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As You Sow So Shall You Reap:
From Capabilities to Opportunities

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ABSTRACT

We develop an *Index of Opportunities* for 130 countries based on their capabilities to undergo structural transformation. The Index of Opportunities has four dimensions, all of them characteristic of a country's export basket: (1) sophistication; (2) diversification; (3) standardness; and (4) possibilities for exporting with comparative advantage over other products. The rationale underlying the index is that, in the long run, a country's income is determined by the variety and sophistication of the products it makes and exports, which reflect its accumulated capabilities. We find that countries like China, India, Poland, Thailand, Mexico, and Brazil have accumulated a significant number of capabilities that will allow them to do well in the long run. These countries have diversified and increased the level of sophistication of their export structures. At the other extreme, countries like Papua New Guinea, Malawi, Benin, Mauritania, and Haiti score very poorly in the Index of Opportunities because their export structures are neither diversified nor sophisticated, and they have accumulated very few and unsophisticated capabilities. These countries are in urgent need of implementing policies that lead to the accumulation of capabilities.

1. INTRODUCTION

The past 20 years have seen the rise of developing countries and their contribution to world GDP growth has increased significantly. The share of these countries in world growth has increased from around 45% in 1990–2000 to almost 60% in the last decade. Among the developing economies, a great deal of attention has been paid to the so-called BRIC countries, Brazil, Russia, India, and China (Wilson and Purushothaman 2003). China and India have seen the fastest growth. However, given their respective per capita incomes of $5,000 and $2,600 (in 2005 PPP$), both are still far from the advanced countries. Brazil and Russia, with per capita incomes of $8,000 and $13,000, are closer to the advanced countries. Whether these four economies will eventually catch-up with the high-income countries will depend on their ability to continue, and to the extent possible accelerate, the pace of structural transformation of their economies.

Structural transformation is the process through which countries change what they produce and how they do it. It involves a shift in the output and employment structures away move from low-productivity and low-wage activities into high-productivity and high-wage activities; as well as the upgrading and diversification of their production and export baskets. This process generates sustained growth and enables countries to increase their income per capita.

In recent research, Hidalgo et al. (2007) and Hausmann, Hwang, and Rodik (2007) argue that while growth and development are the result of structural transformation, not all activities have the same implications for a country's growth prospects. They show that the composition of a country's export basket has important consequences for its growth prospects. Hidalgo et al. (2007) argue that development should be understood as a process of accumulating more complex sets of capabilities (e.g., bridges, ports, highways, norms, institutions, property rights, regulations, specific labor kills, laws, social networks) and of finding paths that create incentives for those capabilities to be accumulated and used (Hidalgo 2009; Hidalgo and Hausmann 2009). 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. They summarize this idea in the newly developed *product space*.

In this paper, we develop a new "Index of Opportunities" based on a country's accumulated capabilities to undergo structural transformation. It captures the potential for further upgrading, growth, and development. The Index of Opportunities has four dimensions, all related to a country's export basket and its position in the product space: (i) its sophistication; (ii) its diversification; (iii) its standardness; and (iv) the possibilities that it offers for a country to export other products with comparative advantage. The idea underlying the index is that, in the long run, a country's income is determined by the variety and sophistication of the products it makes and exports, and by the accumulation of new capabilities.[1]

The rest of the paper is structured as follows. Section 2 provides a summary of Hidalgo et al's. (2007) *product space*, and explains the rationale underlying the Index of Opportunities. Sections 3 through 6 delve into the dimensions of the index, and section 7 shows how it is constructed. We find that China and India are the top-ranked countries among the non-high-income countries (a total of 96 countries).[2] Poland, Thailand, Mexico, and Brazil are next, while Russia is ranked 18th, with a significantly lower index. Other Asian countries ranked high are: Indonesia (8th), Malaysia (10th), the Philippines (13th), Vietnam (21st), and Georgia (29th). In section 8, we analyze and discuss the product space of some non-high-income countries that are ranked high according to our Index of Opportunities and compare it with that of Germany. Section 9 concludes the paper.

2. THE PRODUCT SPACE

According to conventional trade theory, countries export products that use intensively those factors of production in which they are relatively abundant. Thus, the patterns of specialization are uniquely determined by the factor endowments, independently of initial conditions. On the other hand, the new trade theory argues that patterns of specialization cannot be determined independently of initial conditions. In recent work, Hausmann, Hwang, and Rodik (2007) argue that specialization patterns are indeterminate and may be shaped by idiosyncratic elements. They show that there is a positive relationship between the growth prospects of a country and the

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[1] Chang (2009) argues that development is largely about the transformation of the productive structure and the capabilities that support it. This is what the index tries to capture.
[2] For in-depth analyses of China and India, see Felipe et al. (2010a) and Felipe et al. (2010b), respectively.

sophistication level of the country's export basket. One implication of this relationship is that for countries to undergo structural transformation and grow, their export baskets must continuously evolve, and the share of sophisticated exports should increase.

A country's ability to foray into new products depends on whether the set of existing capabilities necessary to produce these products (human and physical capital, legal system, institutions, etc.) can be easily redeployed for the production and export of new products. These existing capabilities reflect the package that the country produces and exports with comparative advantage. For example, it is probably easier for a country that exports T-shirts to add shorts to its export basket than to add smart phones. 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. This implies 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," which requires capabilities that the country probably does not possess. Hidalgo et al. (2007) conceptualize these ideas in the newly developed product space.

The product space is an application of network theory that yields a graphical representation of all products exported in the world. The main aspect of this representation is that it shows the "proximity" of all products. Figure 1 shows the product space. The different circles represent products (a total of 779 in our analysis). The size of the circles is proportional to their share in total world trade. Colors represent the ten different product groups based on Leamer's classification (Leamer 1984). [3] The lines linking the circles represent the proximity between them. Proximity in this context is not a physical concept; rather, it measures the likelihood that a country exports a product given that it exports another one. A red line indicates a high probability of exporting both products with comparative advantage, while a light blue line indicates a low probability that the two products are exported jointly. The rationale is that if two goods need similar capabilities, a country should show a high probability of exporting both with comparative advantage.

We can see that 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

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[3] The products are categorized according to the Leamer Classification (Leamer 1984). See appendix table 1 for Leamer Classification.

exporting it 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 (320 products, 41% of the total). The periphery consists of petroleum, raw materials, tropical agriculture, animal products, cereals, labor intensive goods, and capital intensive goods (excluding metal products).

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.

Figure 1: The Product Space
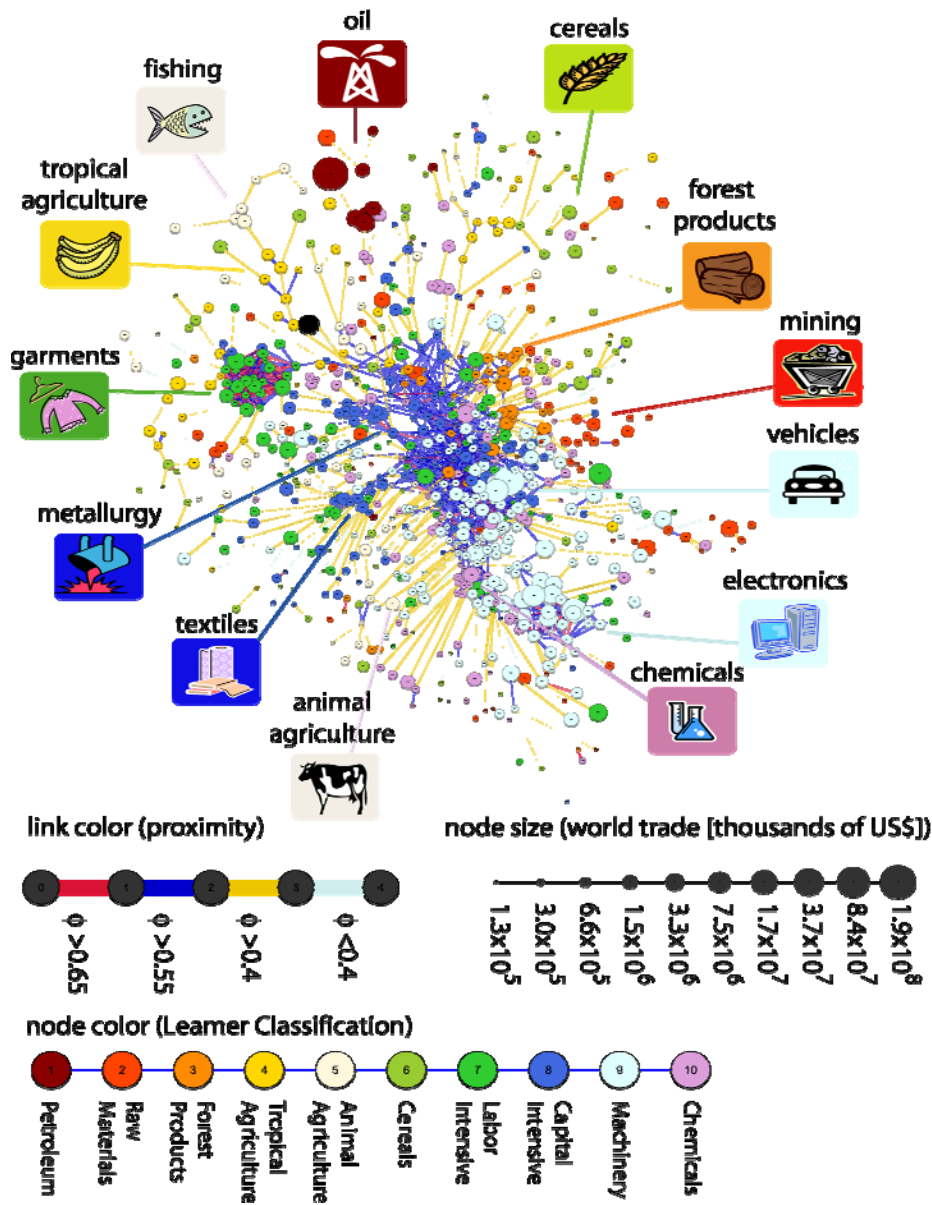
A country's export basket can be described according to the following characteristics: (i) its sophistication; (ii) its diversification; (iii) its standardness; and (iv) possibilities to export other products with comparative advantage.

The level of sophistication of the export basket captures its income content. It is calculated as a weighted average of the income level of the products exported, where the latter is

calculated as a weighted average of the GDP per capita of the countries that export a given product. Therefore, a high level of sophistication indicates that the export basket is similar to that of the rich countries. Hausmann, Hwang, and Rodik (2007) show that countries with a more sophisticated export basket grow faster. We also look at the sophistication level of the products in the "core" of the product space. Countries with a high sophistication level in the core of the product space have acquired more complex capabilities, which will make it easier to export even more sophisticated products.

The diversification of a country's export basket is measured by the number of products in which the country has acquired revealed comparative advantage. Diversification measures the country's ability to become competitive in a wider range of products. The rationale that underlies our analysis is that technical progress and structural change evolve together (technical progress induces structural change and vice versa; they jointly lead to growth), and underlying both is the mastering of new capabilities. An additional aspect of diversification that we look at is the number of "core" commodities that a country exports with comparative advantage. This is an indicator of the range of capabilities that a country has acquired in the core of the product space. Products in the core are, on average, more sophisticated than outside the core and have many other products nearby, which offers the possibility of acquiring comparative advantage in them (because they are nearby, a country already has some of the required capabilities to export them successfully). It might be the case that two countries are equally diversified, but, other things equal, the one that exports more core commodities with comparative advantage will be better off to continue diversifying. The reverse might also be true: two countries may have comparative advantage in a similar (absolute) number of products in the core, but in one case, the number of core commodities exported with comparative advantage might represent a greater share of the total number of commodities exported with comparative advantage. It may be difficult for a small country to export as many products as a large country (e.g., Switzerland, Singapore, or Ireland). However, this country may have a very sophisticated basket. We account for this factor by incorporating in the index the ratio of the number of core commodities exported with comparative advantage to the total number of commodities exported with comparative advantage.

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Another aspect of the export basket is its uniqueness, i.e., how many countries are producing the same product. This measure of uniqueness of the export basket has been called "standardness" (Hidalgo and Hausmann 2009).

The final factor that enters the Index of Opportunities is a measure of the potential for further structural change, called *open forest*. In a recent paper, Hausmann, Rodriguez, and Wagner (2008) conclude that countries with a higher open forest are better prepared to react successfully to adverse export shocks. Open forest is a summary measure of how far the products still not exported with comparative advantage are from the current export basket.

3. EXPORT SOPHISTICATION

The first two factors that we consider in the Index of Opportunities are the sophistication level of the overall export basket (denoted EXPY) and the sophistication level of the core products (denoted EXPY-core).

The sophistication level of the export basket (EXPY) of a country captures its ability to export products produced and exported by the rich countries, to the extent that, in general, the exports of rich countries embody higher productivity, wages, and income per capita. The level of sophistication of a country's export basket is calculated as the weighted average of the sophistication of the products (PRODY) exported.[4]

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

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

where $xval_{ci}$ is the value of country c's export of commodity i and $GDPpc_c$ is country c's per capita GDP. PRODY is measured in 2005 PPP \$. PRODY is then used to compute EXPY as:

Figure 2 shows the top thirty countries in terms of EXPY (average of 2001–07). Panel A shows the non-high-income countries and panel B the high-income.[5] In general, the export basket of the high-income countries is more sophisticated. Malaysia had the highest EXPY during 2001–07, followed by Mexico and Philippines. The sophistication level of China's export basket was around $9,000–$10,000 in the 1960s (not shown) and increased to $15,159 during 2001–07. On the other hand, India's average export sophistication during 2001–07 was $12,005, and ranked 29th among the non-high-income countries. Both China and India have seen a significant increase in the sophisticion level of their export baskets over the last 15 years (figure 3). On the other hand, the sophistication level of the export baskets of both Brazil and Russia has been constant in the $12,000 –$13,000 range over the last 15 years. While export sophistication is observed to remain constant in the high-income countries as well, this happens at much higher levels of sophistication.

$$EXPY_c = \sum_i \left(\frac{xval_{ci}}{\sum_i xval_{ci}} \times PRODY_i \right) \tag{2}$$

EXPY is measured in 2005 PPP$.
        We use highly disaggregated (SITC-Rev.2 4-digit level) trade data for the years 1962–2007. Data from 1962–2000 is from Feenstra et al. (2005). This data is extended to 2007 using the UNCOMTRADE database. PRODY is calculated for 779 products. PRODY used is the average of the PRODY of each product in the years 2003–05. GDP per capita (measured in 2005 PPP$) is from the World Development Indicators.
[5] Only countries with population of two million and above are included in our analysis.

Figure 2: Export Sophistication (EXPY), Average 2001–07
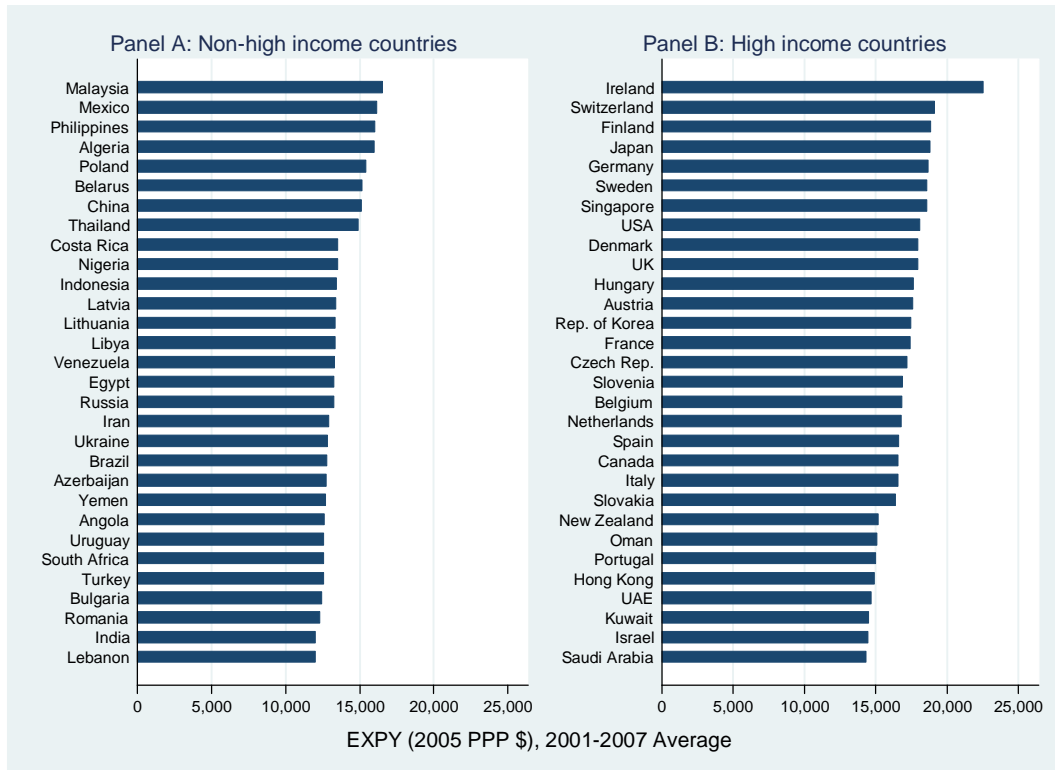
Figure 3: Trend in Export Sophistication
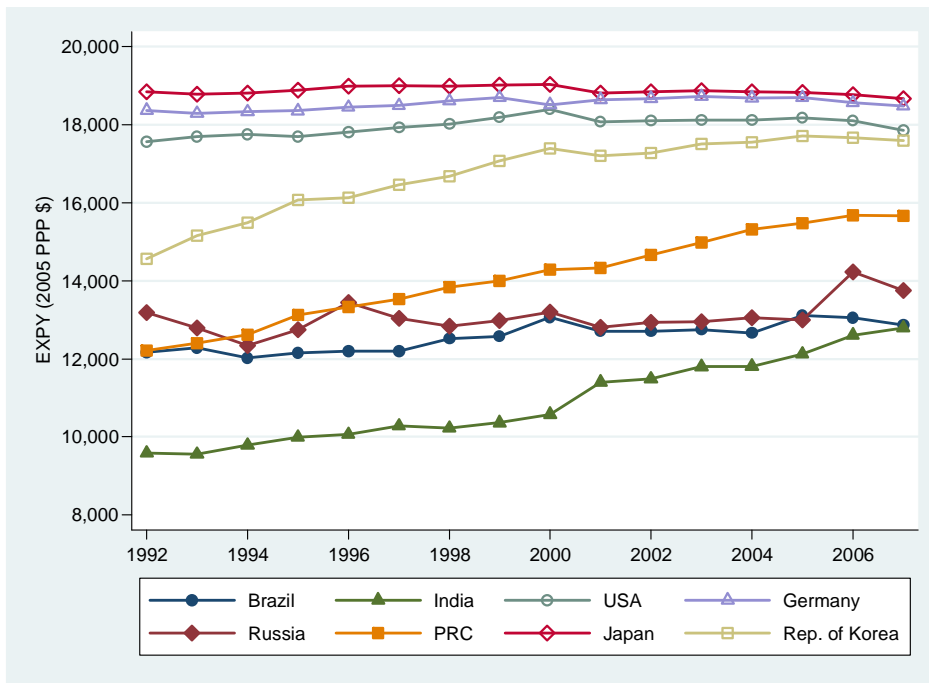
Figure 4: GDP Per Capita, Average 2001–07
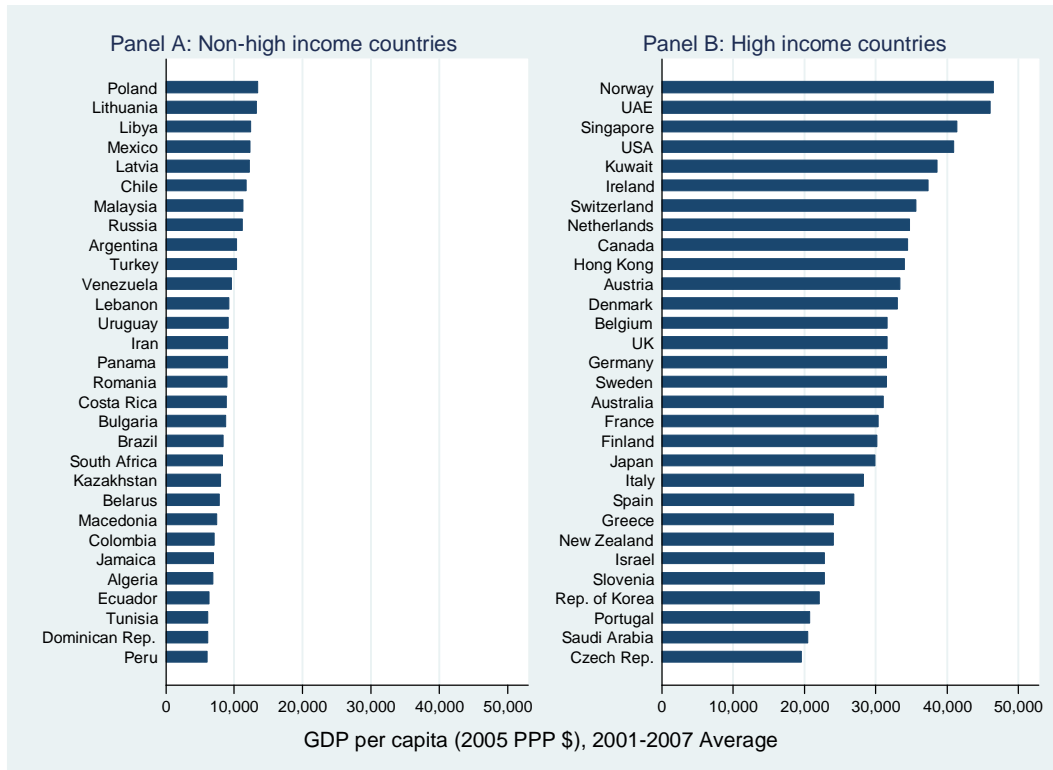
Comparing the sophistication level of the export baskets with the corresponding per capita incomes (figure 4, panel A), we find that countries such as China, Indonesia, and the Philippines have higher export sophistication levels than those of Brazil and Russia, but the latter have higher per capita incomes.[6] India's export sophistication ($12,005) is not significantly different from that of Brazil ($12,836) or from Turkey's ($12,549). The latter two, however, have higher per capita incomes. Figure 5 shows the relationship between sophistication and income per capita. Countries such as China, India, Indonesia, or the Philippines have a more sophisticated export basket than would be expected given their level of development (proxied by per capita income).[7] Among other countries that have a higher than expected sophistication level given their per capita income are Algeria, Egypt, Malaysia, Nigeria, Poland, and Thailand. On

