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The Middle-Income Transition around the Globe: Characteristics of Graduation and Slowdown

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Abstract

The paper investigates the situation of middle-income economies around the world. Since 1965, only 18 economies with a population of more than 3 million and not dependent on oil exports have made the transition to being high income. Many more have not been able to move beyond the middle-income stage. We conduct statistical tests of differences between two groups of economies across a range of growth and development variables. The results suggest that middle-income economies are particularly weak in the following areas: governance, infrastructure, savings and investment, inequality, and quality—but not quantity—of education. The findings are used to suggest whether the People's Republic of China is successfully progressing through the middle-income stage or whether it may get caught in a middle-income trap.

JEL Classification: O14, O33, O40, O53

Contents

1. INTRODUCTION

In 2010 the People's Republic of China (PRC) became the second-largest economy in the world. It surpassed Japan, which had held that position for over 40 years. The move was somewhat inevitable given both the PRC's consistently high growth rates over the 3 decades—as Japan stagnated—and its superior size in terms of population and geography. While the size of its economy is large, the PRC is still a developing country with a modest per capita income. Only in the late 1990s did it graduate from low- to middle-income status. As it continues to expand, increasing attention is now focused on whether it will become a high-income country like several of its neighbors in Northeast Asia or, instead, whether it will suffer the fate of Latin America and Southeast Asia by remaining at the middle-income level of development for decades. As the president of the World Bank noted, "Wise leaders and officials are starting to ask how [the People's Republic of] China can best avoid the middle-income trap" (Zoelick 2010).

In the simple arithmetic of per capita income accounting, a country moves up the income ladder by increasing the value of what it produces at a faster pace than population growth. Sustained increases over several decades allow a country to move to a higher country income classification. Countries move from low to middle income by making a structural transition from agriculture to manufacturing and services. To progress further, they must not only complete that transition and produce at higher levels of efficiency but also engage in higher value production. This means more complex goods and services and, because production processes are increasingly globalized, more complex stages of such production. In crude terms, they move from simple shirts and shoes to designer shirts and shoes; from shirts and shoes to cars and computers; and from assembling cars and computers to designing, manufacturing, and marketing them.

A country may remain at the middle-income stage if it is not able to make the necessary transitions. Upward wage pressure reduces its competitiveness in low-wage production segments while it lacks investment in technology and know-how to master more complex segments that can support higher wages.

Thus, interrogating the middle-income transition means addressing this central puzzle of why only some countries—and indeed the sectors and enterprises in those countries—are able to move up the value chain to higher-value output. Asking this question provokes questions regarding the roles of business and government in the upgrading process, questions that have been at the center of debates on the East Asian miracle and economic development for decades. While there is little disagreement regarding the importance of government in providing public goods in the areas of human capital, infrastructure, institutions, and financial sector regulation, the question is whether these actions alone are sufficient for significant upgrading to take place. Instead, governments may need to play a more active role in promoting the development and use of technology and enticing firms to select and invest in the production of high-value goods and services.

These issues are addressed in this paper. While the paper provides lessons for the PRC, its main empirical focus is on other economies. Section 2 explains the middle-income transition in more detail and Section 3 defines a sample of high- and middle-income economies. The high-income economies are further divided into those that achieved high income before 1965 and those that graduated later. The middle-income economy group includes those that have been middle income since at least 1987, but in many cases have been classified in that manner since the early 1960s. This three-

way classification (two high-income groups, one middle income) is then used in Section 4 to compare differences across a range of variables.

2. PRODUCT CHOICE, TECHNOLOGY, AND VALUE CHAINS

2.1 Nature of the Transition and the Trap

To progress from middle to high income, a country needs to increase the productive output of its economy. At lower levels of development, this involves a structural shift from agricultural production to the manufacture of goods and increasingly, the provision of high-valued services. Agriculture remains important to output and additional increases in farm productivity raise income through mechanization and the application of modern technologies. At the same time, the demand for rural labor falls and this excess or "surplus" labor can be utilized in an expanding manufacturing sector. The competitiveness of such output depends, in no small part, on relative labor costs. Labor is employed at higher levels of productivity than in agriculture but at wage levels sufficiently low to ensure that the output can be priced and marketed competitively. Thus, a common growth strategy for low-income countries is to expand into low-wage, low-cost, low-technology manufacturing in such items as textiles and food processing. Manufacturing adds to the total productive output of the economy, thus increasing income per capita. This pattern is adequate to move a country from low to middle income but growth will be limited if the national competitive strategy remains rooted in low-end manufacturing.

In effect, middle-income countries can get caught in a trap if competitiveness is based on low wages and low value added (Gill and Kharas 2007). Over time, there may be upward pressure on wages. To be able to increase wages and remain competitive requires an increase in one or both of the two dimensions of productivity: the quantitative aspect (also known as the extensive margin) and the qualitative aspect (i.e., value added, or the intensive margin). In other words, either more has to be produced per worker or the value of what each worker produces needs to rise. Producing more is possible with additional technology, improved skills, and better work organization. However, raising the value of what is produced is more critical and requires a fundamental shift in three aspects. It requires a shift in the types of products that it makes (shirts to computers), in the value or sophistication of those goods (low-quality shoes to designer shoes), and/or in the value-added contribution to end products (electronics assembly to chip manufacturing). As two leading economists on the subject have argued, "rich countries don't just produce more per person, [t]hey also produce different kinds of goods" (Hausmann and Rodrik 2006: 4). These shifts require increases in the sophistication of technology, an educated workforce, and changes in work organization and motivation. How to induce existing firms to move up the technological, product-market, and value-added chain and how to induce new entrepreneurs to enter these markets are the critical issues of economic development for middle-income countries.

2.2 Factors that Can Induce a Shift

Thus, while the initial transition from agriculture to industry represents an inter-sectoral shift, the second transition involves an intra-sectoral shift within industry, and predominantly within the manufacturing. In addition, countries also tend to increase

their level of value-added services, which represents both an inter-sectoral shift for countries where services have not been important and an intra-sectoral shift where services are of low value. Singapore is an example of a country that used service sector expansion as part of its high growth strategy, while several East European countries graduated to high-income status in the 2000s, in part, by increasing productivity in the services sector.[1]

To suggest that the path to high-income status is through increased value-added manufacturing and services is easy. Determining the factors that can induce that shift is more difficult, and indeed goes to the heart of the matter regarding the process of economic development. Recent work on the new structural economies suggests that a country should produce within its comparative advantage and that attempts to produce substantially outside of it are unlikely to be successful (Lin and Monga 2010). While that may be true, the key issue is how to shape that comparative advantage so that productive sectors can move up the value chain.

This more substantial question brings with it the full range of development questions. How do countries—and indeed the entrepreneurs and enterprises on which the economy is based—move to a comparative advantage in more sophisticated goods and high-value services? The experience of Northeast Asia is that it is unlikely to be a natural process but instead is one that needs policy guidance and program support. Lessons from the five high-income East Asian economies still provide guidance given that they have represented, until very recently, the only economies outside of Europe that have graduated to high-income status over the past half century.[2] Specific successful sectors in middle-income countries provide similar lessons. As Dani Rodrick has noted, reflecting on the relationship between policies and export success:

> Scratch the surface of non-traditional export success stories from anywhere around the world and you will more often than not find industrial policies, public R&D, sectoral support, export subsidies, preferential tariff arrangements, and other similar interventions lurking beneath the surface. The role played by such policies in East Asia is well-known. What is less well appreciated is how the same holds for Latin America (Rodrick 2004: 15).

