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Pakistan: Competitiveness and Structural Transformation in Pakistan

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Structural Transformation in Pakistan

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Introduction

Structural transformation is the process by which countries change what they produce and move from low-productivity, low-wage activities to high-productivity, high-wage activities. The purpose of this report is to use emerging methodologies to analyze Pakistan's history of and opportunities for structural transformation, in an effort to better understand past economic performance and accelerate future economic growth.

Part 1 looks at the composition of Pakistan's export basket and establishes that the country is specialized in relatively unsophisticated export activities that are typical of poorer countries. Compared to other countries in Asia, Pakistan has not been moving to new and better export activities, and consequently has fallen behind. We show that this is in part because the actual products that Pakistan currently produces are intensive in capabilities with few alternative uses. Pakistan is specialized in a relatively peripheral part of the product space, and has not explored the productive possibilities as actively as its comparators.

Given this record, an important priority in the future is to accelerate structural transformation. Pakistan's current orientation in the product space suggests that such acceleration would require a mix of facilitating movements to nearby activities, as well as encouraging more strategic jumps to new areas of the product space. Part 2 uses the data and methodologies of Part 1 to identify what those nearby and more distant activities might be, while Part 3 discusses appropriate policies that follow from these results and promote structural transformation, without suffering common failures of past industrial policies. The key message is that the government of Pakistan must actively learn the sector-specific constraints to structural transformation and overcome them in order to accelerate future economic growth.

PART 1 - Pakistan's History of Structural Transformation

This first section reviews Pakistan's record of structural transformation from the 1960s to today. We examine how the content of the export basket has been transformed, followed by a look at how the country's opportunities for structural transformation have evolved over time. For this analysis we motivate and define new metrics which are then used to evaluate future opportunities for structural transformation in Part 2 of this paper.

Export Composition

While the actual products comprising a country's export basket have traditionally taken a back seat to the focus on what were considered more fundamental country characteristics like capital stock and total factor productivity, recent research has suggested that what a country exports matters. Hausmann, Hwang and Rodrik (2006) find that the composition of a country's export basket has important implications for economic growth. Countries that are able to move to a more 'sophisticated' export basket given their level of income enjoy accelerated growth in the future.

The level of sophistication of a country's exports is based on how rich are the countries that export the same basket of goods as the country in question. This is calculated as follows. First, the authors develop a measure of the sophistication of each product by calculating the weighted average of the income per capita of the exporters of that product, with the weights consisting of the revealed comparative advantage of each country that exports the good:

$$PRODY_{i,t} = \sum_{c} \frac{\left(xval_{i,c,t} / X_c\right)}{\sum_{j}\left(xval_{i,c,t} / X_c\right)} Y_c$$

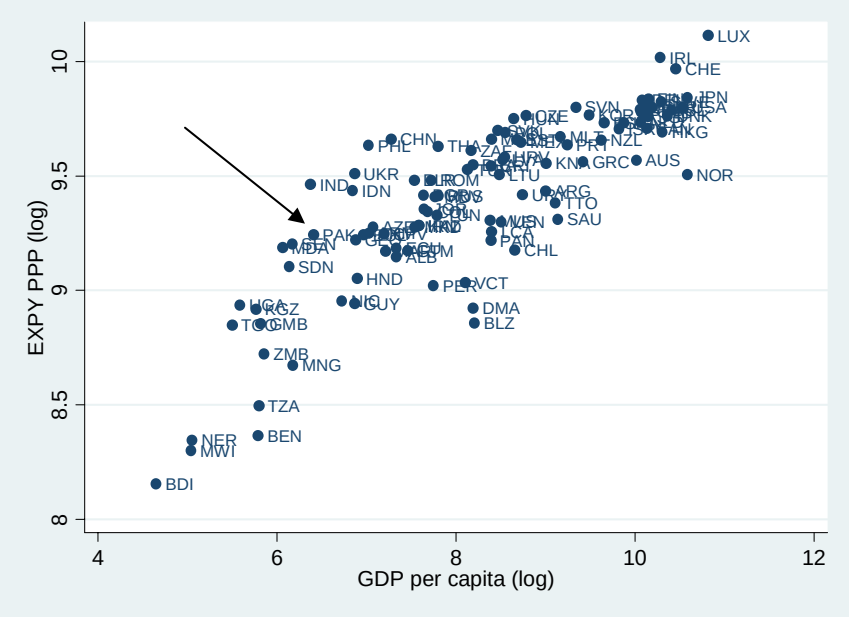
where $xval_{i,c,t}$ equals exports of good i by country c in year t, X_c equals total exports by country c, and Y_c equals GDP per capita of country c. This is a measure of the GDP per capita of the 'typical' country that exports product i. Richer-country goods are more sophisticated as they are associated with countries that pay higher wages. It is important to keep in mind that this is a measure of sophistication that is inferred from the types of countries exporting a good. It is not measuring any technological sophistication directly.

This product-level measure of sophistication is then used to measure the sophistication of a country's export basket as a whole. The authors call is measure *EXPY*. *EXPY* is simply the *PRODY* of each good (i) that the country c exports, weighted by that good's share in the country's export basket (X_c). It represents the income level associated with a country's export package, or alternatively, the income per capita of a country's competitors.

$$EXPY_{c,t} = \sum_{i}\left(\frac{xval_{c,i,t}}{X_{c,t}}\right) PRODY_{i,t}$$

Not surprisingly, the level of income implied by a country's export basket (*EXPY*) is correlated with actual income. That is, rich countries export rich country goods, as illustrated in Figure 1 below.

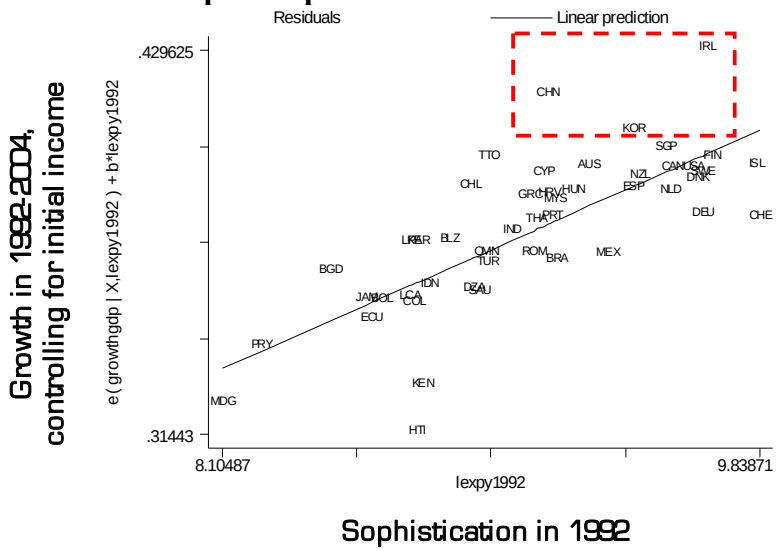
Figure 1
EXPY (PPP) vs. GDP per capita, 2005



Calculated using UN COMTRADE. Note that EXPY is in PPP but real GDP is in market, due to data limitations.

However, Figure 1 also shows significant variance in this relationship. For a given level of income (the x-axis), some countries have managed to develop products that are associated with a level of income much higher than others. Moreover, this variance has important consequences: Hausmann, Hwang and Rodrik (2006) find that countries that have managed to develop a sophisticated export package relative to their income level grow faster. However, countries specialized in relatively unsophisticated export baskets suffer lagging economic performance. In other words, those countries who are higher on the y-axis, at a given level on the x-axis, grow faster. This is shown more clearly in Figure 2, which presents the GDP per capita growth rate on the y-axis controlling for initial income against EXPY on the x-axis: countries with a higher EXPY grow faster.

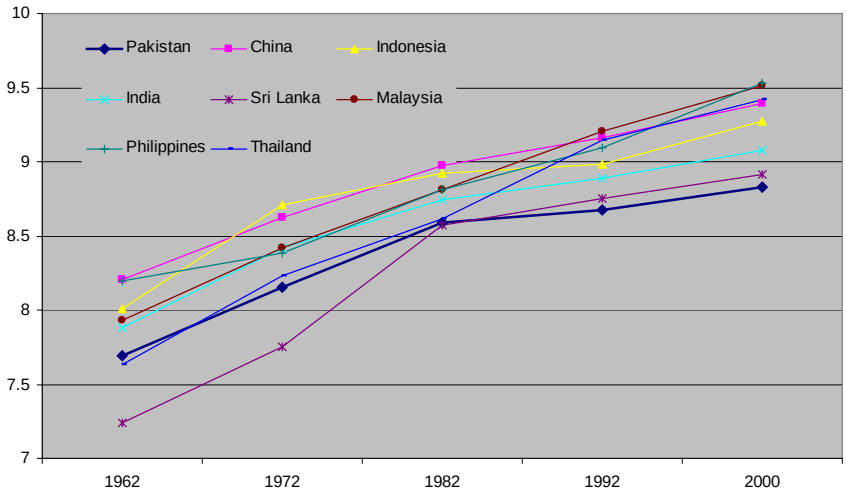
Figure 2
Export Sophistication vs. Growth



Given that EXPY matters for GDP growth, what does Figure 1 say about Pakistan's export sophistication? Remember, for a given level on the x-axis, countries higher on the y-axis have relatively more sophisticated export baskets and grow faster. Figure 1 shows that although Pakistan has a comparable level of GDP per capita to India and Indonesia, it has a much less sophisticated export package. This is even more true when comparing its export package to countries like China, the Philippines, and Thailand. It is only in comparison to countries in other regions with similar levels of income (e.g. Central America) that Pakistan has a comparable or favorable level of export sophistication. For its region, Pakistan is lagging.

This is born out in Figure 3 which shows the long-term evolution of export sophistication for Pakistan and some comparator countries in the region. Not only does Pakistan have the lowest level of export sophistication of this comparator group today, but we can also see in this figure that its relative position has worsened over the past 40 years. Although Pakistan's exports in the 1960s were more sophisticated than those of Thailand and Sri Lanka, this is no longer the case. At the same time, Malaysia and Indonesia have increased their advantage over Pakistan even further.

Figure 3
Historical Movement of EXPY (logs)



Calculated using Feenstra et al (2005).

Considering the content of exports, it seems clear that Pakistan's current export basket and its historical performance in transforming its productive structure are causes for concern. Export sophistication is slightly below average for Pakistan's level of income, and is very low compared to its region. Moreover, this relative position is only worsening over time.

Export Connectedness

Why has Pakistan been unable to move to new, more sophisticated export activities, and what are its opportunities to do so in the future? According to standard trade theory, moving to new export products, or what we call structural transformation, is a consequence of changing comparative advantage. In the Heckscher-Ohlin tradition, this is caused by changing relative factor intensities caused by factor accumulation: as a country accumulates more physical and human capital it naturally moves towards goods that are more intensive in physical and human capital. However, there are many reasons why structural transformation may be more complicated than this picture suggests. Hausmann and Klinger (2006 & 2007) and Hidalgo et al. (2007) investigate the determinants of the evolution of the level of sophistication of a country's exports, and find that instead of shifting production within large homogeneous cones of diversification, the process of structural transformation favors nearby products in a highly heterogeneous 'product space'.

This is based on the idea that every product involves highly specific inputs such as knowledge, physical assets, intermediate inputs, labor training requirements, infrastructure needs, property rights, regulatory requirements or other public goods. They are specific in the sense that those required for one product are particular to it, and somewhat different than those required for another product. Established industries have sorted out the many potential failures involved in assuring the presence of all of these

inputs, which are then available to subsequent entrants in the industry. But firms that venture into new products will find it much harder to secure the requisite inputs. For example, they will not find workers with experience in the product in question or suppliers who regularly furnish that industry. Specific infrastructure needs such as cold storage transportation systems may be non-existent, regulatory services such as product approval and phytosanitary permits may be underprovided, research and development capabilities related to that industry may not be there, and so on.

New firms therefore have to adapt those inputs that already exist in the economy, which are specific to other products. And we find evidence supporting the view that the assets and capabilities needed to produce one good are imperfect substitutes for those needed to produce another good, with this degree of specificity varying from product pair to product pair. For example, the particular set of infrastructure, institutions, and human capital specific to the garment industry are also relatively easily adapted to the wiring harness industry (Klinger 2007), but more difficult to adapt to the call center industry.

This varying degree of substitutability implies that the probability that a country will be good at producing any particular new good is related to its installed capability in the production of other similar, or nearby goods from which the currently existing productive capabilities can be easily adapted. The potential barriers preventing the emergence of new export activities are less binding for nearby products which only require slight adaptations of existing capacity, creating path dependence in the process of structural transformation.

This is found by first developing a measure of distance between products. We measure the distance between each pair of products based on the probability that countries in the world export both. If two goods need the same capabilities, this should show up in a higher probability of a country having comparative advantage in both. Formally, the inverse measure of distance between goods *i* and *j* in year *t*, which we will call proximity, equals

$$\varphi_{i,j,t} = \min\left\{P\left(x_{i,t} \mid x_{j,t}\right), P\left(x_{j,t} \mid x_{i,t}\right)\right\}$$

where for any country *c*

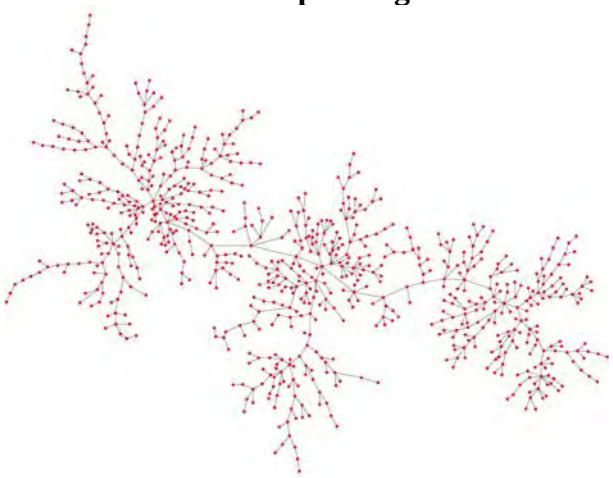
$$x_{i,c,t} = \begin{cases} 1 & if \quad RCA_{i,c,t} > 1 \\ 0 & otherwise \end{cases}$$

and where the conditional probability is calculated using all countries in year *t*. This is calculated using disaggregated export data across a large sample of countries from the World Trade Flows data from Feenstra et. al. (2005) and UN COMTRADE.

These pairwise distances create a product space within which countries jump from one export sector to another. The distances reveal a highly heterogeneous space, which we can illustrate using the tools of network analysis (Hidalgo et al. 2007).

Considering the linkages as measured in the 1998-2000 period, we first create the maximum spanning tree by taking the one strongest connection for each product that allows it to be connected to the entire product space. This is shown below.

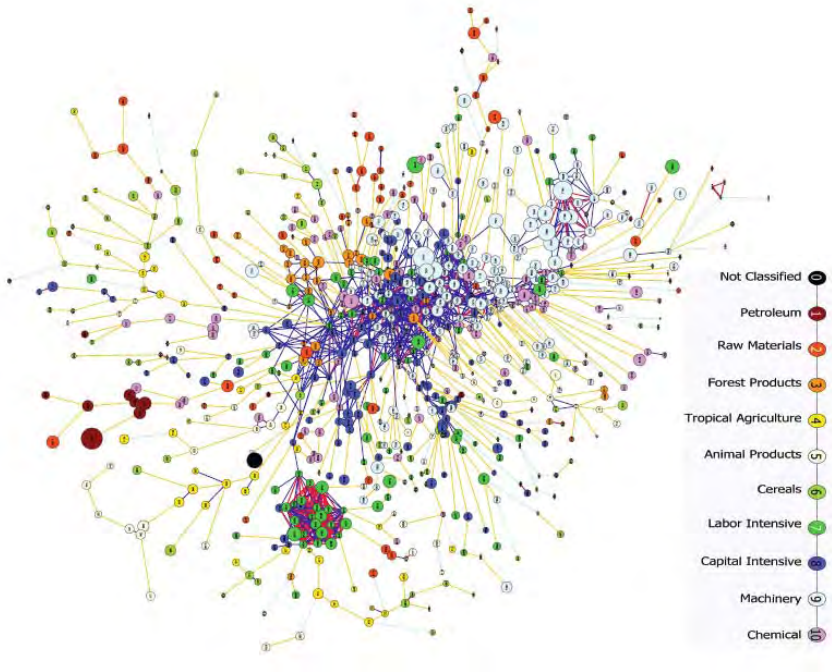
Figure 4
Maximum Spanning Tree



Source: Hidalgo et al. (2007).

