8
Yemen	1.4	2.8	4.2	2.8	14.1	11.3	8.5	35.2	19.7	71	18.3
Zambia	6.3	3.2	4.2	13.7	9.5	6.3	9.5	29.5	17.9	95	18.9

Note: Numbers reported in the first nine columns are the share of each of the nine cells of table 2 in the total number of products exported with RCA (also see note to appendix table 1). RCA_total is the total number of products exported with RCA by each country. share_core is the share of the number of core products exported with RCA in the total number of products exported with RCA.

Appendix Table 3: Distribution of Products across the Nine Cells: Selected Countries (based on averaged RCA for the years 2003 to 2007)

	RCA>1	HPR_HPA	HPR_MPA	HPR_LPA	MPR_HPA	MPR_MPA	MPR_LPA	LPR_HPA	LPR_MPA	LPR_LPA
BRAZIL	**201**	**8.0**	**5.5**	**8.0**	**16.9**	**13.4**	**4.5**	**9.5**	**17.4**	**16.9**
PETROLEUM										
RAW MATERIALS	**15**		6.7	6.7	6.7	6.7	13.3		20.0	40.0
FOREST PRODUCTS	**18**	5.6	11.1	11.1	22.2	11.1		16.7	16.7	5.6
TROPICAL AGRICULTURE	**20**					15.0	5.0	20.0	35.0	25.0
ANIMAL PRODUCTS	**16**	12.5		6.3	12.5	31.3			18.8	18.8
CEREALS	**26**		3.8			3.8	3.8	7.7	26.9	53.8
LABOR INTENSIVE	**12**	16.7	8.3	8.3	25.0	16.7		8.3	16.7	
CAPITAL INTENSIVE	**16**				18.8	25.0		31.3	6.3	18.8
METALS	**18**				33.3	16.7	11.1	16.7	16.7	5.6
MACHINERY	**37**	18.9	16.2	18.9	24.3	5.4	8.1		5.4	2.7
CHEMICALS	**23**	17.4		17.4	26.1	17.4		4.3	17.4	
CHINA	**258**	**6.6**	**4.7**	**9.3**	**13.6**	**11.2**	**13.2**	**14.3**	**17.4**	**9.7**
PETROLEUM	**2**				50.0		50.0			
RAW MATERIALS	**11**		9.1		9.1			9.1	36.4	36.4
FOREST PRODUCTS	**7**	14.3			28.6			14.3	28.6	14.3
TROPICAL AGRICULTURE	**11**				9.1			36.4	45.5	9.1
ANIMAL PRODUCTS	**10**				10.0	30.0	10.0		40.0	10.0
CEREALS	**8**							25.0	12.5	62.5
LABOR INTENSIVE	**69**	2.9	5.8	1.4	14.5	11.6	13.0	23.2	18.8	8.7
CAPITAL INTENSIVE	**48**	6.3			18.8	16.7	2.1	22.9	22.9	10.4
METALS	**19**	36.8	10.5		15.8	5.3	5.3	5.3	15.8	5.3
MACHINERY	**55**	1.8	3.6	40.0	7.3	12.7	30.9	1.8	1.8	
CHEMICALS	**18**	16.7	16.7	5.6	16.7	11.1	22.2		5.6	5.6
INDIA	**258**	**7.4**	**6.2**	**5.0**	**12.4**	**12.0**	**3.5**	**14.0**	**22.9**	**16.7**
PETROLEUM	**1**					100.0				
RAW MATERIALS	**27**		3.7	3.7	3.7	18.5	14.8	3.7	22.2	29.6
FOREST PRODUCTS	**2**							50.0	50.0	
TROPICAL AGRICULTURE	**17**				5.9			41.2	35.3	17.6
ANIMAL PRODUCTS	**13**	7.7			7.7	23.1	7.7		23.1	30.8
CEREALS	**31**				3.2	6.5		9.7	38.7	41.9
LABOR INTENSIVE	**40**		5.0	2.5	7.5	12.5	2.5	30.0	30.0	10.0
CAPITAL INTENSIVE	**45**	2.2			20.0	11.1		22.2	26.7	17.8
METALS	**23**	17.4			39.1	13.0		8.7	13.0	8.7
MACHINERY	**25**	24.0	12.0	16.0	12.0	16.0	8.0		8.0	4.0
CHEMICALS	**34**	20.6	29.4	20.6	11.8	8.8	2.9		5.9	
MALAYSIA	**106**	**4.7**	**1.9**	**19.8**	**11.3**	**11.3**	**17.9**	**7.5**	**11.3**	**14.2**
PETROLEUM	**1**				100.0					