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[6] The average (for the period 2001–07) per capita incomes (measured in 2005 PPP$) of China ($3,823), India ($2,122), Indonesia ($3,100), and the Philippines ($2,846) are not even in the top 30 and therefore are not shown in the chart.

[7] The list of country codes and the corresponding countries is provided in appendix table 2.

the other hand, Brazil, Russia, and the advanced countries are closer to the sophistication levels that would be expected for countries in their respective income categories.

To stress the significance of the point made in the previous paragraph, note that the per capita income of today's rich countries when they had levels of export sophistication similar to those of China and India in 2007 was much higher. For example, Japan's (Korea's) sophistication level in the late 1970s (mid-1990s) was similar to China's sophistication level today, but the per capita income in Japan (Korea) at the time was $17,000 ($16,000), more than three times that of China in 2007, roughly $5,000 (measured in PPP, 2005 prices). Similarly, Korea's EXPY in the year 1985 was comparable to that of India in 2007, but at three times the per capita income (Korea's per capita income in 1985 was $7,500 and India's per capita income in 2007 was $2,600).

Figure 5: EXPY and GDP Per Capita, Average 2001–07

Note: Countries with population less than 2 million were excluded.
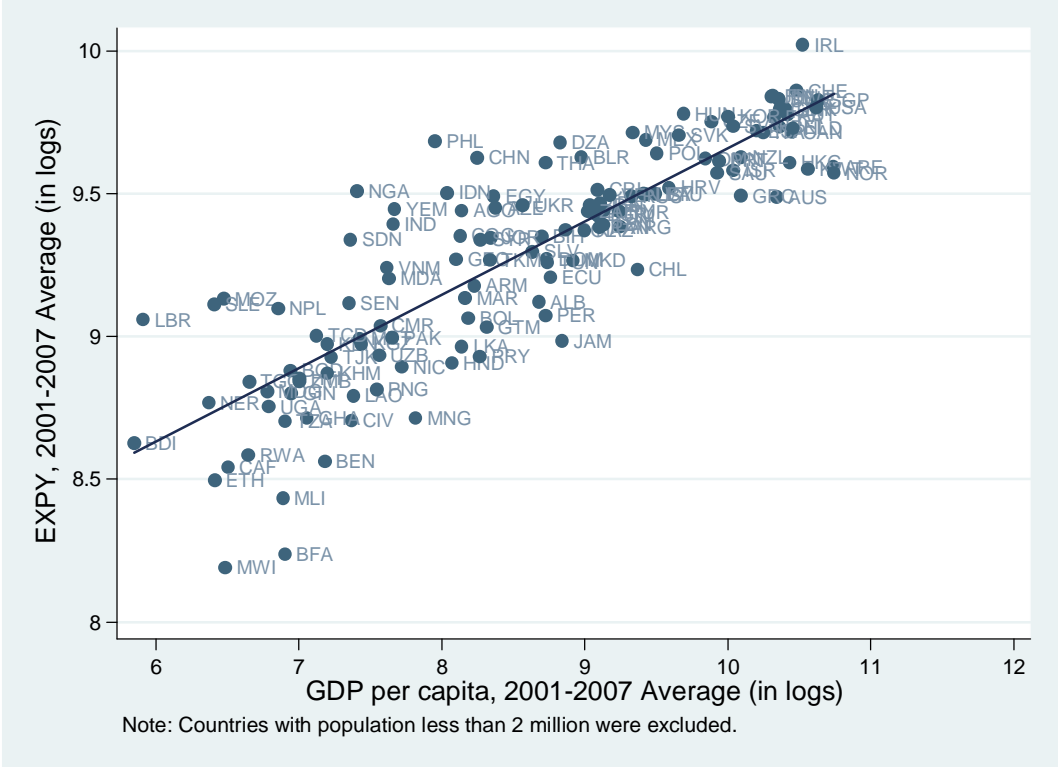
Felipe (2010: table 10.4) estimates that a 10% increase in EXPY at the beginning of the period raises growth by about half a percentage point. From this perspective, the sophistication level of the export basket of some of the lower- and middle-income countries, such as China, India, Indonesia, Thailand, or the Philippines gives them a greater chance of rapid growth in the coming years.

A second indicator of sophistication that we examine is the sophistication level of the exports that belong to the core of the product space. We call this EXPY-core. This is calculated as overall EXPY (equation 2), except that the set of commodities over which sophistication is measured is restricted to the core of the product space: machinery, chemicals, and metals. Core commodities are significantly more sophisticated than commodities outside the core: average PRODY of the core is $18,687, while it was $11,634 for products outside the core.

Figure 6 shows the average sophistication level of the core exports for the period 2001–07. Among the non-high-income countries with the highest sophistication of the core exports, Uruguay's core exports are the most sophisticated, followed by Angola's and India's. It is worth noting that not only does the ranking change, but also the composition of the top 30 countries, when compared with the overall export sophistication (figure 2). For example, Bangladesh and Pakistan, which were not in the top 30 in terms of overall export sophistication (figure 2, panel A), are in the top 30 when we consider the sophistication of the core exports (figure 6, panel A). Similarly, Argentina, which is just outside top 30 in terms of overall export sophistication, is in the top 10 when we consider the sophistication of the core exports. China's core exports are less sophisticated than India's, though the difference is small.

The average sophistication level of India's core exports ($18,955) during 2001–07 is similar to that of France ($19,300), Japan ($19,288), Spain ($19,258), Hong Kong ($18,750), Australia ($18,665), and Korea ($18,308). The latter, however, have much higher income levels than India.

Figure 6: Sophistication of the Core (EXPY-core), Average 2001–2007
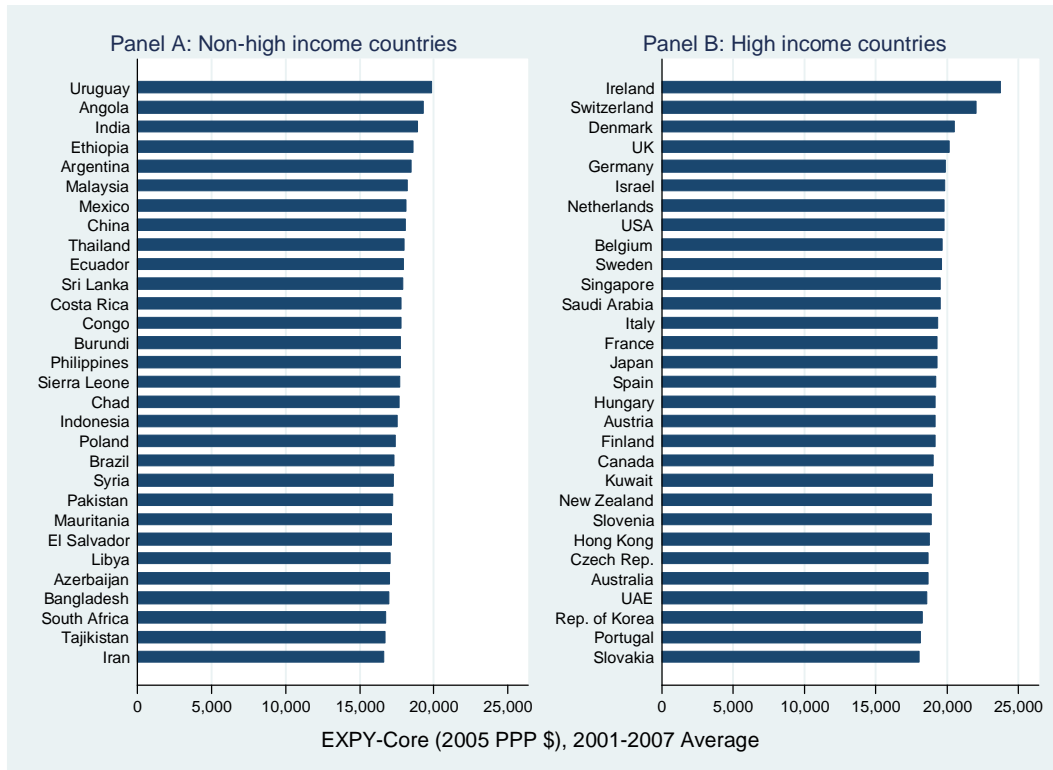
Figure 7 plots the sophistication level of the core exports against per capita income. In general, countries at a higher stage of development have more sophisticated export baskets, but it is worth noting that given their per capita incomes, the sophistication levels of Angola's, India's, China's, and Uruguay's core-exports is greater than what one would expect. On the other hand, the sophistication of Brazil's core exports is close to what one would expect for a country at its stage of development, while Russia's is below the average.

Figure 7: EXPY-core and GDP Per Capita, Average 2001–07

Note: Countries with population less than 2 million were excluded.
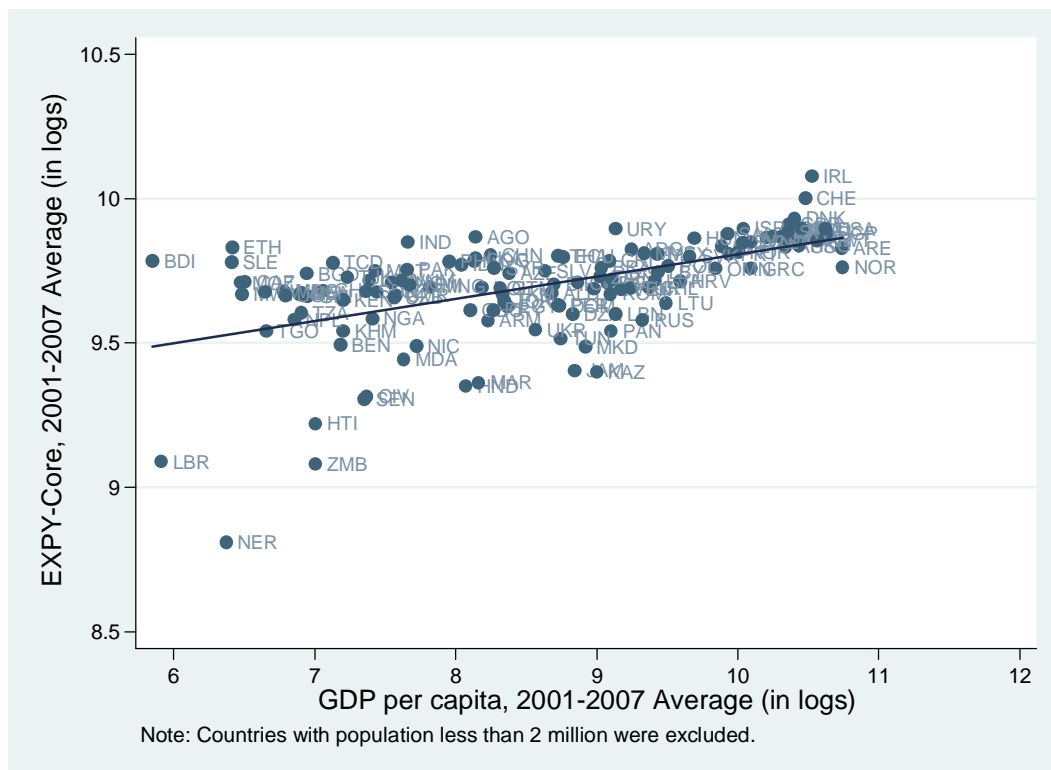
This exercise indicates that the sophistication level of the export basket, and therefore the implicit accumulated capabilities, differs across countries. This is due to the different types of products exported. This brings us to the following question: do countries differ in the number of products exported with comparative advantage?

4. DIVERSIFICATION

A key insight from Hidalgo et al. (2007) is that the more diversified a country, the greater are its capabilities, which allows it to acquire comparative advantage in other products. In this paper, *diversification* is measured by the absolute number of products that a country exports with comparative advantage. Revealed comparative advantage (RCA) is measured as the ratio of the

export share of a given product in the country's export basket to the same share at the world level.[8]

Figure 8 shows the average diversification of the export basket, over the period 2001–07.[9] During this period, China and India exported 257 and 246 products, respectively with comparative advantage. Except for Indonesia (which exported 213 products with comparative advantage) and Thailand (197 products), no other lower-middle income had a comparative advantage in so many products. Other countries so diversified were either upper-middle income countries such as Poland (265), Turkey (235), Bulgaria (214), Romania (194), or Lithuania (192); high-income non-OECD countries such as Slovenia (226) or Croatia (204); or high-income OECD countries such as Germany (340), Italy (325), United States (318), France (315), Spain (300), Belgium (278), Czech Republic (270), Austria (262), Great Britain (244), Netherlands (233), Denmark (216), or Japan (200). Korea had comparative advantage in 154 products during the period 2001–07. Brazil and Russia, both upper-middle income countries, exported 190 and 105 products, respectively, with comparative advantage.

Figure 9 shows that both China and India are positive outliers in the sense that their export baskets are more diversified than one would expect given their income levels. Indonesia, Poland, and Turkey are other non-high-income countries that are positive outliers. Brazil is also above the fitted line; Russia, on the other hand, has comparative advantage in fewer products than would be expected given its income level.

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[8] We use the measure proposed by Balassa (1965), Algebraically:

$$RCA_{ci} = \frac{xval_{ci} / \sum_i xval_{ci}}{\sum_c xval_{ci} / \sum_i \sum_c xval_{ci}} \qquad (3)$$

A country c is said to have revealed comparative advantage (RCA) in a commodity i if the above-defined index, RCA_{ci}, is greater than 1. The index of revealed comparative advantage 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 a RCA in the thousands. However, the highest RCA in automobiles is about 3.6.

[9] Measure of diversification shown is the average number of products that a country exported with revealed comparative advantage during 2001–07. It does not show that a country, say China, had revealed comparative advantage in the same 257 products in each year during 2001–07.