The next step is to overlay this maximum spanning tree with the stronger links, and color-code the linkages between products depending on their proximity. In the Figure below, we show the visual representation of the product space. Each node is a product, its size determined by its share of world trade. In these graphs, physical distances between products are meaningless: proximity is shown by color-coding the linkages between pairs of products. A light-blue link indicates a proximity of under 0.4, a beige link a proximity between 0.4 and 0.55, a dark-blue link a proximity between 0.55 and 0.65, and a red link a proximity greater than 0.65. Links below 0.55 are only shown if they make up the maximum spanning tree, and the products are color-coded based on their Leamer (1984) commodity group.

Figure 5
A Visual Representation of the Product Space



Source: Hidalgo et al. (2007).

We can immediately see from the figure above that the product space is highly heterogeneous. There are peripheral products that are only weakly connected to other products, located on the outer edges of the space. There are some groupings among these peripheral goods, such as petroleum products (the large red nodes on the left side of the network), seafood products (below petroleum products), garments (the very dense cluster at the bottom of the network), and raw materials (the upper left to upper periphery). In addition to these peripheral clusters, there is a core of closely connected products in the center of the network, mainly of machinery and other capital intensive goods.

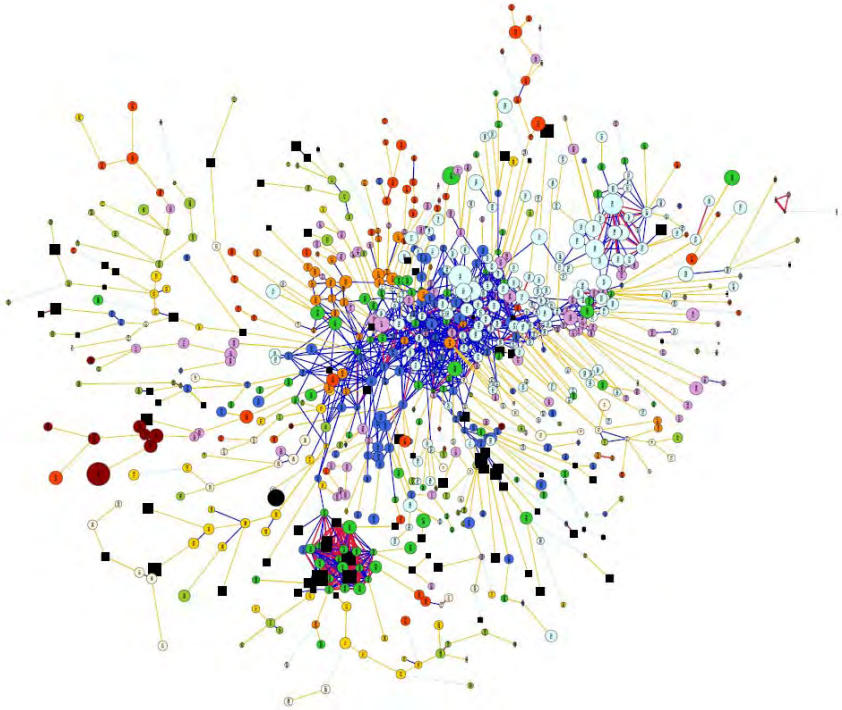
This heterogeneous structure of the product space has important implications for structural transformation. If a country is producing goods in a dense part of the product space, then the process of structural transformation is much easier because the set of acquired capabilities can be easily re-deployed to other nearby products. However, if a country is specialized in peripheral products, then this redeployment is more challenging as there is not a set of products requiring similar capabilities. The process of structural transformation can be impeded due to a country's orientation in this space.

The following figures show Pakistan's location and evolution in the product space by placing a black square over every product in which it has significant exports[1] in the particular year.

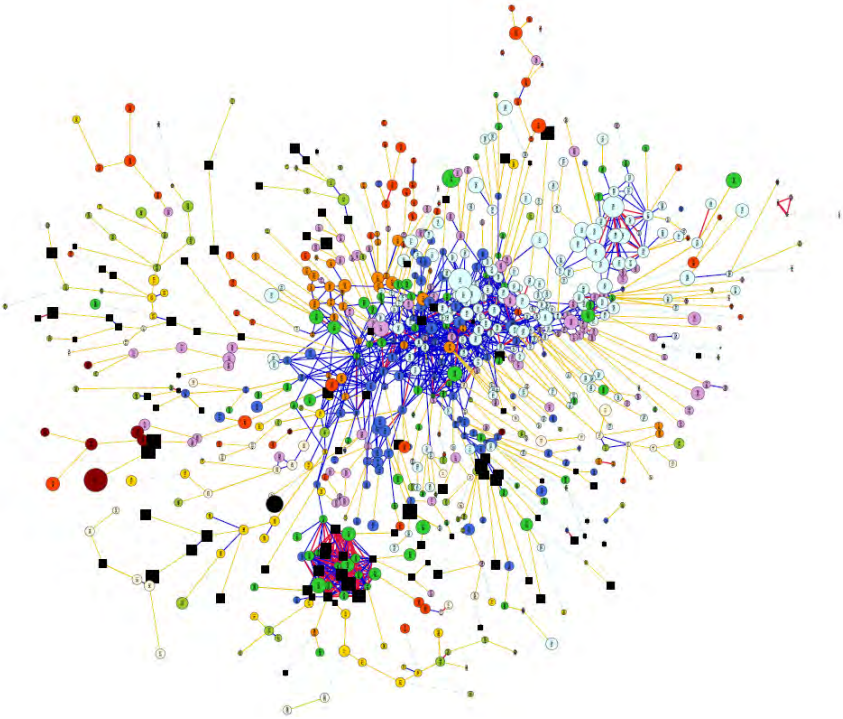
[1] Taken to be when the RCA index is greater than or equal to one: when the country's world market share in that good is greater than its world market share in all exports, or put another way, when the good's share of the country's export basket is greater than the good's share in world exports.

Figure 6
Pakistan's Location in the Product Space

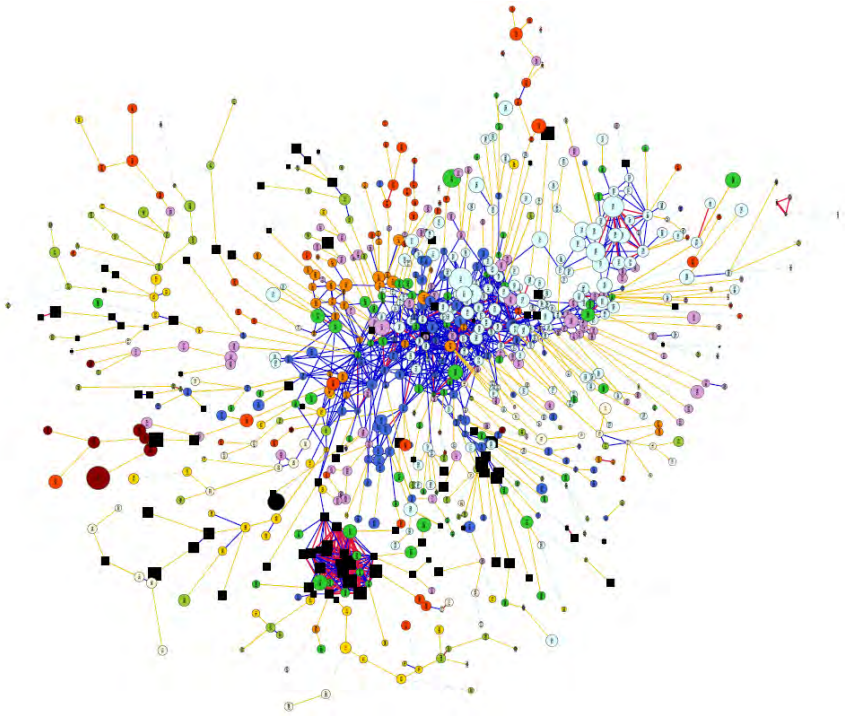
1975



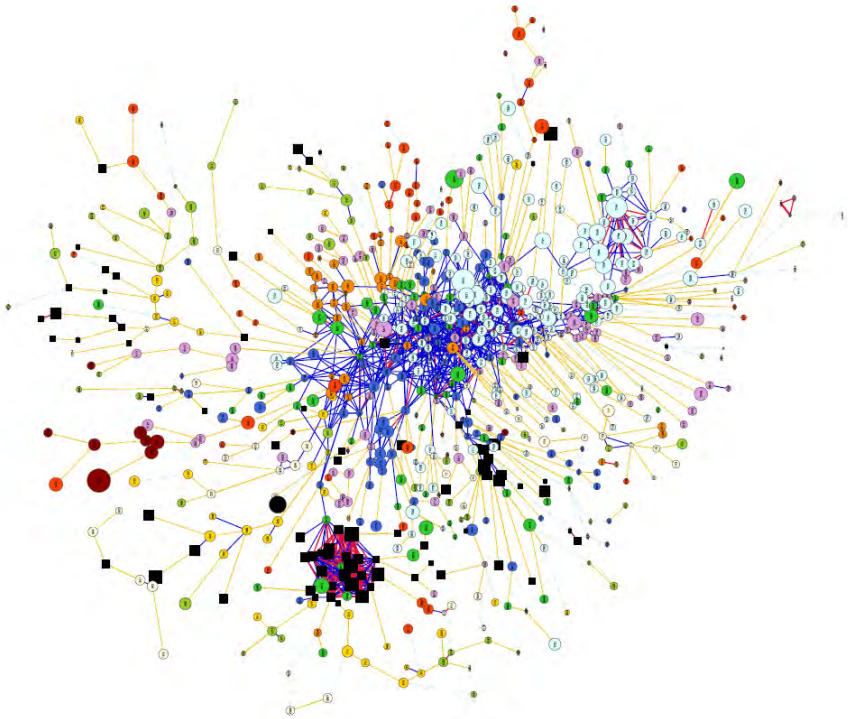
1980



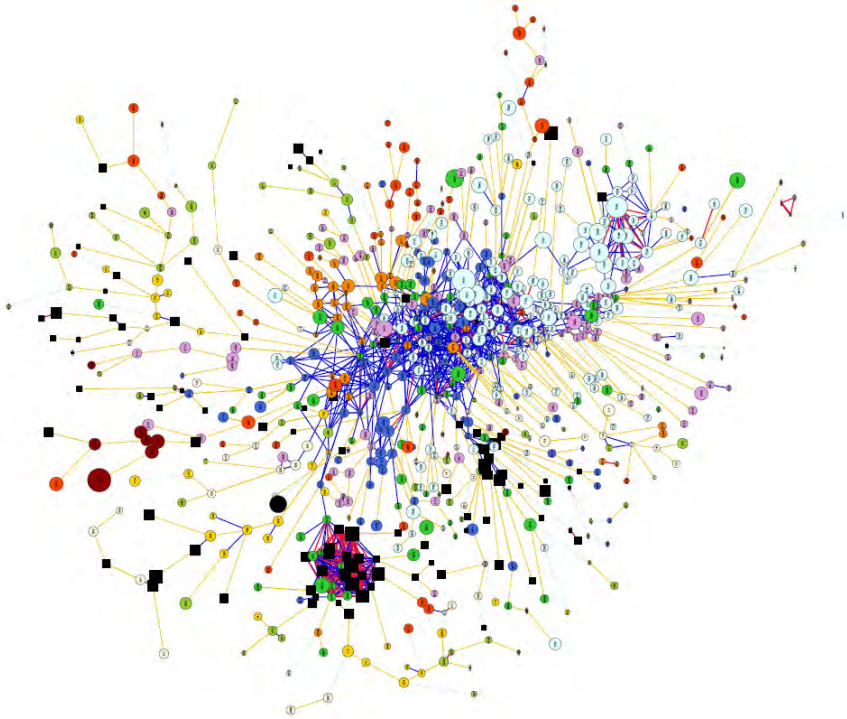
1985



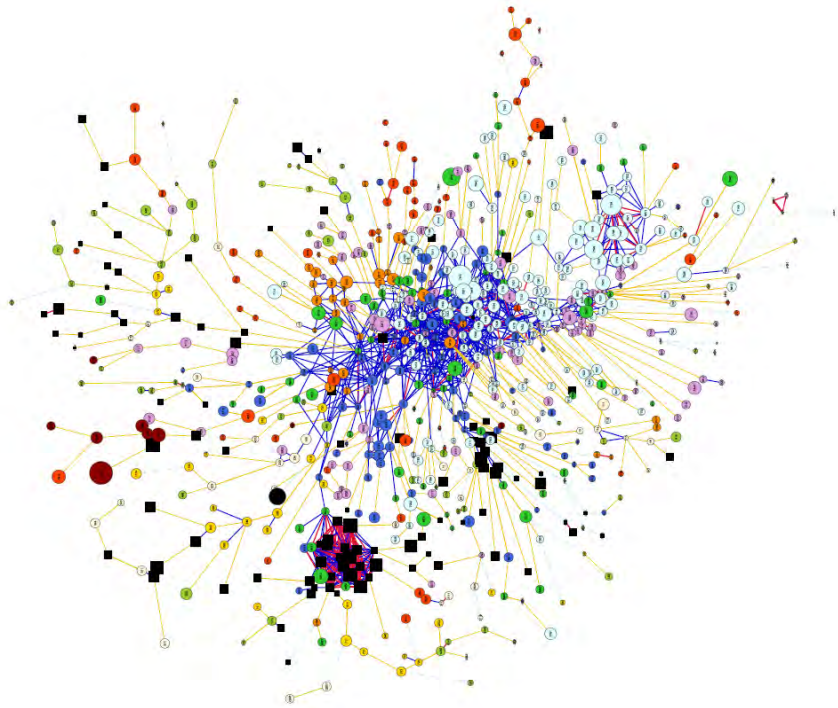
1990



1995



2000



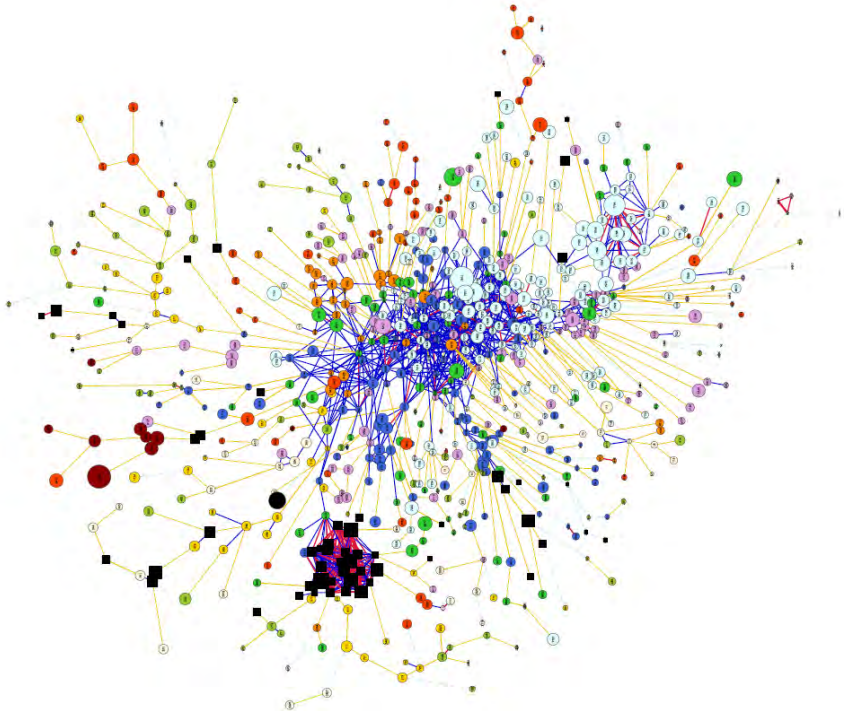
Source: Hidalgo et al. (2007) and author's calculations using Feenstra et al. (2005).

