Working Paper No. 611

Why Has China Succeeded—And Why It Will Continue To Do So

by

Jesus Felipe
Utsav Kumar
Norio Usui
Arnelyn Abdon
Asian Development Bank, Manila, Philippines*

August 2010

* This paper represents the views of the authors and not those of the Asian Development Bank, its executive directors, or the member countries they represent. We are grateful to Justin Lin and Ha-Joon Chang for their very useful comments; the usual disclaimer applies. Contacts: jfelipe@adb.org (corresponding author); ukumar.consultant@adb.org; nusui@adb.org; aabdon.consultant@adb.org.

Levy Economics Institute
P.O. Box 5000
Annandale-on-Hudson, NY 12504-5000
http://www.levyinstitute.org

ABSTRACT

The key factor underlying China's fast development during the last 50 years is its ability to master and accumulate new and more complex capabilities, reflected in the increase in *diversification* and *sophistication* of its export basket. This accumulation was policy induced and not the result of the market, and began before 1979. Despite its many policy mistakes, if China had not proceeded this way, in all likelihood it would be a much poorer country today. During the last 50 years, China has acquired revealed comparative advantage in the export of both labor-intensive products (following its factor abundance) and sophisticated products, although the latter does not indicate that there was leapfrogging. Analysis of China's current export opportunity set indicates that it is exceptionally well positioned (especially taking into account its income per capita) to continue learning and gaining revealed comparative advantage in the export of more sophisticated products. Given adequate policies, carefully thought-out and implemented reforms, and skillful management of constraints and risks, China has the potential to continue thriving. This does not mean, however, that high growth will continue indefinitely.

Keywords: China; Capabilities; Diversification; Export-led Growth; Leapfrogging; Open Forest; Product Space; Sophistication

JEL Classifications: O20, O25, O53

1. INTRODUCTION

There is a vast literature trying to explain China's very high GDP growth rate and poverty reduction since it started its transition to the market system in 1979.[1] The three key stylized facts that underlie China's high output growth rates are: first, its high growth rates of capital accumulation, driven by high investment-output ratios; second, a marked outward orientation through export-led growth policies (Felipe, Laviña, and Fan 2008);[2] and third, the pursuit of industrialization (in particular the production and export of manufactures), a key ingredient for fast growth and development (Rodrik 2006a). China's miracle is that it has been able to sustain this process for three decades.[3]

In this paper we try to gain insight into China's development by analyzing the evolution of its export basket since the 1960s, in particular how it has become more diversified and how it has shifted to products with higher income content. We argue that while reforms after 1979 were important because they opened the economy and provided incentives for the private sector to develop, they could not have succeeded without acknowledging the stock of capabilities that existed in the country. We show that as far back as the 1960s, China's productive structure was quite complex already and this set the basis for the country's future high growth. Reforms toward a market system since the 1980s have been a key in China's development. However, we stress the path-dependent nature of development and emphasize the significant knowledge that had been accumulated before reforms started.

The historical experience of the advanced economies and that of Asian countries such as South Korea indicates that development entails a shift from dependence on agricultural activities (especially on farming) into reliance on modern industrial and

[1] Average GDP growth rate for 1960–2007 was 7.82%, and 6.21% in per capita terms. For 1980–2007, the rates were 9.93% and 8.74%, respectively.

[2] Also, some growth accounting studies have documented that total factor productivity growth has been relatively high. On the contributions of factor accumulation and total factor productivity growth to overall growth, see, for example, Tsui, Hsueh, and Rawski (1995), Borensztein and Ostry (1996), Hu and Khan (1997), Young (2000), Felipe and McCombie (2002), Heytens and Zebregs (2003), Blanchard and Giavazzi (2005), and Islam, Dai, and Sakamoto (2006). Chow (1993) and Felipe and McCombie (2010) discuss the pre-reform period.

[3] See the recent work by Storm and Naastepad (2005) and Lee and Mathews (2010). They emphasize different aspects of East Asia's (China included) development, in particular the drive toward industrialization, the emphasis on capability building, export orientation, industrial targeting, and sequential upgrading. All of them are part of China's story.

service sectors. This shift is referred to as structural transformation, and it is what leads to fast and sustained growth. In other words, becoming a developed country requires achieving sustained growth for a period of decades. In general, the only way to do this is through significant structural transformation.[4]

More precisely, structural transformation is the process by which countries change what they produce and how they do it, as well as how they move from low-productivity and low-wage activities, to high-productivity and high-wage activities. Structural transformation has three components: (i) shifts in the output structure, from activities of relatively low productivity into high-productivity activities; (ii) shifts in the employment structure, typically a decline in the share of employment in agriculture;[5] and (iii) upgrading and diversification of the production and export baskets. It is not obvious how this process happens, except that in all successful cases, there has been some form of government intervention. In the case of China, this process did not start taking place on a major scale until after the Communist Revolution. [6]

Along these lines, Hausmann, Hwang, and Rodik (2007), Hidalgo et al. (2007), Hidalgo (2009) and Hidalgo and Hausmann (2009) have argued recently that growth and development are the result of structural transformation, and, crucial in their story, show

[4] This is a point forcefully emphasized by Chang (2009a) in his critique of some recent interpretations of development as poverty reduction.

[5] The share of agriculture in total GDP has declined significantly, from about 60% during 1952–70, to slightly over 10% in recent years. However, agriculture is still the largest employer in the economy (still over 40% of total employment). Felipe (2009: 150–151) concludes that most of the growth in overall labor productivity in China during 1987–2002 was due to the growth in labor productivity within industry. The contributions of labor productivity growth within agriculture and within services were minimal. Likewise, the contribution of labor relocation from agriculture into industry to overall labor productivity growth was negative due to the decline in the employment share in industry during this period, while the contribution of labor relocation from agriculture into services was significant due to the large increase in the share of employment in services. Overall, the growth in labor productivity in industry plus the effect of relocation of labor from agriculture into services accounts for over 80% of overall labor productivity growth during said period.

[6] Ward (1962) notes that despite China's great knowledge (e.g., printing and gunpowder were invented far ahead of the West), the break-through (i.e., modern take-off as a result of the application of science to economic processes), never came. She argues that "the Confucian gentleman who dominated the official thinking of Chinese society thought science an occupation for charlatans and fools and, therefore, not really respectable […] They (the Confucians) turned their backs on experiment and, in doing so, on science as well. So in China, for ancient glory of its culture, for all the force and vitality of its intellectual tradition, the scientific break-through could not occur" (Ward 1962: 48–49).

that not all products carry the same consequences for a country's development.[7] The reality is that developing countries face serious problems when they try to become competitive in a new product, when they try to enter a new market, and when they try to shift production and exports toward more sophisticated products. Hausmann, Hwang, and Rodik (2007) show that the specific set of products that a country exports has important consequences for the pattern of development. Empirically, a measure of the sophistication of a country's export basket proves to be a good predictor of future growth: controlling for initial income, countries with a more sophisticated export basket (also initially) grow faster. On these grounds, Hidalgo et al. (2007) argue that development has to be understood as the process of accumulating more complex sets of capabilities and of finding paths that create incentives for those capabilities to be accumulated and used. The implication is that a growth miracle sustained for several decades must involve the continual introduction of new goods, not merely continual learning on a fixed set of goods. To analyze development and structural transformation from this perspective, Hidalgo et al. (2007) have developed a new analytical tool called the *product space*.

In this paper, we study how China has progressed since the early 1960s as a result of learning and accumulating the capabilities necessary to produce and export new and more sophisticated products. China's high growth rates during the last five decades, the result of massive investment (reaching 40–50% of GDP) and successful integration into the world economy through trade, only make sense in a context of high assimilation and absorption capabilities, increasing capacity to employ new methods of production and new inputs, and significant upgrading (Abramovitz 1986; Nelson and Pack 1999).[8]

We focus on two aspects: (i) the sophistication of China's export basket; and (ii) the number of products in which China has acquired revealed comparative advantage (diversification). Sophistication and diversification capture different aspects of how countries progress. The first one captures the ability to export products produced and exported by the rich countries to the extent that, in general, they embody higher productivity, wages, and income per capita. The second factor captures the ability to

[7] Certainly these claims are not new. The importance of industrialization was highlighted by Nicholas Kaldor (1967) and others (on this see Felipe et al. [2009]). The contribution of this recent literature is the methods of analysis developed.

[8] The success of China's industrial development is a point also stressed by scholars like Brandt, Rawski, and Sutton (2008). Our analysis uses a different methodology.

become competitive in a wider range of products, measured by the number of products exported with revealed comparative advantage. The rationale that underlies our analysis is that technical progress and structural change evolve together (technical progress induces structural change and vice versa; they jointly lead to growth), and underlying both is the mastering of new capabilities. We look at these two issues at the level of 779 products exported.[9]

The rest of the paper is structured as follows. Section 2 provides an analysis of the sophistication and diversification of China's export basket. Section 3 discusses China's product space. Sections 4 and 5 provide an analysis of China's future export opportunities. Section 6 discusses whether it can continue growing so fast, in the context of the risks and constraints that it faces. Section 7 summarizes the main findings and draws some policy implications.

2. EXPORT SOPHISTICATION AND PRODUCT DIVERSIFICATION

Following Hausmann, Hwang, and Rodik (2007), we first calculate the level of sophistication of a product (PRODY) as a weighted average of the GDP per capita of the countries that export the product in question.[10] This is calculated individually for each product. PRODY provides a measure of the income content of a product. It is, therefore,

[9] Data for the period 1962–76 was downloaded from the National Bureau of Economic Research: http://www.nber.org/data/. See Feenstra et al. (2005) for details. Data for 1977–2006 was downloaded from the United Nations Commodity Trade Statistics: http://comtrade.un.org/

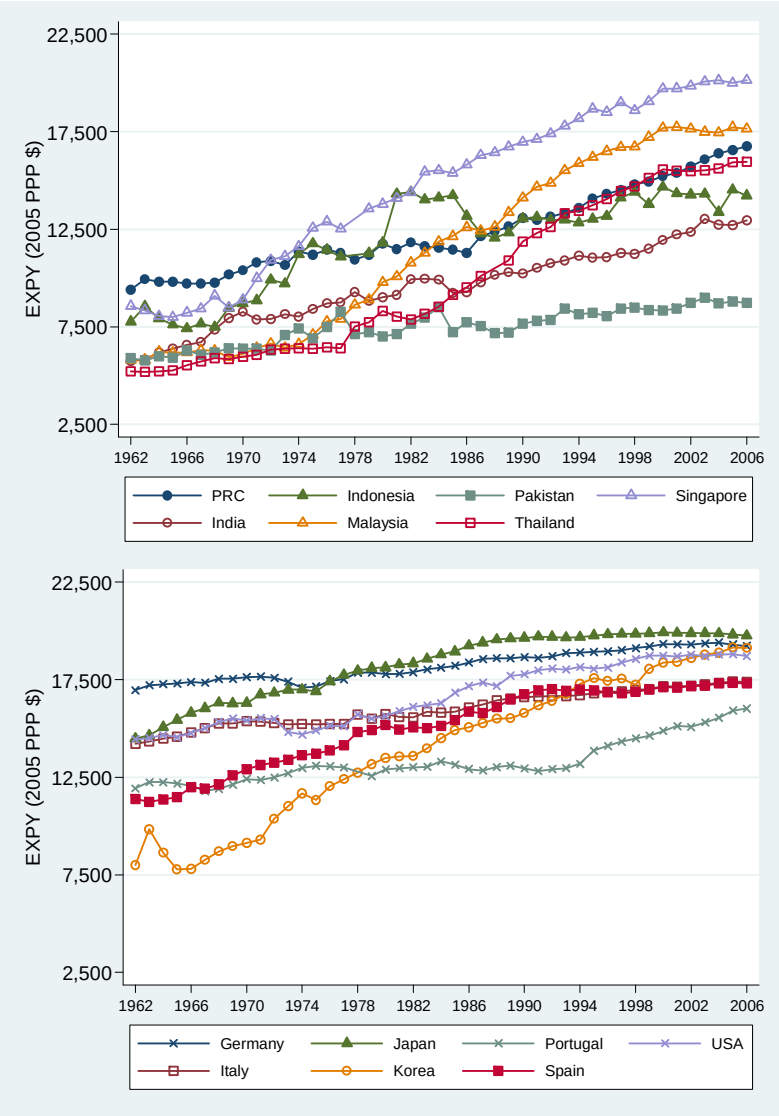
[10] Algebraically: $PRODY_i = \sum_c \left[\frac{xval_{ci} \Big/ \sum_i xval_{ci}}{\sum_c \left(xval_{ci} \Big/ \sum_i xval_{ci} \right)} \right] \times GDPPC_c$, where $xval_{ci}$ is the value of country c's export of commodity i and $GDPPC_c$ is country c's per capita GDP. GDPPC is from World Development Indicators and is measured in 2005 PPP. Therefore, the unit of PRODY is PPP dollars. We have calculated PRODY for the 779 products in our analysis. The product with the highest sophistication level is "furnace burners," with an index of almost $40,000. The product with the lowest level is "tin ores," with an index of $955. By categories, the average sophistication levels are as follows: machinery, $19,549; chemicals, $18,507; metal products, $15,804; forest products, $15,028; labor-intensive, $14,026; petroleum, $13,213; capital-intensive (excluding metals), $12,879; animal products, $12,199; raw materials, $10,967; cereals, $8,681; tropical agriculture, $8,363.

not an engineering notion. For example, a chair will have a high level of sophistication if it is exported by a large group of developed countries. This will simply mean that consumers in other countries are willing to pay a high price for the chair and therefore, the chair will be most likely a product with a high income elasticity. Second, we calculate the level of sophistication of a country's export basket (EXPY) as the weighted average of the level of sophistication of the products that it exports (i.e., of the different PRODY).[11]

Figure 1 shows the EXPY index for China and a group of comparator countries, as well as for some developed countries. The figure indicates that in the early 1960s, when China was still one of the poorest economies in the world, EXPY was about $10,000. By 2006, China's export basket had achieved a relatively high level of sophistication, $16,757, comparable to that of Japan in 1970–75, Spain, Italy and Singapore in 1985–90, and Korea in 1990–95; it has already overtaken Portugal. In Asia, only Japan, Singapore, Korea, and Malaysia are ahead of China today.