In addition, the manner in which these policies are implemented may be important. Relations between government and business must be managed to avoid rent seeking and the capture of regulators. At the same time, businesses need to be weaned off government support so that they can compete, without support, in domestic and international markets.

The rationale for industrial policy comes from the related concepts of information, innovation, and risk. The production of more complex goods comes with substantial risks for businesses and entrepreneurs. The risks are: (i) that the technology may not be mastered and thus the functionality, reliability, and quality of the output might not be adequate to meet buyer requirements (and compete against foreign producers); and (ii) that it may not be produced at a cost that will allow for competitive pricing (Hausmann and Rodrik 2003). Policy support is guidance and support to enterprises to encourage the production of more complex products, and the mastery of more complex technologies to produce a more competitively priced product. A fundamental aspect of the success in East Asia was "closing the technology/knowledge gap" with countries

[1] Czech Republic, Slovakia, Hungary, Croatia, and Poland. The importance of services in their recent development is highlighted in World Bank (2008).

[2] Chile and Uruguay graduated in 2012.

that were more advanced at the time (Stiglitz 2001). Closing the gap required an educated population, but that alone was not sufficient. It required specific policies that were able to overcome the market failures inherit in moving up the technology ladder. The Republic of Korea, Japan, and Taipei,China did not make the leap to becoming high-income economies by continuing to focus on exporting cheap shirts and toys.

There may be a variety of ways to minimize costs as firms struggle through the initial phases of mastering technology. These include tax breaks, technology acquisition incentives, and incentives to export. Incentives to export may come in the form of reduced tariffs on inputs, reduced excise taxes, and increased access to low-cost credit. Taipei,China and the Republic of Korea were successful in tying these incentives to export performance. Economies have also been known to limit external competition to allow infant industries to develop, although this will only be successful if it is progressively reduced so as to ensure that companies do not become complacent behind tariff walls. Along with financial incentives, governments may have a role to play in sharing information about the international technology frontier and about competition and opportunities in foreign markets. Many of these techniques were pioneered in Japan and used in other high-growth East Asian economies. Such incentives and support mechanisms may be effectively employed by a developmental state that has a disinterested and non-politicized approach to the enterprises being promoted. They may work less well when the state is less capable.

The role of foreign direct investment (FDI) in the upgrading process remains a controversial one. While FDI was important for the small economies of Singapore and Hong Kong, China, the larger economies of Japan, the Republic of Korea, and Taipei,China developed strong domestic firms that initially used and adapted foreign technology and then innovated technology to compete in global markets. In the case of Singapore, there was a specific policy to upgrade the nature of FDI such that low-end factories were encouraged to shift offshore (to neighboring parts of Malaysia and Indonesia) and only higher end parts of the value chain were incentivized to remain in Singapore. As global production systems have expanded across geographic locations, the range of companies seeking to locate part of their production in other countries has increased. This has occurred through wholly-owned subsidiaries and joint ventures as well as by contracting out production to domestic firms in developing countries. This latter has been a strategy used by apparel firms but also electronic firms such as Apple. Thus, many developing countries today seek to attract FDI to expand manufacturing and exports, and create employment.

The difficulty is that many economies receive investment at the low end of the value chain, whereas high-end components are produced elsewhere. While FDI introduces new technologies and new products to the production structure, the spillovers to the domestic economy are often limited (Harrison and Rodriquez-Clare 2009). FDI raises productivity but predominantly in the foreign subsidiary itself, its joint venture partners (especially if they are state-owned enterprises), and its suppliers. It tends not to boost productivity horizontally (i.e., among supplying firms in the sector) and thus the knowledge spillovers may be limited. FDI policy, as a component of industrial policy meant to increase technological upgrading, may be best focused on equity requirements that foster/require joint ventures and local content requirements. Economies need to define a strategy, as the successful Asian economies did, to exploit global integration to their advantage. A key difference between Latin America and Northeast Asia may be related to the nature of global integration, with Latin America taking a more laissez-faire approach that has limited the benefits in terms of upgrading.

3. WHICH ECONOMIES ARE MAKING A LONG TRANSITION?

The problem of making the middle-income transition—and indeed getting caught in what is known as the "middle-income trap"—is thought to affect much of Latin America and the second tier of emerging economies in Asia, the so-called tiger cubs of Malaysia, Thailand, Philippines, Indonesia, and possibly Viet Nam (Zhuang, Vandenberg, and Huang 2012). It was thought that these latter countries might follow the five high-growth Asian economies, but they were severely affected by the Asian financial crisis of 1997–1998 and have seen more modest growth since then. Except for Malaysia, they have not achieved the income levels and growth rates that are necessary to propel them to high-income status in the near future.

For the purposes of our analysis, we define a group of economies that are making a rather long transition through the middle-income phase and are possibly caught in a middle-income trap. The criteria are based on the World Bank's country income classifications. There are three main classifications: low, middle, and high income, with "middle" divided further into lower-middle and upper-middle. The World Bank maintains a country income classification database, based on per capita income thresholds, which includes more than 200 economies from 1987 to the present. The thresholds are set in gross national income (GNI) per capita, using the Atlas method and are set in current US dollars. The thresholds are adjusted upwards each year. In 2013, economies with a per capita income of $1,035 or less were classified as low income and those with per capita income of $12,616 or more were classified as high income. Economies in between are middle income with the threshold between lower middle and upper middle set at $4,085.

To create the economy groups, we took the list of economies in *World Development Indicators* (World Bank 2014a) and excluded those with a population of less than 3 million and those that are members of the Organization of Petroleum Exporting Countries (OPEC).[3] The latter economies were excluded because they possess a single, valuable commodity, which distorts their per capita income. We divided the remaining economies into three groups as follows:

- Group 1: Traditional high income: economies that were high income in 1965
- Group 2: Recent high Income: economies that graduated to high income after 1965
- Group 3: Middle income: economies that were middle income continuously during 1987–2013

As a result, any economy that was classified as low income in any year between 1987 and 2013 was excluded. The reason for this criterion is that such an economy is close to the low/middle income threshold and thus has not been middle income for a long period of time. For the high-income groups, the cut-off year of 1965 was used to allow Japan to be included in Group 2. Clearly, Group 2 is comprised of those economies that have recently exited the middle-income stage.

For Group 3, we used 1987 as a cut-off because that is the year that World Bank classifications began. We did, however, project the thresholds back to earlier years

[3] We also analyzed data on Taipei,China, which is not included in WDI.

using the special drawing rights (SDR) deflator and 1987 as the base year.[4] We found that all the economies in Group 3 for which data are available have been middle income since 1962.[5] Thus, the majority, and potentially all, of the Group 3 economies have been middle income for at least 50 years.