We can draw a number of observations from these figures. First of all, Pakistan's overall orientation in the product space as far back as 1975 can be described as 'peripheral'. Like

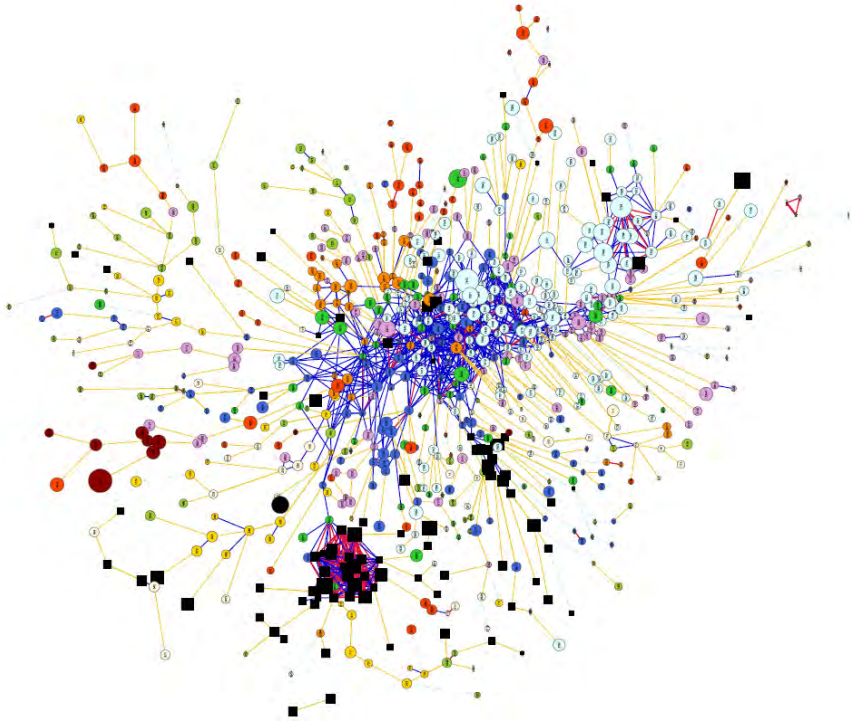
many developing countries, it has almost no production in the tightly-packed industrial core of the product space, in which structural transformation is rather easy. Instead, the country's productive capabilities are spread in the periphery of the space, particularly in garments and textiles (lower portion). Second, we can see that between 1975 and 2000, Pakistan consolidated its presence in this tightly-packed garment cluster. But as noted earlier, while this cluster is tightly connected within itself (i.e. once you make pants, it is easy to then make shorts and skirts) it is very weakly connected to the rest of the space (once you make pants, it is not much easier to make spark plugs or hard drives). Pakistan has almost fully occupied the tight cluster and seems to be left with few nearby options for structural transformation around these sectors. In other words, it has exploited all of the related opportunities in this cluster, and is now left without a path to other areas of the product space. Consistent with this observation, we can see that between 1975 and 2000 Pakistan did not make any substantial jumps and occupy new areas of the product space.

Below we show the location of other comparator countries in the product space as of 2000.

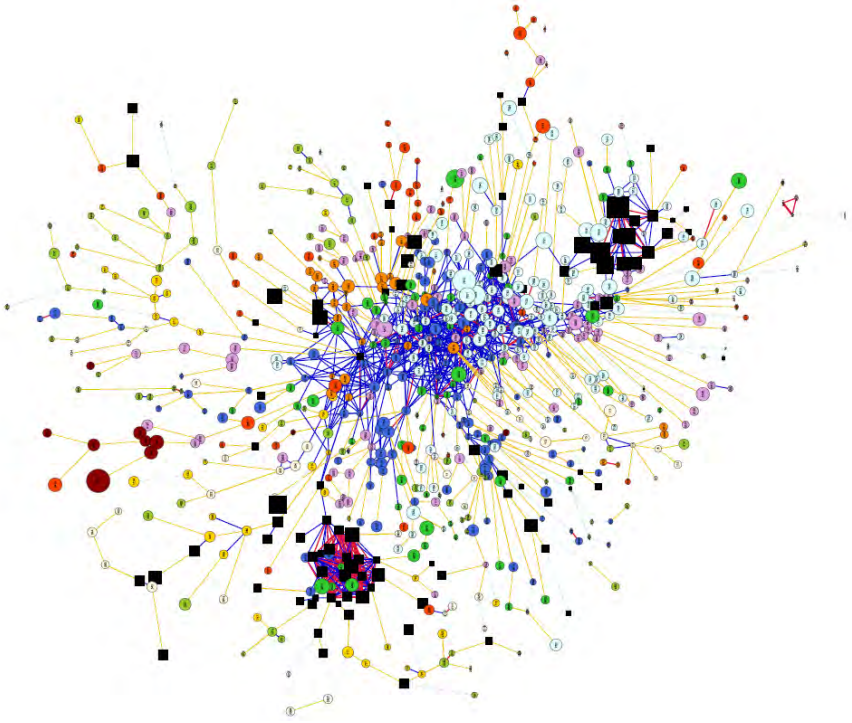
Figure 7
Bangladesh 2000



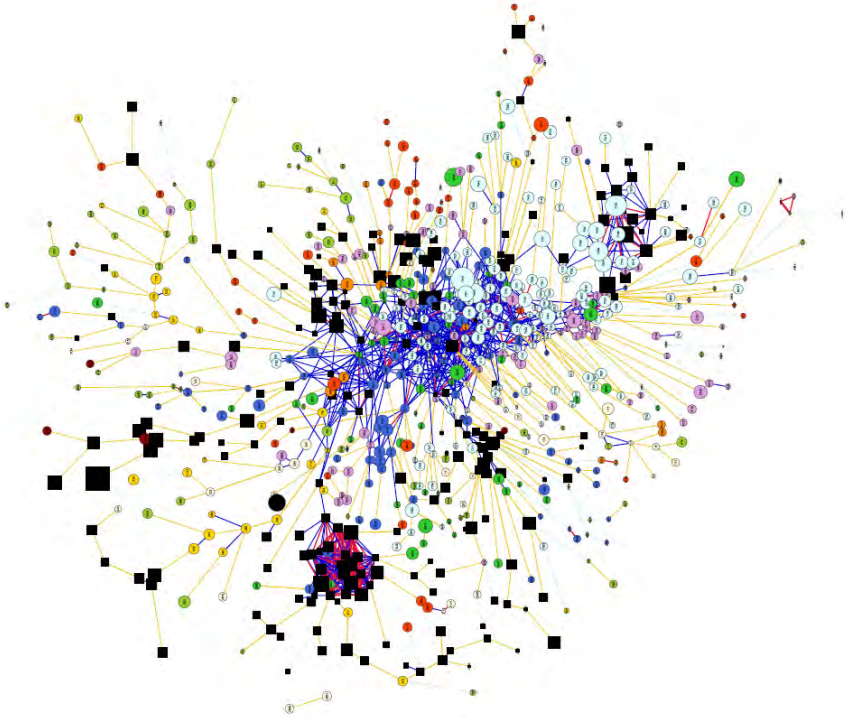
Sri Lanka 2000



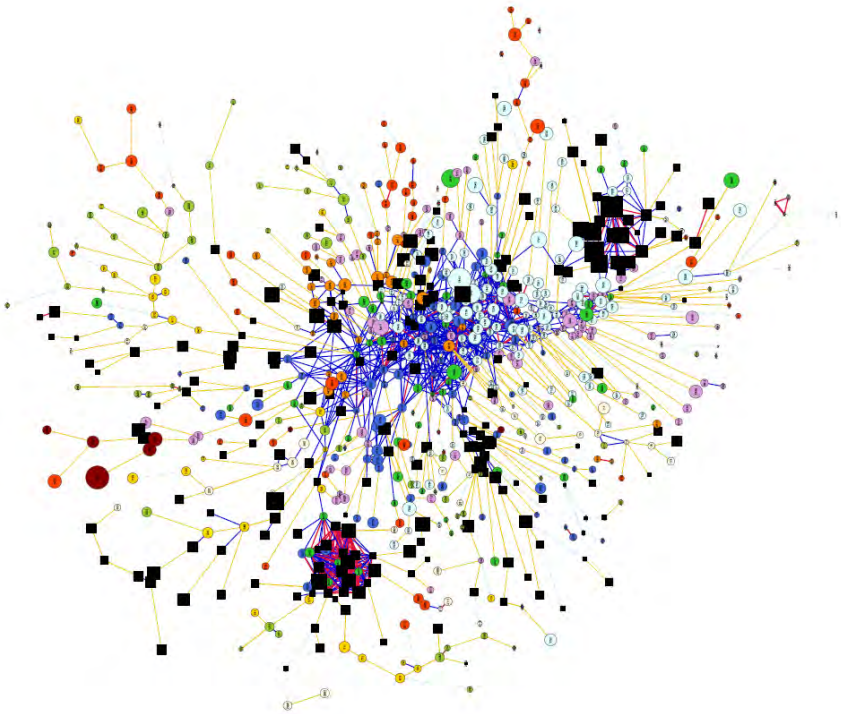
The Philippines 2000



Indonesia 2000



Thailand 2000



Source: Hidalgo et al. (2007) and author's calculations using Feenstra et al. (2005).

We see rather diverse productive structures among these countries. Pakistan's orientation in the product space is similar to Bangladesh and Sri Lanka, which are also specialized in

the garments and textiles area of the space. The Philippines has also occupied that cluster, but that country has also made the jump to another tightly-knit cluster, this one much better connected to the rest of the industrial core: electronics (upper-right). Finally, we can see that Thailand and Indonesia are in a completely different situation when it comes to structural transformation, as they dominate not only dominate garments and electronics, but have also penetrated the industrial core.

In addition to visual analysis, Hausmann and Klinger (2006) have developed a summary statistic for the degree of 'connectedness' of a country's export basket. This is done by first measuring the density of the current export basket of a country around any good. This is the distance of good *i* from country *c*'s export basket at time *t*, calculated as the sum of all paths leading to the product in which the country is present, divided by the sum of all paths leading to the product. Density varies from 0 to 1, with higher values indicating that the country has achieved comparative advantage in many nearby products, and therefore should be more likely to export that good in the future.

$$density_{i,c,t} = \left(\frac{\sum_{k} \varphi_{i,k,t} x_{c,k,t}}{\sum_{k} \varphi_{i,k,t}} \right)$$

Hausmann and Klinger (2007) show that this measure of density is indeed highly significant in predicting how a country's productive structure will shift over time: countries are much more likely to move to products that have a higher density, meaning they are closer to their current production.

We then aggregate this measure of density, which is for a country around any single product, to an overall measure of the connectedness of a country's export basket. This country-level measure is called "open forest". A higher value indicates that the current export basket is a part of the product space that is well connected to other new and valuable opportunities for structural transformation. In other words, a high open forest indicates that the country is located in a dense part of the product space. A low value of open forest indicates the country is specialized in a sparse, unconnected part of the product space. In essence, this number summarizes the visual analysis conducted above with the product space maps.

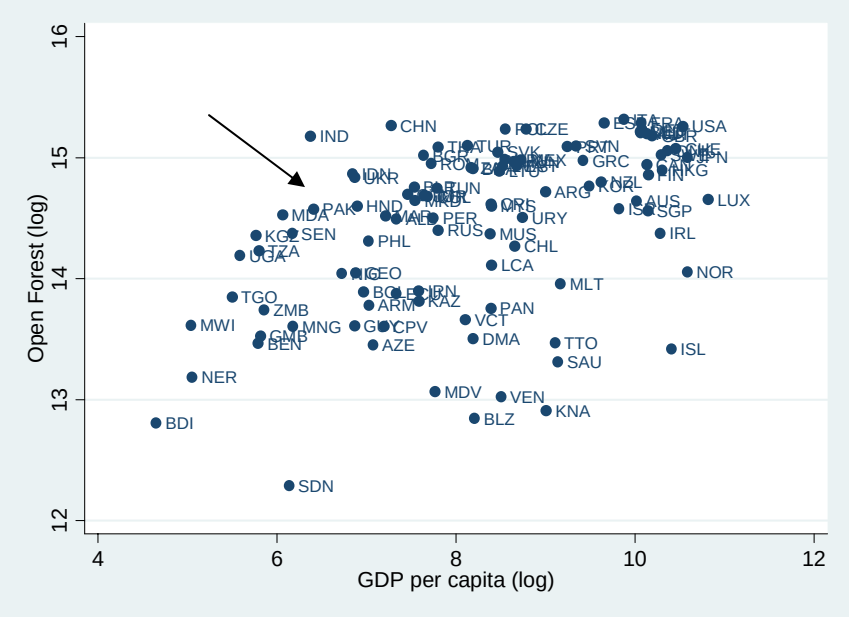
Open forest is calculated as follows:

$$open\_forest_{c,t} = \sum_{i} \sum_{j} \left[\frac{\varphi_{i,j,t}}{\sum_{i} \varphi_{i,j,t}} \left(1 - x_{c,j,t}\right) x_{c,i,t} PRODY_{j,t} \right]$$

Hausmann and Klinger (2006) show that open forest is highly significant in determining the future growth of export sophistication at the country level. Countries with a high level of open forest enjoy faster subsequent growth in export sophistication and overall

economic growth. Figure 8 below shows open forest versus GDP per capita in 2005, with Pakistan highlighted.

Figure 8
Open Forest (PPP) vs GDP per capita, 2005

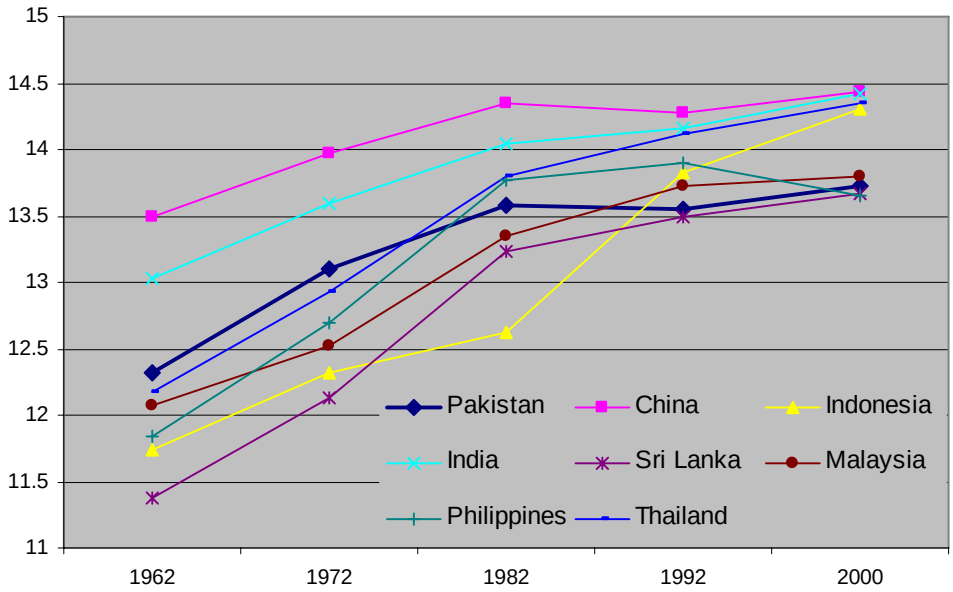


Source: Author's calculations using UN COMTRADE.