[11] Algebraically: $EXPY_c = \sum_i \left(\frac{xval_{ci}}{\sum_i xval_{ci}} \times PRODY_i \right)$. Like PRODY, its unit of measurement is dollars in PPP terms.

Figure 1. Level of Export Sophistication of the Export Basket (EXPY)



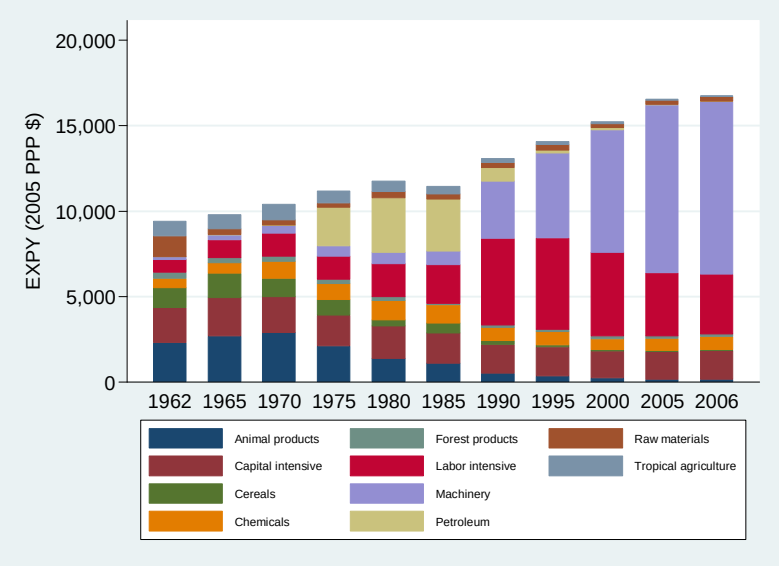
Source: Authors' calculations

Figure 2 decomposes the level of EXPY into the contribution of Leamer's (1984) categories (see appendix table 1). The figure indicates that while in the 1960s most of the level of EXPY was contributed to by animal and capital-intensive products, by 2006 the largest contributor was machinery.

Figure 3 shows the relationship between export sophistication (EXPY) and GDP per capita in 2006. The graph reveals that China's export package is very sophisticated given its income per capita. Felipe (2010: table 10.4) estimates that a 10% increase in EXPY at the beginning of the period raises growth by about half a percentage point. In

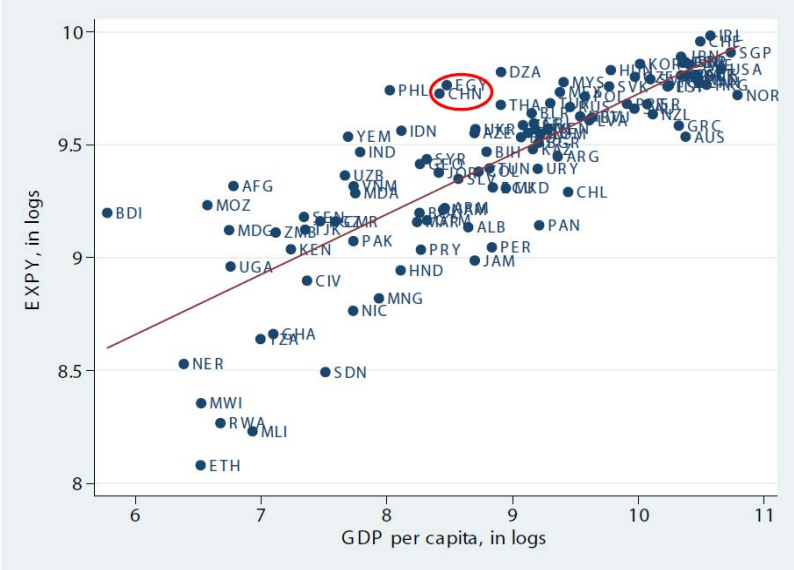
our view, those who criticize today the role of export-led growth in China's policy miss the point that the true driver of growth has been the superb increase in sophistication of its export basket.

Figure 2. China: EXPY by Leamer's Classification



Source: Authors' calculations

Figure 3. Export Sophistication (EXPY) and GDP Per Capita, 2006



Source: Authors' calculations

Diversification is measured as the absolute number of products that a country exports with comparative advantage.[12] This is shown in figure 4, which indicates that in the early 1960s, China already exported a significant number of products with comparative advantage, 105 (out of a total of 779 in the analysis), well ahead of Korea, which exported only 41 products with comparative advantage, and Brazil 45. By 2006, China exported 269 products with comparative advantage, marginally below the number of products exported with comparative advantage by Italy and Spain (among the most diversified countries in the world), and above countries like Japan (192 products) or Korea (135 products). Since the 1960s, the number of products that China exports with comparative advantage has increased very fast. For example, between 1975 and 1980, China gained comparative advantage in 88 new products, and between 1985 and 1990 in another 68.[13]

To gain insight into the products that China exports, we have split them into Leamer's (1984) categories. They are shown in table 1. The most sophisticated products are machinery (with an average level of sophistication PRODY of $19,549), chemicals (with an average PRODY of $18,507), and metal products (with an average PRODY of $15,804). We refer to these as "core" commodities. These three categories contain a total of 325 commodities (181 machinery, 95 chemicals, and 49 metal products) out of the total 779, with an average sophistication level of $18,705 (the average sophistication level of the remaining commodities is $11,794).

---

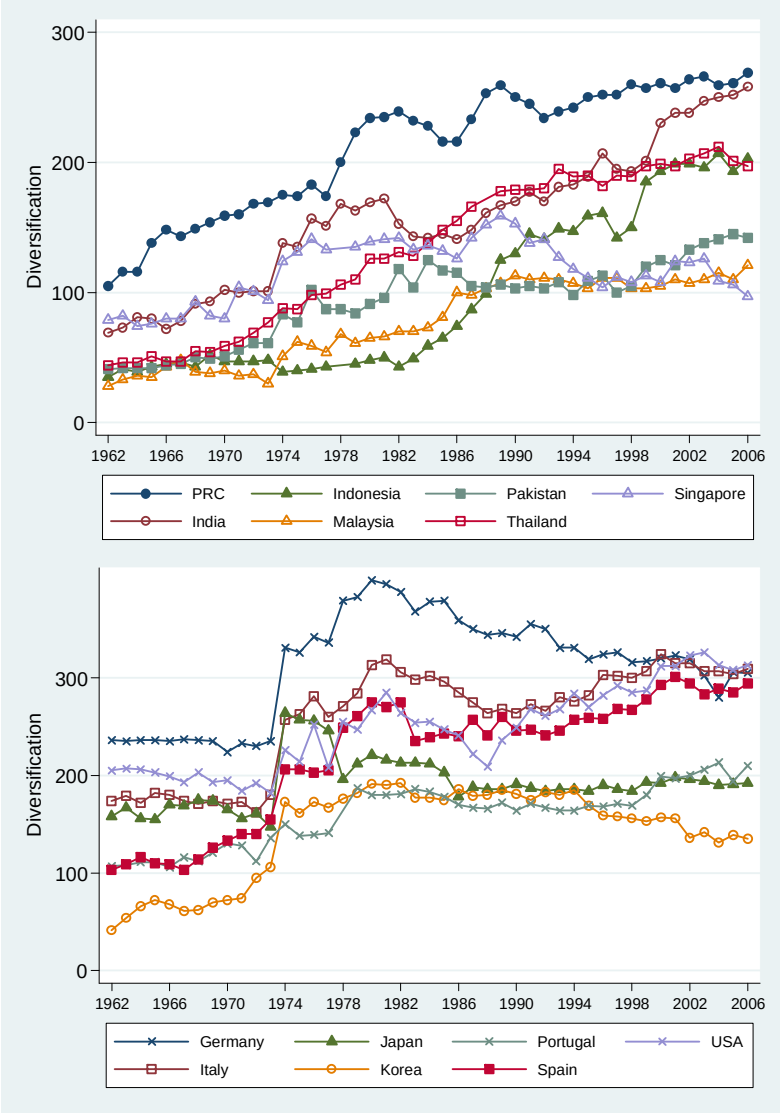
[12] Specifically, this is the number of products with an index of revealed comparative advantage (RCA) greater than 1. The index of revealed comparative advantage is the ratio of the export share of a given product in the country's export basket to the same share at worldwide level (Balassa 1965). Algebraically:

$$RCA_{ci} = \frac{xval_{ci} \Big/ \sum_i xval_{ci}}{\sum_c xval_{ci} \Big/ \sum_i \sum_c xval_{ci}}$$

. The index of revealed comparative advantage can be a problematic indicator, especially if used for comparison of different products. For example, a country very well endowed with a specific natural resource can have an RCA in the thousands. However, the highest RCA in automobiles is about 2.

[13] These figures are the net gain, since China also lost comparative advantage in some products during the periods considered. The net gain is the difference between the number of (new) products in which China acquired comparative advantage and the number of (old) products in which China lost comparative advantage.

Figure 4. Diversification of the Export Basket



Source: Authors' calculations. Note: there is a jump in 1973–74 that results from the oil price shock.

The table shows that China's progression has been impressive. In 1962, out of the 105 products exported with comparative advantage, only fourteen (or 13% of the total) were highly sophisticated, or "core," products: six chemicals (three of which were products with a level of sophistication above $20,000; one of the other three, pyrotechnic articles, was exported with a very high revealed comparative advantage, 12.06), seven metals, and one machinery.[14] The bulk of products that China exported with comparative

[14] The 14 products are: **CHEMICALS** 1. pharmaceutical goods (PRODY=$22,345, RCA=2.24); 2.woods and resin-based chemical products (PRODY=$17,335, RCA=2.92); 3. perfumery and cosmetics

advantage was shared equally between tropical agriculture, animal products, cereals, labor-intensive, and capital-intensive.[15]

Table 1. Export Diversification According to Leamer's Classification

	1962	1965	1970	1975	1980	1985	1990	1995	2000	2005	2006
Petroleum	0	1	1	1	7	5	2	1	2	2	2
Raw materials	9	8	7	10	13	15	17	16	17	12	14
Forest products	3	6	5	4	6	4	4	5	8	7	7
Tropical agriculture	15	22	25	23	22	20	15	16	15	11	10
Animal products	18	24	22	28	30	23	21	19	18	10	10
Cereals	13	19	24	21	25	33	28	15	15	10	10
Labor-intensive	18	22	32	36	54	47	61	62	66	71	69
Capital-intensive (exc. metals)	15	14	15	21	31	34	37	37	39	45	47
Core Commodities											
Metal products	7	7	10	9	14	10	19	20	21	20	23
Machinery	1	4	7	8	6	6	22	36	42	54	57
Chemicals	6	11	11	13	26	19	24	23	18	19	20
Total	**105**	**138**	**159**	**174**	**234**	**216**	**250**	**250**	**261**	**261**	**269**

Source: Authors' calculations. Metal products include iron and steel and manufactures of metals.

By 2006, the number of total products exported with comparative advantage had increased to 269, out of which 100 were core products (37% of the total). Of the three core categories, metal products has seen a steady increase, while the number of chemicals increased until about 1980 and then declined slightly. Naturally, there have been important shifts within metals and chemicals. Within the former, China has lost its comparative advantage in the least sophisticated metals, where it had comparative advantage in 1962,[16] and has gained comparative advantage in metal products that have significantly higher PRODY values.[17]

(PRODY=$13,616, RCA=3.94); 4. chemical elements (PRODY=$13,551, RCA=2.54); 5. pyrotechnic articles (PRODY=$9,774, RCA=12.06); 6. essential Oil, resinoid (PRODY=$6,709, RCA=2.88); **METALS** 7. base metals indoor sanitary ware (PRODY=$21,462, RCA=1.22); 8. tubes and pipes of cast iron (PRODY=$20,510, RCA=1.02); 9. locksmith, safes (PRODY=$17,675, RCA=1.14); 10. nails, screws, etc. of iron, steel, copper (PRODY=$16,762, RCA=1.80); 11. iron and steel powders (PRODY=$14,696, RCA=3.23); 12. bar rods from iron or steel (PRODY=$12,897, RCA=2.05); 13. pig iron, cast iron (PRODY=$8,380, RCA=1.18); **MACHINERY** 14. railway and tramway freight (PRODY=$10,663, RCA=2.32).