The economies are listed in Table 1. Group 1 includes 17 economies comprised of the US, Canada, Australia, New Zealand, Israel, and 12 European economies. This is certainly the core of what has been regarded for many years as the developed world. Group 2, with 18 economies, is more mixed and is comprised of the five high-growth Asian economies of Japan, Republic of Korea, Taipei,China, Hong Kong, China, and Singapore, along with 11 economies in Europe, and 2 in Latin America. It includes 7 East European economies that graduated since 2006. Group 2 economies have reached high-income status at various times over the past 5 decades. Group 3 is comprised of 24 economies, exactly half of which are in Latin America. This underlines the notion that the problem of making the middle-income transition is closely associated with that region. The remaining economies in this group are from various other regions. They include Malaysia, the Philippines, and Thailand, but not Indonesia and Viet Nam which were low-income economies at some point since 1987. The PRC is not included because it was a low-income economy in the 1990s. However, in the data tables in subsequent sections we have included separate figures on PRC for comparative purposes.

[4] The World Bank does not provide thresholds prior to 1987. We used the SDR deflator with the 1987 thresholds to project the thresholds back to earlier years. We could then classify economies for those earlier years based on current GNI per capita (Atlas method).

[5] There is complete data from 1962 to 1987 for 13 of the 24 economies in Group 3. Data for five other economies are available from the mid-1960s. For the remaining economies, data begins from 1970 or thereafter.

Table 1: High- and Middle-income Economy Groups

High Income		**Middle Income**	
Group 1	**Group 2**	**Group 3**	
HI before/in 1965	HI after 1965	MI continuously 1987–2013	
n=17	n=18	n=24	
Europe	**Europe**	**Europe**	**Latin America**
Austria	Croatia	Belarus	Argentina
Belgium	Czech Republic	Romania	Bolivia
Denmark	Hungary		Brazil
Finland	Lithuania	**Asia**	Colombia
France	Poland	Malaysia	Costa Rica
Germany	Slovakia	Philippines	Dominican Republic
Italy	Greece	Thailand	El Salvador
Netherlands	Ireland		Guatemala
Norway	Portugal	**Africa/Near East**	Mexico
Sweden	Russian Federation	Jordan	Panama
Switzerland	Spain	Lebanon	Paraguay
United Kingdom		Morocco	Peru
	Asia	South Africa	
North America/Oceania	Hong Kong, China	Syria	
Australia	Japan	Tunisia	
Canada	Korea, Rep. of	Turkey	
New Zealand	Singapore		
United States	Taipei,China		
Near East	**Latin America**		
Israel	Chile		
	Uruguay		

Note: See text for an explanation of economy classifications.
Source: Authors.

4. EXPLAINING DIFFERENCES

We compare middle-income economies to high-income ones. As allowed for by data availability, we compare these groups across different time periods. We use annual data averaged over a 10-year period for each economy. Thus, for Group 1, the traditional high-income economies, we use the earliest data available which in most cases covers the period 1961–1970. For Group 3, the middle-income economies, we use the latest available data up to 2013. For Group 2, the economies that graduated after 1965, we use the 10-year period up to and including the year of graduation in each case. The year of graduation for these economies is listed in the Appendix. This periodization means that we are not comparing middle-income economies today against high-income economies today, but against high-income economies in their run-up to achieving high-income status, or what we call "graduation." In this way, we are better able to pinpoint the characteristics that allowed these economies to graduate. In cases where different periods are used, as dictated by data availability, these are explained in the Appendix.

To consider differences, we provide three types of data. Firstly, we compute group averages based on the 10-year economy averages. This provides a general sense of whether differences exist between groups and the magnitude of those differences. Secondly, we test whether differences are statistically significant using two comparative tests. One is a t-test, which compares the group averages, and the other is the non-parametric, Kruskal-Wallis test, which is based on ranking order. The latter test is used to reduce the influence of outliers, which can affect disproportionately the mean and thus distort the t-test results. In a sense, we use it as a check on the t-tests. The p-

values reported in the tables are based on the hypothesis that the two groups are the same. Thus a low probability (p-value), notably below .05, indicates that the difference is statistically significant and therefore it is unlikely that the groups exhibit the same characteristics. Thirdly, we provide some basic data on individual economies chosen at random. These descriptive data can highlight that particular economies may be very different from their group as a whole. For example, Malaysia, a middle-income country, exhibits many characteristics that are similar to the high-income group, rather than its own group.

Differences between middle-income and high-income economies are analyzed across 10 factors, ranging from structural transformation and technological innovation to education and infrastructure. The results are provided in the subsections below. We are looking for correlations and not testing for causality, which would be a better approach but would require more complex empirical methods.

4.1 Structural Transformation

Economies make a structural transformation from primary production, notably farming, to secondary production, notably manufacturing, and further into services. How successful a country is in making this transition and how deeply it shifts into high-value manufacturing and services will determine its growth in per capita income. We focus here on industry value added as a share of GDP. Table 2 shows the mean values and statistical test results. In high-income economies, about 35% of total value added is accounted for by industry. The corresponding figure for middle-income economies is 32%. While the difference may appear small, it is statistically significant when all high-income economies are grouped together. It is not significant when only the recent high-income group is compared. Specific economy data is provided in Table 3.

Table 2: Exports and Foreign Investment

	Industry, Value Added (% of GDP)	**High-tech Exports** (% of manufactured exports)	**Manufactured Exports** (% of merchandise exports)	**Food Exports**	**Foreign Direct Investment** (% of GDP)
Group Average (mean)					
High income in/before 1965	36.3	14.7	60.1	18.8	0.8
High income after 1965	35.4	13.0	59.9	18.8	3.7
Middle income	32.1	12.4	53.0	22.4	3.9
Kruskal-Wallis, p-value					
All HI vs. MI	0.02	0.04	0.27	0.13	0.00
Recent HI vs. MI	0.21	0.58	0.27	0.10	0.80
t-test, p-value					
All HI vs. MI	0.02	0.69	0.31	0.48	0.04
Recent HI vs. MI	0.16	0.91	0.42	0.57	0.87

GDP = gross domestic product, HI = high-income economies, MI = middle-income economies.
Note: See Appendix 1 for time periods and the method of calculation.
Source: Authors' calculations based on data from World Bank (2014a), accessed 17 July 2014.

Table 3: Industry Value Added, Exports, and Foreign Investment of Selected Countries

	Industry, Value Added	Manufactured Exports	Food Exports	High-tech Exports	Foreign Direct Investment
	(% of GDP)	(% of merchandise exports)		(% of manufactured exports)	(% of GDP)
High-income Countries					
United Kingdom	40.4	80.6	6.6	25.6	1.4
Germany	44.0	87.1	2.6	12.3	0.4
Japan	43.2	90.8	4.7	24.7	0.01
Ireland	34.3	25.3	59.8	42.2	1.7
Singapore	34.5	44.6	14.0	47.1	5.7
Middle-income Countries					
Malaysia	44.1	68.7	10.1	49.3	3.4
Philippines	32.8	80.9	7.1	63.6	1.2
Brazil	28	44.7	28.9	11.7	2.5
Thailand	43.9	75.1	13.1	25.4	3.3
Turkey	27.8	80.9	9.9	1.8	2
China, People's Republic of	*46.7*	*92.7*	*3.1*	*27.8*	*4.1*

Note: See Appendix for time periods and the method of calculation.
Source: Authors' calculations based on data from World Bank (2014a), accessed 17 July 2014.