As with export sophistication, we see that Pakistan is in a more difficult position than its comparators. Unlike Indonesia, India, and China, Pakistan's current structure of production is not well-connected in the product space. Its activities are peripheral, meaning that it is much more difficult to transform the structure of production and move to new products, as they seem to require capabilities completely unlike those that presently exist in the economy. One interesting case seems to be the Philippines, which has managed to move to a relatively sophisticated export package despite the fact that it does not have as many natural opportunities implied by its orientation in the product space.

Figure 9 below shows the long-term evolution of export connectedness for Pakistan and some comparators. We can see that in 1962 the country had more opportunities in the product space than Thailand, Malaysia, and Indonesia, but since then all three of those countries have moved to much better connected areas of the space while Pakistan's opportunity set has not expanded to the same degree. The country's opportunity set for structural transformation has fallen behind to an even greater degree than its actual export sophistication.

Figure 9
Historical Movement of Open Forest



Calculated using Feenstra et al (2005). Note that this series can not be joined with post-2000 data as Pakistan did not report COMTRADE in 2000.

Pakistan's difficulty in upgrading its export offering to more sophisticated, 'rich-country' products may have been in no small part due to its orientation in the product space. The country is specialized in goods requiring capabilities with few alternative uses that have yet to be exploited, limiting the opportunities for jumps to new activities. This has only worsened over the last 40 years: while comparator countries have actively explored the product space and moved to new, 'high-wage' activities, Pakistan has lagged.

This suggests that future structural transformation will be difficult moving forward. Pakistan's future opportunities for structural transformation, is the subject of the next section.

PART 2 – Pakistan's Future Opportunities for Structural Transformation

We have established that Pakistan suffers from lagging structural transformation: the country has been stuck in a set of unsophisticated export activities while comparator countries have undergone radical productive shifts towards sectors supporting faster economic growth. To catch up, it is necessary that Pakistan 'discover' new export activities.

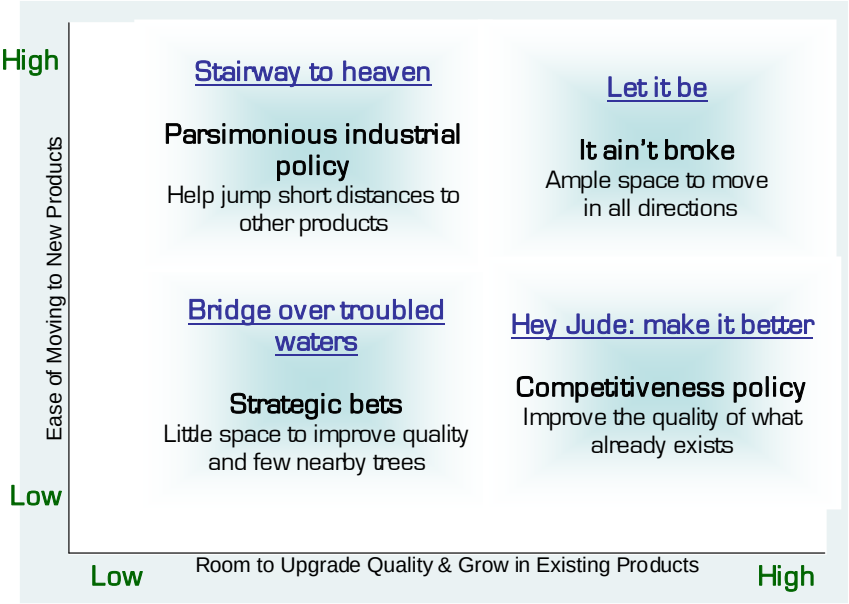
Moreover, we have seen that Pakistan is concentrated in a part of the product space with only moderate opportunities for such transformation. Although not as isolated as countries in other regions with similar levels of development, Pakistan is in a sparse part of the product space compared to other countries in the region, and it has not actively explored this space as its peers.

These two findings have important implications for policy, indicating what type of strategy is most appropriate for accelerating export growth in the country.

One dimension of potential growth is within existing products. The suitability of this dimension depends on whether or not the current basket is sophisticated enough compared to GDP per capita to sustain growth. The other dimension is by moving from existing products to new products. If the current export basket is in a central part of product space, resulting in a high open forest, then there is an apparent path towards new products. However, if the current export package is intensive in capabilities that are not easily redeployed to alternative products, then there is not an obvious path to other parts of the product space, and a jump to a new part of the space is necessary.

These two dimensions are summarized in the figure below, which provides a framework for determining the appropriate policy orientation. The y-axis represents how easy it will be for the country to grow by jumping to new products, and the x-axis represents how easy it will be for the country to grow within existing sectors. The appropriate policy stance for each quadrant of this space is presented in the matrix.

Figure 10
A Policy Map for Structural Transformation



The results in the previous section place Pakistan in between the leftward two quadrants. The country does not have much room to grow within existing sectors, and must move to new export activities. Although it does not have as many nearby opportunities for structural transformation as some of the faster growing regional comparators, it remains in a relatively well-connected part of the product space compared to many countries at its level of income. Therefore, the most appropriate policy orientation in Pakistan would be a parsimonious approach to ensure that the private sector is able to take advantage of nearby opportunities, combined with some focus on strategic investments to allow for movement to completely new parts of the product space.

Both of these policy approaches will be discussed in turn. Fortunately, the data used to diagnose Pakistan's history of structural transformation can also be used to explore the opportunity space for both nearby and more distant new export activities. After doing so, we will provide some policy ideas and guidelines for how such opportunities can be explored.

But one point deserves mention up front: as will be made clear, using product-level data and speaking in terms of sectors does not imply a policy approach of 'picking winners'. This is not about government selecting priority sectors to be protected and subsidized until they are competitive. Rather, the policies outlined below are simply aimed at learning sector-specific barriers and providing the necessary sector-specific public inputs to allow firms to move to new activities. As argued above and supported by the empirical structure of the product space, inputs that the public sector must provide, such as infrastructure, institutions, and education, are not as 'horizontal' as suggested in most models, and are instead quite sector-specific. Building a rural road versus an urban road, or an interior highway versus a costal highway will have important implications for some sectors over others. Building a cold storage transport chain or creating property rights on

the spectrum are other examples of this specificity. As discussed in greater detail by Hausmann and Rodrik (2006), because of this government is already 'doomed to choose' some projects that provide the necessary sector-specific public goods for some industries over others. The analysis and policy guidelines outlined below are simply to help make that choice as informed as possible.

Nearby Activities for Pakistan

Pakistan's open forest is not as high as some faster-growing regional comparators, but it does show that there are some new export activities nearby. What are these nearby activities? Table 1 shows all un-exported products above the 90th percentile of density: these sectors are Pakistan's 'low-hanging fruit', starting with the closest.

Table 1
Pakistan's Low Hanging Fruit: Un-exported Products with High Density

Product	2006 Exports (USM)	World Market (USB)	PRODY	Strategic Value
Other oilseed processing	6	30	3384	5717
Frozen food manufacturing	13	19	3985	6682
Coated and uncoated paper bag manufacturing	5	12	6560	8022
Forest nurseries, forest products, and timber tracts	12	18	2431	4717
Breweries	12	17	5736	7787
Tree nut farming	2	3	4321	5848
Cut stone and stone product manufacturing	9	10	5208	6680
Greenhouse and nursery production	2	14	2784	5468
Animal production, except cattle and poultry and eggs	6	17	7672	6335
Roasted nuts and peanut butter manufacturing	3	9	4746	6431
Blankbook and looseleaf binder manufacturing	2	4	7497	9360
Coffee and tea manufacturing	11	24	3947	9210
Other animal food manufacturing	1	7	4182	8203
Bread and bakery product, except frozen, manufacturing	7	16	6824	9335
Mattress manufacturing	1	3	5893	8944
Soap and other detergent manufacturing	2	20	5795	10180
Primary aluminum production	1	45	10692	6074
Cigarette manufacturing	0	14	11020	8420
Jewelry and silverware manufacturing	96	174	7081	7008
Ferroalloy and related product manufacturing	0	19	1918	5604
Dry, condensed, and evaporated dairy products	16	48	10094	9103
Wood container and pallet manufacturing	1	3	6487	9382
Veneer and plywood manufacturing	0	9	4049	7759

Products with RCA<0.5 and density above the 90th percentile for all un-exported sectors, excluding minerals and oil. In order of decreasing density.

These are 'new' in the sense that Pakistan is not currently an exporter of consequence[2], although there could very well be significant production for the domestic market. But although new, these products have a very high density, meaning that most other countries in the world that export what Pakistan exports, also export these goods. So the question is: why not Pakistan?

It could be that for some of these products, there is a very sensible reason why most countries like Pakistan are significant exporters but Pakistan is not. For example, one of the sectors with the highest density is breweries: most other countries that have a productive structure similar to Pakistan's export beer. But given Pakistan's particular

[2] Defined has having a RCA of 0.5 or greater, meaning that the share of that product's export in Pakistan is greater than half the share of that the product has in global trade.

status as a Muslim nation, it is no surprise that the country is not a major exporter of alcoholic beverages.

But for many of the other products, 'why not Pakistan' is not so clear. Pakistan has been able to achieve comparative advantage in most products that other successful exporters of frozen foods and oilseeds have. This suggests that many of the product-specific capabilities required for frozen foods and oilseeds already exist in Pakistan, yet the country has not yet become a significant exporter of them. The data show that with no other information, one would expect very strongly that Pakistan could be a successful exporter in these sectors. So the question is, why not oil seeds and frozen foods in Pakistan? Although for some sectors like beer there may be a sensible reason why not, for others the public sector by act or omission may be preventing that sector from emerging, or there may be a market failure preventing it that may be corrected through policy.

The data in Table 1 is therefore useful to help guide the search for what particular inputs are missing for new export activities to emerge in Pakistan. Since these are sector-specific, learning what these missing inputs are can't be done at such a high level of aggregation that the specificity is lost in aggregation. The unique needs of the oil seed industry likely will not become apparent in conversations with the president of the chamber of commerce who represents the interest of the private sector as a whole. They also will not be detected by surveys such as the World Bank's Investment Climate Assessment or the World Economic Forum's Global Competitiveness Index. Rather, sector-specificity requires this interaction to be at a much more disaggregated, sector level. The data in Table 1 reveal which conversations and search efforts to prioritize: the new activities that should be most likely to emerge in Pakistan. They can be matched to actual firms, and interactions with these firms can reveal the particular missing inputs and constraints to investment. Institutional design guidelines and policy proposals to bring about the right kind of interactions and facilitate jumps to nearby activities are discussed in Part 3.

New areas of the product space

The fact that the sectors explored above are relatively near suggests that their productive requirements are quite similar to those products that Pakistan already exports, and therefore moving to these new activities would happen comparatively easily, particularly if the government is able to organize itself to learn the sector-specific public goods that the current or potential producers in this sector are clamoring for.

Yet in the case of Pakistan, this may not be enough. Unlike other countries in the region like China, India, and Indonesia, Pakistan is not in a very well-connected part of the product space, meaning a parsimonious approach alone will not result in significant structural transformation and large increases in export sophistication. Even if Pakistan were able to achieve comparative advantage in the sectors listed in Table 1[3], exports would only increase by approximately $408 million, or 2%. This estimate is quite

[3] Calculated as product RCA reaching 1 for each activity, i.e. for the products to have the same share in Pakistan's exports as they do in the world.

conservative, but even an increase of ten times that is relatively small. New areas of the product space have to be reached.

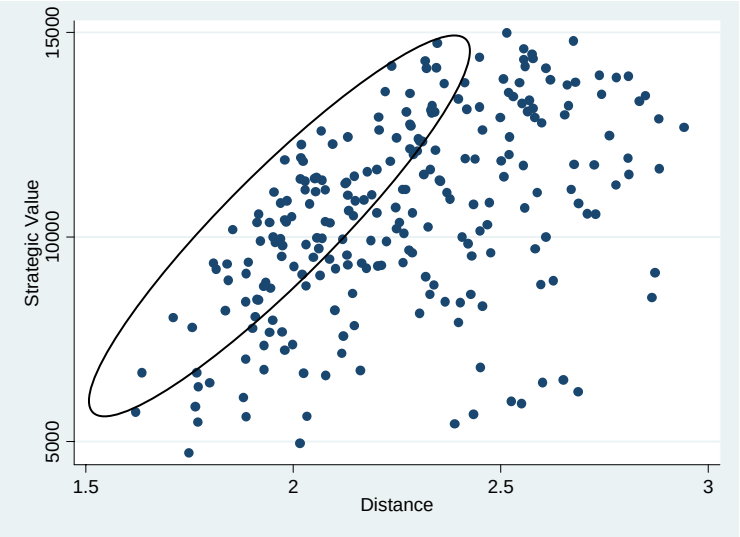
But activities that are in new areas of the product space have requirements that are more dissimilar to those activities that currently exist in the economy. Empirically they occur with much less frequency. They are likely to be more difficult as they require the simultaneous appearance of multiple sets of sector-specific inputs, which is more prone to coordination failures: why create inputs for a sector that does not exist, and how can firms produce in a new sector without the requisite inputs?

Although more difficult, moving to new parts of the product space can be very valuable. Once an activity in a new part of the product space is occupied, there are then other activities near to it that suddenly become more feasible. That is, activities in a new part of the product space involve the creation of significantly new capabilities that then can be applied to other nearby activities with much less difficulty.

So jumping closer is easier, but jumping further can have a larger strategic value. This is illustrated in the following figure. Each dot in this figure is a product not currently exported. The x-axis is (the log inverse of) density: products further to the right on this axis are further away from Pakistan's current location in the product space. The y-axis is strategic value: how many other new opportunities are created if this new activity is successful[4]. The 'low-hanging fruit' listed in Table 1 are the set of products furthest to the left on the x-axis. But we can see that these 'low-hanging fruit' products on average have a lower strategic value: they do not represent the creation of a host of new capabilities with alternative uses. As you allow for further and further jumps, activities emerge with a much higher strategic value. Of course, not all far-away sectors have a high strategic value: many new activities are far from Pakistan's current location in the product space but are not well-located in the product space. But there is clearly a tradeoff between strategic value and distance, and an efficient frontier in this tradeoff, indicated in the figure by a circle.

[4] This is calculated as the increase in open forest if that product were exported with comparative advantage.

Figure 11
Pakistan's Efficient Frontier



*All products with RCA<.5 in 2006 other than mining and oil products. X-axis is -1*log(density), and y-axis is the change in open forest if that product were added to the export basket.*

What are the activities on this efficient frontier? First, if we allow for slightly longer jumps than the 'low-hanging fruit' sectors (taking density between the 75th and 90th percentile). Table 2 shows those activities among the slightly further away that have the highest strategic value. These would be the sectors that are slightly to the right on the x-axis, and are among the highest at that distance on the y-axis.