[15] In 1962, Korea and Brazil exported fewer core products with comparative advantage, seven and three, respectively.

[16] Pig iron, cast iron, PRODY=$8,380; iron and steel powders, PRODY=$14,696; and bars, rods, from iron or steel, PRODY=$12,897.

[17] For example: "wire rod of iron or steel (PRODY=$22,634) and wire, cables, cordage, ropes, plaited bans, sling, and the like (PRODY=$18,478). Similarly, China has gained comparative advantage in more

There are two important observations to make. The first one is that China still exports a high number of products that are labor-intensive with comparative advantage, a total of 69 (the largest group). Second, the most remarkable change has taken place within machinery: from one single product exported with comparative advantage in 1962 (railway and tramway freight not mechanically propelled, PRODY=$10,663, RCA=2.32), to 57 in 2006. China lost its comparative advantage in transport equipment for railway and tramway freight, but has gained comparative advantage in equipment for ships and boats. Moreover, it has already gained comparative advantage in most telecommunication and electronics equipment, as well as in a number of industrial and office equipment. The unweighted average PRODY of the core products exported by China with comparative advantage has increased from $14,741 in 1962, to $16,307 in 1980, and to $17,135 in 2006.[18]

A comparison of China with other countries is truly revealing. Table 2 shows the number of products exported with revealed comparative advantage and the unweighted average level of sophistication (PRODY) of these products, the number of core products exported with comparative advantage (the ordering of the countries is based on this variable) and the unweighted average level of sophistication (PRODY) of these products, GDP per capita of the country, and the share of the number of core products exported with comparative advantage in the total number of products exported with revealed comparative advantage. As it could be expected, all of these countries are developed (see figure 5). Only two developing countries, China and India, make it into this list (ahead, of, for example, Brazil and Russia—these four countries are referred to as the BRICs; China is also ahead of South Korea. These countries are shown at the bottom of the table. See the analysis in Felipe, Kumar, and Abdon [2010a and 2010b]). Given their relatively low income per capita, this is remarkable.[19]

---

sophisticated chemical products, including "provitamins and vitamins" (PRODY=$25,587) and "oxygen-function acids, and their derivatives," (PRODY= $24,839).

[18] The weighted (by the export shares) averages are: $7,893 in 1962, $8,096 in 1980, and $14,888 in 2006. This shows a clear shift to products with higher PRODY within the core.

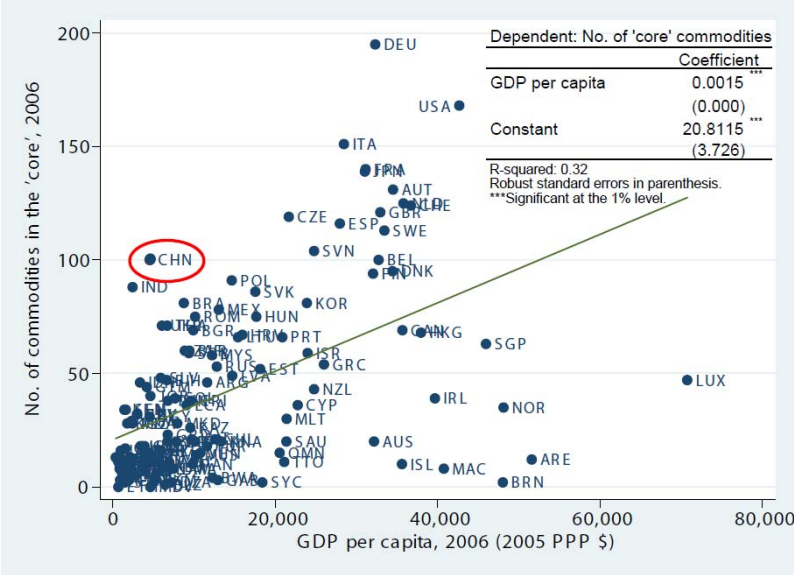
[19] A regression of the share of core commodities exported with comparative advantage in the total number of products exported with comparative advantage on GDP per capita shows that China is above the line (2006 data).

Table 2. Top 20 Countries According to the Number of Core Commodities Exported with Comparative Advantage in 2006

	No. of products exported with RCA>1	Average PRODY of products exported with RCA>1	"Core" products	Average PRODY of "core" products	GDP per capita 2006 (2005 PPP$)	Share of "core" commodities (%)
Germany	305	18,155	195	19,707	32,334	63.9
USA	313	16,197	168	19,489	42,672	53.7
Italy	309	16,015	151	19,297	28,478	48.9
France	303	15,971	140	18,656	31,131	46.2
Japan	192	19,063	139	19,925	31,041	72.4
Austria	235	17,239	131	19,305	34,520	55.7
Netherlands	278	15,720	125	19,343	35,789	45.0
Switzerland	191	18,248	124	20,444	36,702	64.9
United Kingdom	215	17,345	121	19,871	32,941	56.3
Czech Rep.	255	16,042	119	18,279	21,674	46.7
Spain	294	14,930	116	18,257	27,960	39.5
Sweden	197	18,238	113	19,751	33,432	57.4
Slovenia	214	16,185	104	18,549	24,766	48.6
China	**269**	**13,323**	**100**	**17,136**	**4,524**	**37.2**
Belgium	259	15,255	100	18,901	32,729	38.6
Denmark	227	16,017	95	19,945	34,440	41.9
Finland	163	17,671	94	18,922	32,056	57.7
Poland	256	14,404	91	16,682	14,648	35.5
India	258	12,124	88	17,557	2,416	34.1
Slovakia	193	15,379	86	17,368	17,535	44.6
Note:						
Korea (Rank=22)	135	16,974	81	18,986	23,884	60.0
Brazil (Rank=23)	195	13,290	81	16,881	8,745	41.5
Russian Federation (Rank=41)	113	14,054	53	15,296	12,797	46.9

Source: Authors' calculations

Figure 5. No. of "Core" Commodities and GDP Per Capita



Source: Authors' calculations

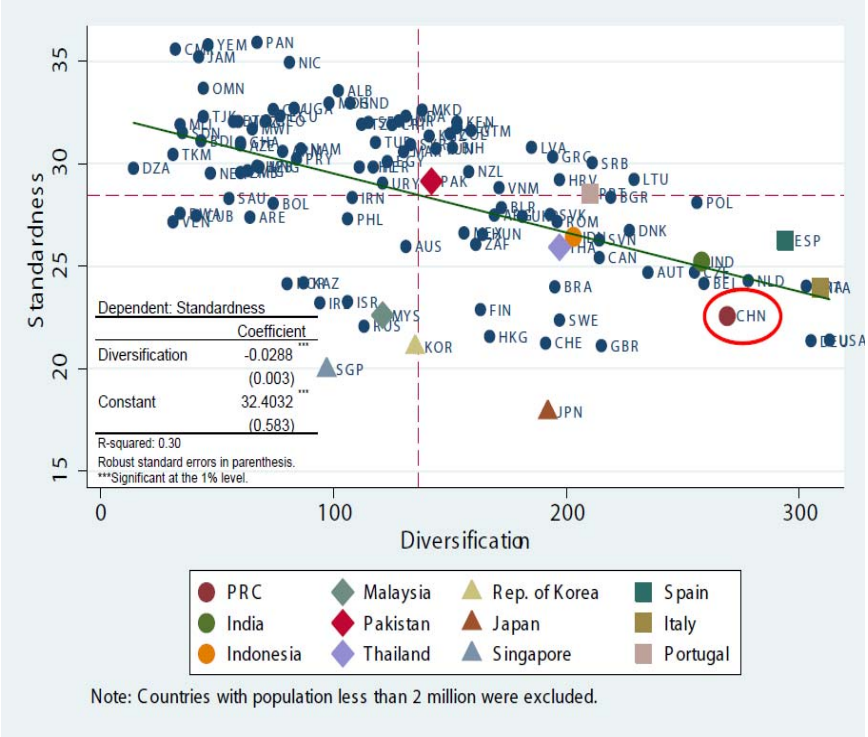
What does China export today? Table 3 shows the export share of the top 20 products (exported with a share of at least 1%), their level of sophistication (PRODY), and the index of revealed comparative advantage (RCA). The table reveals the following: (i) about half of these products have a sophistication level of about $20,000; (ii) the products with the highest export share in China's total exports are "parts and accessories for machines," with a share of 4.68%; and "peripheral units," with a share of 4.11%; and (iii) the products with the highest index of revealed comparative advantage are "children's toys" (RCA=5.01), "digital data processing machines" (RCA=4.49), and "travel goods" (RCA=4.41).

Table 3. Top 20 Exports in 2006

Code	Commodity	Leamer's Classification	PRODY	Export Share (%)	RCA
7599	Parts, nes of and accessories for machines of headings 7512 and 752	Machinery	20,505	4.68	2.24
7525	Peripheral units, including control and adapting units	Machinery	19,438	4.11	3.07
8942	Children's toys, indoor games, etc.	Labor intensive	19,086	3.61	5.01
7643	Television, radio-broadcasting; transmitters, etc.	Machinery	22,238	3.50	1.91
7649	Parts, nes of and accessories for apparatus falling in heading 76	Machinery	21,053	3.47	2.29
7522	Complete digital data processing machines	Machinery	18,606	3.07	4.49
8510	Footwear	Labor intensive	9,997	2.83	3.77
7638	Other sound recording and reproducer, nes; video recorders	Machinery	19,579	2.58	3.81
7764	Electronic microcircuits	Machinery	20,984	2.36	0.84
8310	Travel goods, handbags etc, of leather, plastics, textile, others	Labor intensive	12,957	1.54	4.41
7641	Electrical line telephonic and telegraphic apparatus	Machinery	20,649	1.50	2.91
8219	Other furniture and parts thereof, nes	Labor intensive	13,763	1.36	2.33
8439	Women's, girl's, infant's outerwear, textile, not knitted or crocheted; other outer garments of textile fabrics, not knitted, crocheted	Labor intensive	8,522	1.33	3.36
7788	Other electrical machinery and equipment, nes	Machinery	16,447	1.31	1.55
7611	Television receivers, color	Machinery	15,755	1.29	1.81
7721	Switches, relays, fuses, etc.; switchboards and control panels, nes	Machinery	16,544	1.26	1.06
7712	Other electric power machinery, parts, nes	Machinery	20,237	1.23	2.86
8451	Outerwear knitted or crocheted, not elastic nor rubberized; jerseys, pullovers, slip-overs, cardigans, etc.	Labor intensive	8,045	1.20	3.37
8459	Outerwear knitted or crocheted, not elastic nor rubberized; other, clothing accessories, nonelastic, knitted, or crocheted	Labor intensive	8,085	1.12	3.21
8710	Optical instruments and apparatus	Machinery	21,226	1.08	2.75

Source: Authors' calculations

Figure 6. Diversification and Standardness in 2006



Source: Authors' calculations

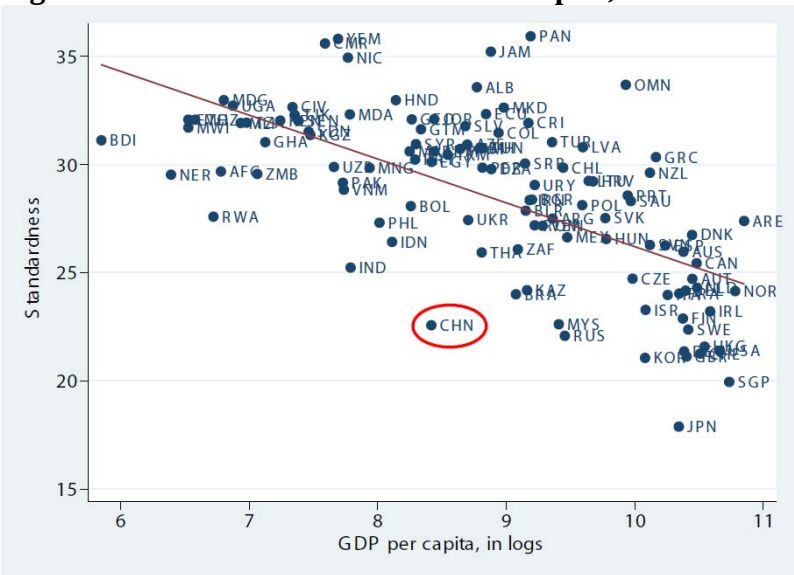
Finally, we have also analyzed the extent to which the products that China exports are unique or not. Figure 6 graphs the number of products exported with comparative advantage against an index of standardness of the products exported.[20] A lower value of standardness indicates that the products exported are more unique (i.e., exported by fewer countries). The best positioned countries are those in the fourth quadrant (high diversification and more unique products), while the worst are those in the second quadrant (low diversification and standard products).[21] Figure 6 indicates that China is in the fourth quadrant, together with most of the developed countries. In Asia, only Japan, Singapore, Korea, Malaysia, and Hong Kong export more unique products than China,

[20] Specifically, standardness is the average ubiquity of commodities exported with comparative advantage for each country c, and is calculated as: $\frac{1}{diversification_c}\sum_i ubiquity_{ic}$, where diversification is the number of products exported by country c with comparative advantage and ubiquity of commodity *i* is the number of countries exporting commodity *i* with comparative advantage (Hidalgo and Hausmann 2009).