	RCA>1	HPR_HPA	HPR_MPA	HPR_LPA	MPR_HPA	MPR_MPA	MPR_LPA	LPR_HPA	LPR_MPA	LPR_LPA
RAW MATERIALS	7			14.3		14.3	14.3	14.3		42.9
FOREST PRODUCTS	9				11.1			22.2	44.4	22.2
TROPICAL AGRICULTURE	6				16.7			16.7	16.7	50.0
ANIMAL PRODUCTS	9				33.3	22.2			33.3	11.1
CEREALS	10						10.0	10.0	30.0	50.0
LABOR INTENSIVE	12	8.3		16.7	25.0	25.0		16.7		8.3
CAPITAL INTENSIVE	3				66.7	33.3				
METALS	4	25.0			25.0		25.0	25.0		
MACHINERY	37		2.7	43.2		13.5	40.5			
CHEMICALS	8	37.5	12.5	25.0			12.5		12.5	
THAILAND	**202**	**7.4**	**2.0**	**9.4**	**18.3**	**14.9**	**9.9**	**11.4**	**18.3**	**8.4**
PETROLEUM	4			25.0		50.0	25.0			
RAW MATERIALS	6					16.7		16.7	16.7	50.0
FOREST PRODUCTS	7	14.3			42.9	14.3			28.6	
TROPICAL AGRICULTURE	16				6.3	6.3		37.5	37.5	12.5
ANIMAL PRODUCTS	16				12.5	31.3	12.5		25.0	18.8
CEREALS	18		5.6		16.7	11.1		16.7	27.8	22.2
LABOR INTENSIVE	32	6.3			15.6	6.3	12.5	15.6	37.5	6.3
CAPITAL INTENSIVE	33				33.3	21.2		24.2	15.2	6.1
METALS	8	25.0			50.0				12.5	12.5
MACHINERY	47	12.8	2.1	31.9	10.6	12.8	27.7		2.1	
CHEMICALS	15	26.7	13.3	20.0	20.0	20.0				
ALGERIA	**20**			**10.0**	**5.0**	**30.0**	**5.0**	**5.0**	**30.0**	**15.0**
PETROLEUM	2					50.0	50.0			
RAW MATERIALS	6			16.7		16.7		16.7	16.7	33.3
FOREST PRODUCTS	1			100.0						
TROPICAL AGRICULTURE	1								100.0	
ANIMAL PRODUCTS	1									100.0
CEREALS	1								100.0	
LABOR INTENSIVE	1					100.0				
CAPITAL INTENSIVE METALS	1								100.0	
MACHINERY	1								100.0	
CHEMICALS	5				20.0	60.0			20.0	
NIGERIA	**28**			**3.6**	**3.6**	**7.1**	**7.1**	**3.6**	**35.7**	**39.3**
PETROLEUM	1						100.0			
RAW MATERIALS	3			33.3			33.3			33.3
FOREST PRODUCTS	2								100.0	
TROPICAL AGRICULTURE	6								50.0	50.0