Table 2
Moving up the Efficient Frontier

Product	2006 Exports (USM)	World Market (USB)	PRODY	Strategic Value
Miscellaneous fabricated metal product manufacturing	17	49	12421	12266
Fabricated structural metal manufacturing	12	26	9969	11935
Plastics plumbing fixtures and all other plastics products	78	100	10074	11883
Prefabricated metal buildings and components	0	11	10366	11850
Electric power and specialty transformer manufacturing	1	15	9251	11422
Household refrigerator and home freezer manufacturing	3	14	6290	11100
Iron and steel mills	42	208	10420	10886
Institutional furniture manufacturing	9	45	7772	10828
Other communication and energy wire manufacturing	1	39	7284	10557
Prefabricated wood building manufacturing	0	6	9776	10499
Frozen cakes and other pastries manufacturing	2	9	9370	10415
Office furniture, except wood, manufacturing	1	3	6687	10367
Other snack food manufacturing	2	11	9436	10355
Paperboard container manufacturing	2	13	6550	10350
Plastics bottle manufacturing	3	5	7857	10004
Mayonnaise, dressing, and sauce manufacturing	0	5	8933	9958
All other food manufacturing	34	39	10418	9900
Cheese manufacturing	0	20	14139	9869
Flavoring syrup and concentrate manufacturing	10	23	10033	9796
Confectionery manufacturing from cacao beans	1	18	4738	9525

Un-exported sectors with density above 75th percentile, top 20 by strategic value.

The themes that emerge from a scan of these activities slightly further along the efficient frontier are various types of food manufacturing, electrical equipment, and some fabricated metal products.

Looking even further along the efficient frontier, we repeat the exercise with a density cutoff of only the 50th percentile. These are products that are quite far away from Pakistan's current structure of production, yet have even higher strategic value.

Table 3
Further along the Efficient Frontier: Strategic Bets

Product	2006 Exports (USM)	World Market (USB)	PRODY	Strategic Value
Paint and coating manufacturing	18	24	8803	12595
Plastics packaging materials, film and sheet	18	50	14361	12453
Plastics pipe, fittings, and profile shapes	6	22	9919	12270
Adhesive manufacturing	6	8	11973	11487
Nonupholstered wood household furniture manufacturing	9	60	7416	11456
Other concrete product manufacturing	0	4	9336	11429
Blind and shade manufacturing	3	10	8384	11394
Metal tank, heavy gauge, manufacturing	2	10	5667	11370
Aluminum sheet, plate, and foil manufacturing	1	39	10976	11339
Showcases, partitions, shelving, and lockers	1	8	10021	11297
Tire manufacturing	4	47	13251	11151
Metal window and door manufacturing	0	9	7106	11145
Reconstituted wood product manufacturing	3	9	13780	11110
Tire cord and tire fabric mills	1	6	28470	11018
Other household and institutional furniture	0	28	8006	10884
Fabricated pipe and pipe fitting manufacturing	0	4	12074	10814
Wood office furniture manufacturing	1	3	11119	10646
Boat building	0	12	12213	10519
Gypsum product manufacturing	0	2	3494	10374

Un-exported sectors with density above 50th percentile, top 20 by strategic value.

As made clear above, this is not meant to be a list of 'winners'. These are sectors that represent the best tradeoff between the difficulty in moving to more distant products, and the benefits of doing so in terms of generating new capabilities with many alternative uses. Given that taking advantage of nearby opportunities may not be enough to generate sustained growth, exploration of these potential 'strategic bets' may be necessary for Pakistan. Policy proposals for this search process are outlined in Part 3. But first, we apply these tools to evaluate other sectoral prioritizations of the government of Pakistan, based on input-output linkages, the Vision 2030 strategy, and absorptive capacity for unskilled labor.

Downstream Sectors

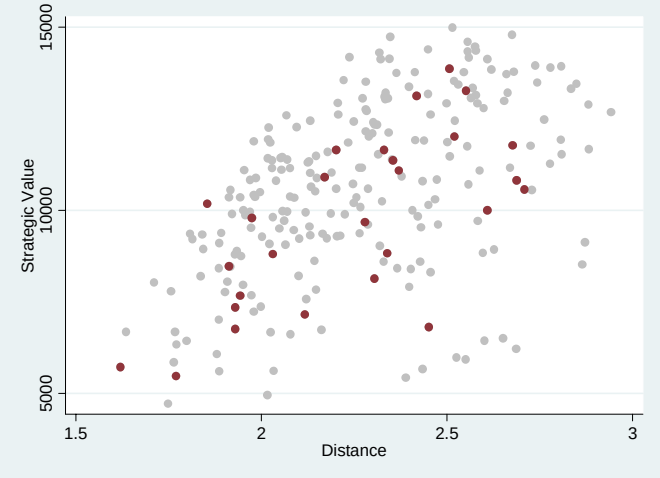
In Pakistan, as in many developing countries, the public sector is already searching for new export activities that it can enable with productivity-enhancing investments. In the past, this search process has been focused 'downstream' from existing export activities. Countries take stock of existing exports (particularly natural resource-based exports) and then focus on how to add more value to them and move into the next downstream activity.

This can be observed in Pakistan where the textile industry has been favored to a large extent as a form of adding value to the country's cotton, rather than consider it as a stand-alone sector that can move into other fibers and products.

As discussed above, the underlying structure of the product space is very heterogeneous and explained by similarity in requirements for diverse types of inputs like physical infrastructure, regulations, labor skills, and technical skills. One can see from the map of the product space that it does not neatly line up along input-output lines. Raw cotton is not next to combed cotton which is not next to cotton garments, and raw diamonds are not next to cut and polished diamonds which are not next to jewelry. Physical input-output relationships have little to do with the structure of the product space, and the fact that you need raw diamonds to be able to cut them does not mean that the two activities need to take place in the same country. Switzerland is renowned for its chocolate, but imports all of its cocoa.

The idea that products that are vertically related are not close to each other in the product space is established in detail in Hausmann, Klinger and Lawrence (2008). We can see the evidence specific to Pakistan by pinpointing downstream activities and considering if they are on the efficient frontier. We take all products currently exported with comparative advantage, and then identify the next downstream activity[5] for each. These are highlighted in the previously-used map of Pakistan's efficient frontier as of 2006.

Figure 12
The Efficient Frontier and Downstream Activities



*All products with RCA<.5 in 2006 other than mining and oil products. X-axis is -1*log(density), and y-axis is the change in open forest if that product were added to the export basket. Highlighted products are those with the highest use coefficients of an existing exports (with RCA>.5 in 2006).*

[5] This is the maximum direct use coefficient for that industry in the US 1997 Input-Output table. The US table is used because it offers a very high level of disaggregation, and cross-country differences in physical inputs are small (compared to uses of labor versus capital, for example. See Hausmann, Klinger and Lawrence 2008).

We can see from this figure that downstream activities are, for the most part, not on the efficient frontier. Although it is a commonly-held belief that presence of the physical input implies that moving downstream is a natural, logical progression in structural transformation, we can see that this is not the case: downstream products are not closer to Pakistan's current location in the product space than non-downstream activities[6].

Not only are downstream activities not close, they are not particularly valuable in terms of generating new capabilities with many uses: their strategic value is, on average, not high, nor is PRODY. This is not to say that no downstream activity is sensible for Pakistan. But it is clear that the search for either low-hanging fruit or valuable strategic bets should not use such input-output linkages as a guide to identify promising activities. Rather, the search process should follow the productive capabilities of the country and consider all potential sectors, as done above.

Vision 2030 Sectors

From 2005 to 2007, Pakistan's Planning Commission worked on a long-term development strategy. The result is Pakistan Vision 2030. This program stresses knowledge and inventiveness as key drivers of future growth. Vision 2030 asserts that Pakistan will be transformed into a knowledge-based economy, harnessing technology to its advantage, assuming that innovation, productivity, and enterprise will make the country a regional hub for industry, education, services and the arts.

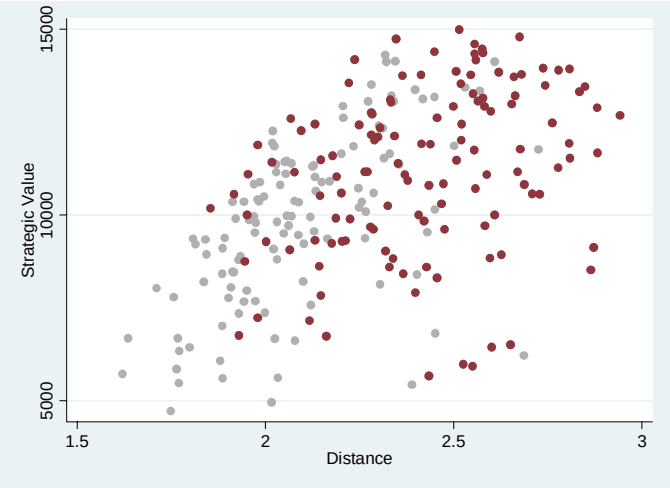
The strategy projects that the share of manufacturing in Pakistan will rise from 18 % in 2005-06 to nearly 30 % by 2030. In its manufacturing strategy, Vision 2030 identifies the following activities as 'priority' sectors for the diversification of manufacturing: 1) machinery, 2) electronics, 3) automobiles, 4) pharmaceuticals, and 5) chemicals.

The document provides no detail regarding how these particular sectors were chosen, nor an idea of which particular policy interventions to adopt in order to help bring them into being. Our ideas regarding the appropriate policy process are outlined in Part 3 of this paper. But we can also use the product space data to determine if the Vision 2030 priority sectors are themselves well-chosen and on the efficient frontier of the distance – strategic value tradeoff.

The following figure highlights the Vision 2030 priority sectors.

[6] A t-test of equality of average distance for downstream versus non-downstream can't be rejected, even at the 10% level.

Figure 13
The Efficient Frontier and Vision 2030 Priority Sectors



*All products with RCA<.5 in 2006 other than mining and oil products. X-axis is -1*log(density), and y-axis is the change in open forest if that product were added to the export basket. Highlighted products are those prioritized in Vision2030.*

One observation from this graph is that a large number of sectors fall under the Vision 2030 prioritization. Although the government may have done sector prioritization at a more detailed, disaggregated level, the prioritization that is publically available in the Vision 2030 document covers more than half of total world trade. This strategy is not very finely focused at the sectoral level, and if you are targeting almost all sectors, it is not easy to learn the sector-specific inputs and constraints as you don't know where to look first. But such a broad focus is not necessarily a bad thing, as it depends on the policy interventions employed and their ability to drill down to sector-specific requirements.

How do the different sectors within the Vision 2030 strategy compare? The following table provides simple averages for each of the targeted sectors, as well as those not targeted.

Table 4
Vision 2030 Priority Sectors

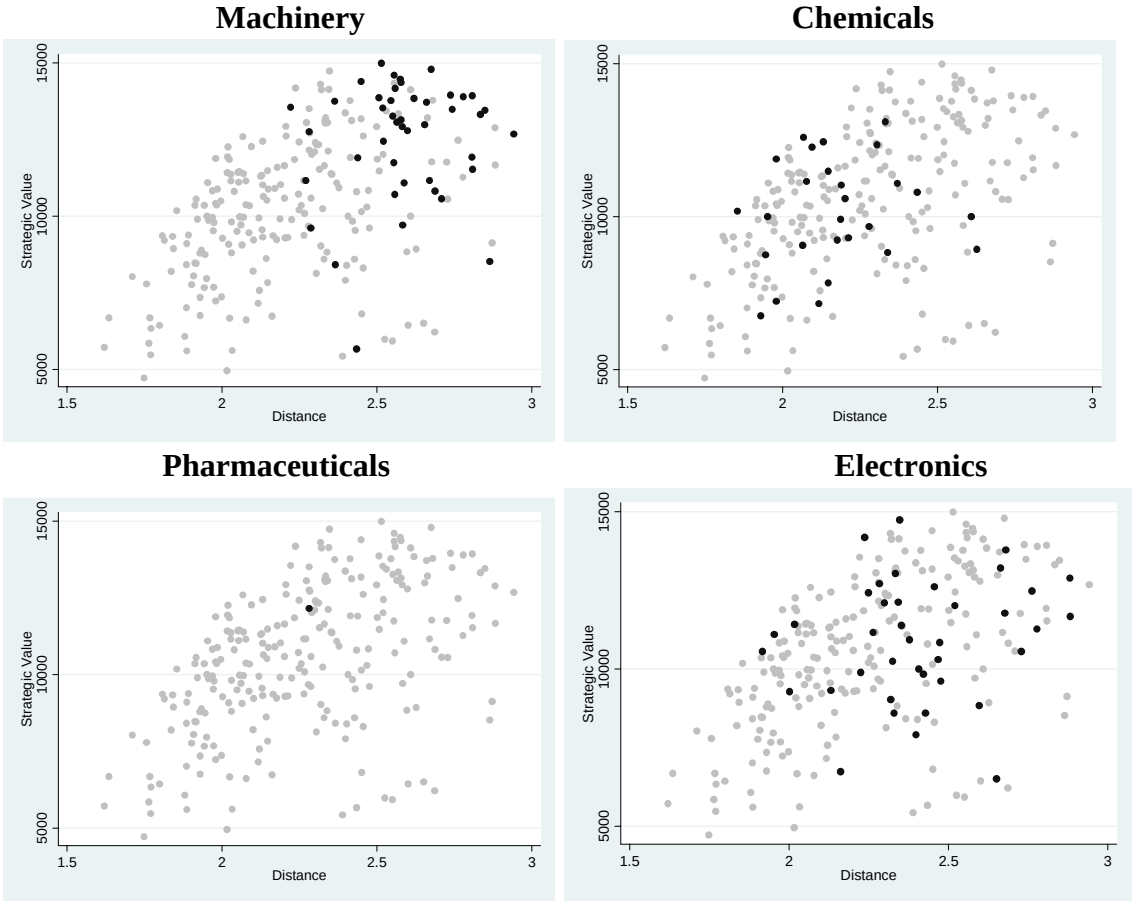
	Average Density	Average Sophistication	Average Strategic Value	Total World Market Size (Trillion)
Automobiles	0.08	12327	10147	1.6
Chemicals	0.12	11544	10134	2.4
Electronics	0.09	13967	10914	2.7
Machinery	0.08	16267	12511	2.0
Pharmaceuticals	0.10	18027	12157	0.4
Non-priority	0.12	9085	9787	5.3

As discussed above, the current level of prioritization is not very deep: roughly two-thirds of exports (in dollar terms) are 'priority sectors'. On average, the targeted sectors are further away (lower density), but have a much higher level of sophistication and strategic

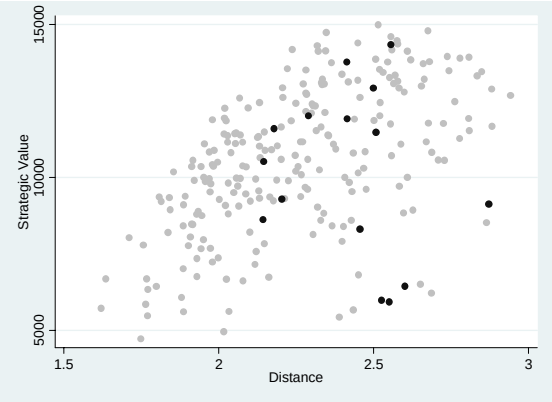
value. The Chemicals sector is the one sector that is closest, but also has the lowest level of sophistication and strategic value of the priority sectors. This would make it the 'low-hanging fruit' sector in the strategy. Machinery, Automobiles, and Electronics are very far away, but compared to one another machinery has higher sophistication and strategic value, automobiles the lowest, and electronics somewhere in between. In other words, in the case of Pakistan, machinery is closer to the efficient frontier than electronics, and especially automobiles.

These comparisons are made clear below, which highlights each of the priority sectors on the efficient frontier map.