Figure 8: Diversification, Average 2001–07

Panel A: Non-high income countries / Panel B: High income countries

Diversification, 2001-2007 Average
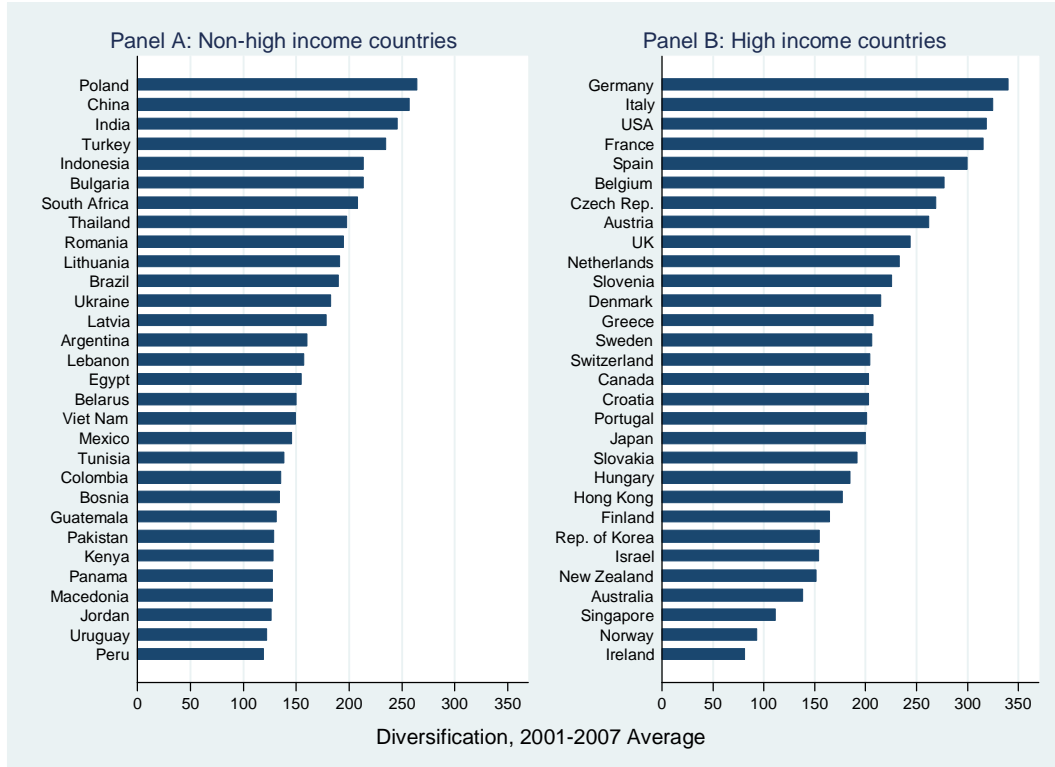
Figure 9: Diversification and GDP Per Capita, Average 2001–07

Note: Countries with population less than 2 million were excluded.
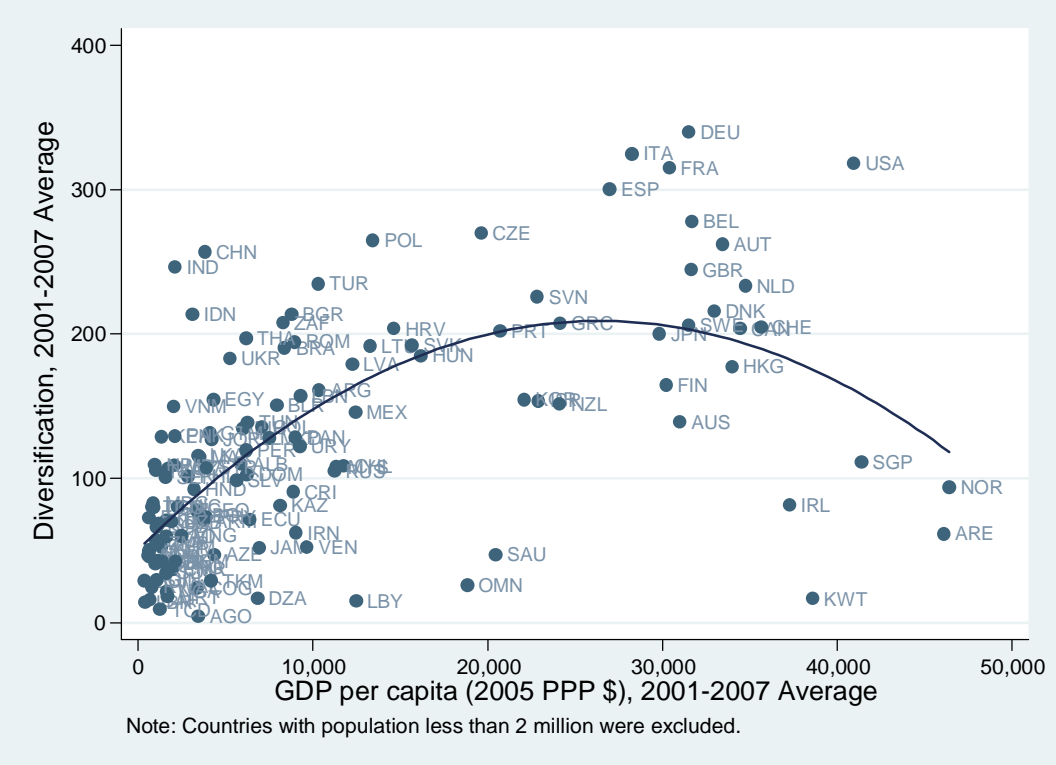
Figure 10 shows the average number of commodities in the core of the product space that countries exported with comparative advantage during 2001–07. On average, China exported 89 products with comparative advantage, India 81. Other lower-middle income countries where a large number of core commodities were exported with comparative advantage are Ukraine (73), Thailand (68), and Indonesia (45). Other countries that have comparative advantage in as many products in the core are either high-income (OECD and non-OECD) countries, or are upper-middle-income countries. Brazil exported 73 products in the core with comparative advantage, Russia only 44. For the high-income countries (those in the OECD) it is not uncommon to have comparative advantage in over 100 core commodities. The average number of products with comparative advantage in the core for the high-income OECD countries is 105.

Figure 10: Diversification-core, Average 2001–07
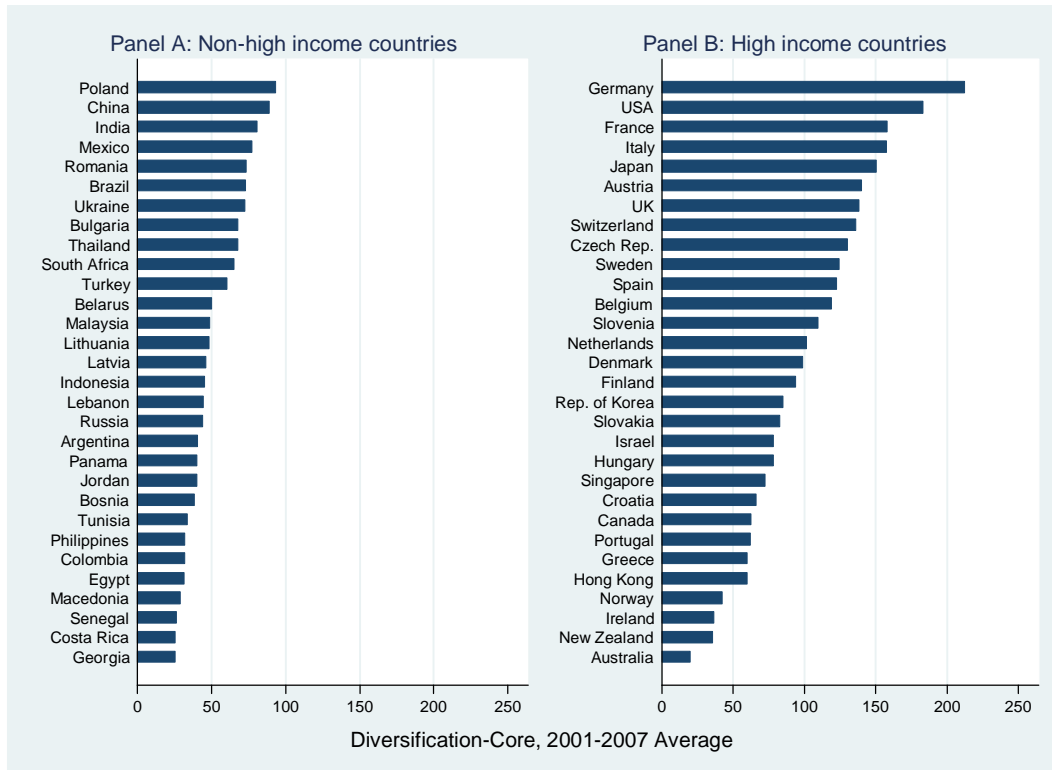
Finally, figure 11 shows that, given per capita income, China and India stand out in terms of number of core products exported with comparative advantage. Brazil, Mexico, Poland, Romania, and Ukraine also stand out in their income group, whereas Russia is close to the fitted line. Oil-rich countries such as Kuwait and Oman, which have a high level of export sophistication, do not do well when it comes to diversification of the export basket.

Figure 11: Diversification-core and GDP per Capita, Average 2001–07

Note: Countries with population less than 2 million were excluded.
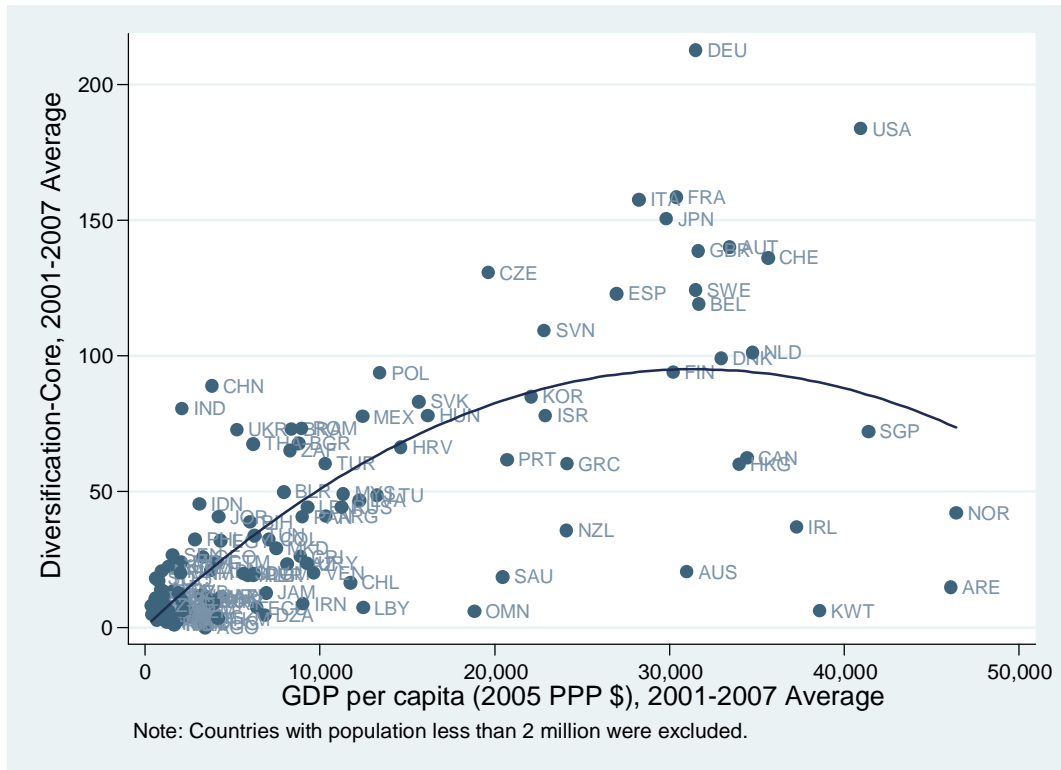
The above discussion has highlighted the role of the size and nature of capabilities, measured by the number of products exported with revealed comparative advantage, both overall and core products. However, it may be the case that two countries export a similar number of products with comparative advantage, but the nature of the products differs, i.e., one of them has comparative advantage in a greater number of core products. For example, Great Britain and Turkey have comparative advantage in a similar number of products, 244 and 235, respectively. However, in the case of Great Britain, of the 244 products exported with comparative advantage, 139 lie in the core; whereas in the case of Turkey, only 60 out of the 235 lie in the core. Thus, the capabilities in the two countries are of a very different nature. A greater share of Great Britain's capabilities seems to be of a more complex nature.

Similarly, two countries might have comparative advantage in a similar number of core products, but they might differ in the total number of products in which they have comparative advantage. For example, India and Korea export a similar number of core products with

comparative advantage, 81 and 85, respectively. This might seem to indicate that both have similar complex capabilities. However, the overall comparative advantage in the two countries is quite different. India has a comparative advantage in 246 products, while Korea in only 155 products. However, in the case of Korea, 85 are in the core, while in the case of India only 81 are in the core, i.e., a smaller share. Thus, Korea has a greater share of complex capabilities.

We account for this in the construction of our index by including the number of commodities with revealed comparative advantage in the core as a ratio of the total number of commodities in which that country has a comparative advantage. We call this the *share-core*.

Figure 12 provides a comparison of share-core for non-high- and high-income countries. In general, high-income countries have a larger share of commodities exported with comparative advantage in the core (an average of 45%) than non-high-income countries (an average of 21%). In the case of non-high-income countries, Mexico stands out with a share of 53% of commodities exported with comparative advantage being in the core of the product space. Is this unusual for a country like Mexico given its per capita income?

Figure 12: Share-core, Average 2001–07

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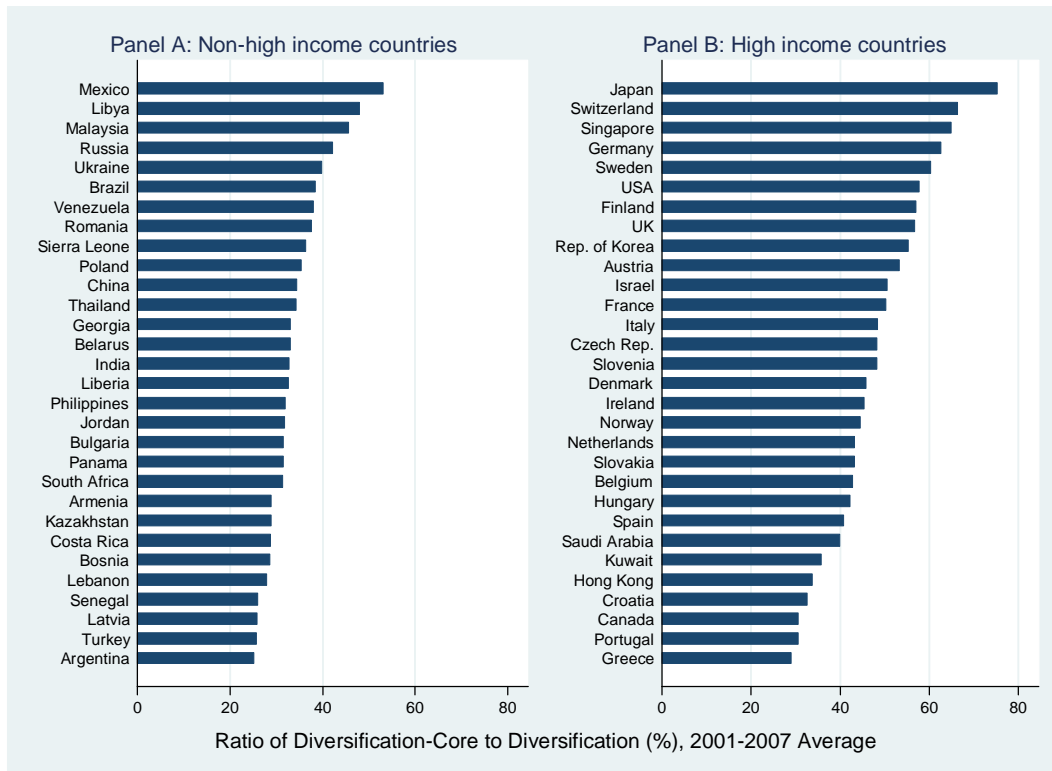
Figure 13 examines share-core across countries relative to their respective per capita income. As noted above, Mexico is a positive outlier, in the sense that it has a higher share of commodities in the core than would be expected for a country at its stage of development. Another point to be noted is that, while China and India were clear positive outliers in terms of diversification and diversification-core, they no longer stand out from the rest of countries in their income group when it comes to share-core (although they are above the fitted line, there are other countries in their income group also above the fitted line). Other non-high-income countries that are significant positive outliers are Libya, Malaysia, and Russia.

In short, figures 12 and 13 show that high-income countries have, in general, a greater share of complex capabilities. For developing countries to reach the status of high-income countries, they will need to acquire more capabilities both by increasing the absolute number of core commodities in which they have a comparative advantage and by shifting the composition of products with comparative advantage towards core commodities.

Figure 13: Share-core and GDP Per Capita, Average 2001–07

Note: Countries with population less than 2 million were excluded.
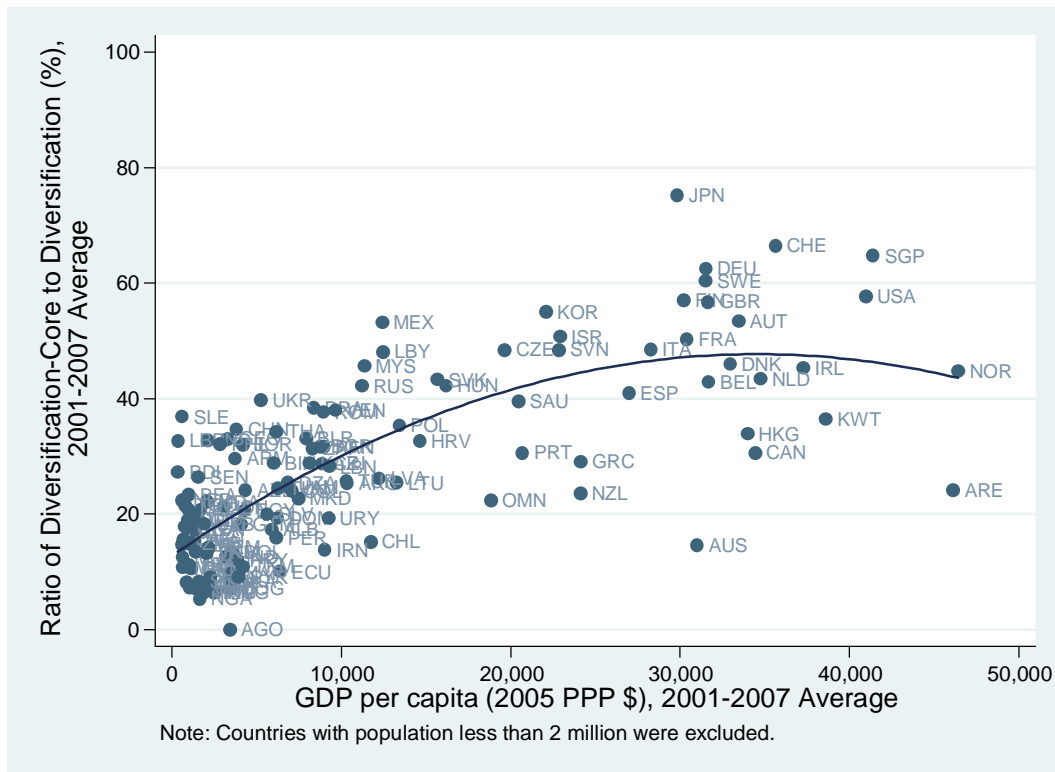
5. STANDARDNESS

A complementary way of analyzing the export composition of a country is by examining how unique the export basket is. If a country exports product A with comparative advantage, how many other countries export the same product with comparative advantage, i.e., is the product exported by only a few countries or by many and therefore is a "standard" commodity? The *standardness* of a country's export is calculated as the average ubiquity of the commodities exported with comparative advantage by a country.[10]

A lower value of standardness indicates that the country's export basket is more unique. Figure 14 shows the relationship between standardness and diversification. Even though by definition standardness and diversification are inversely related, the figure is informative because it shows that there are cases where two countries are diversified in a similar number of products, but their standardness differs. For example, Korea and Egypt export a similar number of products with comparative advantage, but Korea's export package is more unique than Egypt's.

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[10] Hidalgo and Hausmann (2009) compute standardness as follows:

$$Standardness_c = \frac{1}{diversification_c} \sum_i ubiquity_{ic} \tag{4}$$

where, diversification is the total number of commodities in which country c has a comparative advantage and *ubiquity* of commodity i is the number of countries exporting commodity i with comparative advantage.