	RCA>1	HPR_HPA	HPR_MPA	HPR_LPA	MPR_HPA	MPR_MPA	MPR_LPA	LPR_HPA	LPR_MPA	LPR_LPA
ANIMAL PRODUCTS	4								25.0	75.0
CEREALS	5							20.0	20.0	60.0
LABOR INTENSIVE										
CAPITAL INTENSIVE	3				33.3			66.7		
METALS										
MACHINERY	4					50.0			25.0	25.0
CHEMICALS										
BANGLADESH	**81**				**3.7**	**11.1**	**2.5**	**28.4**	**37.0**	**17.3**
PETROLEUM										
RAW MATERIALS										
FOREST PRODUCTS	1							100.0		
TROPICAL AGRICULTURE	4							50.0	25.0	25.0
ANIMAL PRODUCTS	9					22.2	11.1		33.3	33.3
CEREALS	16				6.3		6.3		50.0	37.5
LABOR INTENSIVE	27					7.4		51.9	37.0	3.7
CAPITAL INTENSIVE	18				5.6	11.1		27.8	38.9	16.7
METALS										
MACHINERY	4				25.0	25.0		25.0	25.0	
CHEMICALS	2					100.0				
RWANDA	**69**	**1.4**	**2.9**	**4.3**	**8.7**	**14.5**	**7.2**	**10.1**	**33.3**	**17.4**
PETROLEUM	2					0.0	100.0			
RAW MATERIALS	11					18.2		9.1	27.3	45.5
FOREST PRODUCTS	2			50.0		0.0			50.0	
TROPICAL AGRICULTURE	6					16.7		16.7	33.3	33.3
ANIMAL PRODUCTS	11					9.1		9.1	54.5	27.3
CEREALS	7							14.3	71.4	14.3
LABOR INTENSIVE	7			14.3	14.3	28.6			42.9	
CAPITAL INTENSIVE	4							25.0	75.0	
METALS	5				60.0	40.0				
MACHINERY	7	14.3	14.3		14.3	14.3	28.6	14.3		
CHEMICALS	7		14.3	14.3	14.3	14.3	14.3	14.3		14.3
AUSTRALIA	**140**	**2.9**	**5.0**	**6.4**	**10.7**	**18.6**	**7.1**	**7.1**	**22.9**	**19.3**
PETROLEUM										
RAW MATERIALS	38		2.6	5.3	2.6	15.8	10.5	7.9	21.1	34.2
FOREST PRODUCTS	4		50.0		25.0	25.0				
TROPICAL AGRICULTURE	12				8.3	8.3		16.7	50.0	16.7
ANIMAL PRODUCTS	28	7.1	3.6	7.1	3.6	28.6	3.6	3.6	25.0	17.9
CEREALS	27			11.1	14.8	11.1	11.1	11.1	18.5	22.2
LABOR INTENSIVE	5		20.0	20.0		40.0			20.0	
CAPITAL INTENSIVE	5				20.0	20.0		20.0	40.0	

	RCA>1	HPR_HPA	HPR_MPA	HPR_LPA	MPR_HPA	MPR_MPA	MPR_LPA	LPR_HPA	LPR_MPA	LPR_LPA
METALS	5	20.0			40.0		20.0		20.0	
MACHINERY	4			25.0	50.0	25.0				
CHEMICALS	12	8.3	16.7		16.7	25.0	8.3		16.7	8.3
CHILE	**109**	**2.8**	**0.9**	**9.2**	**14.7**	**16.5**	**6.4**	**15.6**	**22.0**	**11.9**
PETROLEUM										
RAW MATERIALS	18					5.6	11.1	11.1	33.3	38.9
FOREST PRODUCTS	20	5.0	5.0	20.0	25.0	10.0		15.0	15.0	5.0
TROPICAL AGRICULTURE	16				6.3	12.5		37.5	37.5	6.3
ANIMAL PRODUCTS	21	4.8		4.8	4.8	28.6	14.3		28.6	14.3
CEREALS	11			36.4	27.3	9.1	9.1	9.1	9.1	
LABOR INTENSIVE	2					50.0		50.0		
CAPITAL INTENSIVE	4				25.0	25.0		50.0		
METALS	3				33.3			33.3	33.3	
MACHINERY										
CHEMICALS	14	7.1		7.1	28.6	28.6	7.1	7.1	7.1	7.1
SAUDI ARABIA	**56**	**3.6**	**10.7**	**14.3**	**12.5**	**19.6**	**10.7**	**8.9**	**10.7**	**8.9**
PETROLEUM	7			28.6	14.3	28.6	28.6			
RAW MATERIALS	8		25.0	25.0		12.5	12.5	12.5	12.5	
FOREST PRODUCTS	2	50.0			50.0					
TROPICAL AGRICULTURE	3					33.3		33.3	33.3	
ANIMAL PRODUCTS	6				33.3	16.7				50.0
CEREALS	3							33.3	33.3	33.3
LABOR INTENSIVE	5			20.0		20.0	20.0	20.0	20.0	
CAPITAL INTENSIVE	5				20.0	20.0	20.0	0.0	40.0	
METALS	3				33.3	33.3		33.3		
MACHINERY	1									100.0
CHEMICALS	13	7.7	30.8	23.1	7.7	23.1	7.7			
UNITED ARAB EMIRATES	**61**	**1.6**	**3.3**	**13.1**	**14.8**	**18.0**	**8.2**	**14.8**	**13.1**	**13.1**
PETROLEUM	3			33.3			66.7			
RAW MATERIALS	9		11.1	22.2	11.1		11.1	22.2	11.1	11.1
FOREST PRODUCTS										
TROPICAL AGRICULTURE	3							33.3		66.7
ANIMAL PRODUCTS	3			33.3					33.3	33.3
CEREALS	9						11.1	33.3	33.3	22.2
LABOR INTENSIVE	8		12.5		25.0	50.0				12.5
CAPITAL INTENSIVE	10				30.0	30.0		20.0	20.0	
METALS	4				25.0	50.0		25.0		
MACHINERY	7			42.9	14.3	14.3	14.3			14.3
CHEMICALS	5	20.0		20.0	20.0	20.0			20.0	