4.2 Exports and Foreign Direct Investment

Another key indicator of a country's productive capacity is the structure of its exports. Exports must compete internationally and thus export performance provides a sense of what a country can produce competitively. The evidence provided in the third column of Table 3 shows that high-income economies do, indeed, have a higher share of manufactures in their merchandise exports—60% compared to 53% for middle-income economies. The difference is not, however, statistically significant in the four tests conducted.

The second column provides results on high-tech exports that are, initially, rather surprising. The proportion of high-tech goods in total manufactured exports is only slight lower for middle-income economies (12%) than for high-income ones (13%–15%). The difference is statistically significant in only one of the four tests. At first, this is counterintuitive. With an understanding of global production systems, however, the difference is readily explained. The data is based on the technological level of exports, and not on the technological level of the value-added to those exports in the economy. A country that assembles computers but imports most of the components will export a lot of high-tech goods.[6] If we consider individual countries, we find that Malaysia and the Philippines have high levels of high-tech exports—even higher than Japan or Germany. We know, however, that much of this is generated from assembly and export processing operations (Yusuf and Nabeshima 2009).

Food as a share of merchandise exports is higher in middle-income economies, where a greater proportion of national output is based on agriculture. However, the difference with high-income economies is not statistically significant. The lower level of manufactures in these economies may coincide with higher levels of combined food, agricultural raw materials, and minerals exports, instead of food alone.

[6] Yao (2009) highlights the problems of using trade data to assess technological sophistication.

The final column shows the level of FDI as a percentage of GDP. Most of the traditional high-income economies have limited levels of such investment (0.8% of GDP). The proportion increases with the recent high-income economies (3.7%) but here it is a mixed story. The larger high-income Asian economies (Japan, Republic of Korea) relied very little on FDI and built their own industrial and technological capacity, often through the licensing of foreign technology. In contrast, Singapore and Hong Kong, China relied much more on foreign investment. As a group, middle-income economies have higher FDI participation (3.9%) than developed economies and the difference is statistically significant, but only if we group all high-income economies together.

4.3 Technological Innovation

Technological adaptation and innovation are critical for economic development but are difficult to gauge. Research may not translate into commercially viable innovations, notably if it is concentrated in public research institutes that have limited links to the private sector. Nonetheless, research and development (R&D) expenditure is commonly used as a proxy for innovation. In Latin America, the majority of R&D is conducted by the public sector and only about 40% is done by the business community—although this is up from 20% in the 1980s (Goel 2010). In Organisation for Economic Co-operation and Development (OECD) countries, private businesses account for almost 70% of R&D. Furthermore, 88% of R&D in Latin America is concentrated in the four large countries of Brazil, Argentina, Chile, and Mexico. Many middle-income countries often have less success at converting results from research institutes and universities into patents and commercially exploitable products or processes.

Research expenditure is lower in middle-income economies than high-income ones. As shown in Table 4, R&D as a percentage of GDP is 0.5% in middle-income economies, on average, compared to 1% and 2% in recent and traditional high-income economies, respectively. The differences are statistically significant. Several economies that scored well on high-tech exports in the previous section show weak research capacity. These include the Philippines at 0.1% and Thailand at 0.2%. Brazil scores a respectable 1.0%, which is the average for recent high-income economies, while Malaysia is at 0.8%.

Table 4: Research and Development Expenditure

	R&D Expenditure		R&D, selected economies (% of GDP)
Group average (mean), % of GDP		**High-income countries**	
High income in/before 1965	2.0	United States	2.5
High income after 1965	1.0	Germany	2.2
Middle income	0.5	Japan	2.8
		Korea, Rep. of	2.4
Kruskal-Wallis, p-value		Sweden	3.5
All HI vs. MI	0.00	**Middle-income**	
Recent HI vs. MI	0.01	Malaysia	0.8
		Philippines	0.1
t-test, p-value		Brazil	1.0
All HI vs. MI	0.00	Thailand	0.2
Recent HI vs. MI	0.01	Argentina	0.5
		China, People's Rep. of	*1.4*

HI = high-income economies, MI = middle-income economies.

Note: See Appendix for time periods and the method of calculation.

Source: World Bank (2014a), accessed 18 July 2014.

Another measure of technological progress is the number of patents and industrial designs generated by an economy and, more specifically, by its residents. While this is also a crude measure, it does provide some evidence of the effort made within economies to make technological advances. Tables 5 and 6 present data on patents and industrial designs. High-income economies have significantly higher levels of patents and designs than middle-income economies but we must realize that the results are skewed by very high levels in a small number of economies, notably the United States and Japan. Significant differences are found in 10 of the 24 tests conducted, including for patents and designs registered by residents for the Kruskal-Wallis test, which is based on ranking instead of means. Patents and designs can be registered at a national patent office by non-residents. There is a tendency for middle-income economies to have more patents and designs registered by non-residents, relative to residents. This result is probably related to the fact that, as noted above, middle-income economies have higher levels of FDI and foreign firms are making the non-resident registrations.

Table 5: Patents and Industrial Designs, per 1 Million Population, High- versus Middle-income Economies

	Patents Granted in 2012		Patents, total in force	Industrial Designs Registered in 2012		Industrial Designs, total in force
	Residents	Non-residents		Residents	Non-residents	
Group Average (mean)						
High income in/before 1965	98	237	331,970	50	56	49,286
High income after 1965	247	190	190,602	98	47	41,172
Middle income	11	27	16,046	14	11	14,783
Kruskal-Wallis, p-value						
All HI vs. MI	0.00	0.02	0.01	0.00	0.35	0.29
Recent HI vs. MI	0.00	0.19	0.17	0.00	0.80	0.65
t-test, p-value						
All HI vs. MI	0.14	0.04	0.16	0.13	0.05	0.29
Recent HI vs. MI	0.12	0.05	0.24	0.13	0.10	0.37

HI = high-income economies, MI = middle-income economies.

Note: See Appendix for time periods and the method of calculation.

Source: Authors' calculations based on data from WIPO (2012) and population figures from World Bank (2014a), both accessed 18 July 2014.

Table 6: Patents and Industrial Designs, per 1 Million Population, Selected Countries

	Patents Granted in 2012		Patents, total in force	Industrial Designs Registered in 2012		Industrial Designs, total in force
	Residents	Non-residents		Residents	Non-residents	
High-income Countries						
United States	385	421	2,239,231	40	30	269,501
Canada	69	559	144,363	17	103	34,756
Sweden	90	15	..	33	2	6,896
Finland	129	25	46,854	26	8	3,085
High-income Countries after 1965						
Japan	1,757	390	1,694,435	193	29	248,822
Korea, Rep. of	1,681	588	738,312	853	70	260,107
Poland	47	16	41,242	40	1	12,321
Chile	20	168	8981	1	15	1726
Middle-income Countries						
Mexico	2	100	..	7	14	22,821
Thailand	0	14	11,065	21	10	10,783
Malaysia	10	74	21,447	25	40	17,130
Brazil	2	12	..	12	10	..
China, People's Rep. of	*106*	*54*	*875,385*	*335*	*13*	*1,132,132*

Note: See Appendix for time periods and the method of calculation.