[21] The negative relationship between both variables remains when we use the number of core commodities or the percentage of core commodities (out of the total number of commodities exported with comparative advantage) instead of standardness.

but all of them export fewer products with comparative advantage. Figure 7 shows the relationship between standardness and GDP per capita in 2006. The figure shows that, given its income per capita, China has a highly unique export package.

Figure 7. Standardness and GDP Per Capita, 2006



Source: Authors' calculations

3. THE PRODUCT SPACE: COMPARATIVE ADVANTAGE OR INDUSTRIAL POLICY?

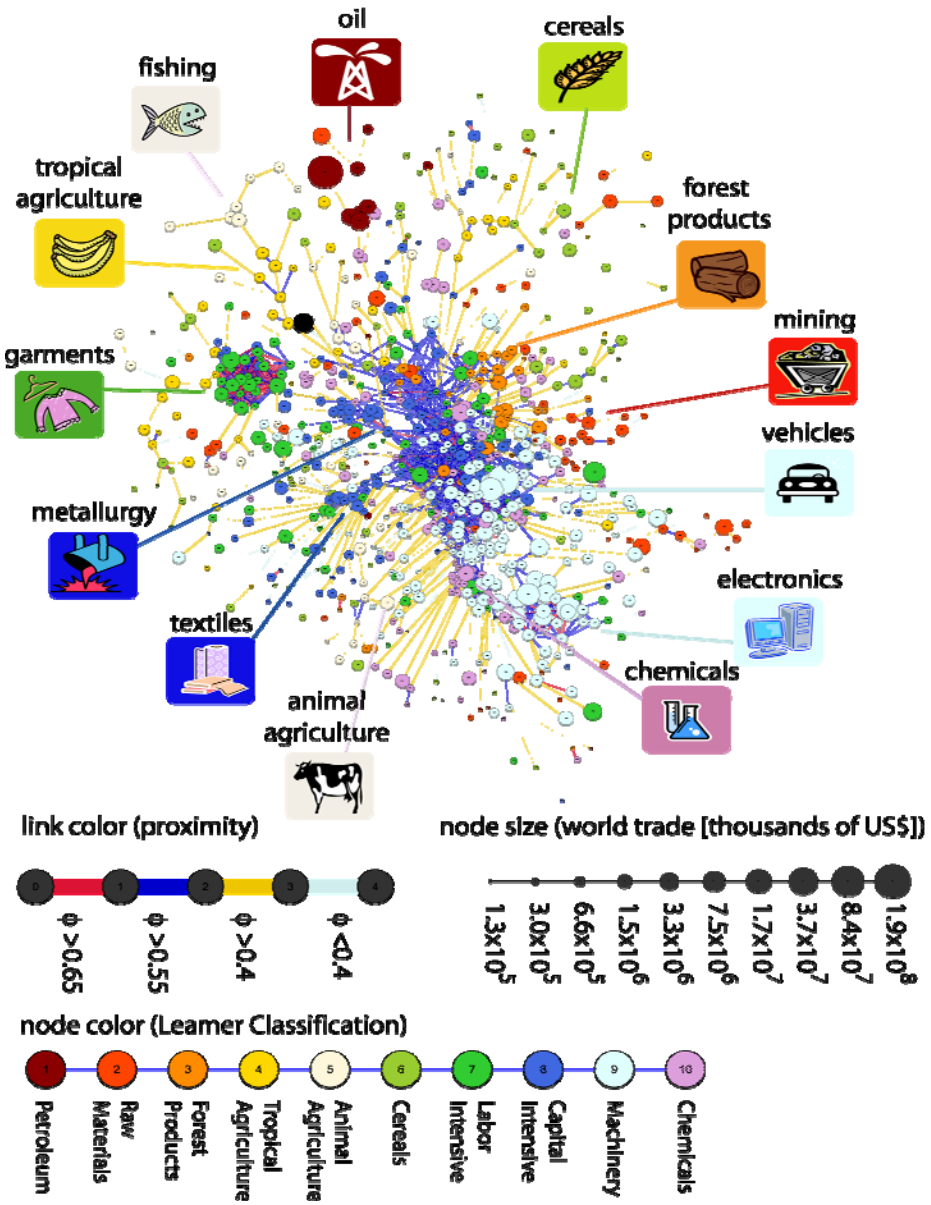
Hidalgo et al. (2007) argue that the production (and export) of different products requires different and very specific capabilities (resources—both human and physical—knowledge of markets, legal system, institutions, etc.). For example, the capabilities required to successfully export oranges are very different from those required to export furniture. What differentiates these capabilities is that some of them can be easily redeployed into the production and export of many other products. Probably this is the case of different types of machinery or of electronics goods. However, there are many other products that require very specific capabilities that cannot be easily redeployed. This is the case of natural resources such as oil.

Hildago et al.'s recently developed concept of product space encapsulates these ideas. The product space uses network theory to produce a graphical representation of all

the products exported in the world (figure 8). The different circles represent products (a total of 779 in our analysis). Their size is proportional to world trade. Colors represent different product groups. The lines that link them represent the distance between them. This is not a physical distance, rather it measures the likelihood that a country exports a product given that it exports the other one. At one extreme, a red line indicates that countries that export one product also export the other product with a high probability, while a light blue line indicates a low probability that the two products can be exported jointly. The rationale is that if two goods need the same capabilities, a country should show a higher probability of having comparative advantage in both.

We can see that the product space is highly heterogeneous. Some peripheral products are only weakly connected to other products. Some groupings appear among these peripheral goods, such as petroleum products, seafood products, garments, and raw materials. These products provide countries with a nature-based comparative advantage. In the center of the network is a core of closely connected products, mainly machinery, chemicals, and capital-intensive (metal) products. Nature does not provide an advantage in these products. When acquired, it is man-made.

Figure 8. The Product Space



Source: Hidalgo et al. (2007)

The heterogeneous structure of the product space has important implications for structural change. Products in the periphery are less sophisticated and with a lower income elasticity of demand for exports than those in the core. That is, not all products are the same qualitatively as carriers of economic development. If a country produces goods in a dense part of the product space, then structural transformation is much easier because the set of acquired capabilities can be easily redeployed to the production of other nearby products. However, if a country specializes in the peripheral products, this redeployment is more challenging, as no other set of products requires similar capabilities. The conclusion is that a country's position in the product space signals its capacity for structural transformation.

Now we superimpose the products that China exports with revealed comparative advantage onto the product space. This is shown in figure 9. For reasons of space, we only show the product spaces corresponding to 1962, 1980, 1990, and 2006 (product spaces for other years are available from the authors upon request). The products exported with comparative advantage are shown with black squares. The number of black squares is exactly the same that appears in table 1 above. The four product spaces reveal important changes in China's export structure, and in particular how the country has managed to establish a strong foothold into the core areas of the product space. As discussed earlier, in 1962, China exported 105 products with comparative advantage, most of them outside the core: tropical agriculture, animal products, cereals, labor-intensive, and capital-intensive (excluding metal products). China's strength in tropical agriculture, animal products, and cereals remained until 1980–1985 (see table 1), when the number of these products exported with comparative advantage started declining. The strength in labor-intensive (the garment cluster) and capital-intensive products, excluding metal products (the textile cluster), has remained, and even increased, until now, most likely reflecting China's relatively low wages.

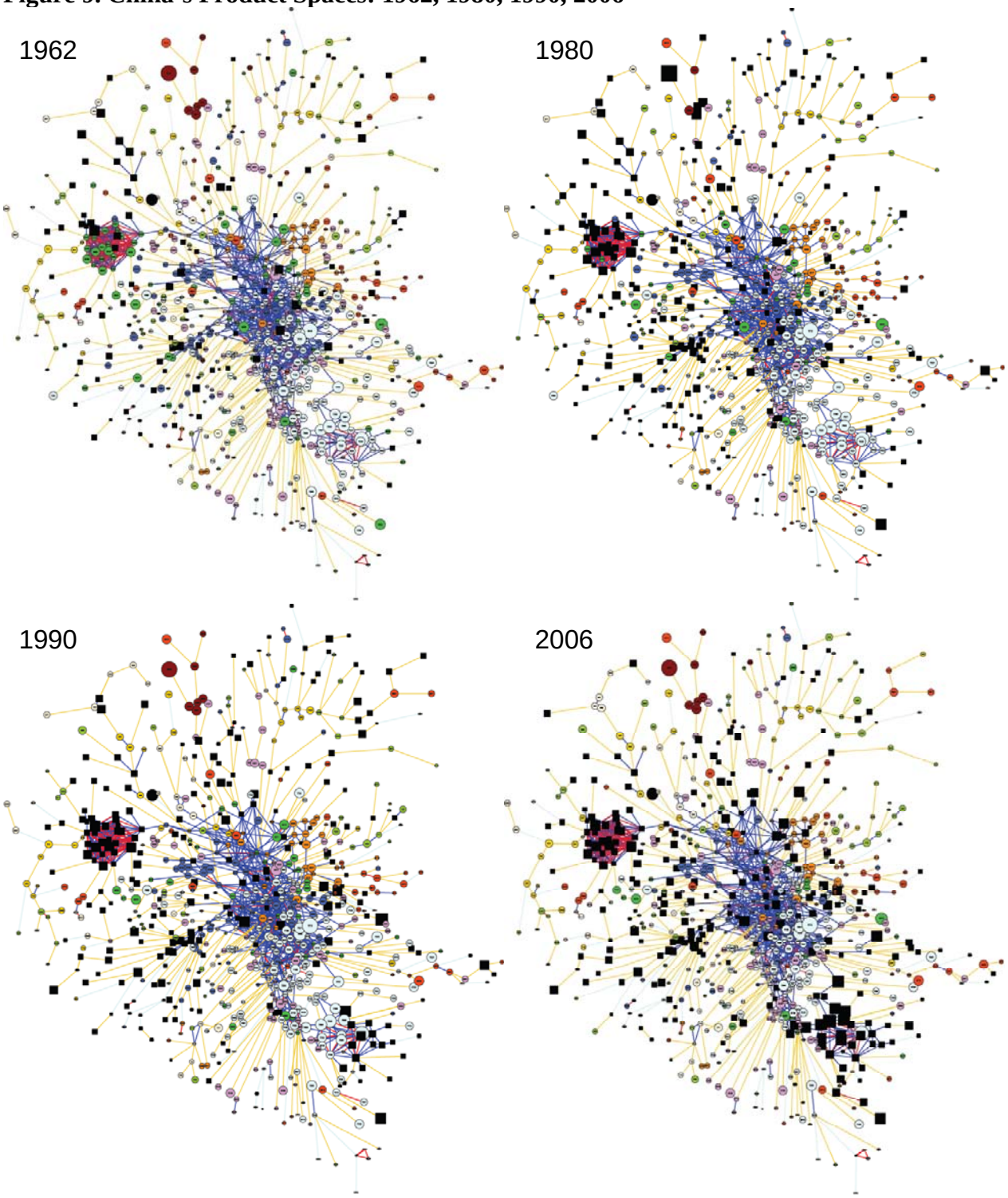
In 1980, at the start of reforms, China already exported a total of 234 products with comparative advantage, with 46 in the core (of which 40 were metals and chemicals), and 11 out of the latter had a sophistication level of $20,000 or above.[22] And

[22] In 1962, out of the fourteen products in the core exported with comparative advantage, only three had a level of sophistication of $20,000 or above. In 1970 the number of products in the core exported with

certainly China had set a very strong presence in the garments (labor-intensive) and textiles (capital-intensive) clusters.

comparative advantage and with a level of sophistication above $20,000 had increased to eight (including "rails and railway track construction materials," at $30,678), then to nineteen in 1995, and to twenty-nine in 2006.

Figure 9. China's Product Spaces: 1962, 1980, 1990, 2006



Arguably, the most remarkable change probably occurred between 1985 and 1990 when China got into electronics (grouped under machinery in Leamer's classification). As table 1 above indicates, in 1980 and 1985, China had comparative advantage in the export of only six machinery products.[23] Figure 9 reveals that during the next five years, a significant change had taken place, as China had set a foot into the electronics area of the product space (22 machinery products exported with comparative advantage). Between 1990 and 2006, the number of machinery products exported with comparative advantage increased to a total of 57. The product spaces also show that China has never been a great exporter (in the sense of having comparative advantage) of petroleum, raw materials, and forest products.