Figure 14: Standardness and Diversification, Average 2001–07

Note: Countries with population less than 2 million were excluded. Dashed lines correspond to the respective means of standardness and diversifcation.
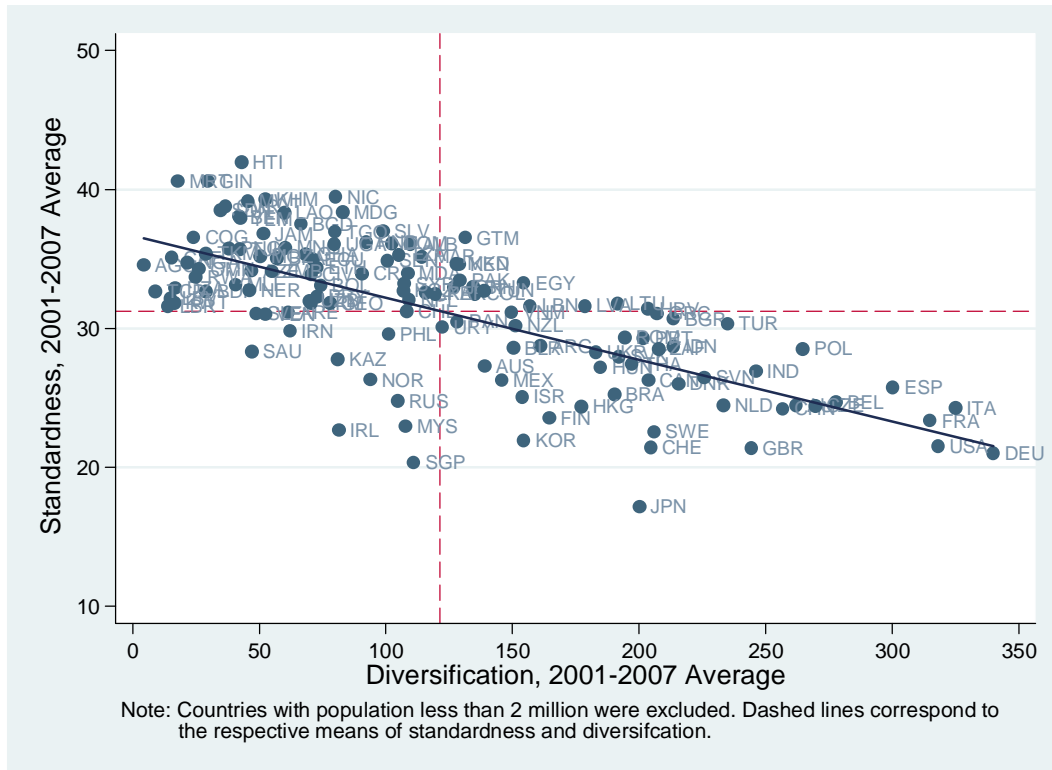
The best positioned countries are those in the fourth quadrant (high diversification and more unique products), while the worst are in the second quadrant (low diversification and more standard products). Brazil, China, India, Poland, and Thailand are some of the non-high-income countries in the fourth quadrant. Russia and Malaysia, on the other hand, are on the border of the third and the fourth quadrants at a level of standardness similar to that of Brazil, China, and India. China and India are on far right and near to the bottom in the fourth quadrant, an area largely comprised of high-income countries.

Finally, figure 15 shows that given their per capita incomes, China and India have a highly unique export package, i.e., have a level of standardness below what one would expect for countries at their level of development. Other countries with a more unique export package than what would be expected given their level of income are Indonesia, Malaysia, Mexico, the Philippines, Thailand, and Vietnam.

Figure 15: Standardness and GDP Per Capita, Average 2001–07

Note: Countries with population less than 2 million were excluded.
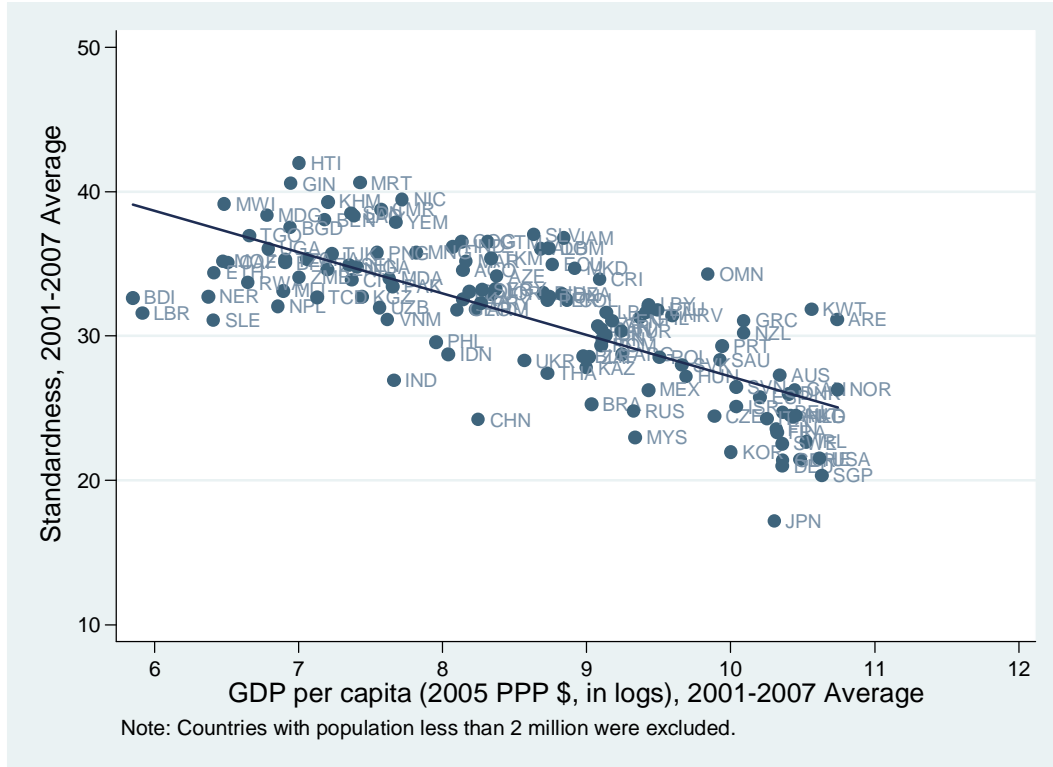
6. OPEN FOREST

The discussion so far has focused on the composition of the current export basket. In this section we ask how far the products currently *not* exported with comparative advantage are from this basket. In other words, given the current capability set, what is the likelihood of exporting these other products with comparative advantage? This measure, called "open forest" (Hausmann and Klinger 2006), is the last factor that enters our Index of Opportunities.

Open forest provides a measure of the (expected) value of the goods that a country could potentially export, i.e., the products that it currently does not export with comparative advantage. This value depends on how far the non-exported goods are from the goods currently being exported with comparative advantage, and on the sophistication level of these non-exported goods. It is calculated as the weighted average of the sophistication level of all potential exports of a country (i.e., those goods not yet exported with comparative advantage), where the weight is

the *density* or distance between each of these goods and those exported with comparative advantage (see section 2 for the definition of density).[11]

One may conclude that, because the developed countries, in general, export more products with comparative advantage than the developing countries, the possibilities for further diversification of the developed countries (and, therefore, of a high value of open forest) are limited. However, this is not exactly what matters for the purposes of open forest. Developed countries have comparative advantage in sophisticated products (e.g., some types of machinery). These products are "close" to many other sophisticated products, for example, other types of machinery or chemicals, in the sense that there is a high probability that the country can export them successfully (i.e., that it can acquire comparative advantage) because these products use capabilities similar to the ones the country already possesses. On the other hand, there are products that are "far" from the current basket (i.e., greater distance and hence low probability that the country acquires comparative advantage in them) and developed countries will probably not export them. These products tend to have low sophistication (e.g., natural resources, some agricultural products) and contribute little to open forest. Therefore, even though developed countries have revealed comparative advantage in the export of a large number of goods, many of the products that they do not export with comparative advantage are highly sophisticated and the probability of exporting them is high. Hence the relatively high open forest of these countries.

The opposite is true for developing countries. Even though they can potentially export many products (those in which they do not have a comparative advantage) and most of them are

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[11] Algebraically:

$$Open\_Forest_c = \sum_j \left[\omega_{cj}(1 - x_{cj}) PRODY_j \right] \tag{5}$$

where $\omega_{cj} = \dfrac{\sum_i \phi_{ij} x_{ci}}{\sum_i \phi_{ij}}$ is the density; $x_{ci}, x_{cj} = \begin{cases} 1 \text{ if RCA}_{i,j} \geq 1 \text{ for country } c \\ 0 \text{ if RCA}_{i,j} < 1 \text{ for country } c \end{cases}$; φ_{ij} denotes the proximity

or probability that the country will shift resources into good *j* (not exported with comparative advantage), given that it exports good *i*; $PRODY_j$ (see equation 1) is a measure of the sophistication of product *j* (not exported with comparative advantage); and $\omega_{cj} PRODY_j$ is the expected value (in terms of the sophistication of exports) of good *j*. Open forest is measured in 2005 PPP$.

sophisticated (e.g., machinery), the probability that these countries export them is low because they do not have the capabilities to do it (i.e., they are from the current export basket). Hence the low open forest of these economies.

Figure 16 shows the value of open forest of various countries. For the reasons discussed above, high-income countries have a very high value of open forest: the goods not exported with comparative advantage that are close to their current export basket are highly sophisticated. Among the developing countries, Poland has the highest open forest ($2,602,986), followed by India ($2,284,511), Turkey ($2,268,770), and China ($2,227,843). Other than China and India, no other lower-middle-income country has such a high open forest. Other countries with high open forest values are Ukraine ($1,940,032), Thailand ($1,928,222), Indonesia ($1,898,851), and Brazil ($1,978,485). Russia ($1,185,006) has a significantly lower open forest, which highlights the lower opportunities for further diversification available given the sophistication level of their current export basket.

Figure 16: Open Forest, Average 2001–07
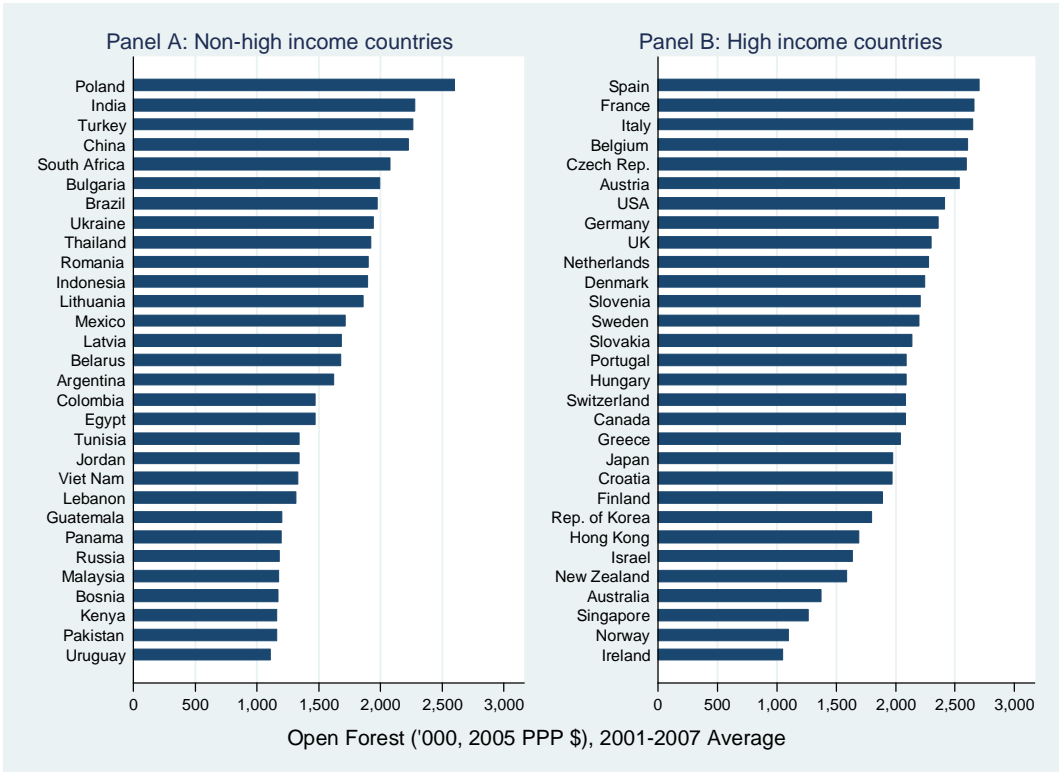
Figure 17 shows the regression of open forest and per capita income. Given their stage of development, China and India are clear outliers in that their open forest is much higher than what is predicted by the regression. Other countries that have similar open forest values to China and India are Poland and Turkey. However, they have higher per capita income.

Figure 17: Open Forest and GDPpc, Average 2001–07

Note: Countries with population less than 2 million were excluded.
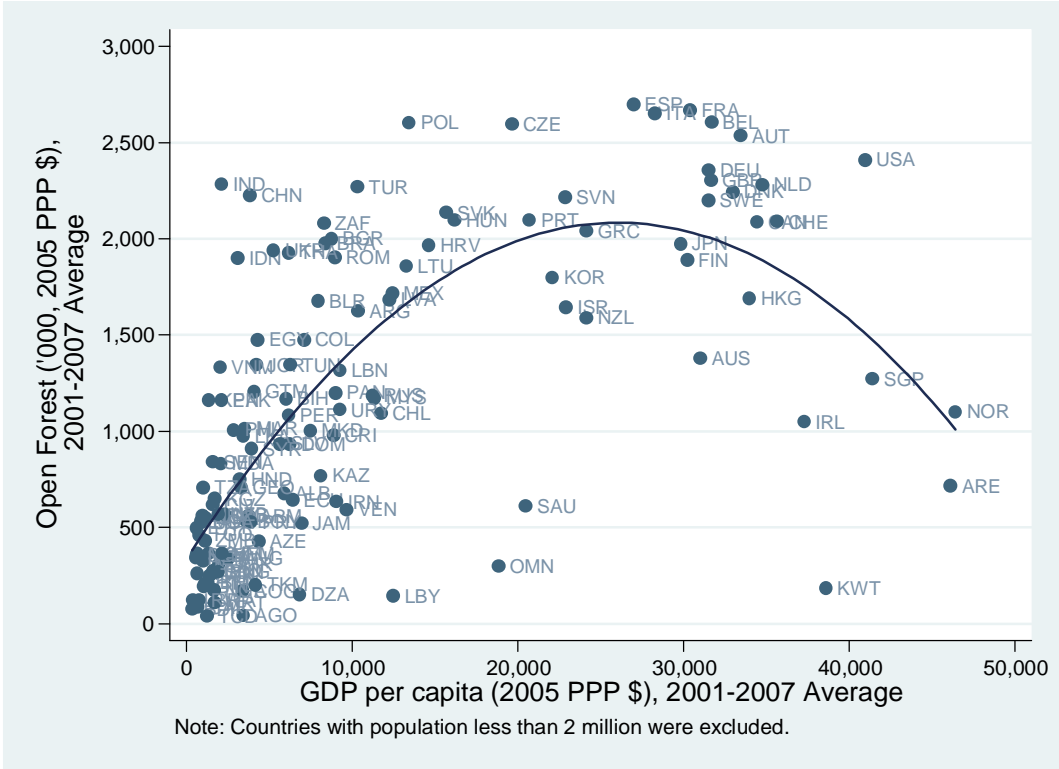
7. AS YOU SOW, SO SHALL YOU REAP: INDEX OF OPPORTUNITIES

We have used the product space to infer countries' capabilities and the opportunities they provide for further structural change. The existing capabilities of a country are an indicator of its capacity to transform its portfolio of exports from less sophisticated products to more sophisticated products, and thereby generate future growth. In previous sections, capabilities have been summarized in the form of seven indicators, namely, EXPY (figure 2), EXPY-core (figure 6), diversification (figure 8), diversification-core (figure 10), share-core (figure 12),

standardness (figure 14), and open forest (figure 16). In the previous sections we have shown the top thirty countries according to each indicator. Based on these charts, some countries consistently appear in the top thirty, while others are in the top thirty only in some of the indicators. On the other hand, if we look at the performance of some countries relative to their per capita incomes (figures 5, 7, 9, 11, 13, 15, and 17), we see that some countries are better off than what would be expected. In this aspect, China and India stand out.

In this section, we combine the information discussed previously and develop a new Index of Opportunities to rank countries on the basis of their accumulated capabilities. We present two indices. The first one ranks only developing countries (a total of 96 countries), while the second one includes developed countries (a total of 130 countries). Our methodology is designed to "reward" countries that perform well given their income per capita and "penalize" those that perform poorly given their income per capita. We do this as follows.

We estimate cross-country regressions (using data for both high-income and non-high-income countries) of each of the seven indicators on the level of GDP per capita.[12] Each indicator has two components that enter the construction of the index. One is the actual value of the indicator, which captures the actual capabilities. The other one is the residual from the regression of the indicator on GDP per capita. This shows whether a country is a positive or a negative outlier given its current stage of development. The residual obtained in each case is considered a "reward" or a "penalty." For example, consider export sophistication. The procedure we use involves running a regression of our measure of export sophistication (EXPY) on GDP per capita (where both are specified in levels). The residual obtained from this regression is a reward if it is positive and a penalty if the residual is negative. This procedure is repeated for the other six indicators. Referring back to our discussion of standardness in section 5, a lower value is considered better. In this case, therefore, a negative residual corresponds to a reward and a positive residual to a penalty.

These seven indicators and their residuals from the regressions on GDP per capita are, however, not comparable directly because they have different units. To solve this problem, we rescale all seven indicators and the residuals such that they lie between 0 (minimum value) and 1

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[12] We use the average for the period 2001–07 for each of the seven indicators and for GDP per capita. For diversification, diversification-core, share-core, and open forest, the square of GDP per capita was also included as regressor (see figures 9, 11, 13, and 17)

(maximum value).[13] For purposes of the construction and rescaling of the first index, we do not include the high-income countries, since we are interested only in the future opportunities for further transformation of the non-high-income countries. An increasing value, except in the case of standardness, is considered better. To average across the seven indicators we need to ensure that an increasing value of standardness (and its residual) also corresponds to an improvement. We do so by subtracting the rescaled value of standardness from 1. With all the seven indicators (and their residuals) scaled to lie between 0 and 1, and an increasing value corresponding to an improvement, we averaged the fourteen components to obtain the Index of Opportunities.

Table 1 shows the seven indicators (and their corresponding residuals) and the Index of Opportunities for the 96 non-high-income countries. A higher value of the index indicates that a country has accumulated more capabilities, and this provides the country with more opportunities to generate and sustain further transformation and growth. [14]

Table 1 shows that, among the non-high-income countries, China has the highest score, followed by India, Poland, Thailand, and Mexico. Brazil comes in 6th place and Russia in 18th. Other Asian countries well placed are Indonesia (8th), Malaysia (10th), the Philippines (13th), Vietnam (21st), and Georgia (29th). China and Thailand rank in the first quintile in all indicators. On the other hand, some Asian countries are ranked in the fourth and fifth quintiles (Tajikistan, Bangladesh, Turkmenistan, Lao PDR, Mongolia, and Cambodia). This low ranking is a reflection of these countries' export baskets' position in the product space (in general, low diversification and sophistication). Obviously, this can be reversed through policies to, for example, help develop new capabilities.

So far we have discussed the growth opportunities of non-high-income countries. Table 2 shows the Index of Opportunities for both the high-income and the non-high-income countries (130 countries). To construct this index, we repeat the exercise described previously and rescale each of the indicators (to lie between 0 and 1), this time also including the high-income countries.[15]

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[13] Each indicator is rescaled as follows. Suppose the original value of the indicator i is X, and the rescaled value is X_{new}. Then, $X_{new} = (X - X_{min})/(X_{max} - X_{min})$ where, X_{min} (X_{max}) is the minimum (maximum) value of indicator i among the set of non-high-income countries in table 1.

[14] We have also checked if the ranking is influenced by the choice of period over which the data is averaged. We constructed the Index of Opportunities based on averages for 2003–07 and 2005–07, and find that the respective correlations with the reported index for 2001–07 are very high: 0.995 and 0.987, respectively.