	RCA>1	HPR_ HPA	HPR_ MPA	HPR_ LPA	MPR_ HPA	MPR_ MPA	MPR_ LPA	LPR_ HPA	LPR_ MPA	LPR_ LPA
IRELAND	**86**	**11.6**	**12.8**	**24.4**	**10.5**	**11.6**	**8.1**	**4.7**	**9.3**	**7.0**
PETROLEUM										
RAW MATERIALS	8		12.5			25.0	12.5		25.0	25.0
FOREST PRODUCTS	2	50.0			50.0					
TROPICAL AGRICULTURE	6				16.7	33.3	16.7	33.3		
ANIMAL PRODUCTS	16	6.3	12.5	12.5	12.5	25.0	6.3	6.3	18.8	
CEREALS	9				33.3	11.1			11.1	44.4
LABOR INTENSIVE	6		16.7	50.0		16.7			16.7	
CAPITAL INTENSIVE	2	50.0						50.0		
METALS	1				100.0					
MACHINERY	15	13.3	13.3	53.3			20.0			
CHEMICALS	21	23.8	23.8	38.1	4.8		4.8		4.8	
SINGAPORE	**112**	**10.7**	**14.3**	**28.6**	**7.1**	**11.6**	**9.8**	**1.8**	**8.0**	**8.0**
PETROLEUM	5	20.0		20.0		40.0	20.0			
RAW MATERIALS	7						14.3		14.3	71.4
FOREST PRODUCTS	1		100.0							
TROPICAL AGRICULTURE	5							20.0	40.0	40.0
ANIMAL PRODUCTS	5				20.0	20.0			60.0	
CEREALS	5				20.0	0.0	20.0		40.0	20.0
LABOR INTENSIVE	12	8.3		41.7	16.7	25.0		8.3		
CAPITAL INTENSIVE	2					50.0			50.0	
METALS										
MACHINERY	38	10.5	10.5	39.5	7.9	10.5	18.4			2.6
CHEMICALS	32	18.8	34.4	34.4	3.1	6.3	3.1			
FINLAND	**172**	**26.7**	**14.0**	**13.4**	**16.3**	**11.0**	**2.3**	**7.6**	**6.4**	**2.3**
PETROLEUM	1	100.0								
RAW MATERIALS	14		7.1	7.1		21.4	14.3	14.3	21.4	14.3
FOREST PRODUCTS	25	12.0	12.0	16.0	24.0	16.0		4.0	12.0	4.0
TROPICAL AGRICULTURE	3					33.3		66.7		
ANIMAL PRODUCTS	4	25.0	50.0			25.0				
CEREALS	6	16.7	16.7	16.7	16.7	16.7		16.7		
LABOR INTENSIVE	10	50.0		10.0	10.0	10.0		20.0		
CAPITAL INTENSIVE	7	57.1			28.6			14.3		
METALS	16	18.8			43.8	12.5		12.5	12.5	
MACHINERY	61	31.1	18.0	23.0	13.1	6.6	1.6	1.6	3.3	1.6
CHEMICALS	25	36.0	24.0	8.0	12.0	8.0	4.0	4.0	4.0	

Note: The second column provides the total number of products exported with RCA and the disaggregation into the 11 Leamer categories. The rest of the columns provide the percentage of the number of products in each of the 9 cells in table 2.