Figure 14



Automobiles

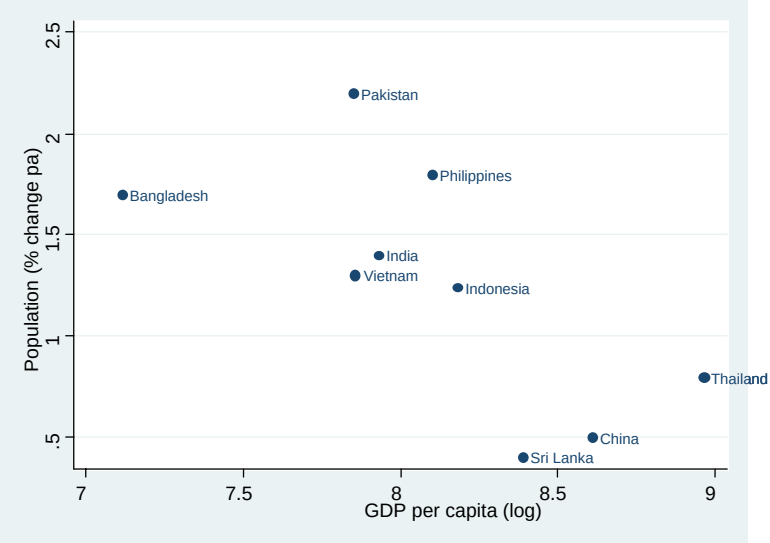


While the devil is in the details in terms of how these sectors are actually supported, it is clear that the prioritization itself could be further rationalized. Moreover, these results show the differing circumstances of the various priority sectors, which have the same implications for appropriate policy for each, from more parsimonious to more strategic. Chemicals is a closer sector, meaning much of the requisite inputs already exist or can be easily adapted from existing capabilities, and there are likely existing actors in this sector in Pakistan that can be engaged to learn what is missing for these sectors to succeed. Machinery, on the other hand, is a much more distant activity. Jumps to these products will be more difficult, and likely would require greater coordination. However, they represent the generation of significantly new productive capabilities for Pakistan that could lead to more radical structural transformation. These two situations imply different policy approaches for the different priority sectors, which are discussed further in Part 3.

Labor Intensive Sectors

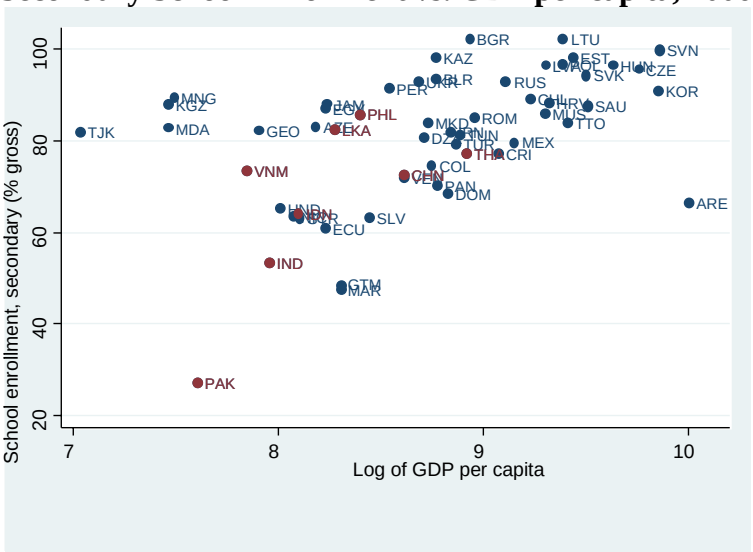
Another existing sector prioritization of the Pakistani government is along the lines of labor intensity. Pakistan has the highest population growth rates in its comparator group, along with the lowest rates of secondary school enrollment (see Figure 15 and 16). With high and rising unemployment and a demographic structure that will bring larger numbers of young and unskilled workers into the workforce over the coming years, a clear policy priority is to encourage economic activity that can absorb this unskilled labor and avoid social unrest caused by massive unemployment. Given the fixed stock of arable land and high population pressure in rural areas, these activities would have to be non-agricultural in character.

Figure 15
Population growth vs. GDP per capita, 2006



Source: WDI.

Figure 16
Secondary School Enrollment vs. GDP per capita, 2006



Source: WDI.

This suggests that beyond strategic value, sophistication, and distance, a clear dimension of importance for Pakistan is intensity in labor, particularly in unskilled labor. We can incorporate this dimension into our analysis and identify which sectors are on or near the efficient frontier, and at the same time are also intensive in unskilled labor.

Using a labor force survey[7], we characterize activities by their intensity in unskilled labor and match that to the product space data. First, we present the 25 sectors that are most intensive in unskilled labor, providing data on distance, sophistication, and strategic value. This is shown in Table 5.

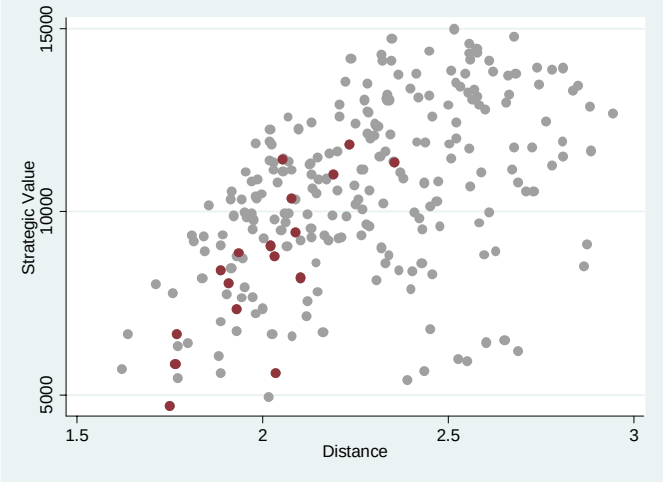
Table 5
The 25 sectors most intensive in unskilled labor

Product	2006 Exports (USM)	World Market (USB)	PRODY	Strategic Value	Density	Unskilled Labor
Cigarette manufacturing	0	14	11020	8420	0.15	0.852
Other tobacco product manufacturing	1	3	6239	8214	0.12	0.852
Logging	0	9	6455	9456	0.12	0.835
Cattle ranching and farming	0	7	4314	8796	0.13	0.801
Poultry and egg production	1	3	4907	8885	0.14	0.801
Forest nurseries, forest products, and timber tracts	12	18	2431	4717	0.17	0.797
Lime manufacturing	0	1	4278	9089	0.13	0.797
Clay refractory and other structural clay products	1	6	8626	11846	0.11	0.793
Gypsum product manufacturing	0	2	3494	10374	0.13	0.793
Other concrete product manufacturing	0	4	9336	11429	0.13	0.793
Ceramic wall and floor tile manufacturing	0	13	8322	8042	0.15	0.793
Cut stone and stone product manufacturing	9	10	5208	6680	0.17	0.793
Asphalt shingle and coating materials manufacturing	0	2	11374	11024	0.11	0.793
Nonclay refractory manufacturing	2	6	7211	11366	0.09	0.793
Oilseed farming	12	22	2153	5617	0.13	0.754
Grain farming	7	40	5252	7345	0.15	0.754
Sugarcane and sugar beet farming		1	9424		0.09	0.754
Tree nut farming	2	3	4321	5848	0.17	0.754
Wood windows and door manufacturing	0	5	7810	9504	0.13	0.724
Wood container and pallet manufacturing	1	3	6487	9382	0.15	0.724
Reconstituted wood product manufacturing	3	9	13780	11110	0.13	0.724
Engineered wood member and truss manufacturing	1	6	8440	10596	0.10	0.724
Veneer and plywood manufacturing	0	9	4049	7759	0.15	0.724
Greenhouse and nursery production	2	14	2784	5468	0.17	0.709
Animal production, except cattle and poultry and eggs	6	17	7672	6335	0.17	0.707

Although relatively unsophisticated, many of these products are very near to Pakistan's current location in the product space, such as nursery & forestry products and animal products (see Figure 18). Overall, labor-intensive products are relatively nearby for Pakistan, which is good news for the country. Compare this to another country with an even larger unemployment problem: South Africa. In that country, sectors intensive in unskilled labor are very far away from current production (Hausmann and Klinger 2006b).

[7] This is the percentage of labor in the ISIC 3-digit industry that has only primary education, and was graciously provided by the ADB. India's labor force survey is used as it is more disaggregated and therefore allows for a finer analysis. This is a valid approximation as the relative costs of capital and labor in both countries are similar. Moreover, analysis by the ADB at a higher level of aggregation confirms that intensities in unskilled labor by sector are very similar in the two countries.

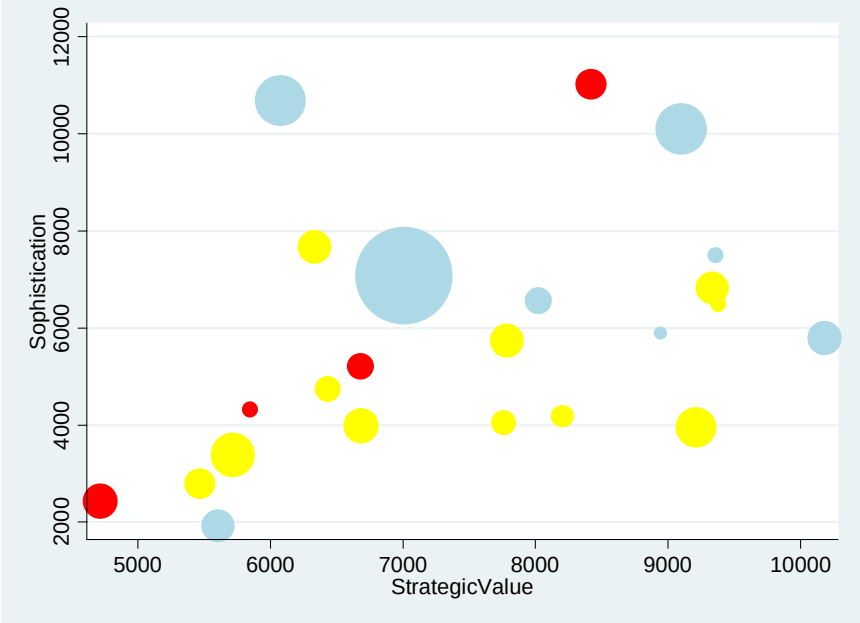
Figure 17
The Efficient Frontier and Activities Intensive in Unskilled Labor

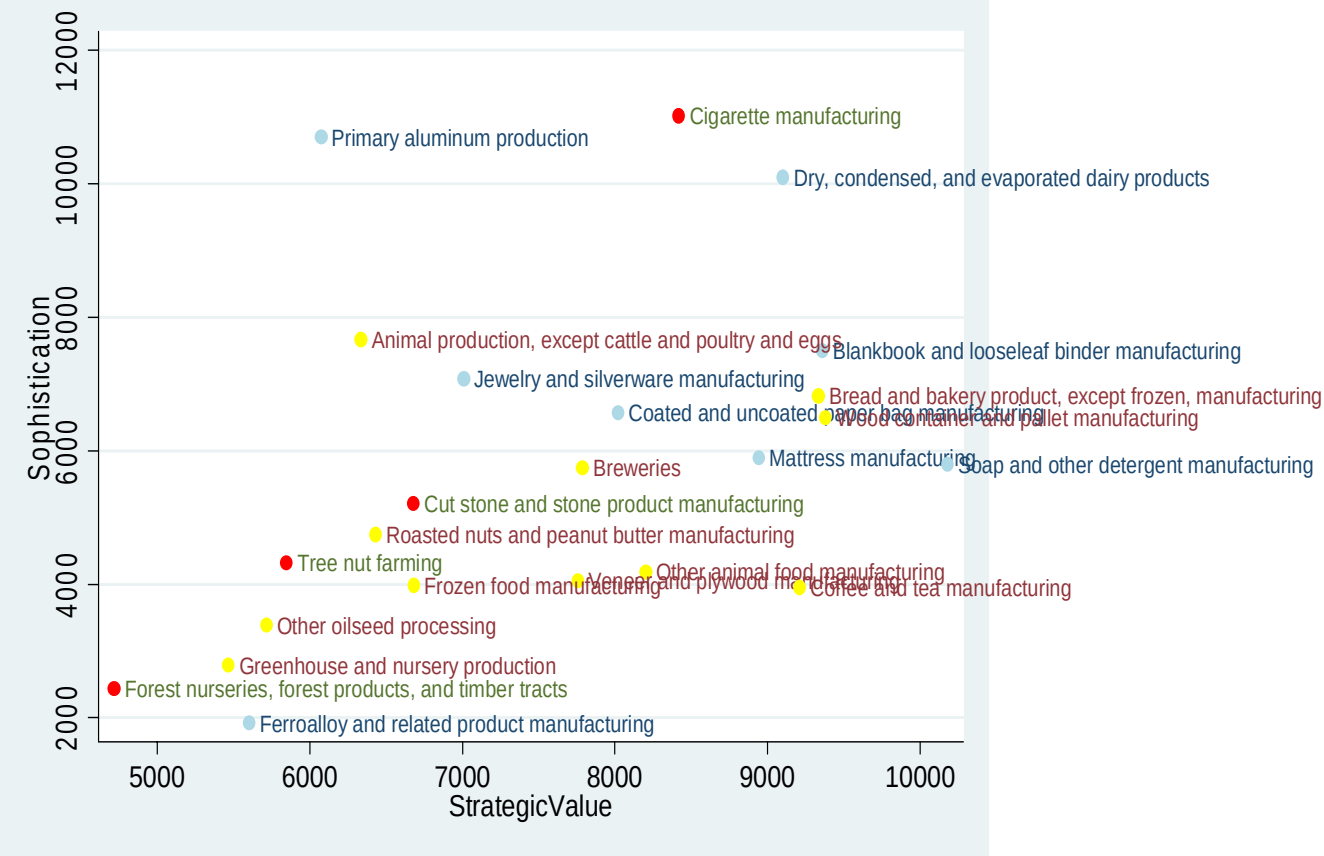


*All products with RCA<.5 in 2006 other than mining and oil products. X-axis is -1*log(density), and y-axis is the change in open forest if that product were added to the export basket. Highlighted products are those sectors where at least 75% of the labor force is unskilled.*

This shows that other dimensions in addition to strategic value and sophistication may be important for Pakistan, and can be incorporated into the analysis of new sectors. There are many methodologies for doing so. As one example, we take all sectors with density in the 90th percentile or higher (the low-hanging fruit sectors identified above). We plot their sophistication on the x-axis and strategic value on the y-axis, so sectors that are more sophisticated and strategically valuable approach the upper-right corner of the plane. Finally, we color-code the sectors based on their intensity in unskilled labor, and size the nodes based on the size of the market in that sector. The result is shown in Figure 18, along with a second plot that provides the product names.

Figure 18
Incorporating Multiple Dimensions to the Analysis





We observe multiple tradeoffs in this Figure. In terms of the market size of the opportunities, the largest are aluminum, dairy, jewelry, oilseeds, and coffee/tea production. Dairy products in particular offer high sophistication and strategic value, but only oilseeds and coffee/tea are at least moderately intensive in unskilled labor. Of the nearby activities highly intensive in unskilled labor (forestry, tree nut farming, stone products, and cigarette manufacturing), only cigarette manufacturing has relatively high sophistication and strategic value, and none are among the best opportunities in terms of market size.

This is but one way to incorporate the multiple dimensions to be considered. The data appendix provides each of these variables for every un-exported sector (as of 2006). Other dimensions could be added to this data and alternative methodologies employed to combine them. In addition, the appendix provides a new source of data with which to evaluate a sector's proximity, using input-output data to directly identify each products required capabilities and each country's stock of capabilities.

But identifying priority sectors, be they low-hanging fruit or strategic bets, is only the first step. How this identification can be used to promote structural transformation is the next question, and is taken up in Part 3.