[15] For table 2, X_{min} and X_{max} are taken over the set of all (high- and non-high-income) countries.

As expected, the high-income countries dominate the top twenty. However, what is interesting is that the top eight countries in table 1 (except Ukraine) make it to the top twenty in table 2: China is third behind Germany and the United States; India is fifth, just behind Japan, and ahead of France and Italy; Poland is ranked 14th; Thailand is ranked 15th; Brazil 18th; Mexico 19th; and Indonesia 20th. Not only do these seven countries rank very high in terms of the overall score, but also rank high on most individual indicators.[16]

While most of the high income countries are in the top quintile, there are a few that lie in the fifth quintile. These are commodity-rich countries such as Saudi Arabia, Oman, UAE, and Kuwait. These countries do not perform well on any of the components, especially with respect to the diversification of their exports baskets, their low presence in the core, and their low future opportunities.

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[16] Some of the 14 components are highly correlated with each other. Out of the 91 possible correlations, 18 are greater than 0.7 (in the sample of all countries). One may argue then that these variables are capturing similar information. To avoid this problem, we constructed the index using the first component obtained from a principal components analysis (PCA). The first principal component accounts for 51.3% of the total variance of the variables. The Pearson correlation between the index shown here and that obtained from the PCA is 0.99 and the rank correlation between the two is 0.99. Given this, we decided to continue working with the index based on the 14 variables.

Table 1: Index of Opportunities and its Components: Non-high-income Countries

COLOR LEGEND	FIRST QUINTILE	2nd QUINTILE	3rd QUINTILE	4th QUINTILE	FIFTH QUINTILE

Country	EXPY		EXPY-Core		Diversification		Diversification-Core		Share Core		Standardness		Open Forest		Index of Opportunities	Rank
	Actual	Residual	Actual	Residual	Actual	Residual	Actual	Residual	Actual	Residual	Actual	Residual	Actual	Residual		
China	0.8921	0.9020	0.8694	0.9006	0.9698	0.9767	0.9496	0.9918	0.6497	0.8077	0.9352	1.0000	0.8538	0.9174	0.9011	1
India	0.6486	0.6746	0.9328	0.9874	0.9287	1.0000	0.8611	1.0000	0.6148	0.8399	0.7917	0.8698	0.8759	1.0000	0.8590	2
Poland	0.9105	0.7054	0.8170	0.7393	1.0000	0.7581	1.0000	0.6840	0.6642	0.4721	0.7070	0.5694	1.0000	0.7611	0.7706	3
Thailand	0.8703	0.8254	0.8647	0.8700	0.7411	0.7202	0.7221	0.7186	0.6450	0.7035	0.7656	0.7672	0.7370	0.7410	0.7637	4
Mexico	0.9689	0.7919	0.8746	0.8123	0.5436	0.4081	0.8290	0.5819	1.0000	0.9297	0.8260	0.7213	0.6549	0.5014	0.7460	5
Brazil	0.7127	0.6036	0.8105	0.7874	0.7142	0.6382	0.7802	0.6787	0.7208	0.7137	0.8795	0.8548	0.7566	0.6885	0.7385	6
Ukraine	0.7136	0.6751	0.5542	0.5458	0.6862	0.7027	0.7771	0.7981	0.7467	0.8700	0.7208	0.7335	0.7416	0.7753	0.7172	7
Indonesia	0.7564	0.7702	0.8256	0.8613	0.8042	0.8661	0.4840	0.6647	0.3982	0.5204	0.6976	0.7465	0.7255	0.8396	0.7114	8
South Africa	0.6911	0.5821	0.7677	0.7424	0.7811	0.6947	0.6962	0.6172	0.5892	0.5500	0.7067	0.6626	0.7960	0.7233	0.6857	9
Malaysia	1.0000	0.8501	0.8791	0.8289	0.3977	0.3122	0.5252	0.3808	0.8592	0.7854	1.0000	0.9361	0.4427	0.3533	0.6822	10
Romania	0.6744	0.5491	0.6960	0.6581	0.7301	0.6369	0.7832	0.6608	0.7072	0.6758	0.6647	0.6036	0.7278	0.6490	0.6726	11
Bulgaria	0.6825	0.5622	0.7418	0.7094	0.8042	0.7015	0.7237	0.6215	0.5951	0.5402	0.5945	0.5282	0.7656	0.6850	0.6611	12
Philippines	0.9618	1.0000	0.8399	0.8794	0.3719	0.5247	0.3466	0.5701	0.6028	0.7916	0.6513	0.6992	0.3782	0.5659	0.6560	13
Belarus	0.8946	0.8122	0.7152	0.6898	0.5612	0.5260	0.5328	0.5045	0.6193	0.6017	0.7032	0.6652	0.6389	0.6058	0.6479	14
Turkey	0.6906	0.5359	0.7186	0.6675	0.8859	0.7303	0.6443	0.5064	0.4818	0.3411	0.6134	0.5211	0.8697	0.7277	0.6382	15
Argentina	0.6398	0.4794	0.8959	0.8577	0.6018	0.4992	0.4366	0.3447	0.4762	0.3323	0.6964	0.6134	0.6180	0.5210	0.5723	16
Jordan	0.6064	0.5818	0.6653	0.6767	0.4707	0.5606	0.4336	0.5776	0.5999	0.7282	0.4763	0.4783	0.5092	0.6226	0.5705	17
Russian Federation	0.7445	0.5743	0.5901	0.5192	0.3856	0.3052	0.4718	0.3437	0.7910	0.7031	0.9050	0.8318	0.4473	0.3602	0.5695	18
Egypt	0.7451	0.7309	0.6459	0.6548	0.5771	0.6437	0.3405	0.5016	0.3860	0.4524	0.4595	0.4576	0.5605	0.6610	0.5583	19
Latvia	0.7532	0.5607	0.7520	0.6823	0.6698	0.5138	0.4992	0.3330	0.4855	0.2820	0.5455	0.4099	0.6421	0.4950	0.5446	20
Viet Nam	0.5168	0.5329	0.7512	0.7929	0.5584	0.7034	0.2122	0.5037	0.2480	0.3783	0.5695	0.6221	0.5047	0.7006	0.5425	21
Bosnia Herzegovina	0.6099	0.5451	0.7370	0.7343	0.4997	0.5296	0.4137	0.4873	0.5384	0.5746	0.4735	0.4425	0.4414	0.5052	0.5380	22
Lithuania	0.7530	0.5375	0.6579	0.5699	0.7197	0.5344	0.5206	0.3194	0.4734	0.2352	0.5352	0.3798	0.7095	0.5278	0.5338	23
Sierra Leone	0.4226	0.4622	0.8363	0.9001	0.1711	0.4408	0.1924	0.5563	0.6845	1.0000	0.5737	0.6527	0.1229	0.4472	0.5331	24
Colombia	0.6311	0.5437	0.7434	0.7294	0.5030	0.5016	0.3466	0.3927	0.4505	0.4198	0.4990	0.4513	0.5609	0.5677	0.5243	25
Lebanon	0.6465	0.5112	0.6140	0.5662	0.5869	0.5128	0.4733	0.4100	0.5250	0.4323	0.5448	0.4630	0.4984	0.4524	0.5169	26
Uruguay	0.6930	0.5626	1.0000	0.9820	0.4531	0.4052	0.2519	0.2404	0.3617	0.2261	0.6255	0.5541	0.4187	0.3883	0.5116	27
Panama	0.6389	0.5097	0.5503	0.5008	0.4761	0.4305	0.4336	0.3900	0.5941	0.5310	0.6050	0.5360	0.4531	0.4238	0.5052	28
Georgia	0.5411	0.5308	0.6291	0.6476	0.2825	0.4373	0.2748	0.4945	0.6208	0.7941	0.5345	0.5599	0.2612	0.4532	0.5044	29
Tunisia	0.5321	0.4542	0.5227	0.5007	0.5162	0.5354	0.3618	0.4368	0.4574	0.4613	0.4864	0.4521	0.5093	0.5520	0.4842	30

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Country	EXPY		EXPY-Core		Diversification		Diversification-Core		Share Core		Standardness		Open Forest		Index of Opportunities	Rank
	Actual	Residual	Actual	Residual	Actual	Residual	Actual	Residual	Actual	Residual	Actual	Residual	Actual	Residual		
Costa Rica	0.7682	0.6530	0.8434	0.8175	0.3313	0.3158	0.2779	0.2736	0.5386	0.4643	0.4241	0.3349	0.3677	0.3571	0.4834	31
Kenya	0.3312	0.3460	0.6703	0.7134	0.4783	0.6630	0.2382	0.5565	0.3255	0.5091	0.3881	0.4312	0.4383	0.6744	0.4831	32
Nepal	0.4112	0.4421	0.5926	0.6340	0.4032	0.6161	0.2214	0.5621	0.3569	0.5675	0.5219	0.5884	0.2041	0.4992	0.4729	33
Kyrgyzstan	0.3315	0.3381	0.7038	0.7455	0.3939	0.5817	0.2366	0.5381	0.3954	0.5809	0.4868	0.5353	0.2384	0.4966	0.4716	34
Rep. of Moldova	0.4881	0.5008	0.4516	0.4700	0.4010	0.5749	0.2565	0.5365	0.4137	0.5873	0.4211	0.4551	0.3094	0.5401	0.4576	35
Venezuela	0.7488	0.6142	0.7138	0.6694	0.1843	0.1777	0.2122	0.1955	0.7128	0.6573	0.5759	0.4909	0.2159	0.2116	0.4557	36
Pakistan	0.3447	0.3434	0.8006	0.8453	0.4800	0.6374	0.1053	0.4180	0.1421	0.2404	0.4485	0.4850	0.4379	0.6434	0.4551	37
Armenia	0.4695	0.4425	0.5886	0.5991	0.2545	0.4001	0.2229	0.4347	0.5438	0.6766	0.5339	0.5511	0.2036	0.3896	0.4507	38
Guatemala	0.3683	0.3245	0.7188	0.7356	0.4882	0.5785	0.2550	0.4448	0.3423	0.4061	0.2868	0.2677	0.4554	0.5829	0.4468	39
Syria	0.6003	0.5815	0.8088	0.8343	0.3955	0.5089	0.1038	0.3356	0.1487	0.1676	0.4612	0.4665	0.3399	0.4948	0.4462	40
Senegal	0.4249	0.4433	0.3272	0.3416	0.3703	0.5677	0.2840	0.5814	0.4889	0.7064	0.3726	0.4098	0.3126	0.5629	0.4424	41
Azerbaijan	0.7036	0.6844	0.7837	0.8026	0.1635	0.3072	0.1206	0.3297	0.4524	0.5344	0.4125	0.4039	0.1523	0.3260	0.4412	42
Kazakhstan	0.6288	0.5182	0.4090	0.3583	0.2946	0.3056	0.2489	0.2790	0.5435	0.4989	0.7462	0.7102	0.2843	0.3112	0.4383	43
Sri Lanka	0.3259	0.2930	0.8535	0.8878	0.4279	0.5506	0.1023	0.3555	0.1546	0.1962	0.4957	0.5139	0.3657	0.5336	0.4326	44
El Salvador	0.5639	0.5034	0.7947	0.8006	0.3631	0.4302	0.2107	0.3462	0.3758	0.3839	0.2610	0.2110	0.3491	0.4426	0.4312	45
Uzbekistan	0.3078	0.3072	0.6818	0.7194	0.2512	0.4584	0.1359	0.4499	0.3420	0.5026	0.5251	0.5742	0.2071	0.4621	0.4232	46
Peru	0.3945	0.3063	0.6492	0.6380	0.4432	0.4791	0.2031	0.3182	0.2983	0.2632	0.4984	0.4674	0.4070	0.4717	0.4170	47
TFYR of Macedonia	0.5379	0.4333	0.4939	0.4566	0.4745	0.4680	0.3099	0.3497	0.4255	0.3731	0.3847	0.3160	0.3763	0.4053	0.4146	48
Burundi	0.1526	0.1735	0.8410	0.9080	0.0944	0.3882	0.0840	0.4855	0.4478	0.7121	0.4901	0.5636	0.0152	0.3703	0.4090	49
Dominican Rep.	0.5426	0.4665	0.6477	0.6358	0.3769	0.4236	0.2107	0.3217	0.3602	0.3393	0.3082	0.2529	0.3488	0.4222	0.4041	50
Ethiopia	0.0998	0.1100	0.9063	0.9753	0.2628	0.5148	0.1145	0.4962	0.2251	0.4165	0.3999	0.4577	0.1797	0.4934	0.4037	51
Mozambique	0.4359	0.4758	0.7430	0.7991	0.1766	0.4437	0.0672	0.4578	0.2299	0.4208	0.3578	0.4097	0.1271	0.4489	0.3995	52
Libya	0.7513	0.5535	0.7880	0.7186	0.0406	0.0000	0.0763	0.0000	0.9045	0.8069	0.5167	0.3735	0.0417	0.0000	0.3980	53
Uganda	0.2108	0.2248	0.6894	0.7388	0.2891	0.5259	0.1481	0.5085	0.3152	0.5175	0.3112	0.3531	0.1903	0.4904	0.3938	54
Algeria	0.9577	0.9057	0.6144	0.5932	0.0483	0.1405	0.0458	0.1707	0.4678	0.4518	0.4778	0.4322	0.0447	0.1546	0.3932	55
Iran	0.7199	0.5966	0.7583	0.7241	0.2222	0.2234	0.0916	0.1241	0.2547	0.0979	0.6408	0.5751	0.2318	0.2416	0.3930	56
Togo	0.2559	0.2765	0.5504	0.5904	0.2902	0.5309	0.1832	0.5410	0.3939	0.6229	0.2650	0.3032	0.1656	0.4749	0.3889	57
Bolivia	0.3884	0.3577	0.7216	0.7440	0.2688	0.4168	0.1053	0.3510	0.2501	0.3107	0.4673	0.4793	0.1929	0.3868	0.3886	58
Yemen	0.6997	0.7298	0.7323	0.7713	0.1465	0.3659	0.0641	0.3842	0.2358	0.3574	0.2149	0.2221	0.1268	0.3878	0.3885	59
United Rep. of Tanzania	0.1865	0.1957	0.6193	0.6622	0.3873	0.6015	0.1252	0.4856	0.2015	0.3678	0.3518	0.3966	0.2612	0.5438	0.3847	60
Albania	0.4280	0.3489	0.6994	0.6949	0.4054	0.4563	0.2031	0.3291	0.3265	0.3100	0.3116	0.2626	0.2494	0.3520	0.3841	61
Chad	0.3500	0.3686	0.8342	0.8908	0.0181	0.2938	0.0183	0.3914	0.3098	0.4937	0.4887	0.5458	0.0000	0.3206	0.3803	62
Chile	0.5128	0.3098	0.7205	0.6540	0.3993	0.3053	0.1756	0.0990	0.2849	0.0435	0.5639	0.4398	0.4114	0.3185	0.3742	63
Mali	0.0765	0.0761	0.6961	0.7450	0.1399	0.4017	0.0901	0.4592	0.3901	0.6081	0.4646	0.5235	0.1121	0.4228	0.3718	64
Liberia	0.3850	0.4265	0.1643	0.1792	0.0373	0.3412	0.0489	0.4573	0.6137	0.9216	0.5466	0.6266	0.0330	0.3839	0.3689	65

Country	EXPY		EXPY-Core		Diversification		Diversification-Core		Share Core		Standardness		Open Forest		Index of Opportunities	Rank
	Actual	Residual	Actual	Residual	Actual	Residual	Actual	Residual	Actual	Residual	Actual	Residual	Actual	Residual		
Morocco	0.4378	0.4133	0.3764	0.3732	0.4229	0.5439	0.1191	0.3649	0.1826	0.2282	0.3582	0.3582	0.3803	0.5425	0.3644	66
Burkina Faso	0.0134	0.0070	0.6993	0.7483	0.2024	0.4519	0.1420	0.4986	0.3872	0.6038	0.3637	0.4100	0.1198	0.4285	0.3626	67
Nigeria	0.7644	0.8116	0.5961	0.6301	0.0664	0.3185	0.0122	0.3675	0.0972	0.2047	0.3800	0.4165	0.0529	0.3473	0.3618	68
Ghana	0.1916	0.1976	0.7093	0.7572	0.2463	0.4814	0.0763	0.4400	0.1910	0.3467	0.3494	0.3910	0.1986	0.4859	0.3616	69
Tajikistan	0.3036	0.3149	0.7657	0.8155	0.1459	0.3924	0.0611	0.4179	0.2525	0.4145	0.3310	0.3663	0.0824	0.3822	0.3604	70
Ecuador	0.4911	0.4066	0.8610	0.8635	0.2573	0.3222	0.0763	0.2116	0.1866	0.1123	0.3692	0.3184	0.2358	0.3248	0.3598	71
Paraguay	0.3051	0.2600	0.6309	0.6432	0.2633	0.4026	0.0931	0.3284	0.2236	0.2639	0.5100	0.5217	0.1915	0.3746	0.3580	72
Bangladesh	0.2768	0.2935	0.7820	0.8369	0.2386	0.4798	0.0519	0.4273	0.1387	0.2864	0.2348	0.2647	0.2010	0.4932	0.3576	73
Côte d'Ivoire	0.1877	0.1838	0.3360	0.3508	0.2545	0.4730	0.1420	0.4705	0.3531	0.5325	0.4264	0.4697	0.2256	0.4908	0.3497	74
Madagascar	0.2384	0.2551	0.7061	0.7569	0.3017	0.5365	0.0718	0.4501	0.1500	0.3081	0.1903	0.2176	0.1929	0.4930	0.3477	75
Sudan	0.6004	0.6343	0.7060	0.7492	0.1163	0.3614	0.0305	0.3850	0.1542	0.2803	0.1826	0.1962	0.0886	0.3793	0.3475	76
Angola	0.6932	0.6938	0.9578	1.0000	0.0000	0.2043	0.0000	0.2767	0.0000	0.0000	0.3913	0.3968	0.0019	0.2368	0.3466	77
Rwanda	0.1347	0.1443	0.7042	0.7560	0.0790	0.3602	0.0473	0.4365	0.3104	0.5170	0.4357	0.4949	0.0329	0.3669	0.3443	78
Congo	0.6124	0.6064	0.8430	0.8768	0.0762	0.2670	0.0183	0.2922	0.1312	0.1680	0.2854	0.2786	0.0517	0.2786	0.3419	79
Turkmenistan	0.5389	0.5087	0.6915	0.7053	0.0949	0.2573	0.0336	0.2702	0.2019	0.2239	0.3466	0.3332	0.0643	0.2605	0.3236	80
Central African Rep.	0.1176	0.1280	0.7453	0.8014	0.0433	0.3350	0.0260	0.4250	0.2714	0.4724	0.3618	0.4138	0.0190	0.3599	0.3229	81
Honduras	0.2913	0.2604	0.3653	0.3647	0.3379	0.4853	0.1237	0.3822	0.2355	0.3092	0.3044	0.3035	0.2778	0.4704	0.3222	82
Lao People's Dem. Rep.	0.2302	0.2296	0.7534	0.7999	0.2134	0.4389	0.0504	0.3987	0.1443	0.2662	0.1919	0.2061	0.0928	0.3814	0.3141	83
Papua New Guinea	0.2421	0.2363	0.7431	0.7857	0.1295	0.3611	0.0260	0.3668	0.1214	0.2242	0.3265	0.3521	0.0903	0.3682	0.3124	84
Niger	0.2172	0.2386	0.0000	0.0000	0.1607	0.4331	0.1099	0.4938	0.4197	0.6647	0.4860	0.5548	0.1180	0.4441	0.3101	85
Mongolia	0.1921	0.1683	0.7257	0.7604	0.2150	0.4098	0.0412	0.3510	0.1197	0.1945	0.3251	0.3397	0.1177	0.3671	0.3091	86
Cameroon	0.3713	0.3761	0.6908	0.7288	0.1245	0.3553	0.0305	0.3678	0.1412	0.2467	0.1684	0.1737	0.1048	0.3780	0.3041	87
Zambia	0.2565	0.2698	0.1582	0.1646	0.1942	0.4414	0.0870	0.4511	0.2798	0.4623	0.4158	0.4666	0.1538	0.4519	0.3038	88
Nicaragua	0.2838	0.2736	0.4968	0.5166	0.2918	0.4800	0.0779	0.3899	0.1686	0.2672	0.1317	0.1268	0.2062	0.4484	0.2971	89
Jamaica	0.3380	0.2272	0.4139	0.3763	0.1821	0.2459	0.1359	0.2360	0.4618	0.4400	0.2725	0.1999	0.1879	0.2681	0.2847	90
Cambodia	0.2709	0.2801	0.5499	0.5837	0.1843	0.4248	0.0397	0.4032	0.1320	0.2633	0.1407	0.1535	0.1277	0.4208	0.2839	91
Guinea	0.2350	0.2477	0.6868	0.7343	0.0976	0.3655	0.0336	0.4129	0.1955	0.3583	0.0740	0.0842	0.0614	0.3791	0.2833	92
Malawi	0.0000	0.0000	0.6942	0.7466	0.1585	0.4288	0.0519	0.4457	0.1948	0.3758	0.1485	0.1748	0.0877	0.4164	0.2803	93
Benin	0.1257	0.1223	0.5008	0.5312	0.1448	0.3938	0.0687	0.4269	0.2792	0.4515	0.2069	0.2284	0.0684	0.3735	0.2802	94
Mauritania	0.3423	0.3505	0.7956	0.8446	0.0521	0.3059	0.0122	0.3661	0.1157	0.2268	0.0721	0.0705	0.0272	0.3252	0.2791	95
Haiti	0.2620	0.2758	0.2587	0.2729	0.1487	0.4046	0.0504	0.4229	0.2092	0.3726	0.0000	0.0000	0.0666	0.3807	0.2232	96