Source: Authors' calculations based on data from WIPO (2014) and population figures from World Bank (2014a), both accessed 20 July 2014.

4.4 Governance and Institutions

Good governance is an important ingredient for economic growth. Government activity permeates all levels of commercial life and therefore the manner in which elected officials and civil servants carry out their mandates can affect economic progress. Governance is conducted through institutions that impact a host of factors, including human capital accumulation, infrastructure development, productivity growth, and technological progress.

Studies indicate a positive link between good governance, including effective institutions, on the one hand, and economic growth, on the other (Zhuang, de Dios, and Lagman-Martin 2010; Le 2009; Tebaldi and Elmslie, 2008; Rivera-Batiz (2002). Moreover, this association is more evident in the long run than the short run. The positive association also appears to hold across regions. A study of developing economies in Asia shows that those governments with above average performance on such aspects as government effectiveness, regulatory quality, and rule of law in 1998 grew faster during the 1998–2008 period by 1.6, 2.0, and 1.2 percentage points, respectively, as compared to economies with below average performance. Developing Asia, however, has a lot of catching up to do to achieve the quality of governance in OECD and East European countries (Zhuang, de Dios, and Lagman-Martin 2010).

Similarly, the quality of governance is found to be critical in transition economies confronting a shift from socialism to capitalism. Redek and Susjan (2005) tested two hypotheses in this regard: (i) that those countries with institutions closer to market economies adjust faster to the demands of market mechanisms, and (ii) that economic performance and institutional quality are highly correlated. The hypotheses were confirmed with robust results. The fairness of the legal system, protection of private

property rights, stability of the financial system, and a modest, incorrupt, and supportive state all contribute to high and stable long-run economic growth. Moreover, after many years of transition, most countries of the former Soviet Union are still grappling with institutional reforms while countries with narrower gaps to close, such as Slovenia, Hungary, and Poland, quickly established institutions very close to those of capitalist economies. This latter set of East European countries also performed better in terms of output growth (Redek and Susjan 2005).

The Worldwide Governance Indicators (WGI) were used in the current study to assess the performance of high- and middle-income economies.[7] As shown in Table 7, high-income economies, as a group, consistently perform better than middle-income economies in terms of all six indicators across all variables.[8] The results of the tests also indicate significant differences between the groups. The scores of the governance indicators for the recent high-income economies though are not as strong as those of the traditional high-income group (Table 8).

Table 7: Governance Indicators, High- versus Middle-income Economies

	Voice and Accountability	Political Stability	Government Effectiveness	Regulatory Quality	Rule of Law	Control of Corruption
Group Average (mean)						
High income in/before 1965	1.39	0.86	1.73	1.51	1.62	1.83
High income after 1965	0.77	0.63	0.95	1.01	0.82	0.76
Middle income	–0.16	–0.42	–0.11	0.02	–0.31	–0.31
Kruskal-Wallis, p-value						
All HI vs. MI	0.00	0.00	0.00	0.00	0.00	0.00
Recent HI vs. MI	0.00	0.00	0.00	0.00	0.00	0.00
t-test, p-value						
All HI vs. MI	0.00	0.00	0.00	0.00	0.00	0.00
Recent HI vs. MI	0.00	0.00	0.00	0.00	0.00	0.00

HI = high-income economies, MI = middle-income economies.

Note: See Appendix for time periods and the method of calculation.

Source: Authors' calculations based on data from World Bank (2014b), accessed 21 July 2014.

[7] WGI covers over 200 economies. It measures six dimensions of governance: voice and accountability; political stability and absence of violence/terrorism; government effectiveness; regulatory quality; rule of law; and control of corruption. These indicators are based on several hundred individual variables, taken from a wide variety of data sources. The data reflect the views on governance of the survey respondents and public, private, and nongovernment sector experts worldwide (Kaufman, Kraay, and Mastruzzi 2010).

[8] The six governance indicators are measured on a scale ranging from –2.5 to +2.5, with higher values reflecting better governance outcomes.

Table 8: Governance Indicators, Selected Countries

	Voice and Accountability	Political Stability	Government Effectiveness	Regulatory Quality	Rule of Law	Control of Corruption
High Income						
Finland	1.58	1.49	2.14	1.75	1.94	2.39
United States	1.22	0.44	1.64	1.54	1.55	1.51
Norway	1.60	1.29	1.92	1.39	1.91	2.12
France	1.25	0.56	1.56	1.13	1.41	1.38
High Income after 1965						
Japan	0.99	1.00	1.33	0.99	1.29	1.26
Korea, Rep.	0.66	0.35	0.97	0.76	0.90	0.41
Croatia	0.38	0.43	0.44	0.35	–0.01	–0.07
Uruguay	0.98	0.77	0.50	0.43	0.54	1.00
Middle Income						
Brazil	0.41	–0.02	0.04	0.14	–0.34	–0.03
Chile	1.02	0.72	1.24	1.49	1.26	1.41
Malaysia	–0.42	0.28	1.04	0.49	0.50	0.31
Philippines	–0.01	–1.18	–0.07	–0.02	–0.48	–0.57
China, People's Rep. of	*–1.53*	*–0.46*	*–0.00*	*–0.24*	*–0.42*	*–0.49*

Note: See Appendix for time periods and the method of calculation.

Source: Authors' calculations based on data from World Bank (2014b), accessed 21 July 2014.

4.5 Macroeconomic Stability

Businesses require a stable macroeconomic environment for investment and production planning. Large changes in prices, fluctuations in the exchange rate, and distortions in capital markets caused by excessive government borrowing can limit the growth process. Indeed, governments in Latin America experienced considerable difficulty in managing the macroeconomy from the mid-1970s to the early 1990s. Part of the instability was caused by global problems related to oil price hikes and the resulting inflation. In Latin America's case, excessive international borrowing resulted in an inflation-debt spiral that severely interrupted the development process. Other regions have been affected by instability, as well, arising either from specific domestic problems and inadequate policy measures, or global shocks. The East Asian financial crisis of 1997–1998 stalled the development process in parts of Asia, although most countries were able to restore stability and growth in a few years but with lower investment levels.

Table 9 provides the results of comparisons between the economy groups in terms of inflation and government spending (surplus/deficit). In this case we have deviated from the usual use of 10-year periods to look at averages across 20 years. Even with this expanded period, it does not include Latin America's lost decade of the 1980s. It does, however, include the Asian financial crisis.

Table 9: Macroeconomic Stability, Selected Indicators

	Inflation		Government Cash Deficit/Surplus as % of GDP
	annual average	average coefficient of variation	
Group Averages (mean)			
High income in/before 1965	8.7	0.53	–0.67
High income after 1965	22.6	1.07	–1.64
High income after 1965 (modified)	15.1	0.88	..
Middle income	30.9	1.44	–2.18
Middle income (modified)	10.8	1.00	..
Kruskal-Wallis, p-value			
All HI vs. MI	0.09	0.00	0.95
Recent HI vs. MI	0.30	0.30	0.41
All HI vs. MI (modified)	0.18	0.00	..
Recent HI vs. MI (modified)	0.07	0.48	..
t-test, p-value			
All HI vs. MI	0.00	0.03	0.28
Recent HI vs. MI	0.00	0.00	0.59
All HI vs. MI (modified)	0.81	0.04	..
Recent HI vs. MI (modified)	0.41	0.00	..