PART 3 – Policy Implications

Productive activity requires different types of inputs. Some are provided by the market and others are provided by the government. Among the latter, some are public goods in the sense that they are non-rival and non-excludable, such as property rights, regulation, security, certification rules. Others do not have those characteristics but have been taken over to a large extent by governments because of other forms of market failures. These include elements such as infrastructure, education, labor training, certification services, etc. The sector specificity of these public inputs is reflected in the fact that countries have literally hundreds of thousands of pages of economically relevant legislation and hundreds of government agencies. Each one of these pages of legislation and each public agency have a differential effect on different parts of the product space.

The high number of public inputs is not unlike the plethora of privately provided inputs. However, markets have three elements that facilitate the coordination of the provision of private inputs with their demand. First, markets have prices that provide information about willingness to pay and relative costs. Second, products are provided by profit motivated firms that respond to the price information. Third, capital markets mobilize resources available to firms that are expected to generate profits. Hence, coordination can take place in a decentralized manner because the market as a self-organizing process involves a system of information, incentives and resource mobilization. And yet, markets may fail for a myriad of reasons that may require public action.

Most public inputs have no price, so there is no decentralized mechanism to reveal information. Moreover, there is no clear incentive for governments to respond to the information, as the profit motive is not a relevant or powerful incentive for public policy. Finally, even if the information and incentive problems are addressed, the government often does not have a decentralized self-organizing mechanism to mobilize resources: these are mobilized most frequently through centralized budgetary processes.

This creates major challenges for public policy. First, how to assure the best possible provision of public inputs to existing activities, given the information, incentives and resource mobilization problems mentioned above? Second, how to identify the industries that could have existed with an alternative provision of public inputs but that do not exist precisely because of these missing inputs?

Existing activities exist and consequently it is possible to engage them in dialogue or interact with them through other means. Potential new activities don't exist yet and consequently require a different treatment.

Luckily, such efforts can be guided by the rich set of data and indicators that we have used in this paper, which allow us to systematically scan Pakistan's opportunity space and evaluate which sectors should be easier for Pakistan to enter versus those that would be more difficult; which sectors would be worth the effort versus those without much strategic value; and which sectors could absorb more of Pakistan's unskilled labor versus those that use relatively little. Here we offer some ideas on what to do with these data.

We first discuss the institutional guidelines for facilitating the emergence of more nearby sectors forming part of a parsimonious industrial strategy. This is followed by a discussion of strategic jumps. Finally, we offer some preliminary suggestions on ADB-supported projects for both.

Institutional set-up for learning / facilitating nearby jumps

The Pakistani government needs a mechanism to enhance its dialogue with the private sector in order to learn the sector-specific inputs that are missing. The government would argue that this is already occurring. But this public-private dialogue has to identify barriers at a much higher level of specificity than is currently the case. While useful, meetings between the prime minister and the head of the chamber of commerce who represents all sectors will not get this job done: at this high level of aggregation, the particular needs of each individual sector will be lost. Only the lowest-common denominator across industries or those concerns of the largest existing industries will rise to the surface. For example, while an overall tax reduction may be mentioned, the telecom upgrading needed by the call center industry and the IP regulatory reform needed by the pharmaceutical industry will be lost in aggregation, as these sectors may be small or non-existent. In order to identify sector-specific constraints, the dialogue must occur at a much more disaggregated level, and therefore must have the necessary bandwidth to deal with that complexity (Hausmann 2008).

Organizing such a private-public dialogue at lower levels of aggregation is difficult, as there are hundreds of thousands of different business interests in Pakistan and limited government time and attention, and it is not obvious what the right way of organizing the issues may be. Moreover, Pakistan's productive structure and the structure of the product space are both changing over time. Therefore, this dialogue process should have the ability to bring in new sectors of the economy as new opportunities for structural transformation emerge.

Hausmann, Rodrik and Sabel (2008) offer some specific policy proposals to achieve such a dialogue and overcome the three problems mentioned above: information, incentive and the resource mobilization. These particular policy suggestions must be examined to determine their appropriateness in the Pakistani context.

We can identify some general design principles for any policy initiative that promotes public-private dialogue and that can act on sector-specific constraints and opportunities. Based on Hausmann and Rodrik (2006) and Hausmann, Rodrik and Sabel (2008), these principals are:

- Let the private sector self-organize and coalesce around common requirements. Do not place these requirements in pre-determined boxes; and allow new interests to engage the public sector rather than limit this interaction to it to those sectors identified as high-potential at some given date. The lists that we have compiled can help prioritize discussions as well as help decide on the allocation of scarce

resources once these are identified, but they shouldn't be taken as a final determination on where to focus efforts.

- The process should be transparent. This dialogue, particularly the requests from the private sector, should be made public in order to limit rent-seeking and to increase the legitimacy of this endeavor vis-à-vis the rest of society so as to make sure that policy goals are in the public interest.
- Interventions should be focused on identifying and providing public inputs that increase a sector's productivity or allow it to come into being. The effect of these interventions should be to increase productivity, not to subsidize low productivity.
- The private sector should be willing to invest its own funds in these sectors so that the investment passes a market test. Co-financing is a good signaling mechanism that there is real demand for the required input.
- Interventions should have clear criteria for success (to identify losers), accountability (to let losers go as early as possible), and sunset clauses (to ensure no financial commitments are open-ended).

These guidelines will help minimize the chances for a parsimonious industrial strategy to fall victim to corruption, inefficiency, government failure, and private capture. These are always risks, but the alternatives of either wishing away sector-specificity or pre-selecting both sectors and specific inputs without private sector input will only prolong Pakistan's lack of structural transformation.

Institutional set-up for strategic bets

While creating this high-bandwidth public-private dialogue will help overcome barriers to the emergence of nearby activities (as well as growth in existing sectors), it will likely not be enough for Pakistan to achieve more fundamental structural transformation through longer jumps in the product space. Moving to more distant export activities is difficult. These long jumps do not occur with much regularity. While nearby activities require the same or similar capabilities as those already existing in the country, distant export activities have capability requirements that are very different. Firms that wish to jump to these new activities will face many missing capabilities, and the wider range of these capabilities would have to appear simultaneously to make such jumps feasible.

In addition, it may not be so easy to learn what particular capabilities are missing. In the case of the nearby sectors, there are already firms present in the economy in similar activities. For many of the 'low-hanging fruit' sectors, there are already small amounts of exports in the country, and there is most likely production for the domestic market. This means that there are existing firms in the country that can be engaged to learn what is missing. They are the counterparts for the dialogue discussed above. But for very distant activities, it is not so easy to find a counterpart, and a process of search, promotion (including actively seeking foreign direct investment) and evaluation is necessary.

Some general policy proposals to facilitate the search for distant opportunities and larger leaps in the product space are also provided in Hausmann, Rodrik and Sabel (2008). The authors suggest either a 'venture fund' or to re-focus development banks to facilitate

longer jumps. Such a body would have an open window that encourages investors to come with business plans for such activities, and should identify the aspects of the business environment that are problematic or missing so that the industry becomes viable. Financial support is granted in part to encourage the private sector to develop such plans and to reveal this publicly-valuable information to the venture fund. The venture fund should act as an information revelation mechanism of the space of opportunities and obstacles and should help devise policy solutions to the obstacles identified. The venture fund should be evaluated not in terms of the amount of money it lends, but instead on the amount of investment it triggers by helping fix the provision of public inputs, even if these investments are financed privately.

For some industries dominated by large international firms (for example, automobile components or air conditioners), this process can be learned by engaging those international firms directly, encouraging them to invest in the country and having them identify the problems that limit their productivity. There could also be domestic firms in related industries whose problems may be similar to those of the industries dominated by international firms. This process of learning the particular constraints that affect further-away sectors as well as cost/benefit analyses of the investments that they would require to emerge could be subcontracted to management consulting firms.

The result would be the identification of interested parties willing to invest their own funds, as well as to carry out feasibility studies (including cost-benefit analyses) for a variety of potential strategic bets (identifying those sector-specific capabilities that are missing), and proposals for policy reforms and public investments that would be required to allow these new activities to succeed. The venture fund should be willing to partially co-finance these projects.

Another way to facilitate the search for new activities is to build a new industrial zone with its own management team. The zone would solve some easy-to-identify constraints such as power, water supply, transportation infrastructure for goods and workers and access to regulatory and certification services. Beyond this, the management team will have to promote the use of the industrial zone by attracting new investors. These will have specific concerns about how to operate in the country, given its public inputs or other missing capabilities. The management team should have the capacity to analyze these missing inputs, explore ways to circumvent them, and inform government of problems, solutions and costs in order to assess whether addressing these problems is warranted in light of the potential new investments that it would crowd in.

Here again, the idea is that the industrial zone, just as the venture fund, is in the core business of exploring the space of opportunities and obstacles, and of identifying solutions that trigger new activities. Every opportunity must be taken to design solutions that are as general as possible and that have the widest possible effect on new activities, beyond the effect on the initial investor who helped identify the obstacle.

These institutions are designed in this open-architecture search mode in order to avoid the well-known failures in directed industrial policies of the past that created white elephants

rather than structural transformation. To this end, the guidelines in the previous section equally apply to such institutions, particularly the focus on productivity-enhancing investments and the provision of sector-specific public goods, rather than the provision of subsidies to low productivity activities.

Potential role for the ADB in this process

There are important functions that the Asian Development Bank can play in order to help Pakistan implement the strategy described above. These include (i) support for institutionalizing the dialogue process, (ii) creation of the institutions designed to search the longer strategic jumps through a venture fund, (iii) a set of industrial zones, and (iv) technical assistance.

1) Support for the public-private dialogue process. This loan would support the creation of deliberation councils and would provide funding for studies to support the technical work of the councils. These studies would help identify ways in which productivity could be increased through the adequate provision of public inputs (legal framework, regulatory issues, infrastructure, education, labor training and R&D). The loan would have resources to fund the budgetary costs of the solutions that this process will identify, and the rules of use should provide assurances that such solutions are consistent with the public interest. Moreover, the existence of resources to be allocated to the solutions creates incentives for the private sector to participate in the deliberation councils rather than free-ride on the efforts of others. It would also provide incentives to the political process to fund such solutions.

2) Creation of a venture fund designed to promote new activities or processes. The fund would be willing to co-finance projects that involve new products or processes. The organization should develop the capacity to identify the missing capabilities and public inputs that make these new activities risky or difficult. It should have as one of its main functions to inform the government about the presence of obstacles and to propose solutions. Care must be given in the design of the governance structure of the fund to make sure that management targets the performance indicators that are adequate to the informational and transformational objectives of the fund. This means that conventional metrics such as the amount of money invested are inadequate. The proper measures should relate to the amount of investment that was encouraged thanks to the elimination of the identified constraints, irrespective of whether these investments are carried out by the initial investor or by others who may benefit from the reform; and irrespective whether they are financed by the fund or through other means.

3) Creation of a set of industrial zones with adequate infrastructure and with a management team focused on identifying and promoting new activities and on finding solutions that improve the business environment by improving the provision of public inputs. Additional resources should be provided beyond the construction of the industrial zones in order to address the obstacles identified through the above mentioned initiatives.

4) The ADB could provide technical support and training to the staff of these entities as well as to the relevant ministries, and develop appropriate software and information systems to facilitate the search process.

Appendix – Measuring Capabilities Directly

The underlying methodology for the construction of the product space is the measurement of the distances between products. As described above, these are measured by the minimum of the pairwise conditional probabilities of co-exporting goods. That is, the proximity of good A to good B is either the probability of exporting good A given you export good B, or vice versa—whichever is smaller. Measuring distances in this manner results in the structure of the product space as illustrated, and has the strong predictive power over future structural transformation as laid out in Hausmann and Klinger (2006 & 2007).

The resulting structure of the product space supports the observations from more in-depth qualitative work at the sector-level (e.g. Klinger 2007) that inputs are sector-specific, but with varying degrees of substitutability across products. But, it is important to note that our measure of distance is not explicitly based on these inputs. It is merely an outcomes-based measure that shows what happens in global production, without presupposing why.

Although from one point of view this 'agnostic' nature is a strength of the probability-based proximity measure, we can complement this with a metric that more explicitly examines sector-specific inputs. This metric and some of its preliminary findings relating to Pakistan are the subject of this appendix.

Incorporating capabilities into distance explicitly

The 1997 US input-output table is highly disaggregated, showing input-output relationships between 454 sectors. So for each tradable sector, we know its input requirements across all 454 potential input sectors.

Among these sectors, 328 are traded in significant quantities, meaning they are tradable inputs. If a country does not have domestic production of plastic pipes but requires them for the production of toilets and refrigerators, they can be imported from other countries.

The other 126 sectors, however, are non-traded. Office administrative services or water & sewage systems are inputs that can not be imported, so if a particular business requires trained temporary secretaries or an efficient high-capacity sewage system but can not locate it in the country, it is in trouble. They face a chicken-and-egg problem for those that are privately provided: why would an industry supplying that non-tradable input come into being with no domestic demand, and how could the domestic industry demanding that input come into being without it? Moreover, the supply of these inputs is in many cases the monopoly of the state. These non-traded inputs are the capabilities discussed above.

In addition to non-traded inputs, we are able to identify labor inputs using the United States Bureau of Labor Statistics data. This data shows the labor requirements by industry, across over 500 different employment categories, allowing us to measure for each industry its requirements of surveying and mapping technicians, and its

requirements for telemarketers. To the degree that labor is not freely mobile and firms cannot freely import workers with various sets of sector-specific skills, these categories of human capital can also be considered capabilities.

By combining these two sets of data, we have a vector of the capabilities used by each tradable sector, and with this we can construct a measure of product proximity based on how similar the actual capability requirements are. We do this by simply taking the correlation between the capability requirements for each product pair. Just as with the conditional probability, a higher value indicates that the input uses are more similar.

Preliminary empirical testing shows that this metric does indeed predict future structural transformation. Below, we present the results of a simple OLS regression of the probability of exporting a particular sector in 2005 controlling for whether or not it is exported in 2000, and density in 2000. The first column calculates density with the standard proximity based on the conditional probability, and the second column calculates it with proximity based on the correlation of capability requirements for the product pairs.

Table 6
Significance of Capability-Based Proximity

	(1) Exported in 2005?	(2) Exported in 2005?
Exported in 2000?	0.689***	0.694***
	(0.00371)	(0.00368)
Density (log, probability-based)	0.0639***	
	(0.00668)	
Density (log, capability correlation-based)		0.0213***
		(0.00532)
Observations	39156	38913
R-squared	0.543	0.543

Standard errors in parentheses
Includes country dummies (not shown)
*** p<0.01, ** p<0.05, * p<0.1

Our outcomes-based measure of density has greater statistical and economic significance than the capability-based measure (the standard deviation of probability-based density is .2 and of capability-based density is .25). This is not surprising: our capability-based measures depend on the level of aggregation in the US IO table, and the noise in applying these input-output relationships in the United States to the rest of the world[8].

Although its predictive power is lower, it remains a statistically significant determinant of future structural transformation, generated from an independent set of data, and therefore provides an interesting additional piece of information with which to evaluate Pakistan's

[8] However this is not as problematic as might first appear. There is significant evidence that IO relationships are relatively similar across countries, even when comparing developed to developing countries (e.g. Chenery and Watanabe 1958, Simpson and Tsukui 1965, Santhanam and Patil 1972). Moreover, to the degree that this is not true, it will bias our results towards 0, so the fact that we find significant results despite attenuation bias is all the more interesting.

future opportunities for structural transformation. Moreover, it allows us to pinpoint both existing and missing capabilities. These exercises are pursued below. However, it should be stressed that this is an emerging methodology and set of data that has not undergone as much empirical testing and scrutiny as the metrics used in the body of the paper, and should therefore be applied with caution.

What does the capability data say about nearby activities?