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Table 2: Index of Opportunities and its Components: All Countries

COLOR LEGEND	FIRST QUINTILE	2nd QUINTILE	3rd QUINTILE	4th QUINTILE	FIFTH QUINTILE

Country	EXPY		EXPY-Core		Diversification		Diversification-Core		Share Core		Standardness		Open Forest		Index of Opportunities	Rank
	Actual	Residual	Actual	Residual	Actual	Residual	Actual	Residual	Actual	Residual	Actual	Residual	Actual	Residual		
Germany	0.7949	0.6189	0.7736	0.7455	1.0000	0.8975	1.0000	1.0000	0.8319	0.7864	0.8452	0.7338	0.8711	0.6011	0.8214	1
USA	0.7653	0.3877	0.7681	0.6346	0.9349	0.9581	0.8636	0.8991	0.7677	0.7254	0.8246	0.5625	0.8915	0.7677	0.7679	2
China	0.6109	0.9129	0.6685	0.9006	0.7523	0.9780	0.4180	0.7495	0.4599	0.7819	0.7161	1.0000	0.8228	0.9221	0.7638	3
Japan	0.8037	0.6649	0.7368	0.7123	0.5834	0.4787	0.7077	0.6931	1.0000	1.0000	1.0000	0.9523	0.7279	0.4745	0.7525	4
India	0.4441	0.7109	0.7173	0.9874	0.7204	1.0000	0.3790	0.7544	0.4352	0.8040	0.6062	0.8895	0.8441	1.0000	0.7352	5
France	0.7324	0.5526	0.7375	0.7071	0.9255	0.8176	0.7453	0.7321	0.6689	0.5888	0.7505	0.6331	0.9878	0.6857	0.7332	6
Italy	0.6849	0.5282	0.7390	0.7326	0.9553	0.8385	0.7413	0.7321	0.6451	0.5699	0.7130	0.6193	0.9823	0.6703	0.7251	7
Switzerland	0.8229	0.5760	0.9004	0.8781	0.5970	0.5413	0.6405	0.6293	0.8850	0.8491	0.8277	0.6484	0.7707	0.5694	0.7240	8
Czech Rep.	0.7189	0.7489	0.7007	0.7730	0.7906	0.7049	0.6142	0.6597	0.6441	0.6567	0.7066	0.7443	0.9605	0.6805	0.7217	9
United Kingdom	0.7586	0.5648	0.7875	0.7635	0.7153	0.6188	0.6526	0.6338	0.7547	0.6908	0.8300	0.7127	0.8512	0.5864	0.7086	10
Austria	0.7409	0.5038	0.7315	0.6655	0.7681	0.6854	0.6586	0.6420	0.7108	0.6335	0.7046	0.5290	0.9382	0.6741	0.6847	11
Sweden	0.7916	0.6146	0.7553	0.7201	0.6009	0.5053	0.5847	0.5623	0.8026	0.7503	0.7830	0.6566	0.8122	0.5539	0.6781	12
Spain	0.6897	0.5607	0.7350	0.7409	0.8821	0.7644	0.5786	0.5654	0.5448	0.4545	0.6535	0.5651	1.0000	0.6812	0.6726	13
Poland	0.6235	0.7383	0.6282	0.7393	0.7757	0.7722	0.4402	0.5643	0.4702	0.5508	0.5413	0.6343	0.9637	0.7746	0.6583	14
Thailand	0.5959	0.8449	0.6649	0.8700	0.5749	0.7366	0.3179	0.5851	0.4566	0.7101	0.5862	0.8023	0.7102	0.7556	0.6579	15
Belgium	0.7009	0.4824	0.7566	0.7199	0.8149	0.7169	0.5598	0.5361	0.5696	0.4622	0.6965	0.5461	0.9648	0.6774	0.6574	16
Slovenia	0.7042	0.6641	0.7146	0.7575	0.6600	0.5545	0.5141	0.5232	0.6440	0.6154	0.6247	0.5931	0.8179	0.5428	0.6379	17
Brazil	0.4881	0.6478	0.6232	0.7874	0.5540	0.6594	0.3434	0.5611	0.5102	0.7171	0.6734	0.8767	0.7291	0.7061	0.6341	18
Mexico	0.6634	0.8151	0.6725	0.8123	0.4217	0.4427	0.3649	0.5029	0.7079	0.8658	0.6324	0.7633	0.6311	0.5295	0.6304	19
Indonesia	0.5179	0.7958	0.6348	0.8613	0.6238	0.8740	0.2130	0.5527	0.2819	0.5841	0.5341	0.7847	0.6992	0.8487	0.6290	20
Hungary	0.7445	0.8545	0.7318	0.8543	0.5379	0.4959	0.3669	0.4436	0.5612	0.6103	0.5956	0.6594	0.7732	0.5745	0.6288	21
Rep. of Korea	0.7348	0.7226	0.6794	0.7166	0.4477	0.3499	0.3999	0.4092	0.7357	0.7375	0.8073	0.8320	0.6615	0.4221	0.6183	22
Slovakia	0.6756	0.7674	0.6643	0.7655	0.5596	0.5245	0.3911	0.4768	0.5759	0.6379	0.5639	0.6280	0.7880	0.5945	0.6152	23
Denmark	0.7587	0.5387	0.8110	0.7821	0.6294	0.5448	0.4657	0.4380	0.6108	0.5106	0.6437	0.4606	0.8289	0.5814	0.6146	24
Ukraine	0.4887	0.7114	0.4262	0.5458	0.5323	0.7201	0.3421	0.6330	0.5286	0.8247	0.5519	0.7737	0.7147	0.7880	0.6129	25
Finland	0.8051	0.6593	0.7313	0.7004	0.4774	0.3764	0.4415	0.4121	0.7584	0.7000	0.7428	0.6263	0.6960	0.4514	0.6127	26
Netherlands	0.6980	0.4167	0.7684	0.7028	0.6826	0.6149	0.4765	0.4534	0.5768	0.4678	0.7055	0.5099	0.8423	0.6140	0.6093	27
South Africa	0.4733	0.6287	0.5903	0.7424	0.6060	0.7126	0.3065	0.5241	0.4171	0.6044	0.5411	0.7135	0.7671	0.7389	0.5976	28
Malaysia	0.6848	0.8668	0.6760	0.8289	0.3085	0.3524	0.2312	0.3819	0.6082	0.7664	0.7657	0.9458	0.4266	0.3898	0.5881	29
Romania	0.4618	0.5994	0.5352	0.6581	0.5664	0.6581	0.3448	0.5503	0.5006	0.6911	0.5090	0.6634	0.7014	0.6688	0.5792	30

Country	EXPY		EXPY-Core		Diversification		Diversification-Core		Share Core		Standardness		Open Forest		Index of Opportunities	Rank
	Actual	Residual	Actual	Residual	Actual	Residual	Actual	Residual	Actual	Residual	Actual	Residual	Actual	Residual		
Philippines	0.6586	1.0000	0.6458	0.8794	0.2885	0.5525	0.1526	0.4958	0.4267	0.7707	0.4987	0.7445	0.3645	0.5904	0.5763	31
Bulgaria	0.4674	0.6110	0.5704	0.7094	0.6238	0.7189	0.3185	0.5267	0.4212	0.5977	0.4552	0.5993	0.7378	0.7028	0.5757	32
Singapore	0.7904	0.4147	0.7501	0.6048	0.3183	0.3609	0.3387	0.3499	0.8634	0.8465	0.8720	0.6148	0.4637	0.4360	0.5731	33
Belarus	0.6126	0.8331	0.5499	0.6898	0.4353	0.5538	0.2345	0.4563	0.4384	0.6400	0.5385	0.7157	0.6157	0.6280	0.5673	34
Turkey	0.4729	0.5876	0.5526	0.6675	0.6872	0.7461	0.2836	0.4574	0.3411	0.4607	0.4696	0.5933	0.8381	0.7431	0.5643	35
Israel	0.5757	0.4809	0.7698	0.8342	0.4455	0.3435	0.3669	0.3675	0.6746	0.6524	0.6804	0.6614	0.6032	0.3710	0.5591	36
Ireland	1.0000	0.7936	1.0000	0.9995	0.2298	0.2028	0.1734	0.1449	0.6026	0.5040	0.7780	0.5611	0.3798	0.2839	0.5467	37
Croatia	0.5308	0.5829	0.5763	0.6534	0.5936	0.5733	0.3125	0.4098	0.4342	0.4823	0.4259	0.4721	0.7253	0.5616	0.5239	38
Portugal	0.6021	0.5624	0.6724	0.7218	0.5885	0.4975	0.2903	0.3070	0.4063	0.3482	0.5105	0.4839	0.7733	0.5213	0.5204	39
Argentina	0.4381	0.5374	0.6889	0.8577	0.4668	0.5285	0.1922	0.3601	0.3371	0.4546	0.5332	0.6717	0.5955	0.5481	0.5150	40
Canada	0.6863	0.4067	0.7243	0.6447	0.5940	0.5244	0.2930	0.2590	0.4065	0.2574	0.6331	0.4248	0.7700	0.5520	0.5126	41
Jordan	0.4153	0.6285	0.5115	0.6767	0.3651	0.5864	0.1909	0.5003	0.4247	0.7271	0.3647	0.5569	0.4907	0.6439	0.5059	42
Egypt	0.5102	0.7609	0.4967	0.6548	0.4477	0.6645	0.1499	0.4545	0.2733	0.5373	0.3518	0.5394	0.5402	0.6801	0.5044	43
Viet Nam	0.3539	0.5850	0.5776	0.7929	0.4332	0.7207	0.0934	0.4559	0.1756	0.4862	0.4361	0.6791	0.4863	0.7175	0.4995	44
Russian Federation	0.5098	0.6217	0.4537	0.5192	0.2991	0.3458	0.2077	0.3595	0.5600	0.7098	0.6929	0.8572	0.4311	0.3963	0.4974	45
Latvia	0.5158	0.6097	0.5782	0.6823	0.5196	0.5423	0.2198	0.3531	0.3437	0.4200	0.4177	0.4989	0.6188	0.5235	0.4888	46
China, Hong Kong SAR	0.5968	0.2890	0.7053	0.6229	0.5153	0.4424	0.2823	0.2465	0.4499	0.3111	0.7081	0.5250	0.6207	0.4269	0.4816	47
Bosnia Herzegovina	0.4177	0.5958	0.5667	0.7343	0.3877	0.5571	0.1821	0.4460	0.3811	0.6214	0.3626	0.5265	0.4254	0.5331	0.4812	48
Lithuania	0.5156	0.5891	0.5059	0.5699	0.5583	0.5617	0.2292	0.3449	0.3352	0.3877	0.4098	0.4733	0.6838	0.5544	0.4799	49
Sierra Leone	0.2894	0.5222	0.6431	0.9001	0.1328	0.4735	0.0847	0.4875	0.4846	0.9142	0.4393	0.7051	0.1185	0.4784	0.4767	50
Colombia	0.4322	0.5946	0.5716	0.7294	0.3902	0.5307	0.1526	0.3891	0.3189	0.5148	0.3821	0.5340	0.5405	0.5921	0.4766	51
Uruguay	0.4746	0.6114	0.7689	0.9820	0.3515	0.4400	0.1109	0.2974	0.2560	0.3815	0.4789	0.6213	0.4035	0.4228	0.4715	52
Lebanon	0.4427	0.5657	0.4721	0.5662	0.4553	0.5413	0.2083	0.3994	0.3716	0.5234	0.4172	0.5439	0.4803	0.4833	0.4622	53
Greece	0.5112	0.3649	0.6195	0.6102	0.6043	0.4946	0.2829	0.2697	0.3871	0.2843	0.4399	0.3431	0.7519	0.4851	0.4606	54
Georgia	0.3705	0.5831	0.4838	0.6476	0.2191	0.4702	0.1210	0.4503	0.4394	0.7725	0.4093	0.6263	0.2517	0.4841	0.4521	55
Panama	0.4375	0.5643	0.4231	0.5008	0.3694	0.4638	0.1909	0.3874	0.4206	0.5913	0.4632	0.6059	0.4366	0.4563	0.4508	56
Kenya	0.2268	0.4189	0.5154	0.7134	0.3711	0.6827	0.1048	0.4876	0.2304	0.5763	0.2972	0.5170	0.4224	0.6927	0.4469	57
Costa Rica	0.5260	0.6917	0.6485	0.8175	0.2570	0.3559	0.1223	0.3174	0.3813	0.5454	0.3247	0.4351	0.3544	0.3934	0.4408	58
Tunisia	0.3643	0.5151	0.4019	0.5007	0.4004	0.5626	0.1593	0.4156	0.3238	0.5434	0.3724	0.5347	0.4908	0.5773	0.4402	59
Pakistan	0.2360	0.4167	0.6156	0.8453	0.3723	0.6586	0.0464	0.4043	0.1006	0.3914	0.3434	0.5627	0.4220	0.6635	0.4342	60
Nepal	0.2816	0.5043	0.4557	0.6340	0.3128	0.6386	0.0974	0.4910	0.2526	0.6165	0.3996	0.6504	0.1967	0.5275	0.4328	61
Kyrgyzstan	0.2270	0.4119	0.5412	0.7455	0.3055	0.6062	0.1042	0.4765	0.2799	0.6257	0.3727	0.6054	0.2298	0.5250	0.4326	62
New Zealand	0.6134	0.5098	0.7163	0.7459	0.4379	0.3312	0.1680	0.1486	0.3139	0.1940	0.4749	0.3867	0.5825	0.3497	0.4266	63
Syria	0.4110	0.6282	0.6219	0.8343	0.3068	0.5376	0.0457	0.3547	0.1053	0.3412	0.3531	0.5469	0.3275	0.5233	0.4241	64
Rep. of Moldova	0.3342	0.5565	0.3472	0.4700	0.3111	0.5998	0.1129	0.4756	0.2929	0.6301	0.3224	0.5372	0.2982	0.5661	0.4182	65
Guatemala	0.2522	0.3999	0.5527	0.7356	0.3787	0.6031	0.1122	0.4204	0.2423	0.5054	0.2196	0.3781	0.4389	0.6064	0.4175	66