GDP = gross domestic product, HI = high-income economies, MI = middle-income economies.

Note: See Appendix for time periods and the method of calculation.

Source: Authors' calculations based on data from World Bank (2014a), accessed 22 July 2014.

Inflation has been, on average, higher in middle-income economies. The overall figure of 31% annual inflation for the period is distorted by hyperinflation experienced by a few economies, notably in the early 1990s. If we remove the five economies with annual inflation rate above 100%, the average falls to 11% (Table 9, middle income modified). This is certainly still high. For the recent high-income economies, the figure of 23% is also high but is affected disproportionately by a brief spell of hyperinflation in Croatia. If we remove Croatia, the average falls to 15% over a 20-year period.

Table 10: Macroeconomic Stability, Selected Countries

	Inflation		Government Cash
	average annual	average coefficient of variation	deficit/surplus as % of GDP
High Income			
France	8.0	0.4	–3.7
United States	5.8	0.3	–5.1
Germany	12.4	0.6	–1.8
Australia	9.8	1.0	–3.6
Norway	14.9	1.1	14.1
High Income after 1965			
Korea, Rep. of	11.4	0.6	1.7
Japan	5.8	0.3	–5.1
Hungary	15.0	0.6	–5.1
Chile	7.1	0.7	2.0
Russian Federation	150.9	2.4	4.0
Middle Income			
Brazil	248.3	2.6	–2.3
Philippines	6.2	0.8	–2.4
Malaysia	3.7	1.0	–3.3
Turkey	41.7	0.9	–2.5
Thailand	3.2	0.8	0.1
China, People's Rep.	*4.0*	*0.7*	..

Note: See Appendix for time periods and the method of calculation.

Source: Authors' calculations, based on data from the World Bank (2014a), accessed 22 July 2014.

We have also calculated the coefficient of variation, to test whether inflation is highly variable. The results follow a similar pattern with high-income economies demonstrating less variability than middle-income ones. Overall, differences between middle-income and recent high-income economies are not statistically significant. Another measure of macroeconomic stability is the size of the budget deficit. We find that deficits on average are smaller in high-income economies but the differences are not statistically significant (Tables 9 and 10).

4.6 Financial System Development

A robust financial system is also important for economic development. The system provides a vehicle for saving and channels savings into investment to expand productive capacity. The financial system also provides a payment system to facilitate commercial transactions.

Since the early 1990s, a number of studies have found a strong positive correlation between financial sector development and economic growth (for a review see Zhuang et al. 2009). Path-breaking studies by King and Levine (1993a, 1993b) showed that a country would grow by an additional 1% annually if its financial depth (ratio of liquid liabilities to GDP) were to increase from the mean of the slowest growing countries to that of the faster growing. The studies suggest that financial depth can explain about 20% of the growth difference between slow- and fast-growing countries over the period 1960–1989. A subsequent study found that the results held when controlling for simultaneity bias (Levine, Loayza, and Beck 2000). Furthermore, the contribution of financial sector development to economic growth is also likely to be more significant and more persistent in developing countries than in developed ones (Mavrotas and Son 2006).

Due to the inherent risks associated with investments in higher value goods that may be new to the domestic and, sometimes, global economy, there is often a dearth of low-cost, long-term finance in these areas. Some governments, particularly in East Asia, have used government financing or credit subsidies to support these new and emerging producers. The question of whether these credit supports were a fundamental ingredient in the success of the high-growth Asian economies was a key point of contention in the debate regarding the miracle economies. Specific Asian governments used low-cost credit as an incentive to companies that were able to achieve production and export targets in key sectors. As such, governments lowered the cost of capital in those areas that were inherently high risk. Whether other economies, without a disinterested and politically shielded bureaucracy, can successfully deploy similar incentive mechanisms, remains an issue. Such mechanisms may only work where a developmental state exists.

The issue of financial sector support for growth has affected the outcomes of financial deregulation policies and financial crises over the past several decades. While financial deregulation, notably increased financial sector competition and the elimination of interest rate controls, was needed in many developing countries, rapid liberalization has often led to crisis. The sequence of rapid deregulation and crisis affected many Latin American countries in the 1980s, notably under the prescriptions of the Washington Consensus, and contributed to the lost decade of the 1980s. In Asia, the financial and currency crisis of 1997–1998 called into question the Asian growth model and the role of the financial sector. Key high-growth economies were affected; notably those with heavy foreign inflows and less-than-adequate banking supervision and controls. The Republic of Korea was heavily affected and, indeed, slipped briefly from high- to middle-income status as a result of the crisis. These economies have, however, regained momentum since and shored up their financial sectors by building a cushion against further currency runs by accumulating foreign reserves. Asian financial sectors were not the cause of, and were able to resist contagion from, the US-led global financial crisis of 2008–2009.

Table 11 provides basic measures of the financial system and shows the results of tests for differences between high- and middle-income groups. Table 12 provides data for a number of selected countries.

Table 11: Financial Sector Development, High- versus Middle-income Economies

	Money Supply (M2) as % of GDP	**Domestic Credit to Private Sector** as % of GDP	**Non-performing Loans** as % of total loans	**Interest Rate Spread** lending–deposit
Group Average (mean)				
High income in/before 1965	51.3	43.5	2.5	10.4
High income after 1965	55.5	48.6	6.5	4.1
Middle income	67.0	49.6	5.4	8.7
Kruskal-Wallis, p-value				
All HI vs. MI	0.81	0.65	0.01	0.03
Recent Hi vs. MI	0.82	0.24	0.66	0.03
t-test, p-value				
All HI vs. MI	0.18	0.61	0.45	0.71
Recent HI vs. MI	0.41	0.93	0.53	0.03

GDP = gross domestic product, HI = high-income economies, MI = middle-income economies.

Note: See Appendix for time periods and the method of calculation.

Source: Authors' calculations based on data from World Bank (2014a), accessed 15 July 2014.

Table 12: Financial Sector Development, Selected Countries

	Money Supply (M2) as % of GDP	Domestic Credit to Private Sector as % of GDP	Non-performing Loans to Total Loans, %	Interest Rate Spread (lending–deposit) %
High Income				
United States	67.6	86.6	2.8	n/a
Germany	n/a	61.4	3.2	4.8
United Kingdom	36.3	19.8	2.7	2.0
Norway	49.3	33.4	1.1	7.7
Italy	67.4	60.8	9.5	6.0
High Income after 1965				
Japan	74.9	80.3	2.1	3.6
Korea, Rep. of	45.6	43.4	0.6	0.2
Chile	75.0	88.2	1.7	3.7
Russian Federation	41.8	36.5	5.6	6.0
Poland	45.4	33.9	5.0	4.7
Middle Income				
Brazil	63.0	46.3	3.4	35.6
South Africa	75.2	147.6	3.8	3.9
Malaysia	131.5	109.1	4.7	2.8
Philippines	59.1	30.5	4.1	4.3
Thailand	116.2	115.4	5.3	4.3
China, People's Republic of	*167.7*	*121.8*	*3.3*	*3.2*

GDP = gross domestic product.