Above, we identified Pakistan's 'low-hanging fruit'. These were sectors that most other countries in the world like Pakistan are also successful in, but Pakistan is not. The capability data provides an alternative way to identify what might be low-hanging fruit. We use Pakistan's export data as of 2006, and identify what capabilities the country currently has. For example, Pakistan has significant exports in the 'cut & sew apparel' industry, so we say that Pakistan has all of that sector's required capabilities (such as first-line managers of production & operating workers, nondepository credit intermediation, warehouses, and power generation and supply). We do the same for all industries in which Pakistan has significant exports, and the result is Pakistan's 'capability set' implied by exports.

Using this capability set, we can ask the question: what are the sectors that Pakistan has all of the requisite capabilities for, but does not yet have significant exports in? Insofar as the data captures all of the significant input-output relationships with sufficient accuracy, and capabilities can be easily expanded once they exist in some part of the economy, this gives an alternative list of the country's low-hanging fruit.

Table 7
Pakistan's 'Low-hanging fruit' based on Capabilities
Sorted by World Market Size

Product	World Market (US B)
Jewelry and silverware manufacturing	174
Plastics material and resin manufacturing	173
Audio and video equipment manufacturing	160
AC, refrigeration, and forced air heating	114
Wiring device manufacturing	84
Other major household appliance manufacturing	73
Other commercial and service industry machinery manufacturing	69
Other basic inorganic chemical manufacturing	57
Optical instrument and lens manufacturing	54
Dry, condensed, and evaporated dairy products	48
Toilet preparation manufacturing	48
Tire manufacturing	47
Ophthalmic goods manufacturing	46
Household vacuum cleaner manufacturing	45
Electricity and signal testing instruments	40
Other communication and energy wire manufacturing	39
All other food manufacturing	39
Motorcycle, bicycle, and parts manufacturing	38
Metal can, box, and other container manufacturing	37
Synthetic rubber manufacturing	36
Glass and glass products, except glass containers	36
Watch, clock, and other measuring and controlling device manufacturing	36
Hardware manufacturing	35
Industrial process variable instruments	34
Distilleries	34
Wineries	33
Doll, toy, and game manufacturing	32
Other oilseed processing	30
Electric housewares and household fan manufacturing	29
Synthetic dye and pigment manufacturing	27
Lighting fixture manufacturing	25
Paint and coating manufacturing	24
Coffee and tea manufacturing	24
Flavoring syrup and concentrate manufacturing	23
Office machinery manufacturing	23
Automatic environmental control manufacturing	23
Oilseed farming	22
Hand and edge tool manufacturing	21
Cheese manufacturing	20
Soap and other detergent manufacturing	20
Coated and laminated paper and packaging materials	20
Soybean processing	20
Photographic film and chemical manufacturing	19
Storage battery manufacturing	19
Frozen food manufacturing	19
Confectionery manufacturing from cacao beans	18
Household cooking appliance manufacturing	18

Sectors requiring only capabilities that are used in other existing exports of Pakistan. Take the product of the country / product matrix with 1's if the product is exported with comparative advantage and multiply it by the product / capability matrix also converted to 1's if the use coefficient is greater than 0, and then take all non-zero country / capability elements as existing.

As with the lists in the body of the report, this does not necessarily mean that Pakistan should be a prominent exporter in all of these sectors. However, in the public sector's search for sector-specific constraints to private sector growth, these sectors may be the first place to look.

Similarly, we can also consider the distance of each sector based on the number of missing capabilities, which is another statistically significant predictor of structural transformation. Those sectors missing three or more capabilities would require the simultaneous appearance of multiple inputs and labor skills that do not presently exist in the economy, and are therefore more difficult to reach and would require more of a strategic approach. Those sectors missing only one or two capabilities are more likely to appear in similar countries over time, and should therefore be more likely to emerge in Pakistan. Facilitating the emergence of these sectors should either happen naturally or only require incremental investments by the private sector or the removal of particular constraints by the public sector.

Table 8
Pakistan's Unexported Products by Number of Missing Capabilities

1 missing	**2 missing**
Missing 1 capability	Missing 2 Capabilities
Farm machinery and equipment manufacturing	Construction machinery manufacturing
Scales, balances, and miscellaneous general purpose machinery	Other communications equipment manufacturing
Semiconductor machinery manufacturing	Plastics material and resin manufacturing
Plastics plumbing fixtures and all other plastics products	Audio and video equipment manufacturing
All other industrial machinery manufacturing	Other engine equipment manufacturing
Metal valve manufacturing	AC, refrigeration, and forced air heating
Optical instrument and lens manufacturing	Search, detection, and navigation instruments
Plastics packaging materials, film and sheet	Paper and paperboard mills
Fluid power cylinder and actuator manufacturing	Heavy duty truck manufacturing
Steel wire drawing	Primary nonferrous metal, except copper and aluminum
Grain farming	Other major household appliance manufacturing
All other food manufacturing	Other commercial and service industry machinery manufacturing
Industrial truck, trailer, and stacker manufacturing	Animal, except poultry, slaughtering
Watch, clock, and other measuring and controlling device manufacturing	Relay and industrial control manufacturing
Pump and pumping equipment manufacturing	Primary smelting and refining of copper
Doll, toy, and game manufacturing	Speed changers and mechanical power transmission equipment
Air and gas compressor manufacturing	Switchgear and switchboard apparatus manufacturing
Photographic and photocopying equipment manufacturing	Motor and generator manufacturing
Pulp mills	Toilet preparation manufacturing
Plastics and rubber industry machinery	Copper rolling, drawing, and extruding
Sawmill and woodworking machinery	Primary aluminum production
Paper industry machinery manufacturing	Household vacuum cleaner manufacturing
Textile machinery manufacturing	Mining machinery and equipment manufacturing
Soap and other detergent manufacturing	Aluminum sheet, plate, and foil manufacturing
Food product machinery manufacturing	Glass and glass products, except glass containers
Fluid power pump and motor manufacturing	Electric housewares and household fan manufacturing
Printing machinery and equipment manufacturing	Nonferrous metal, except copper and aluminum, shaping
Animal production, except cattle and poultry and eggs	Office machinery manufacturing
Packaging machinery manufacturing	Power-driven handtool manufacturing
Industrial process furnace and oven manufacturing	Household cooking appliance manufacturing
Lawn and garden equipment manufacturing	Bread and bakery product, except frozen, manufacturing
Surface active agent manufacturing	Household laundry equipment manufacturing
Paperboard container manufacturing	Cutting tool and machine tool accessory manufacturing
Conveyor and conveying equipment manufacturing	Electric power and specialty transformer manufacturing
Welding and soldering equipment manufacturing	Household refrigerator and home freezer manufacturing
Coated and uncoated paper bag manufacturing	Industrial mold manufacturing
Blind and shade manufacturing	Special tool, die, jig, and fixture manufacturing
Elevator and moving stairway manufacturing	Other aluminum rolling and drawing
Electron tube manufacturing	Other animal food manufacturing
Sand, gravel, clay, and refractory mining	Overhead cranes, hoists, and monorail systems
Fabricated pipe and pipe fitting manufacturing	Poultry processing
Measuring and dispensing pump manufacturing	Other concrete product manufacturing
Polish and other sanitation good manufacturing	Secondary processing of other nonferrous
Poultry and egg production	Mattress manufacturing
Gypsum product manufacturing	Rendering and meat byproduct processing
Automatic vending, commercial laundry and drycleaning machinery	
Lime manufacturing	

3 missing	more than 3 missing
Missing 3 capabilities	Missing more than 3 capabilities
All other electronic component manufacturing	Oil and gas extraction
Broadcast and wireless communications equipment	Automobile and light truck manufacturing
Travel trailer and camper manufacturing	Motor vehicle parts manufacturing
Turbine and turbine generator set units manufacturing	Pharmaceutical and medicine manufacturing
Oil and gas field machinery and equipment	Iron and steel mills
Pesticide and other agricultural chemical manufacturing	Other computer peripheral equipment manufacturing
Metal can, box, and other container manufacturing	Computer storage device manufacturing
Meat processed from carcasses	Semiconductors and related device manufacturing
Metal cutting machine tool manufacturing	Aircraft manufacturing
Nitrogenous fertilizer manufacturing	Aircraft engine and engine parts manufacturing
Ferrous metal foundaries	Ship building and repairing
Metal forming machine tool manufacturing	Nonupholstered wood household furniture manufacturing
Power boiler and heat exchanger manufacturing	Other aircraft parts and equipment
Phosphatic fertilizer manufacturing	Coal mining
Metal tank, heavy gauge, manufacturing	Telephone apparatus manufacturing
Truck trailer manufacturing	Institutional furniture manufacturing
Motor vehicle body manufacturing	Miscellaneous wood product manufacturing
Rolling mill and other metalworking machinery	Copper, nickel, lead, and zinc mining
	Motorcycle, bicycle, and parts manufacturing
	Sawmills
	Other household and institutional furniture
	Fabricated structural metal manufacturing
	Ferroalloy and related product manufacturing
	Forest nurseries, forest products, and timber tracts
	Railroad rolling stock manufacturing
	Magnetic and optical recording media manufacturing
	Book publishers
	Metal household furniture manufacturing
	Boat building
	Other millwork, including flooring
	Upholstered household furniture manufacturing
	Prefabricated metal buildings and components
	Logging
	Metal window and door manufacturing
	Reconstituted wood product manufacturing
	Veneer and plywood manufacturing
	Showcases, partitions, shelving, and lockers
	Cattle ranching and farming
	Prefabricated wood building manufacturing
	Computer terminal manufacturing
	Engineered wood member and truss manufacturing
	Wood windows and door manufacturing
	Blankbook and looseleaf binder manufacturing
	Office furniture, except wood, manufacturing
	Wood container and pallet manufacturing
	Wood office furniture manufacturing
	Propulsion units and parts for space vehicles and guided missiles
	Guided missile and space vehicle manufacturing
	Electronic computer manufacturing

The final exercise we conduct with this data is more speculative. First, we take all of Pakistan's missing capabilities as per the methodology employed in the previous section, considering both labor categories and non-traded inputs form the IO table. We then ask the question, for each missing capability, what products would become feasible if it were added? For example, the water and sewage input is not currently used by any of Pakistan's current major export sectors, and therefore that capability is not assigned as present in Pakistan. If this capability were to appear in Pakistan (for example, through an upgrading of industrial water and sewage services made available by the public sector), we examine what sectors would then have no missing capabilities for the country? In this example, it is the grain farming industry (already identified in the body of the report as a high-potential sector). We do this for each capability, and then sort by the total world market size for all goods that are added to the country's 'feasible set', as of 2006.

Table 9
Pakistan's Missing Capabilities and the Sectors They Would Add to the Feasible Set

If you added this capability…	… you'd add these products to the feasible set	with this world market for the product (US Bil),	which adds to this for all products under this capability
Engine and other machine assemblers	Scales, balances, and miscellaneous general purpose machinery	138	518
Engine and other machine assemblers	Oil and gas field machinery and equipment	69	518
Engine and other machine assemblers	Fluid power cylinder and actuator manufacturing	47	518
Engine and other machine assemblers	Mining machinery and equipment manufacturing	39	518
Engine and other machine assemblers	Industrial truck, trailer, and stacker manufacturing	37	518
Engine and other machine assemblers	Pump and pumping equipment manufacturing	33	518
Engine and other machine assemblers	Air and gas compressor manufacturing	30	518
Engine and other machine assemblers	Fluid power pump and motor manufacturing	20	518
Engine and other machine assemblers	Power-driven handtool manufacturing	19	518
Engine and other machine assemblers	Packaging machinery manufacturing	17	518
Engine and other machine assemblers	Industrial process furnace and oven manufacturing	15	518
Engine and other machine assemblers	Lawn and garden equipment manufacturing	14	518
Engine and other machine assemblers	Conveyor and conveying equipment manufacturing	13	518
Engine and other machine assemblers	Welding and soldering equipment manufacturing	13	518
Engine and other machine assemblers	Elevator and moving stairway manufacturing	9	518
Engine and other machine assemblers	Overhead cranes, hoists, and monorail systems	6	518
General and operations managers	All other industrial machinery manufacturing	96	327
General and operations managers	Metal cutting machine tool manufacturing	30	327
General and operations managers	Plastics and rubber industry machinery	24	327
General and operations managers	Sawmill and woodworking machinery	23	327
General and operations managers	Paper industry machinery manufacturing	23	327
General and operations managers	Textile machinery manufacturing	21	327
General and operations managers	Food product machinery manufacturing	20	327
General and operations managers	Turned product and screw, nut, and bolt manufacturing	19	327
General and operations managers	Printing machinery and equipment manufacturing	18	327
General and operations managers	Metal forming machine tool manufacturing	15	327
General and operations managers	Cutting tool and machine tool accessory manufacturing	15	327
General and operations managers	Industrial mold manufacturing	12	327
General and operations managers	Special tool, die, jig, and fixture manufacturing	8	327
General and operations managers	Rolling mill and other metalworking machinery	4	327
Painters, transportation equipment	Travel trailer and camper manufacturing	150	244
Painters, transportation equipment	Heavy duty truck manufacturing	78	244
Painters, transportation equipment	Truck trailer manufacturing	9	244
Painters, transportation equipment	Motor vehicle body manufacturing	6	244
Scientific research and development services	Other basic organic chemical manufacturing	238	238
Custom compounding of purchased resins	Plastics plumbing fixtures and all other plastics products	100	233
Custom compounding of purchased resins	Miscellaneous electrical equipment manufacturing	62	233
Custom compounding of purchased resins	Plastics packaging materials, film and sheet	50	233
Custom compounding of purchased resins	Plastics pipe, fittings, and profile shapes	22	233
Computer hardware engineers	Other communications equipment manufacturing	193	193
Coil winders, tapers, and finishers	Relay and industrial control manufacturing	63	183
Coil winders, tapers, and finishers	Switchgear and switchboard apparatus manufacturing	53	183
Coil winders, tapers, and finishers	Motor and generator manufacturing	52	183
Coil winders, tapers, and finishers	Electric power and specialty transformer manufacturing	15	183
Custom roll forming	Search, detection, and navigation instruments	103	103
Water, sewage and other systems	Grain farming	40	40
Business support services	Analytical laboratory instrument manufacturing	39	39
Iron and steel forging	Ball and roller bearing manufacturing	30	30
Plate work manufacturing	Fabricated structural metal manufacturing	26	26
Veterinary services	Animal production, except cattle and poultry and eggs	17	20
Veterinary services	Poultry and egg production	3	20
Computer support specialists	Magnetic and optical recording media manufacturing	17	17
Computer support specialists	Audio and video media reproduction	0	17
Cookie and cracker manufacturing	Bread and bakery product, except frozen, manufacturing	16	16
Bookkeeping, accounting, and auditing clerks	Other animal food manufacturing	7	13
Bookkeeping, accounting, and auditing clerks	Dog and cat food manufacturing	6	13
Forging machine setters, operators, and tenders, metal and plastic	All other forging and stamping	9	9
Multiple machine tool setters, operators, and tenders, metal and plastic	Spring and wire product manufacturing	7	7
Semiconductor processors	Electron tube manufacturing	7	7
Tortilla manufacturing	Mayonnaise, dressing, and sauce manufacturing	5	5

What are some observations from this data? First, it would suggest that technical and business administration skills are missing in Pakistan, and their presence might add significantly to Pakistan's feasible set. To some extent this may be a public sector shortcoming (for example, insufficient funding to technical colleges and universities for technical and business administration programs), but these could also be capabilities that are acquired through on-the-job training, which is not occurring because the sectors in which this training happens are being held back by some other public sector constraint. Therefore, it can not be over-emphasized that this list does not necessarily imply either 1)

that it is the public sector's job to provide these missing capabilities, or 2) if these missing capabilities would be provided, these sectors would emerge.

Instead, this is a first look at a new dataset and exploration of some of its implications for Pakistan. As such, its implications should only be taken as suggestive, and a subordinate complement to the methodology and analysis in the body of the report.

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