Country	EXPY		EXPY-Core		Diversification		Diversification-Core		Share Core		Standardness		Open Forest		Index of Opportunities	Rank
	Actual	Residual	Actual	Residual	Actual	Residual	Actual	Residual	Actual	Residual	Actual	Residual	Actual	Residual		
Sri Lanka	0.2231	0.3718	0.6563	0.8878	0.3319	0.5769	0.0450	0.3667	0.1094	0.3609	0.3796	0.5872	0.3525	0.5599	0.4149	67
Venezuela	0.5128	0.6572	0.5488	0.6694	0.1430	0.2259	0.0934	0.2704	0.5046	0.6783	0.4409	0.5677	0.2081	0.2561	0.4126	68
Armenia	0.3215	0.5047	0.4526	0.5991	0.1974	0.4352	0.0981	0.4143	0.3850	0.6916	0.4088	0.6187	0.1962	0.4241	0.4105	69
Azerbaijan	0.4818	0.7196	0.6026	0.8026	0.1268	0.3478	0.0531	0.3512	0.3202	0.5937	0.3159	0.4938	0.1468	0.3640	0.4086	70
Norway	0.5686	0.0000	0.6244	0.3740	0.2668	0.4281	0.1976	0.2606	0.5925	0.5598	0.6311	0.2376	0.3994	0.5247	0.4047	71
El Salvador	0.3861	0.5588	0.6111	0.8006	0.2817	0.4636	0.0927	0.3611	0.2661	0.4901	0.1999	0.3299	0.3365	0.4741	0.4037	72
Senegal	0.2910	0.5054	0.2516	0.3416	0.2872	0.5930	0.1250	0.5026	0.3461	0.7121	0.2853	0.4988	0.3013	0.5876	0.4020	73
Kazakhstan	0.4306	0.5720	0.3145	0.3583	0.2285	0.3463	0.1095	0.3207	0.3847	0.5693	0.5713	0.7539	0.2739	0.3501	0.3988	74
Uzbekistan	0.2107	0.3844	0.5243	0.7194	0.1949	0.4901	0.0598	0.4234	0.2421	0.5718	0.4021	0.6384	0.1995	0.4924	0.3967	75
Peru	0.2702	0.3837	0.4992	0.6380	0.3438	0.5096	0.0894	0.3442	0.2112	0.4070	0.3817	0.5477	0.3922	0.5015	0.3942	76
Saudi Arabia	0.5695	0.5211	0.7486	0.8312	0.1272	0.0462	0.0874	0.0956	0.5314	0.5061	0.5500	0.5368	0.2153	0.0776	0.3889	77
Ethiopia	0.0684	0.2093	0.6969	0.9753	0.2038	0.5432	0.0504	0.4513	0.1593	0.5125	0.3062	0.5394	0.1732	0.5220	0.3865	78
TFYR of Macedonia	0.3684	0.4965	0.3798	0.4566	0.3681	0.4991	0.1364	0.3632	0.3012	0.4827	0.2945	0.4191	0.3627	0.4388	0.3834	79
Burundi	0.1045	0.2657	0.6467	0.9080	0.0732	0.4240	0.0370	0.4449	0.3170	0.7160	0.3752	0.6294	0.0147	0.4058	0.3830	80
Mozambique	0.2985	0.5342	0.5713	0.7991	0.1370	0.4762	0.0296	0.4282	0.1628	0.5155	0.2739	0.4987	0.1225	0.4800	0.3805	81
Dominican Rep.	0.3716	0.5260	0.4981	0.6358	0.2923	0.4574	0.0927	0.3463	0.2550	0.4594	0.2360	0.3655	0.3361	0.4548	0.3805	82
Iran	0.4929	0.6416	0.5831	0.7241	0.1723	0.2689	0.0403	0.2275	0.1803	0.2932	0.4907	0.6392	0.2234	0.2844	0.3759	83
Uganda	0.1444	0.3112	0.5301	0.7388	0.2243	0.5537	0.0652	0.4587	0.2231	0.5820	0.2383	0.4506	0.1833	0.5192	0.3731	84
Bolivia	0.2660	0.4293	0.5548	0.7440	0.2085	0.4509	0.0464	0.3640	0.1771	0.4397	0.3578	0.5577	0.1859	0.4214	0.3717	85
Yemen	0.4791	0.7600	0.5631	0.7713	0.1136	0.4030	0.0282	0.3839	0.1669	0.4719	0.1645	0.3394	0.1222	0.4223	0.3707	86
United Rep. of Tanzania	0.1277	0.2855	0.4762	0.6622	0.3004	0.6248	0.0551	0.4450	0.1426	0.4791	0.2693	0.4876	0.2517	0.5696	0.3698	87
Algeria	0.6558	0.9163	0.4724	0.5932	0.0374	0.1908	0.0202	0.2555	0.3312	0.5368	0.3659	0.5178	0.0431	0.2023	0.3670	88
Albania	0.2931	0.4216	0.5378	0.6949	0.3145	0.4881	0.0894	0.3508	0.2312	0.4392	0.2385	0.3738	0.2404	0.3886	0.3644	89
Libya	0.5145	0.6033	0.6059	0.7186	0.0315	0.0585	0.0336	0.1528	0.6403	0.7813	0.3957	0.4679	0.0401	0.0564	0.3643	90
Togo	0.1753	0.3572	0.4232	0.5904	0.2251	0.5583	0.0806	0.4783	0.2789	0.6546	0.2029	0.4083	0.1595	0.5046	0.3641	91
Chad	0.2397	0.4390	0.6414	0.8908	0.0140	0.3351	0.0081	0.3883	0.2193	0.5657	0.3742	0.6143	0.0000	0.3589	0.3635	92
Chile	0.3511	0.3868	0.5540	0.6540	0.3098	0.3460	0.0773	0.2123	0.2017	0.2558	0.4318	0.5242	0.3964	0.3570	0.3613	93
Mali	0.0524	0.1792	0.5353	0.7450	0.1085	0.4367	0.0397	0.4291	0.2762	0.6444	0.3558	0.5953	0.1081	0.4553	0.3543	94
Australia	0.5076	0.2222	0.7003	0.6484	0.4013	0.3061	0.0954	0.0467	0.1937	0.0000	0.5917	0.4261	0.5041	0.3038	0.3534	95
Morocco	0.2998	0.4787	0.2894	0.3732	0.3281	0.5706	0.0524	0.3723	0.1293	0.3829	0.2743	0.4549	0.3665	0.5683	0.3529	96
Ecuador	0.3363	0.4728	0.6620	0.8635	0.1996	0.3619	0.0336	0.2801	0.1321	0.3032	0.2827	0.4211	0.2273	0.3629	0.3528	97
Ghana	0.1312	0.2871	0.5454	0.7572	0.1911	0.5118	0.0336	0.4175	0.1352	0.4645	0.2675	0.4828	0.1914	0.5149	0.3522	98
Bangladesh	0.1896	0.3723	0.6013	0.8369	0.1851	0.5102	0.0228	0.4099	0.0982	0.4230	0.1798	0.3756	0.1937	0.5218	0.3514	99
Nigeria	0.5234	0.8326	0.4584	0.6301	0.0515	0.3584	0.0054	0.3739	0.0688	0.3667	0.2910	0.5045	0.0510	0.3842	0.3500	100
Tajikistan	0.2079	0.3913	0.5887	0.8155	0.1132	0.4280	0.0269	0.4042	0.1788	0.5112	0.2534	0.4618	0.0794	0.4171	0.3484	101
Paraguay	0.2089	0.3426	0.4852	0.6432	0.2043	0.4376	0.0410	0.3504	0.1583	0.4075	0.3905	0.5938	0.1846	0.4099	0.3470	102

Country	EXPY		EXPY-Core		Diversification		Diversification-Core		Share Core		Standardness		Open Forest		Index of Opportunities	Rank
	Actual	Residual	Actual	Residual	Actual	Residual	Actual	Residual	Actual	Residual	Actual	Residual	Actual	Residual		
Burkina Faso	0.0092	0.1177	0.5377	0.7483	0.1570	0.4840	0.0625	0.4528	0.2741	0.6415	0.2785	0.4989	0.1154	0.4607	0.3456	103
Angola	0.4747	0.7279	0.7365	1.0000	0.0000	0.2509	0.0000	0.3192	0.0000	0.2258	0.2996	0.4877	0.0019	0.2799	0.3432	104
Madagascar	0.1633	0.3382	0.5429	0.7569	0.2340	0.5636	0.0316	0.4236	0.1062	0.4379	0.1457	0.3355	0.1859	0.5216	0.3419	105
Liberia	0.2636	0.4904	0.1263	0.1792	0.0289	0.3797	0.0215	0.4279	0.4345	0.8602	0.4185	0.6829	0.0318	0.4186	0.3403	106
Sudan	0.4112	0.6751	0.5429	0.7492	0.0902	0.3988	0.0134	0.3844	0.1091	0.4188	0.1398	0.3174	0.0854	0.4143	0.3393	107
Congo	0.4194	0.6503	0.6482	0.8768	0.0591	0.3099	0.0081	0.3286	0.0929	0.3415	0.2186	0.3873	0.0498	0.3193	0.3364	108
Côte d'Ivoire	0.1285	0.2748	0.2584	0.3508	0.1974	0.5038	0.0625	0.4359	0.2499	0.5924	0.3265	0.5496	0.2174	0.5195	0.3334	109
Rwanda	0.0922	0.2398	0.5415	0.7560	0.0613	0.3976	0.0208	0.4154	0.2197	0.5817	0.3336	0.5710	0.0317	0.4026	0.3332	110
Turkmenistan	0.3690	0.5635	0.5317	0.7053	0.0736	0.3007	0.0148	0.3153	0.1429	0.3800	0.2654	0.4337	0.0619	0.3022	0.3186	111
Central African Rep.	0.0805	0.2253	0.5731	0.8014	0.0336	0.3739	0.0114	0.4085	0.1921	0.5510	0.2770	0.5022	0.0184	0.3960	0.3175	112
Honduras	0.1994	0.3429	0.2809	0.3647	0.2621	0.5154	0.0544	0.3827	0.1667	0.4387	0.2331	0.4085	0.2677	0.5003	0.3155	113
Lao People's Dem. Rep.	0.1576	0.3156	0.5793	0.7999	0.1655	0.4717	0.0222	0.3927	0.1021	0.4091	0.1469	0.3257	0.0894	0.4163	0.3139	114
Papua New Guinea	0.1658	0.3215	0.5714	0.7857	0.1004	0.3985	0.0114	0.3735	0.0860	0.3801	0.2500	0.4497	0.0870	0.4039	0.3132	115
Mongolia	0.1316	0.2611	0.5580	0.7604	0.1668	0.4444	0.0181	0.3640	0.0848	0.3597	0.2490	0.4392	0.1134	0.4028	0.3109	116
Cameroon	0.2542	0.4457	0.5312	0.7288	0.0966	0.3930	0.0134	0.3741	0.0999	0.3957	0.1290	0.2983	0.1010	0.4131	0.3053	117
Nicaragua	0.1943	0.3547	0.3820	0.5166	0.2264	0.5104	0.0343	0.3874	0.1193	0.4098	0.1008	0.2584	0.1987	0.4796	0.2981	118
Zambia	0.1757	0.3513	0.1216	0.1646	0.1506	0.4741	0.0383	0.4242	0.1980	0.5440	0.3184	0.5470	0.1482	0.4828	0.2956	119
Niger	0.1488	0.3235	0.0000	0.0000	0.1247	0.4663	0.0484	0.4499	0.2971	0.6834	0.3722	0.6219	0.1137	0.4755	0.2947	120
United Arab Emirates	0.5855	0.0301	0.6942	0.4751	0.1704	0.3253	0.0698	0.1216	0.3194	0.2190	0.4364	0.0000	0.2551	0.3996	0.2930	121
Cambodia	0.1855	0.3604	0.4228	0.5837	0.1430	0.4585	0.0175	0.3954	0.0934	0.4071	0.1077	0.2811	0.1231	0.4535	0.2880	122
Guinea	0.1609	0.3316	0.5281	0.7343	0.0757	0.4026	0.0148	0.4012	0.1384	0.4724	0.0567	0.2223	0.0592	0.4141	0.2866	123
Mauritania	0.2344	0.4229	0.6118	0.8446	0.0404	0.3466	0.0054	0.3731	0.0819	0.3820	0.0552	0.2106	0.0262	0.3633	0.2856	124
Malawi	0.0000	0.1115	0.5338	0.7466	0.1230	0.4622	0.0228	0.4209	0.1379	0.4845	0.1137	0.2992	0.0845	0.4494	0.2850	125
Benin	0.0861	0.2202	0.3851	0.5312	0.1123	0.4293	0.0302	0.4096	0.1977	0.5367	0.1585	0.3447	0.0659	0.4089	0.2797	126
Jamaica	0.2315	0.3134	0.3183	0.3763	0.1413	0.2900	0.0598	0.2948	0.3269	0.5287	0.2087	0.3205	0.1811	0.3094	0.2786	127
Oman	0.6083	0.6088	0.6201	0.6690	0.0652	0.0000	0.0274	0.0507	0.2632	0.1984	0.3107	0.2640	0.0980	0.0000	0.2703	128
Kuwait	0.5783	0.1703	0.7221	0.5961	0.0364	0.0331	0.0282	0.0000	0.4781	0.3550	0.4078	0.0802	0.0550	0.0488	0.2564	129
Haiti	0.1794	0.3566	0.1989	0.2729	0.1153	0.4394	0.0222	0.4072	0.1481	0.4823	0.0000	0.1507	0.0642	0.4157	0.2323	130

The Index of Opportunities that we have presented ranks countries according to the accumulated set of capabilities, an indicator of the opportunities to continue transforming and growing. To see how the index performs as a predictor of future growth, we constructed the index for 1980–86. We use exactly the same indicators and the same procedure discussed above. Figure 18 shows that there is a positive and a statistically significant relationship between the capabilities that existed in the early 1980s and opportunities in the form of per capita GDP growth over the period 1980–2007.[17]

Figure 18: Index of Opportunities (1980–86) and Per Capita GDP Growth (1980–2007)

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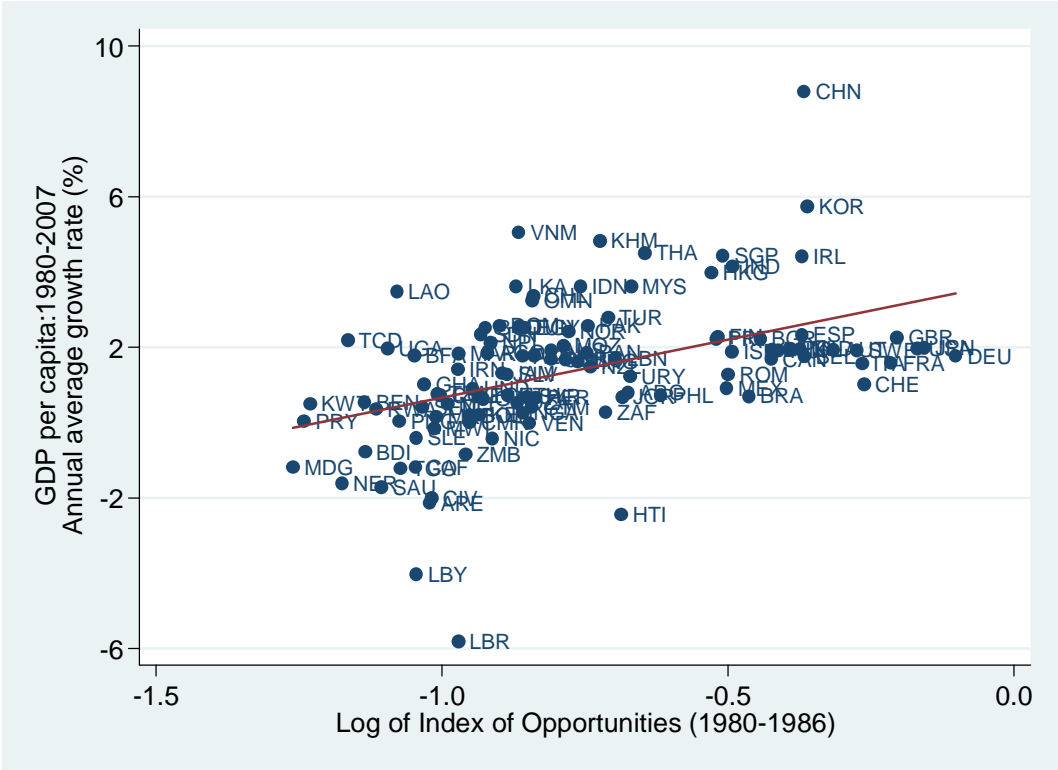
[17] The estimated coefficient of the regression of the average annual growth of GDP per capita (1980–2007) on the Index of Opportunities (1980–1986) is 3.09, statistically significant at the 1% confidence level. This coefficient implies that a 10% increase in the value of the index yields 0.31 percentage points of additional growth.

8. THE PRODUCT SPACES OF BRAZIL, CHINA, GERMANY, INDIA, INDONESIA, POLAND, RUSSIA, AND THAILAND

The high ranking of countries such as China, India, Poland, Thailand, Brazil, and Indonesia is a manifestation of their orientation within the product space. It is instructive to compare the product spaces of these countries. In addition, we also look at the product space of Russia, which is one of the BRIC countries, but ranked much lower in the Index of Opportunities. Finally, we discuss Germany's product space (ranked highest in the Index of Opportunities).

The product space was shown in figure 1. We superimpose on it the products that the eight countries export with comparative advantage. We show them with black squares. Figure 19 shows the product space maps of Brazil, China, India, and Russia. Figure 20 shows the product space maps of Germany, Indonesia, Poland, and Thailand. The product space maps shown are for the year 2007.

Among the non-high-income countries, China has the highest number of black squares (265) and Russia has the lowest (105)—as we discussed above, this is a measure of the diversification of the export basket.[18] Similarly, China has the highest number of squares in the core of the product space (106), while Russia has the lowest (42). India and Poland are second in terms of diversification, with comparative advantage in 254 products. As opposed to the product space of China (figure 19), both Indonesia and Thailand (figure 20) have very little presence in the core of the product space. Poland's presence in the core of the product space is also significant, with comparative advantage in 89 products.

China has as many as 60 black squares in the machinery sector, most of them in the electronics sector (bottom right hand cluster, see figure 1). One common characteristic that Indonesia and Thailand share with China is that they are also present in the machinery sector. This could be due to the presence of regional production networks, especially in office machinery and telecommunications. India and Poland lack comparative advantage in machinery, especially in the electronics category. Like India, Poland also has comparative advantage in metal products and in some peripheral sectors. In the case of India, it is the chemical sector, with as many as 35 black squares, that stands out. In the case of Brazil, the machinery sector, with 38

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[18] These are actual figures for 2007. They differ from those discussed in the section on diversification, which are averages for 2001–07.

black squares, dominates the core of the product space. On the other hand, products with comparative advantage in the core are almost equally split between metals, machinery, and chemicals in Russia. While China never has been a great exporter (in the sense of having comparative advantage) of petroleum, raw materials, and forest products (products that lie in the periphery of the product space), Brazil, India, and Russia export quite a few of these products with comparative advantage.