While the analysis shows that China has strong revealed comparative advantage in labor-intensive products (a total of 69 products in 2006), it also reveals that its comparative advantage in core products is impressive. In our view, the only way to understand this is by acknowledging China's increasing capacity to master and accumulate capabilities, and the role played by industrial policy (table 4).[24] China started using "export processing zones" as a key strategy to learn (and accumulate capabilities) from foreign firms in the advanced countries when these restructured their global production networks (Zhang and Song 2000).[25] The landmark FDI legislation was the Equity Joint Venture Law of 1979 (table 5). The law was historic in that it signified a reversal of the political stance against economic opening, and in that it laid the foundation for the foreign investments that have emerged since 1979. In 1986, the State Council released a document entitled "Regulations to Encourage Foreign Investments" to shift the FDI regime from "permitting" to "encouraging" FDI. The regulations allowed export-oriented and technologically advanced foreign firms to enjoy various benefits relating to taxes, credit, input charges, labor management, export rights, and foreign exchange requirements. Foreign investors were required to enter joint ventures with domestic firms for technology transfer (Yueh 2009).

[23] In 1980 these six products were: domestic electro-mechanical appliances, invalid carriages, clocks, sewing machines, electric filament lamps, and cycles (not motorized). In 1985 the six products were: watches, portable radio receivers, other radio receivers, clocks, machinery for the grain milling industry, and cycles (not motorized).
[24] There is still a debate going on about the usefulness of industrial policy. The fact is that Western developed countries used industrial policy since the 15th century to protect and develop the manufacturing sector. See the detailed analyses in Chang (2002) and Reinert (2007), and the debate between Lin and Chang (2009). In our view, it is impossible to understand how rich countries got rich without being aware that they heavily protected their industries when they were taking off. China is doing nothing different. It is simply replicating what many other countries, including the United States, did (e.g., set industry standards, regulations, buy-local policies, procurements, patent laws advantageous to domestic producers, etc.) to build their own industries.
[25] This took place after the currency realignment following the Plaza Accord (1985), which led to a significant appreciation of the yen.

China was able to bargain effectively with foreign investors because of the leverage of its large market size.[26]

Table 4. China's Industrial Policy

State ownership	Was extremely high as a result of Communist takeover, but thousands of state enterprises have been privatized or shut down as the economy underwent massive market restructuring.
Subsidized credit	Still significant subsidized credit through state owned banks, directed at state enterprises.
Tax incentives	Strongly biased toward foreign investment and high technology
Tariff and nontariff protection	Levels have come down significantly with WTO entry, but still significant nontariff barriers.
Foreign direct investment (FDI) targeting	Initially there was very strong control on FDI. Then, policy changed strategically: country opened up and favored cutting-edge investment in key areas. Foreign firms have come to use China both as an export platform, low-cost manufacturing hub, and for its large domestic market. The government has been effective at creating strong competition among foreign firms and induced them to bring best technologies.
Local content requirements	Important mechanism to develop backward linkages succeed because of capabilities of domestic firms.
Intellectual property rights	Weak until required to update as part of WTO accession in 2001. Enforcement is weak and is likely to become a very controversial issue in future in relations with developed countries.
Government procurement	Important mechanism to develop national firms in many areas. Also effective use of national standards to support competitiveness of indigenous firms.
Promoting large domestic firms	Multiple instruments used to create world-class indigenous (public and private) companies to compete with multinational corporations (MNCs) domestically and eventually abroad.

Source: Dahlman (2009: 307)

Also, the jump into the electronics cluster in the 1990s (driven by foreign firms) was the result of participation in global value chains (Felipe 2010: 249–252). The evidence, consistent with the discussion in this paper, is that China has done a great deal of impressive catching up through mechanisms such as "original equipment manufacturer," "original design manufacturer," and "original brand manufacturer." This shift into electronics was possible only because China had previously acquired the capabilities necessary to assemble and export these goods. While socialist controls and regulations inhibited private enterprise, the positive legacy is that they provided a solid foundation for the forthcoming growth, e.g., wide access to education and health, highly egalitarian land distribution, increased female labor force participation, a system

[26] We have to add the role played by the undervaluation of the yuan, in the words of Rodrik (20100), "a kind of industrial policy."

of economic regional decentralization, and a very active government that promoted technological development.[27]

Table 5. Major FDI laws after 1978

Laws and Regulations	Key components
Equity Joint Venture Law (1979)	Laid down the foundation for successive laws on FDI, including income tax and labor management.
Wholly Foreign-owned Enterprises Law (1986) and Sino-Foreign Cooperative Joint Venture Law (1988)	Developed a legal infrastructure governing the three main forms of foreign invested enterprises (FIEs)—equity joint ventures, cooperative joint ventures, and wholly foreign-owned—and devising favorable policy treatments for FDI.
Regulations to Encourage Foreign Investments (1986)	Shifted FDI policy from "permitting" to "encouraging" FDI; separated FIEs into two categories—those qualifying for favorable treatments (export-oriented and technology-advanced FIEs) and those qualifying for normal treatment; and qualified FIEs enjoyed benefits related to taxes, credit access, input charges, labor management, export rights, and foreign exchange balance requirements.
Provisional Regulations for Guiding the Direction of Foreign Investment (1995, revised 1997)	Laid out a positive and negative list of economic sectors and official intentions of investment priorities. FDI-involved projects are divided into four categories—encouraged, allowed, restricted, and prohibited.

Source: Authors

What lies behind this progression? In the product space model, development is a path-dependent process. There is no growth trajectory that acts as a "center of gravity" toward which the economy is inexorably and inevitably drawn. Long-run growth and development depend on a succession of short- and medium-term developments along a historical adjustment path. During the 1960s and 1970s, China had already made inroads into the core of the product space. This was part of China's industrialization drive since the 1950s. It was deliberate and policy-induced,

[27] Bardhan (2008) argues that there are three important myths about how globalization has stimulated China's (and India's) recent rapid growth. The standard argument, he claims, is that "decades of socialist controls and regulations stifled enterprise in India and China and led them to a dead end. A mix of market reforms and global integration finally unleashed their entrepreneurial energies. As these giants shook off their 'socialist slumber,' they entered the 'flattened' playing field of global capitalism. The result has been high economic growth in both countries and correspondingly large declines in poverty." Regarding China, he argues that the country had already achieved growth rates of about 9% per annum between 1978 and 1993, higher than those of the successful East Asian countries between 1960 and 1980. Regarding poverty, about two-thirds of the decline in extremely poor people between 1981 and 2004 had taken place by the mid-1980s. This large decline was probably related to domestic factors and not to global competition. These factors included: (i) a significant increase in agricultural productivity following decollectivization; (ii) land reform program; and (iii) increased farm procurement prices.

a stated objective of Chinese policymakers (Wilcox, Weatherford, and Hunter 1962: 80–100; Wang and Li 1995). Using data for 2000, Felipe and Estrada (2008) estimate that China's actual manufacturing sector as a share of GDP in 2000, 34.5%, was about five percentage points above what a regression of this share on income per capita (and its square), population, and openness predicted, 27.5%. This is consistent with the old notion that manufacturing is the "engine of growth" embedded in *Kaldor's first law* (Kaldor 1967; Felipe et al. 2009; see also Rodrik 2006a), and with the fact that growth accelerations are associated with structural changes in the direction of manufacturing (Hausmann, Hwang, and Rodik 2006).

The heavy industrial expansion and huge capital construction projects undertaken during the 1950s (employing labor-using and capital-saving methods), together with the speedy introduction of modern technology (assistance from the Soviet Union), led to very significant increases in industrial production, electric power and steel output (Wilcox, Weatherford, and Hunter 1962: 92, table 5). We insist that we do not argue that the industrial policies before market reforms were introduced were completely successful. Without any doubt they led to a lot of waste, miscalculations, low-quality products, poor planning, and inefficiencies. It is likely the capabilities created were not well utilized and scarce resources were wasted under ambitious government policies. Our point is that the reason why in 1980 China could export 234 commodities with comparative advantage (46 of them in the core) is that during the previous decades it had mastered and accumulated a large number of capabilities and know-how. Only this way could Chinese entrepreneurs respond to the market incentives created by the market reforms. For decades China protected its industry and slowly allowed it to graduate to the international market. Moreover, China's trade as far back as the 1950s was "an absolutely crucial element (necessary, but not sufficient) in its headlong modernization. Imported machinery and equipment, embodying modern technology, contributes an output-raising potential that substantially outweighs short-run costs […] Without trade many years of painful technological growth would be required" (Wilcox, Weatherford, and Hunter 1962: 90–91).[28]

Can this fast process be equated with what is referred to in the literature as leapfrogging, that is, the idea that some stages of development can be bypassed (supported by government-led

[28] Felipe (2009: 123–127) argues that for countries lagging behind the technological frontier, endogenous technical progress is partly dependent on the acquisition and mastery of more advanced production techniques from the leader countries, which, in turn, depends on the country's capabilities. If technology is sector specific, its diffusion from the more to the less advanced countries will be faster the higher the degree of structural similarity between them.

industrial policy) in an attempt to move faster up the development ladder? Our view is that leapfrogging is not supported by careful empirical and firm-level research (Hobday 1995).[29] Case studies suggest that firms acquire technology through a costly, difficult, and incremental learning process. The notions of learning and capability accumulation contradict the idea of leapfrogging. China's firms did not leapfrog from one vintage of technology to another. On the contrary, firms engaged (and still are) in a painstaking and cumulative process of technological learning. The route to advanced electronics and information technology has been a long difficult learning process, driven by the manufacture of goods for export. Moreover, as we showed in table 1, of the 269 products that China exported with comparative advantage in 2006, the largest category was labor-intensive products (a total of 69 or 25% of the total).

We close this section with reference to a well-known paper by Gregory Chow (1993: 811), who argued that China's 6% average rate of growth (of real national income) per annum between 1952 and 1980 was entirely due to factor accumulation and that technological progress during that period was absent. [30] We do not have data going back to the 1950s, and it is possible that the Great Leap Forward and the Cultural Revolution inflicted significant losses in many areas, including a decrease in output in some years (Naughton 2008). In the early stages, China adopted a centrally planned economic system based on state and collective ownership of all means of production, and resources, outputs, and prices were controlled. Authorities prioritized

[29] Kim (1997) described Hyundai's efforts to produce a car after it had purchased the foreign equipment, hired expatriate consultants, and signed licensing agreements with foreign firms, as follows:

> "Despite the training and consulting services of experts, Hyundai engineers repeated trials and errors for fourteen months before creating the first prototype. But the engine block broke into pieces at its first test. New prototype engines appeared almost every week, only to break in testing. No one on the team could figure out why the prototypes kept breaking down, casting serious doubts even among Hyundai management on its capability to develop a competitive engine. The team had to scrap eleven more broken prototypes before one survived the test. There were 2,888 engine design changes […] Ninety-seven test engines were made before Hyundai refined its natural aspiration and turbocharger engines […] In addition, more than 200 transmissions and 150 test vehicles were created before Hyundai perfected them in 1992" (Kim 1997: 129).

This is far from the notion of leapfrogging.

[30] Chow's (1993) definition of technical progress, implicit in aggregate production function studies, is the portion of overall growth not due to factor accumulation. Chow estimated Cobb-Douglas production functions and technical progress was proxied by a linear time trend that, in his regressions, was statistically insignificant. However, see Felipe and McCombie (2002 and 2010). Felipe and McCombie (2010) prove that Chow's (1993) regressions were dubious. He estimated Cobb-Douglas production functions for different sectors and proxied technical progress through a linear time trend. For reasons difficult to accept, he eliminated some years from the regressions to obtain a good fit. Felipe and McCombie show that the analysis and conclusions were flawed. Using his data set for the construction sector, Felipe and McCombie reestimated the regression and concluded, in Chow's own terms, that there was technical progress. Our definition of (technical) progress, as noted in the introduction, is a process of accumulating capabilities that leads to an increase in the level of sophistication and diversification of the export basket.

heavy industrialization (iron and steel, chemical fertilizer, and petrochemicals) and the needed resources for investment in heavy industries were extracted from rural areas. However, attempts to increase industrial production through politically forced resource mobilization resulted in a wide range of misreporting by production units. Further, industrial policy in this period emphasized local self-sufficiency, which resulted in all local governments being involved in a wide range of areas; moreover, "Chinese planning was extraordinarily haphazard and unrealistic" (Naughton 1990: 746).[31]

Having said this, the evidence indicates that by 1980, at the time transition and market reforms started, China had already gained revealed comparative advantage in the export of 234 products, of which 46 were core products, and that it had reached a level of export sophistication (EXPY) of $11,000, higher than that of many other developing countries today. Given that in 1950 China was a very poor and backward economy, our interpretation of this evidence is that the country's progress during the next three decades was remarkable, and difficult to square with the conclusion that growth had been essentially due to factor accumulation and that technical progress had been absent. China's impressive progression and growth after the introduction of market reforms cannot be understood without factoring in the capabilities that had been developed and accumulated over the three decades under the planning system and prior to the introduction of market reforms. Without these capabilities, entrepreneurs could not respond to the incentives created by the market reforms.[32] We elaborate upon this in the next section.