Note: See Appendix for time periods and the method of calculation.

Source: Authors' calculations based on data from World Bank (2014a), accessed 1 November 2014.

For financial depth we consider two measures: the money supply (M2), and domestic credit to the private sector, both measured as a percentage of GDP. For money supply, there is little difference between high- and middle-income economies, as measured by the p-values of the two tests. Indeed, the mean score for middle-income economies, 67%, is slightly above that of the two high-income groups (51% and 56%). Some middle-income economies, such as Thailand and Malaysia, have a large M2 relative to the size of the economy; above 100% in both cases. For most economies, in all groups, the figure ranges from 40% to 70%. The other measure of financial depth—credit to the private sector—also does not show significant differences between the economy groups. On average, bank credit averages 43%–50% of GDP.

Middle-income economies have higher levels of non-performing loans (NPLs) than the traditional high-income economies, at 5.4% versus 2.5%. The difference is statistically significant. However, recent high-income economies have slightly higher levels than middle-income economies but the difference is not significant. Malaysia and Thailand have rates of 4.7% and 5.3% respectively, which may be possibly related to the aftermath of the Asian financial crisis and the high credit creation evidenced by the data on related indicators above.

A measure of efficiency and the competitiveness of the financial sector is the spread between interests on loans and deposits. A lower spread provides incentives to savers while containing the cost to borrowers. According to this measure, there is a significant difference better high- and middle-income economies. While the traditional high-income economies have had high spreads (10.4 percentage points), the rate for recent high-income economies (4.1 percentage points) is lower than for middle-income economies

(8.7 percentage points). Thus, the lower rate of credit allocated to the private sector in middle-income economies may be accounted for, in part, by a higher cost of credit. From our group of selected economies, Brazil stands out as having a very large spread, averaging 36 percentage points. Other middle-income economies show spreads on par with high-income economies, including the three Southeast Asian economies.

4.7 Savings and Investment

A key ingredient to increasing the productive capacity of an economy is the ability to gather savings and channel them into investment. Broadly, the investment rate does mirror the savings rate. Northeast Asian economies are well known for their high savings rates as a source of building capacity during the high growth decades.

There are considerable differences in savings rate between high- and middle-income economies, as shown in Table 13. High-income economies save around 25% of GDP, on average, while the rate for middle-income economies is lower at 18%. The reduced savings rates translate into investment rates that are 5 percentage points lower in middle-income economies. The differences, in savings, investment, and fixed investment rates, are statistically significant throughout the various tests.

Table 13: Savings and Investment, High- and Middle-income Economies Compared

	Savings as % of GDP	Gross Capital Formation (investment) as % of GDP	Fixed Capital Formation (fixed investment) as % of GDP
Group Average (mean)			
High income in/before 1965	26	27	25
High income after 1965	25	27	25
Middle income	18	22	22
Kruskal-Wallis, p-value			
All HI vs. MI	0.00	0.00	0.00
Recent HI vs. MI	0.03	0.03	0.05
t-test, p-value			
All HI vs. MI	0.00	0.00	0.00
Recent HI vs. MI	0.04	0.02	0.04

GDP = gross domestic product, HI = high-income economies, MI = middle-income economies.

Note: See Appendix for time periods and the method of calculation.

Source: Authors' calculations, based on data from World Bank (2014a), accessed 15 July 2014.

The differences can be seen more dramatically in the individual economy data, presented in Table 14. Annual investment rates were reviewed for the 30-year period from 1978 to 2008. The first column in the table shows the number of years in which the investment rate was below 20% of GDP. The second column indicates the years in which it was above 30%. In East Asia, investment fell below 20% for only 2 years in Singapore and not at all in the other three economies, demonstrating very consistent investment patterns. In addition, rates over 30% were achieved frequently in Singapore and the Republic of Korea. In contrast, investment in Latin America was much lower, in part because the 30-year period includes the lost decade of the 1980s. All economies in that region, except Chile, experienced at least 10 years in which investment was below 20% and just over half of the economies were below that level for more than 15 of the 30 years.

Table 14: High and Low Investment Rates, 1984–2013

	No. of years between 1984–2013 (30 years) that investment as proportion of GDP was:				
	< 20%	**> 30%**		**< 20%**	**> 30%**
East Asia			**Latin America, MI**		
Singapore	1	19	El Salvador	30	0
Korea, Rep. of	0	21	Bolivia	29	0
Japan	2	5	Guatemala	25	0
Hong Kong, China	0	4	Brazil	22	0
			Argentina	26	0
Southeast Asia			Costa Rica	13	0
Malaysia	1	9	Dominican Republic	13	0
Thailand	0	11	Peru	14	1
Philippines	13	0	Paraguay	19	0
			Mexico	10	0
China, People's Rep. of	0	30			
			Latin America, HI		
			Chile	3	0
			Uruguay	28	0

GDP = gross domestic product, HI = high-income economies, MI = middle-income economies.

Note: See Appendix for time periods and the method of calculation.

Source: Authors' calculations based on data from World Bank (2014a), accessed 15 July 2014.

As well, none of the Latin American economies, with the exception of Brazil, invested more than 30% of GDP in any year during the 30-year period. Thus, the region's capacity to grow has been stifled by its low investment in productive capacity. The three Southeast Asian economies show mixed results. Malaysia and Thailand resemble high-income economies because the investment rate dipped below 20% only once and was frequently above 30%. Note that this period includes the Asian financial crisis years of 1997–1998.[9] The Philippines, however, experienced low investment for 13 of the 30 years and never surpassed the 30% mark.

4.8 Inequality

High income inequality may impede the growth process and limit progress up the income ladder. For middle-income economies, there may be four channels by which this occurs. First, low-income households have limited purchasing power and thus contribute little to domestic demand. Second, high inequality results in low human capital development as decent education and health care are not affordable to a large base of low-income households. As a result, workers from these households are less able to contribute high productivity to the growth process. Instead, they are stuck in low-paid jobs, informal work, or survivalist self-employment and become ensnarled in a poverty trap that is perpetuated across generations.

The third channel is similar to the first but relates to value in the production-consumption cycle. A thick middle class not only boosts demand generally, it also creates demand for higher value goods and services. These middle-class goods include household appliances, electronics, automobiles, and leisure services. The limited demand for these goods means that they are less likely to be produced domestically. Thus, part of the economy gets stuck in a low-income production-consumption equilibrium in which low-value goods are produced to supply the demand from low-income households, while the demand for middle- and high-income goods remains stunted. Domestic firms are less likely to invest in the production of higher

[9] In Thailand, investment fell to 20% in 1998 and 21% in 1999.

value goods and services and are not likely to achieve economies of scale or engage in technological learning. The small middle class resorts to imports to satisfy wants that cannot be satisfied by domestic firms.