Figure 19: Product Space: Brazil, China, India, and Russia (2007)
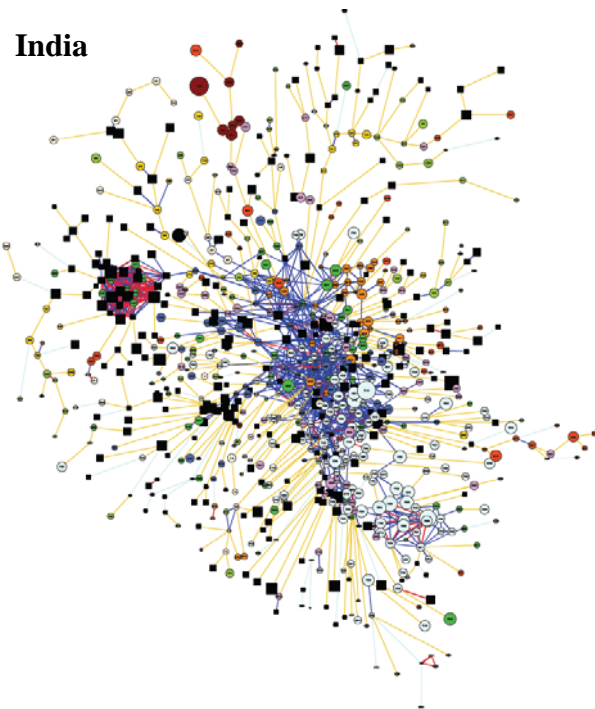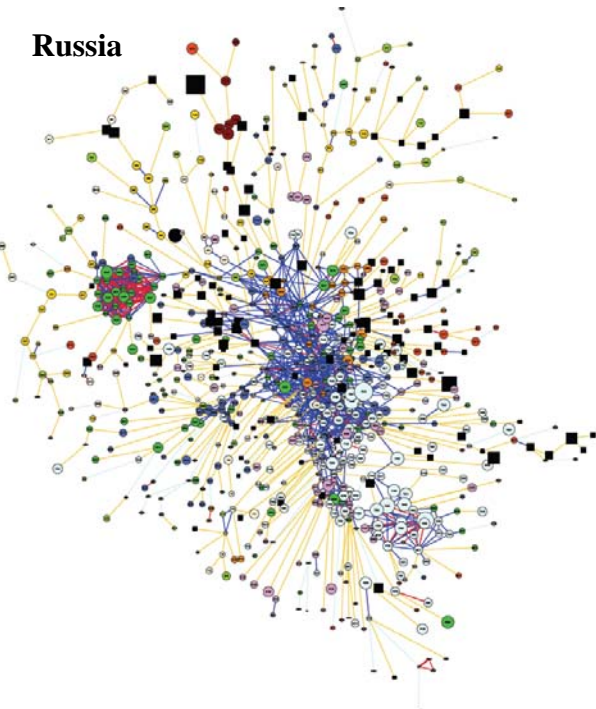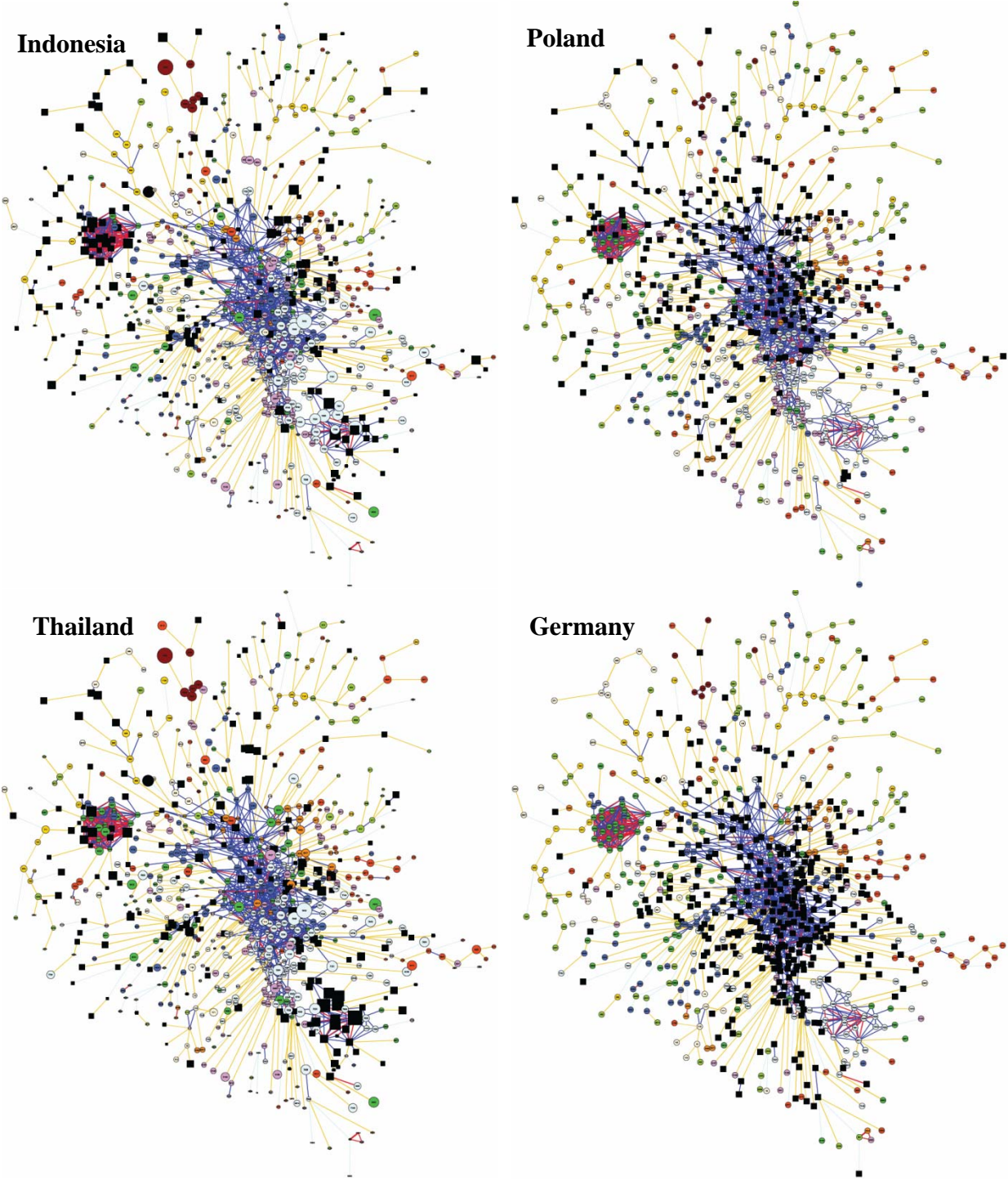

Brazil
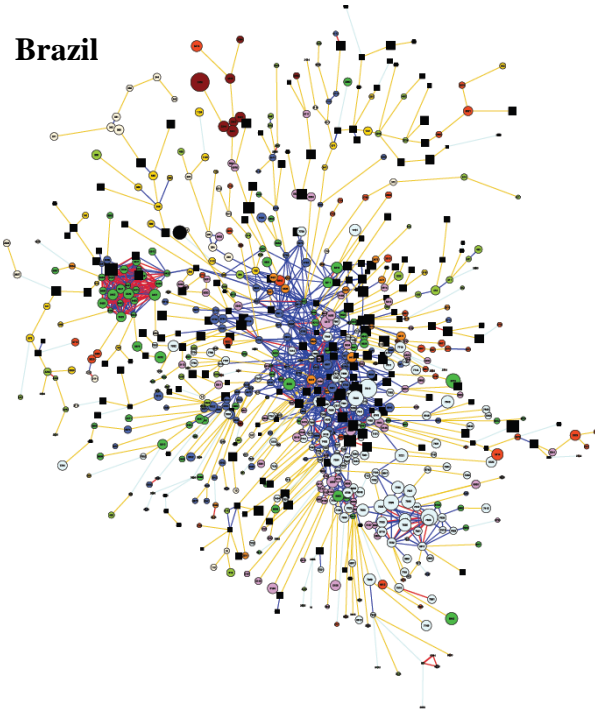
China
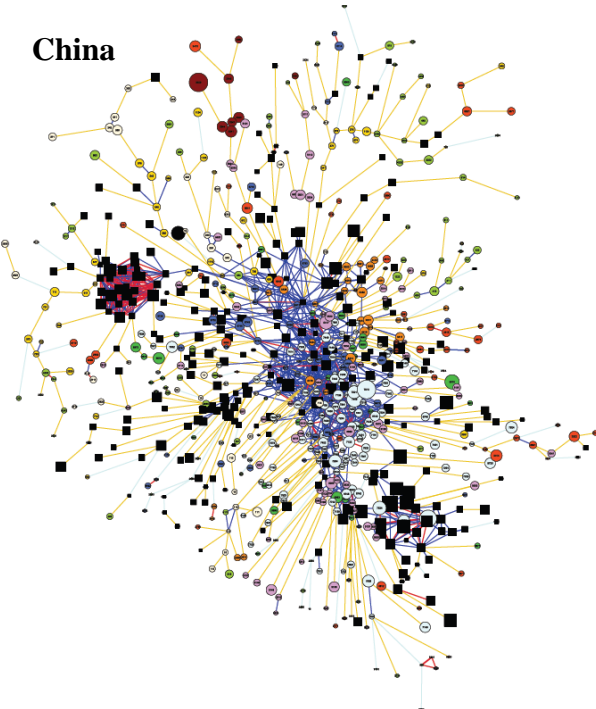
India

Russia

Figure 20: Product Space: Indonesia, Poland, Thailand, and Germany (2007)


Indonesia

Poland

Thailand

Germany

What does the product space of a high-income industrialized country look like? Figure 20 also shows the product space of Germany, ranked number 1 in the Index of Opportunities. Germany exports 330 products with comparative advantage, the highest number among the 130 countries. Of the 330 products exported with comparative advantage, 206 are in the core, again the highest. The large number of commodities in which Germany has a comparative advantage gives it a wide range of capabilities. Further, these capabilities are of complex nature, as shown by the comparative advantage in core products. Another feature of Germany's product space is the lack of products exported with comparative advantage in the periphery, as well as in the labor-intensive sectors. A key difference with some of the countries analyzed earlier is that, within machinery, Germany does not export electronics products with comparative advantage (bottom right of the product space, see figure 1). Germany has comparative advantage in 113 products in the machinery category, most of which are "general industrial," "specialized machinery for particular industries," and "power generation." None of the top six non-high-income countries has significant presence in those three 2-digit sectors.

Finally, we analyze how far the products not exported with comparative advantage are from the current export baskets. Figure 21 shows, for the eight countries, the scatter plots of the sophistication of these products against the inverse of density. Density measures the likelihood that a new product be exported with comparative advantage, given the products currently exported with comparative advantage.[19] In all cases, except Germany, the scatter plot is either vertical or slanting upward. This indicates that the products close-by are less sophisticated; in other words, more sophisticated products lie farther away and, most likely, these countries do not have the required capabilities to export them with comparative advantage. In the case of Germany, however, the scatter plot slants downwards, i.e., the nearby products are the ones with higher sophistication (as expected, given Germany's significant presence in the core), and the ones far away are the less sophisticated products. Among the non-high-income countries, potential exports are closer to the current export basket in China and India, followed by Poland and Thailand. Russia, as expected, is furthest from the origin.

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[19] Figure 21 shows the inverse of density: the lower this number, the greater the chance of being exported with comparative advantage.

Figure 21: Unexploited Products: PRODY and Distance from the Current Export Basket (2007)
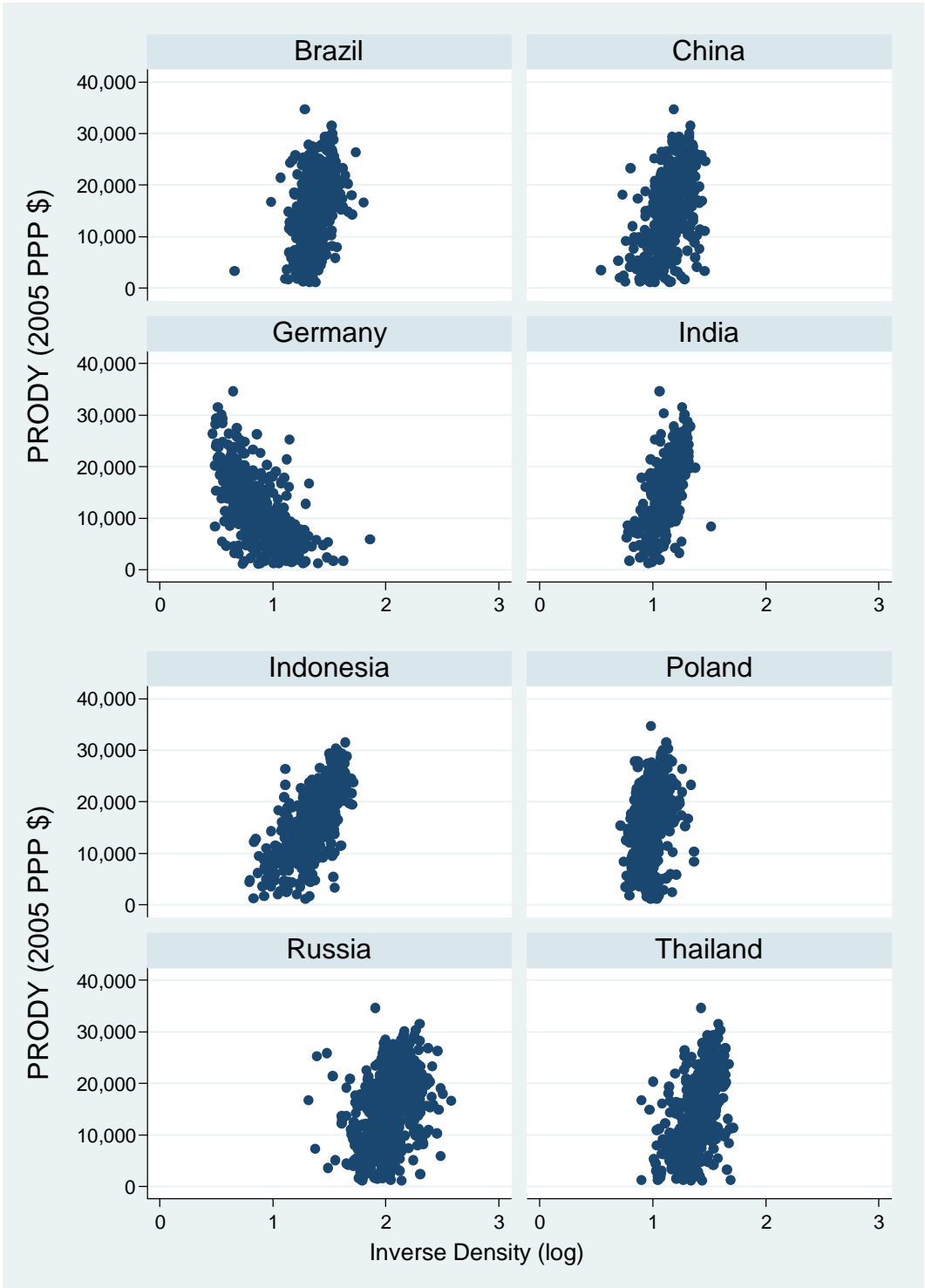
9. CONCLUSION

In this paper we have developed an Index of Opportunities, based on four dimensions that relate to a country's export basket and its position in the product space. The four dimensions are the sophistication of the export basket, its diversification, its standardness (uniqueness), and the possibilities of exporting other products with comparative advantage. The idea underlying the index is that, in the long run, a country's income is determined by the variety and sophistication of the products it makes and exports, and by the capacity of the country to accumulate new capabilities.

The results show that countries like China, India, Poland, Thailand, Mexico, and Brazil have accumulated a significant number of capabilities that will allow them to do well in the long run. To do so, they diversified and increased the level of sophistication of their export structures. Of course, these are not the only factors that will determine these countries' performance in the long run: good policies and incentives do matter. Our point is that these countries have sown the land with good seeds. If they take care of it (i.e., if they implement appropriate policies, provide support with good governance, and provide the right incentives), they should expect a good harvest. At the other extreme, countries like Guinea, Malawi, Benin, Mauritania, and Haiti score very poorly in the Index of Opportunities because their export structures are neither diversified nor sophisticated, and they have accumulated very few and unsophisticated capabilities. These countries are in urgent need of implementing policies that lead to the accumulation of capabilities.

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Appendix Table 1: Leamer's Classification and SITC Rev. 2 (2-digit)

Leamer's Classification	SITC	Leamer's Classification	SITC
1. Petroleum		**7. Labor-intensive**	
Petroleum and petroleum products	33	Nonmetallic mineral	66
		Furniture	82
		Travel goods, handbags	83
2. Raw materials		Articles of apparel	84
Crude fertilizer and crude minerals	27	Footwear	85
Metalliferous ores	28	Miscellaneous manufacture	89
Coal	32	Postal packages, not classified	91
Gas	34	Special transactions, not classified	93
Electric current	35	Coin (other than gold coin)	96
Nonferrous metals	68		
Gold, nonmonetary	97		
		8. Capital-intensive	
		Leather	61
3. Forest products		Rubber	62
Cork and wood	24	Textile yarn, fabrics	65
Pulp and waste paper	25	Sanitary fixtures and fittings, nes	81
Cork and wood	63	*Iron and steel*	*67*
Paper	64	*Manufactures of metals, nes*	*69*
4. Tropical Agriculture		**9. Machinery**	
Vegetables and fruit	05	*Power generating*	*71*
Sugar	06	*Specialized for particular industries*	*72*
Coffee	07	*Metalworking*	*73*
Beverages	11	*General industrial*	*74*
Crude rubber	23	*Office and data processing*	*75*
		Telecommunications	*76*
		Electrical	*77*
5. Animal products		*Road vehicles*	*78*
Live animals	00	*Other transport equipment*	*79*
Meat	01	*Professional and scientific instruments*	*87*
Dairy products	02	*Photographic equipment*	*88*
Fish	03	*Armored vehicles, firearms, and ammunition*	*95*
Hides, skins	21		
Crude animal and vegetable materials	29		
Animal and vegetable oils and fats	43	**10. Chemicals**	
Animals, live (nes)	94	*Organic*	*51*
		Inorganic	*52*
6. Cereals		*Dyeing and tanning*	*53*
Cereals	04	*Medicinal and pharmaceutical*	*54*
Feeds	08	*Oils and perfume*	*55*
Miscellaneous edible products	09	*Fertilizers*	*56*
Tobacco	12	*Explosives*	*57*
Oil seeds	22	*Artificial resins and plastic*	*58*
Textile fibers	26	*Chemical materials, nes*	*59*
Animal oils and fats	41		
Fixed vegetable oils and fats	42		

Source: Leamer (1984) and Hidalgo et al. (2007). Note: Italicized subsectors are in the core of the product space.

Appendix Table 2: List of Country Codes

ISO Code	Country	ISO Code	Country	ISO Code	Country
AGO	Angola	GTM	Guatemala	NPL	Nepal
ALB	Albania	HKG	China, Hong Kong SAR	NZL	New Zealand
ARE	United Arab Emirates	HND	Honduras	OMN	Oman
ARG	Argentina	HRV	Croatia	PAK	Pakistan
ARM	Armenia	HTI	Haiti	PAN	Panama
AUS	Australia	HUN	Hungary	PER	Peru
AUT	Austria	IDN	Indonesia	PHL	Philippines
AZE	Azerbaijan	IND	India	PNG	Papua New Guinea
BDI	Burundi	IRL	Ireland	POL	Poland
BEL	Belgium	IRN	Iran	PRT	Portugal
BEN	Benin	ISR	Israel	PRY	Paraguay
BFA	Burkina Faso	ITA	Italy	ROM	Romania
BGD	Bangladesh	JAM	Jamaica	RUS	Russian Federation
BGR	Bulgaria	JOR	Jordan	RWA	Rwanda
BIH	Bosnia Herzegovina	JPN	Japan	SAU	Saudi Arabia
BLR	Belarus	KAZ	Kazakhstan	SDN	Sudan
BOL	Bolivia	KEN	Kenya	SEN	Senegal
BRA	Brazil	KGZ	Kyrgyzstan	SGP	Singapore
CAF	Central African Rep.	KHM	Cambodia	SLE	Sierra Leone
CAN	Canada	KOR	Rep. of Korea	SLV	El Salvador
CHE	Switzerland	KWT	Kuwait	SVK	Slovakia
CHL	Chile	LAO	Lao People's Dem. Rep.	SVN	Slovenia
CHN	China	LBN	Lebanon	SWE	Sweden
CIV	Côte d'Ivoire	LBR	Liberia	SYR	Syria
CMR	Cameroon	LBY	Libya	TCD	Chad
COG	Congo	LKA	Sri Lanka	TGO	Togo
COL	Colombia	LTU	Lithuania	THA	Thailand
CRI	Costa Rica	LVA	Latvia	TJK	Tajikistan
CZE	Czech Rep.	MAR	Morocco	TKM	Turkmenistan
DEU	Germany	MDA	Rep. of Moldova	TUN	Tunisia
DNK	Denmark	MDG	Madagascar	TUR	Turkey
DOM	Dominican Rep.	MEX	Mexico	TZA	United Rep. of Tanzania
DZA	Algeria	MKD	TFYR of Macedonia	UGA	Uganda
ECU	Ecuador	MLI	Mali	UKR	Ukraine
EGY	Egypt	MNG	Mongolia	URY	Uruguay
ESP	Spain	MOZ	Mozambique	USA	USA
ETH	Ethiopia	MRT	Mauritania	UZB	Uzbekistan
FIN	Finland	MWI	Malawi	VEN	Venezuela
FRA	France	MYS	Malaysia	VNM	Viet Nam
GBR	United Kingdom	NER	Niger	YEM	Yemen
GEO	Georgia	NGA	Nigeria	ZAF	South Africa
GHA	Ghana	NIC	Nicaragua	ZMB	Zambia
GIN	Guinea	NLD	Netherlands		
GRC	Greece	NOR	Norway		