Our view of China's development is consistent with the key characteristic of development embedded in the product space, namely, that it is path-dependent. For developing countries to move fast in the product space and reach the core, they often need to defy their comparative advantage. In the case of China, this was done by protecting certain capital and technology-industries, giving them monopoly positions and subsidizing them through various price distortions, including suppressed interest rates. These price distortions often created shortages and the government had to resort to using administrative measures to allocate resources directly to nonviable firms in priority industries. As we noted above, these policies

[31] Brandt, Rawski, and Sutton (2008: 569) argue that prior to market reforms "…visitors to Chinese factories encountered obsolete and dysfunctional products; vans and transformers that failed to keep out rainwater, sewing machines that leaked oil onto the fabric, power tillers rusting outside a factory that churned out fresh batches of unwanted inventory, and so on" (Brandt et al. 2008, p.569).

[32] We have to add that despite the erroneous agricultural policies that precipitated the famine of 1960–61, and again slowed agriculture during the "Cultural Revolution" of 1966–67, China's progress in agriculture during 1962–2000 was remarkable (Lin 1998).

misallocated some resources, but this does not mean that economic performance was poor. The conclusion is that if China had not proceeded this way, today it would be a much poorer country.

4. CHINA'S "OPEN FOREST"

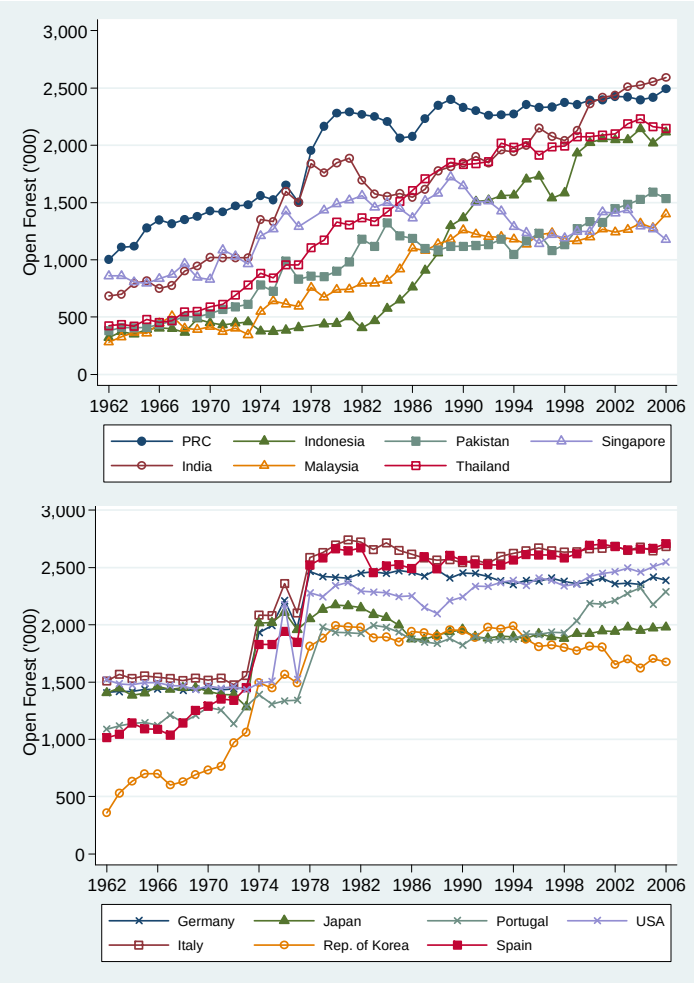
Another complementary way of analyzing how China has progressed during the last forty years is by looking at the country's (future) export opportunity set at different points in time. Hausmann and Klinger (2006) provide a measure of a country's export structure that captures the flexibility of an economy to adapt to external shocks and encapsulates the potential for further structural change. This measure, which they call *open forest*, is a weighted average of the *sophistication* of all potential export goods of a country (i.e., those goods not yet exported with comparative advantage), where the weight is the *density* or distance between each of these goods and the economy's present export basket. *Density* (distance) in this context is not a physical concept; rather, it measures how close (far) a commodity not exported with comparative advantage is to the country's export basket. It is a proxy for the probability that a country can successfully export a "new" product (i.e., that it acquires revealed comparative advantage in it).[33] Open forest captures the (expected) value of the goods that the country could potentially export, i.e., the products that it currently does not export with comparative advantage. This value, therefore, depends on how far the nonexported goods are from the current basket (i.e., distance,

[33] Algebraically: $Open\_Forest_c = \sum_j \left[\frac{\sum_i \varphi_{ij} x_{ci}}{\sum_i \varphi_{ij}} (1 - x_{cj}) PRODY_j \right]$, where $\frac{\sum_i \varphi_{ij} x_{ci}}{\sum_i \varphi_{ij}}$ is the density and $x_{ci,cj} = \begin{cases} 1 \text{ if } \text{RCA}_{i,j} \geq 1 \text{ for country } c \\ 0 \text{ if } \text{RCA}_{i,j} < 1 \text{ for country } c \end{cases}$; φ_{ij} denotes the proximity or probability that the country will shift resources into good j, given that it exports good i; $PRODY_j$ is a measure of the sophistication of product j (not exported with comparative advantage), calculated as a weighted average of the income per capita of the countries that export it; and $\omega_{cj} PRODY_j$ is the expected value (in terms of the sophistication of exports) of exporting good j. First, we calculate the number of products in which China currently exhibits revealed comparative advantage (i.e., RCA>1). Second, we calculate the sophistication of all products. Third, we calculate the distance between the current export basket (i.e., the products in which China has currently revealed comparative advantage) and each of the products not currently exported with comparative advantage. Fourth, we compute open forest as the sum of the multiplications *density* times *sophistication* (for the products not exported with comparative advantage).

or the probability that the country can export them) and on how sophisticated these nonexported goods are.

We have calculated *open forest* for China and for a group of comparator countries since the 1960s. This is shown in figure 10. China's open forest in 1962 was $1,003 (in thousands, 2005 PPP$). It ranked twenty-first in the world. By 2006 its open forest had increased to $2,414, the ninth largest in the world.[34]

Figure 10. Trend in Open Forest



Source: Authors' calculations

[34] The ten largest open forest values in 2006 were (in thousands, 2005 PPP$): Poland, $2,618; Spain, $2,551; India, $2,548; Lithuania, $2,501; Czech Republic, $2,499; Italy, $2,462; Denmark, $2,436; Bulgaria, $2,435; China, $2,414; and Belgium, $2,401.

As we argued in the previous section, this phenomenal progression is the result of path-dependency. Once China had set a foot into the core, it could diversify and upgrade its export basket quickly. In other words, once the country gained comparative advantage in some sophisticated products in the core, it became easier to "move around." These products are "close" to many other sophisticated products (e.g., other types of machinery or chemicals) in the sense that there is a high probability that China can export them successfully (i.e., that it can acquire comparative advantage) because they use capabilities that are similar to the ones that the country already possesses.

What about those commodities located "far" from the current basket (i.e., high distance and hence low probability that China acquires comparative advantage in them)? These products tend to be unsophisticated (e.g., natural resources, some agricultural products) and therefore contribute little to open forest. Therefore, even though China has gained revealed comparative advantage in the export of 269 products, still many of the products that it does not export with comparative advantage are highly sophisticated and in the core (there are 325 core products and China exports 100 of them with comparative advantage) and the probability of exporting them is high. Hence, China's high open forest.

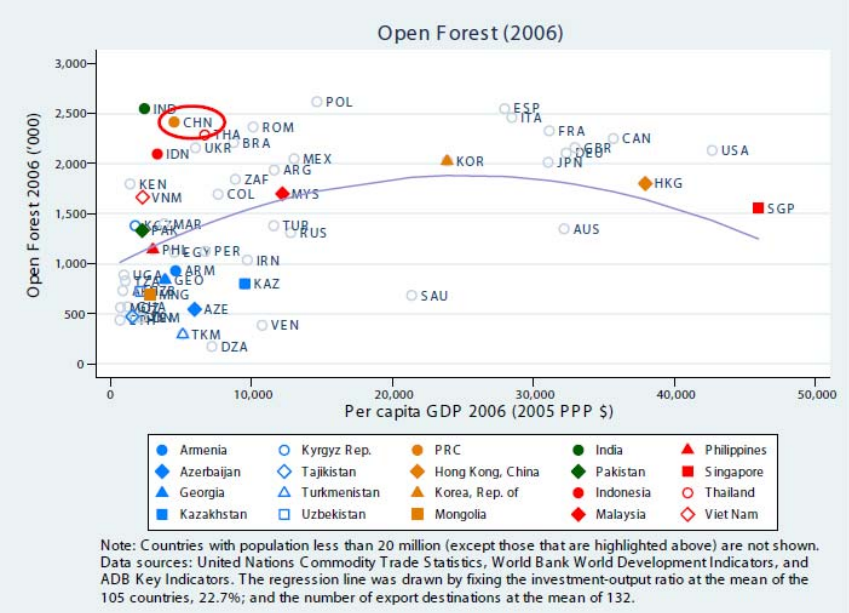
Table 6 shows the top ten contributors to China's open forest in 2006 ($2,414,000). All of them are very sophisticated products (seven of them with PRODY above $30,000, and including—although at a high distance—the most sophisticated product in our analysis, "furnace burners"), indicating that China is very well-positioned in the core of the product space.

Table 6. Top 10 Contributors to Open Forest in 2006

Commodity	Leamer's Classification	PRODY	Density	Contribution to Open Forest
Angles, shapes, sections, and sheet piling, of iron or steel	Capital-intensive	35,177	0.350	12,299
Pearls, not mounted, set, or strung	Labor-intensive	25,242	0.457	11,546
Other electronic valves and tubes	Machinery	21,976	0.510	11,205
Sulphonamides, sultones, and sultams	Chemicals	30,593	0.355	10,847
Furnace burners; mechanical stokers, etc., and parts thereof, nes	Machinery	39,521	0.273	10,781
Sound recording tape, discs	Labor-intensive	33,809	0.310	10,475
Safety glass consisting of toughened or laminated glass, cut or not	Labor-intensive	32,232	0.322	10,367
Bonded fibre fabrics, etc., whether or not impregnated or coated	Capital-intensive	31,250	0.327	10,216
Rails and railway track construction materials, of iron or steel	Capital-intensive	30,687	0.321	9,843
Swine, live	Animal products	26,388	0.371	9,781

Source: Authors' calculations

Figure 11. Opportunities for Economic Transformation: Open Forest



Dependent: Open Forest	Coefficient
GDP per capita	0.073263 ***
	(0.015)
GDP per capita^2	-0.000001 ***
	(0.000)
Investment-output ratio	25.80148 ***
	(8.424)
No. of export destinations	10.70858 ***
	(2.674)
Constant	-1037.917 ***
	(363.929)

R-squared: 0.53
Robust standard errors in parenthesis.
***Significant at the 1% level.

Source: Authors' calculations

Finally, we have estimated a regression of open forest on income per capita (and its square), the investment-output ratio, and the number of export destinations, using data for 105 countries for 2006. The line in figure 11 provides the expected value of open forest given income per capita; to draw it, we fix the investment-output ratio and the number of export destinations their sample's averages, 22.7% and 132, respectively.

Results indicate that China's expected (i.e., predicted by the regression) open forest ($2,107,000), given the values of the three right-hand variables, is below the actual one ($2,414,000). This reinforces the conclusion that China's future is bright.

5. WHAT ELSE CAN CHINA EXPORT?

Given the analysis and conclusions in the previous section, we can ask "what else can China export?" Table 6, above, contains some of the most sophisticated products in the analysis (see their PRODY). This is why China has a high open forest. But can China successfully export all these products today? To answer this question we get back to the product space and analyze the products that China does not export with revealed comparative advantage. This represents China's export opportunity set. In our analysis there are 509 products that China does not export with comparative advantage (all the products in the open forest). Therefore, these are potential "new" exports. They are shown in figure 12. Certainly China will not be able to export all of them with comparative advantage, but certainly there is still room to increase the number of exports with comparative advantage.[35]

Figure 12 shows how "far" each product is from the current export basket. This allows us to divide all these products into three groups, depending on how far they are from the current export basket: "nearby," "middle distance," and "far away."[36] The three groups are separated by a dashed line. By construction of the product space, products "closest" to China's current export basket, i.e., those "nearby," use capabilities that are similar to those the country already has and, therefore, it should not be difficult for Chinese firms (that already export these products in small

[35] Table 2 above shows that the United States, France, Italy, and Germany export slightly above 300 products with comparative advantage.

[36] Products "nearby" are those with a distance (the inverse of density) of less than 0.5 standard deviations from the average of all unexploited products; products at "middle" distance are those with between ±0.5 standard deviations from the average; and products "far away" are those with a distance of at least 0.5 standard deviations from the average. A longer list of products can be provided by the authors upon request.

amounts) to become competitive exporters of these products (i.e., increase the export share of these products and acquire revealed comparative advantage). These are a total of 247 products. On the other hand, products farther to the right require more specific capabilities and it is more likely that Chinese firms do not have these yet; therefore, their successful export today is probably more challenging. There are total of 262 products in the two groups (171 "middle distance" and 91 "far away").

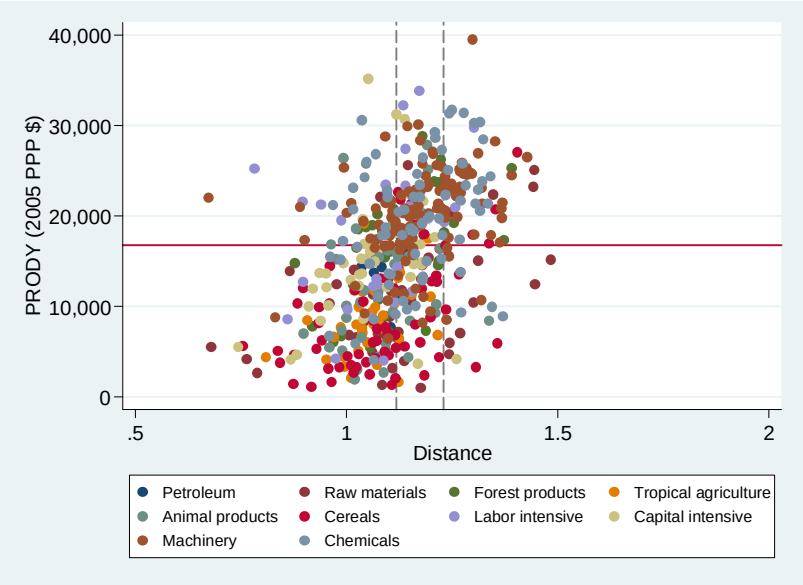
Table 7 shows the top ten products nearby, the top five products at middle distance, and the top five far away, ordered by sophistication (PRODY), the Leamer category they belong to, and the current index of revealed comparative advantage. All these products meet the condition that their level of sophistication (PRODY) is above the country's average level (EXPY). The table also provides the strategic value of each of these products. The strategic value of a product is a proxy for the spillovers derived from acquiring comparative advantage in the product in question. Specifically, it is the increase in open forest assuming that China gains comparative advantage in that product.[37]

The table shows an increasing level of sophistication in the products that China can potentially export successfully as one moves to the right. All the products in the table are highly sophisticated (most of them are core products), corroborating our previous observations on China's possibilities.

[37] Algebraically, the "strategic value" of a product *j* is defined as:

$Strategic\ value_j = \sum_i \frac{\varphi_{ij}}{\sum_j \varphi_{ij}} (1 - x_{ci}) PRODY_i$, for all *i* and $i \neq j$, where φ_{ij} is the proximity between *i* and *j* and $x_{ci} = 1$ if country *c* exports commodity *i* with comparative advantage. Strategic value is the potential contribution of commodity *j* to the open forest if it is assumed to be exported with comparative advantage (i.e., RCA>1).

Figure 12. Density of the Products in China's Open Forest, 2006



Source: Authors' calculations

How can China acquire revealed comparative advantage in some of these products? China needs to develop and carefully implement a set of policies that allow its firms to take advantage of the huge potential warranted by their privileged position in the product space. Given the success achieved during the last fifty years, policymakers need to measure well the *amount* of intervention that they exert and think more about the *quality* of these interventions. For example, at this point, China does not need to take strategic bets, i.e., to try to gain comparative advantage in products that are "far away." The country needs first to develop the necessary capabilities to successfully export these products. Likewise, support to new activities (e.g., provision of specific public inputs, tax breaks, subsidies, etc.) has to be guided by very clear sunset clauses and performance benchmarks, and policymakers have to learn to identify sectors that have no future as quickly as possible and, hence, to stop supporting them.

Table 7. Commodities with the Highest Strategic Values (ordered by PRODY) in 2006

	Commodity Description	Leamer's Classification	PRODY	Strategic Value	RCA
"Nearby"	Other nonelectric parts and accessories of machinery, nes	Machinery	28,754	13,146	0.590
	Alkyds and other polyesters	Chemicals	24,239	14,906	0.581
	Medicaments (including veterinary medicaments)	Chemicals	22,803	13,134	0.024
	Aluminium and aluminium alloys, worked	Raw materials	22,084	13,076	0.522
	Passenger motor vehicles (excluding buses)	Machinery	21,687	13,153	0.021
	Non-domestic refrigerators and refrigerating equipment, parts, nes	Machinery	20,836	13,936	0.854
	Paper and paperboard, creped, crinkled, etc., in rolls or sheets	Forest products	20,183	13,027	0.310
	Transmission, conveyor, or elevator belts, of vulcanized rubber	Capital-intensive	20,112	15,245	0.485
	Special products of textile materials	Capital-intensive	19,631	13,193	0.741
	Central heating equipment, not electrically heated, parts, nes	Capital-intensive	19,571	15,159	0.146
"Middle"	Industrial and laboratory furnaces and ovens, etc., parts, nes	Machinery	30,097	16,371	0.511
	Other nitrogen-function compounds	Chemicals	29,237	15,996	0.303
	Paper and paperboard, coated, impregnated, etc., in rolls or sheets	Forest products	28,853	15,763	0.258
	Parts, nes of the machines falling within heading 725	Machinery	27,116	15,082	0.152
	Work holders, dividing heads for machine-tools, etc.; tool holders	Machinery	25,779	15,552	0.412
"Far Away"	Furnace burners; mechanical stokers, etc., and parts thereof, nes	Machinery	39,521	14,696	0.505
	Organo-sulphur compounds	Chemicals	31,440	14,221	0.485
	Nonmechanical or electrical instruments for physical, etc., analysis	Machinery	28,222	14,194	0.224
	Machinery, accessories for type-setting, for printing blocks, etc.	Machinery	25,271	14,519	0.204
	Photographic film, plates and paper (other than cinematograph film)	Machinery	25,192	14,143	0.362

Source: Authors' calculations

In our view, China needs to devise an optimal combination of *horizontal* and *vertical* policy instruments.[38] The objective of the first type of policies is to resolve economy-wide market failures that affect broad sectors of the economy (e.g., provide subsidies to innovation, relief financial constraints for SMEs), while the second aim at developing new comparative advantages by promoting specific new activities (these are the products labeled "nearby" and "middle" in table 7). To increase the possibility of success, China's government needs to tailor policies and tools to each sector and then implement these policies in close collaboration with the private sector, which needs to be nurtured. Therefore, the spectrum of interventions is relatively large, ranging from a hands-off approach (e.g., simply creating the necessary market institutions) to acting as a central operator in a sector. Experience shows that coordination with the private sector increases the chances of policy success.

Moreover, the more China becomes a market economy the more it will have to pay attention to market failures. Indeed, the discovery of new products is subject to market failures that result in the under-provision of entrepreneurship in pursuit of structural change (Hausmann and Rodrik 2003). Two market failures in particular are rampant in developing countries, namely: (i) information externalities incurred in discovering the cost structure of an economy, i.e., discovery of the new activities that can be exported profitably;[39] and (ii) coordination externalities in the presence of scale economies.[40] Both are reasons why diversification and discovery are unlikely to take place in a market economy without *some kind* of government action. China has been heavily involved in supporting its industry for decades. However, as it advances in its quest to become more a market-oriented economy, the role of the state should be to create a climate of collaboration with the private sector more than to provide subsidies.

[38] I do not want to overstretch the distinction between horizontal and vertical industrial policies, as often it is difficult to differentiate both. On this see Chang (2009).

[39] Information externalities derive from the fact that searching for a new product is an activity with great social value, one that is but poorly rewarded. If entrepreneurs fail in their attempts, they will have to bear all the search costs. However, if they succeed, other producers/exporters will quickly learn and follow them. In this case, there is a *clear* case for the government to subsidize investments (to the initial investor) in *new, nontraditional activities*, and not in activities already established.

[40] Coordination externalities derive from the fact that many projects require simultaneous investments in order to be profitable (e.g., hotels will not be built unless the government provides good public infrastructure, but the government will not build infrastructure unless the private sector builds the hotels). Coordination failures often do not need subsidies to the private sector.

6. WILL GROWTH CONTINUE INDEFINITELY? RISKS, CONSTRAINTS, AND SCENARIOS

The analysis in the previous sections indicates that China's growth will remain strong, but it should not be overstretched, as the country faces a number of serious challenges. Indeed, the perennial questions in discussions about China's performance are, first, whether growth will remain fast (at about 10% per annum) in the longer term, and second, and related, whether the challenges that it faces will prove to be an insurmountable barrier.[41] Moreover, is high growth desirable? Growing fast has both pros and cons. China's problem is how to transform the countryside, where hundreds of millions of people still live and are mostly engaged in agriculture. While high growth is still important to lift living standards, it may not be a sufficient condition for high employment creation. Moreover, it may lead to imbalances and inflation.

Our argument, developed in previous sections, is that China has amassed a huge stock of capabilities that are key to continue growing. But this analysis should not be misconstrued: thirty years of high growth does not imply unending growth. In fact, in our view, a more appropriate statement is that it means that the probability that China continues to grow at 10% per annum is diminishing. Naturally this will have consequences. In our view, there are three important risks/constraints that policymakers should be aware of, as they will affect the country's long-term performance. First, China's economy is in a state of delicate balancing in many fronts, including coastal-interior/urban-rural areas and across income groups. It is well-known that inequalities are on the rise. One key policy concern is how to redistribute wealth from the wealthier to the poorer areas. Second, there are serious environmental concerns. Third, while on many fronts China appears to be a market economy, it is not in many important aspects, including the allocation of capital.[42] Given these issues, there are three possible scenarios for the medium-to-long term, 2010–2030:

(i) China continues registering very high growth rates (10% and above) much longer. This is very unlikely. Growth during the previous thirty years has done wonders. However, it has also created imbalances and inefficiencies;

[41] Zeng and Wang (2007) provide a very useful SWOT analysis of China. They highlight China's weak institutions, low overall educational attainment, weak indigenous innovation capacity, and poor linkages between research and development and industry.

[42] Felipe et al. (2008) show that the productivity of capital has been on a downward trend for a long time.

(ii) a controlled deceleration that results in an average annual growth for the twenty-year period of about 5% (Felipe, Kumar, and Abdon 2010c). As argued here, what underlies China's high growth during the last decades is the massive accumulation of capabilities. The rate of accumulation will decline. As Felipe et al. (2010c) argue, for China to continue growing at 8–10% per annum during the next twenty years, it would have to continue gaining comparative advantage in more products and increasing the level of sophistication of its export package in a way that does not seem plausible. With this reduction in growth, China's policymakers will have to monitor the employment elasticity of growth (Felipe and Hasan 2006: table 3.6);[43] or

(iii) a serious downturn, as a consequence of, for example, a financial crisis. As China becomes more a market economy, this risk will increase (Minsky 2008). As argued above, markets do not allocate capital in China and the degree of inefficiency is high. The crisis can also be the result of the vertigo that the growth figures produce. To avoid a crisis, either growth comes down or there is a drastic reduction in consumption of resources per unit produced, as well as in the pattern of final consumption. [44] This is the scenario to avoid as it would have very serious economic and social consequences. It is worthwhile trading some of the high growth for stability.

7. CONCLUSIONS: WHAT LIES AHEAD AND WHAT CHINA *SHOULD* DO

In this paper we have discussed China's impressive performance since the 1960s as a result of its capacity to accumulate and master capabilities. China's increasing capabilities are reflected in the number of products exported with revealed comparative advantage (degree of diversification)

[43] Felipe and Hasan (2006) note that China's employment elasticity of growth declined between the 1980s and the 1990. While in the first decade 3% output growth generated 1% employment growth, in the 1990s the same employment growth required 8% output growth.

[44] Brown (2005) estimates that if China reached the level of oil consumption that the United States had in 2004, in 2031 it (China) would need 99 million barrels/day. Note that this figure is well above total world production in 2007 (at about 82 million barrels/day). Also, if in 2031 China consumed the same amount of paper that the United States consumed in 2004, it would need 303 million tons, double the world production in 2004. Finally, if each Chinese family owned three cars per every four persons (the same as the typical American family), in 2031 there would be 1.1 billion cars, which would be difficult to fit into the country in the current circumstances.

and in the increasing sophistication of its export basket. We have used the recently developed product space methodology to document and analyze these changes.

The analysis indicates that by 1962, China had acquired revealed comparative advantage in the export of 105 products (out of 779 in our analysis), although only 14 were "core" products (metals, chemicals, machinery) with a significant level of sophistication, especially taking into account its income per capita. By 1980, when transition started, China had already attained comparative advantage in the export of a significant number of products, a total of 234 (of which 46 were core products, mostly chemicals and metals), and it already had a relatively high index of export sophistication (given its income level). Despite the hardship imposed by the Great Leap Forward, the Cultural Revolution, and all the inefficiencies of the planning system, it is difficult to square these gains, which had to entail significant structural transformation of the Chinese economy, as well as mastering of a significant number of capabilities, with lack of technical progress (however broadly defined). Our analysis indicates that the government's priority industries did not necessarily go against China's factor abundance, as the country has gained comparative advantage in the export of both labor-intensive and sophisticated products. This strategy has paid off, as there is no doubt that a country with an inefficient industrial sector is better off than one with a weak or no industrial sector at all. This evolution helps explain the shift that occurred during the late 1980s, when China truly set foot into the core of the product space and, in particular, into electronics and machinery. In 1990, the number of core products exported with comparative advantage reached 65.

By 2006, China's export basket was highly sophisticated and one of the most diversified in the world: it exported 269 products with comparative advantage, of which 100 were core products. No other developing country can match China's spectacular performance. We have argued that this was the result of industrial policies that allowed the accumulation of product-specific capabilities. In our view, if in 1950 China had tried to go "the other way," probably today it would be a much poorer country.

A measure of the future export opportunities reveals that China is extremely well-positioned to continue performing very well. From a policy perspective, this analysis, together with that on sophistication and diversification, indicates that Chinese policymakers should not feel pressure and rush to undertake major interventions and reforms, as the country has achieved a relatively high level of sophistication and diversification in its export basket, as well as a very

large potential export opportunity set. In simple terms, "let it be."[45] An unorthodox and gradualist development path, based on implementing well-focused reforms in key areas (Rodrik 2006b) while rejecting many of the so-called Washington-Consensus reforms, has served China very well. While the country will have to implement many reforms (e.g., labor and capital markets, the development of services) in the coming decades, something that policymakers know well, a cautious pace is still the route to follow in the medium term. The private sector could be invited to this process through, for example, sectoral round-tables, deliberation and investment advisory councils, and public-private venture funds. In the words of Brandt, Rawski, and Sutton (2008: 570): "Chinese experience shows that despite their undoubted benefits, neither privatization of enterprise ownership nor extensive deregulation, full price flexibility, rule of law, and other widely recommended institutional changes must necessarily precede a broad-gauged advance of manufacturing capabilities."

China is implementing policies to achieve a "harmonious society" (Felipe 2010: 1–6). Chinese policymakers have realized that solving problems such as unemployment and underemployment, a deteriorating environment, or increasing inequalities, will determine how well the country does in the next decades (Wen 2010). Perhaps policymakers should think less in terms of a growth target and more in terms of employment creation (and unemployment/underemployment reduction) and structural transformation targets. Growth will be a by-product. Development is a path-dependent process and China has acquired tremendous knowledge and competency that will allow it to continue thriving in the next decade. This does not mean, however, that growth rates of 10% and above will remain forever, as China faces a number of constraints and risks.

Analyzing China in the year 2030, the miracle of the previous twenty years will not be, most likely, that annual growth remained at 10%; rather, it *should be* that, in 2010, its policymakers well understood the country's potential, together with the constraints and risks that it faced and, most importantly, that they successfully implemented a series of reforms that allowed the country to continue transforming.

[45] This is an expression used by Ricardo Hausmann.

REFERENCES

Abramovitz, M. 1986. "Catching-Up, Forging Ahead and Falling Behind." *Journal of Economic History* 46: 386–406.

Balassa, B. 1965. "Trade Liberalization and Revealed Comparative Advantage." *Manchester School of Economics and Social Studies* 33: 99–123.

Bardhan, P. 2008. "What Makes a Miracle. Some Myths about the Rise of China and India." *Boston Review* January–February.

Blanchard, O., and F. Giavazzi. 2005. "Rebalancing Growth in China: A Three-Handed Approach." Working Paper 05-32 (November 25). Cambridge, MA: Department of Economics. Massachusetts Institute of Technology.

Borensztein, E., and J.D. Ostry. 1996. "Accounting for China's Economic Performance." *The American Economic Review, Papers and Proceedings* 86(2): 224–228.

Brandt, L., T.G. Rawski, and J. Sutton. 2008. "China's Industrial Development." in L. Brandt and T.G. Rawski (eds.), *China's Great Transformation.* Cambridge, UK: Cambridge University Press.

Brown, L. 2005. "China is replacing the United States as World's Leading Consumer." *New Perspectives Quarterly* (Spring).

Chang, H.-J. 2002. *Kicking Away the Development Ladder*. London: Anthem Press.

————. 2009a. "*Hamlet* without the Prince of Denmark: How development has disappeared from today's 'development' discourse." in S. Khan and J. Christiansen (eds.), *Towards New Developmentalism: Markets as Means rather than Master.* Abingdon: Routledge. Forthcoming.

————. 2009b. "Industrial Policy: Can we go beyond an unproductive confrontation?" Presented at the Annual World Bank Conference on Development Economics (ABCDE). Version of September 30.

Chow, G.C. 1993. "Capital Formation and Economic Growth in China." *Quarterly Journal of Economics* 108(August): 809–842.

Dahlman, C. 2009. "Growth and Development in China and India." in M. Cimoli, G. Dosi, and J. E. Stiglitz (eds.), *Industrial Policy and Development: The Political Economy of Capability Accumulation.* London: Oxford University Press.

Feenstra, R., R. Lipsey, H. Deng, A. Ma, and H. Mo. 2005. "World Trade Flows: 1962–2000." Working Paper 11040. Cambridge, MA: National Bureau of Economic Research (NBER).

Felipe, J. 2010. *Inclusive Growth, Full Employment and Structural Change: Implications and Policies for Developing Asia,* second edition. London: Anthem Press.

Felipe, J., and J.S.L. McCombie. 2002. "Productivity in China before and after 1978 revisited." *Zagreb International Review of Economics and Business* 5(1): 17–43.

————. 2010. "Modeling Technological Progress and Investment in China: Some Caveats." Mimeograph.

Felipe, J., and R. Hasan. 2006. *Labor Markets in Asia. Issues and Perspectives*. London: Palgrave Macmillan.

Felipe, J., and G. Estrada. 2008. "Benchmarking Developing Asia's manufacturing sector." *International Journal of Development Issues* 7(2): 97–119.

Felipe, J., E. Laviña, and E.X. Fan. 2008. "The Diverging Patterns of Profitability, Investment and Growth of China and India, 1980–2003." *World Development* 36(5): 741–774.

Felipe, J., M. León-Ledesma, M. Lanzafame, and G. Estrada. 2009. "Sectoral Engines of Growth in Developing Asia: Stylized Facts and Implications." *Malaysian Journal of Economic Studies* 46(2): 107–133.

Felipe, J., U. Kumar, and A. Abdon. 2010a. "Exports, capabilities, and industrial policy in India." Mimeograph. Manila: Asian Development Bank. Available at: http://jesusfelipe.com/download/industrial_policy_india.pdf

————. 2010b. "As you sow so shall you reap: from capabilities to opportunities." Mimeograph. Manila: Asian Development Bank. Available at: http://jesusfelipe.com/download/Index_of_Opportunities.pdf

————. 2010c. "Using capabilities to project growth 2010–2030" Mimeograph. Manila: Asian Development Bank. Available at: http://jesusfelipe.com/download/Growth_Forecasts.pdf

Hausmann, R., L. Pritchett, and D. Rodrik. 2006. "Growth Accelerations." *Journal of Economic Growth* 10: 303–329.

Hausmann, R., J. Hwang, and D. Rodrik. 2007. "What you export matters." *Journal of Economic Growth* 12(1): 1–15.

Hausmann, R., and B. Klinger. 2006. "Structural Transformation and Patterns of Comparative Advantage." CID Working Paper No. 128. Cambridge, MA: Center for International Development, Harvard University.

Hausmann, R., and D. Rodrik. 2003. "Economic Development as Self-discovery." *Journal of Development Economics* 72(2): 603–633.

Heytens, P., and H. Zebregs. 2003. “How Fast Can China Grow?” in W. Tseng and M. Rodlauer (eds.), *China Competing in the Global Economy*. Washington, DC: International Monetary Fund.

Hidalgo, C. 2009. “The Dynamics of Economic Complexity and the Product Space over a 42-year Period.” Working Paper No.189. Cambridge, MA: Center for International Development at Harvard University.

Hidalgo, C., and R. Hausmann. 2009. “The Building Blocks of Economic Complexity.” *Proceedings of the National Academy of Sciences* 106(26): 10570–10575.

Hidalgo, C., B. Klinger, A. L. Barabasi, and R. Hausmann. 2007. “The Product Space Conditions the Development of Nations.” *Science* 317: 482–487.

Hobday, Michael. 1995. *Innovation in East Asia*. Cheltenham, UK: Edward Elgar.

Hu, Z.F., and M.S. Khan. 1997. “Why is China Growing so Fast?” *International Monetary Fund Staff Papers* 44(1): 103–131.

Islam, N., E. Dai, and H. Sakamoto. 2006. “Sources of Growth.” in Y. Wu (ed.), *Economic Growth, Transition and Globalization in China*. Northampton: Edward Elgar.

Kaldor, N. 1967. *Strategic Factors in Economic Development*. Ithaca, NY: New York State School of Industrial and Labor Relations, Cornell University.

Kim, L. 1997. *From Imitation to Innovation: Dynamics of Korea’s Technological Learning*. Boston, MA: Harvard Business School Press.

Leamer, E. 1984. *Sources of International Comparative Advantage: Theory and Evidence*. Cambridge: MIT Press.

Lee, K., and J.A. Mathews. 2010. “From Washington Consensus to BeST Consensus for world development.” *Asian Pacific Economic Literature* 24(1): 86–103.

Lin, J. 1998. “How did China feed itself in the past? How will China feed itself in the future?” Second Distinguished Economist Lecture, presented at the International Maize and Wheat Improvement Center, Mexico, DF. Downloaded from: http://apps.cimmyt.org/english/docs/special_publ/del/2del/2distecon_text.htm

Lin, J., and H.-J. Chang. 2009. “Should Industrial Policy in Developing Countries Conform to Comparative Advantage or Defy It? A Debate between Justin Lin and Ha-Joon Chang.” *Development Policy Review* 27(5): 1–20.

Minsky, H. 2008. *Stabilizing an Unstable Economy*. New York: McGraw-Hill.

Naughton, B. 1990. “China’s Experience with Guidance Planning.” *Journal of Comparative Economics* 14: 743–767.

————. 2008. “A Political Economy of China’s Economic Transition.” in L. Brandt and T.G. Rawski (eds.), *China’s Great Transformation*. Cambridge, UK: Cambridge University Press.

Nelson, R.R., and H. Pack. 1999. “The Asian Growth Miracle and Modern Growth Theory.” *Economic Journal* 109(457): 416–436.

Reinert, E. 2007. *How Rich Countries Got Rich…and Why Poor Countries Stay Poor*. London: Constable.

Rodrik, D. 2006a. “Industrial Development: Stylized Facts and Policies.” John F. Kennedy School of Government, Harvard University. Available at: ksghome.harvard.edu/~drodrik/industrial%20development.pdf

————. 2006b. “Goodbye Washington Consensus, Hello Washington Confusion?” The John F. Kennedy School of Government, Harvard University.

————. 2010. “Making Room for China in the World Economy.” *American Economic Review, Papers and Proceedings* (forthcoming).

Storm, S., and C.W.M. Naastepad. 2005. “Strategic Factors in Economic Development: East Asian Industrialization 1950–2003.” *Development and Change* 36(6): 1059–1094.

Tsui, K.-Y., T.-T. Hsueh, and T.G. Rawski. 1995. *Productivity, Efficiency and Reform in China’s Economy*. Hong Kong; The Chinese University of Hong Kong.

Wang, H., and S. Li. 1995. *Industrialization and Economic Reform in China*. Beijing: New World Press.

Ward, B. 1962. *The Rich Nations and the Poor Nations*. New York: W.W. Norton and Company.

Wen, J. 2010. “Report on the Work of the Government.” Delivered at the Third Session of the Eleventh National People’s Congress, March 5.

Wilcox, C., W.D. Weatherford, and H. Hunter. 1962. *Economies of the World Today: Their Organization, Development, and Performance*. New York and Burlingame: Harcourt, Brace & World, Inc.

Young, A. 2000. “Gold into Base Metals: Productivity Growth in the People’s Republic of China during the Reform Period.” Working Paper 7856. Cambridge, MA: National Bureau of Economic Research (NBER).

Yueh, L.Y. 2009. “Perspectives on Chnia’s Economci Growth: Prospects and Wider Imapct.” in N. Dinello and W. Shaoguang (eds.), *China and India and Beyond: Development Drivers and Limitations*. Cheltenham, UK: Edward Elgar.

Zeng, D.Z., and S. Wang. 2007. “China and the Knowledge Economy: Challenges and Opportunities.” World Bank Policy Research Working Paper 4223. Washington, DC: The World Bank.

Zhang, K.H., and S. Song. 2000. “Promoting Exports. The role of inward FDI in China.” *China Economic Review* 11: 385–396.

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

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