Fourth, inequality can hamper investment and growth if it spills over into social unrest. The poor may feel a sense of economic injustice or that policies discriminate against them. They may vent their frustration through protests or armed insurrection. Democratic governments may respond by implementing populist policies that can reduce inequality. However, such policies can also lead to fiscal imbalances and a rising debt burden, as occurred in several Latin American countries in the 1970s and 1980s.

Inequality is much higher in Latin America than other parts of the world and half of the countries in our middle-income group are from that one region. This suggests a possible link between inequality and middle-income stagnation. To determine the possible links between inequality and country income, we tested for differences in the Gini coefficient. As Gini estimates can vary considerably, we averaged the results of various studies in the WIDER (2014) database. This allowed us to smooth out anomalies resulting from the different methodologies employed. Gini coefficients have a possible range of 0 to 1 but in reality tend to range from 0.25 (very equal) to 0.65 (very unequal).

The 14 Latin American countries in our sample had an average Gini of 0.52 over the 10-year period from 1999 onward.[10] This figure exaggerates the region's current level of inequality because inequality has declined somewhat in recent years. By one estimate, the Latin American Gini has decreased by an annual rate of 1.1% over a 7–8 year period beginning in 2000 (Lustig 2010). That decline may be attributed to a fall in the earnings gap between unskilled and skilled labor (which is related to expanded education) and to an increase in targeted government transfers to the poor (Lustig 2010). Nonetheless, inequality in the region is higher than in our middle-income group as a whole and considerably above the average for the recent high-income group of 0.37 (Table 15).

Table 15: Inequality, Measured by Gini Coefficient

	Gini coefficient
Group Average (mean)	
High income in/before 1965	37
High income after 1965	37
Middle income	45
China, People's Rep. of	46
Kruskal-Wallis, p-value	
All HI vs. MI	0.00
Recent HI vs. MI	0.00
t-tests, p-value	
All HI vs. MI	0.00
Recent HI vs. MI	0.00

HI = high-income economies, MI = middle-income economies.

Note: See Appendix for time periods and the method of calculation.

Source: Authors' calculations based on data from WIDER (2014), accessed 15 July 2014.

[10] Calculating a Gini coefficient is not an exact science and involves differences in methodology and the data used. The results from different studies for the same year can differ by several percentage points. As a result, we averaged the results from various studies reported in the WIDER dataset. The number of studies in the dataset for each 10-year period can differ greatly. For example, for Australia there are 25 studies between 1961 and 1970, while for Austria, there is only one study for that period.

Furthermore, our calculations indicate that 11 of 23 middle-income economies had an average Gini above 0.45. This compares to 4 of 32 high-income economies (Table 16). The Philippines, which has a Spanish colonial heritage like many countries in Latin America, also has high inequality at 0.47. Its Asian neighbors are slightly lower at 0.46 for Thailand and 0.42 for Malaysia. It may come as no surprise that our statistical tests show highly significant differences between middle- and high-income groups.

Table 16: Inequality, Selected Economies

Economy Groups	Gini Coefficient (average)				Economies with Average Gini Coefficient at/above 45	
	Lowest		Highest		Number	%
Traditional high income	Australia/Austria	29	New Zealand	50	3 of 17	18
Recent high income	Czech Republic	26	Chile	52	1 of 15	7
Middle income	Belarus	29	South Africa	61	11 of 23	48

Note: See Appendix for time periods and the method of calculation.

Source: Authors' calculations based on data from WIDER (2014), accessed 115 July 2014.

Inequality is a significant concern currently in the PRC where it has increased in parallel with rapid GDP growth. Here again Gini coefficient estimates vary considerably based on the nature of the study conducted, but together provide some picture of the trend. The average Gini was 0.37 for the 12 studies of the PRC conducted between 1999 and 2004 and recorded by WIDER (2014). The two studies for 2004 suggest it was just above 0.45, which is high by international standards.[11]

Inequality is a concern in the PRC because of its potential to ignite social unrest. It may also retard growth, although it does not appear to have had an impact over the past 2 decades when inequality was rising but the growth rate remained very high. Furthermore, a recent study suggests that the increase in equality up to the mid-2000s appears to have leveled off in 2005–2008 (Lin, Zhuang, and Yarcia 2010). In early work on US inequality, Simon Kuznets (1955) suggested that inequality will first rise as a country develops and then fall even as income continues to increase. The PRC may have reached such a "Kuznets turning point," with a possible decrease to be expected in the years ahead. However, it should be noted that the US, with the world's largest economy, registered a Gini of 0.46 in 2004, which is high by international standards. Among the five high-growth Asian economies, there is a mixed record. Hong Kong, China and Singapore have relatively high rates (both at 0.42), although they are below Latin American levels. The larger economies of Japan and the Republic of Korea have lower Ginis at 0.37 and 0.33, respectively, while Taipei,China posted a very equal 0.29. These latter figures are the averages for studies during the 10 years in the run up to graduation.

4.9 Education

The education and skills of the workforce are critical to raising productivity and economic growth. Knowledgeable workers are needed at all levels of the economy, from shop floor workers who operate equipment and engineers who invent new processes and products, to government officials who craft and implement policies. A variety of studies demonstrate the link between the level and quality of education and

[11] WIDER (2014) provides a figure of 0.469 for 2004; Cain, Hasan, and Magsombol (2010) generate a figure of 0.4725, also for 2004; and Lin, Zhuang, and Yarcia (2010) produce a result of 0.46 for 2005.

GDP growth (Hanushek and Woessmann 2007, 2008, 2009; Atherton, Appleton, and Bleaney 2008; E. Jamison, D. Jamison, and Hanushek 2007).

Tables 17 and 18 provide data on educational attainment, which is a quantitative measure. The category "at least primary" indicates the share of the population aged 15 and above with at least some primary education, that is, it includes all graduates of the primary, secondary, and tertiary levels and those with some primary, secondary, and tertiary education. A similar approach is taken for the other categories. The data are from the Barro-Lee database (Barro and Lee 2010), which provides figures for every fifth year.

Table 17: Educational Attainment, High- versus Middle-income Economies

	Percentage of Population Aged 15 or over with:		
	at least some primary education	at least some secondary education	at least some tertiary education
Group Average (mean)			
High income in/before 1965	97	36	7
High income after 1965	89	53	8
Middle income	87	53	11
Kruskal-Wallis, p-value			
All HI vs. MI	0.00	0.08	0.01
Recent HI vs. MI	0.35	0.94	0.12
t-test, p-value			
All HI vs. MI	0.03	0.11	0.01
Recent HI vs. MI	0.71	0.95	0.11

HI = high-income economies, MI = middle-income economies.

Note: See Appendix for time periods and the method of calculation.

Source: Authors' calculations based on data from Barro and Lee (2010).

Table 18: Educational Attainment, Selected Countries

	At Least Primary	At Least Secondary	Tertiary
	% of population aged 15 and over		
High Income in/before 1965			
United States	98	70	17
Germany	98	24	3
Sweden	99	37	6
Australia	99	66	17
High Income after 1965			
Japan	99	41	7
Korea, Rep. of	92	58	20
Chile	96	67	22
Hungary	99	70	11
Middle Income			
Brazil	86	44	6
Malaysia	89	69	11
Philippines	95	64	26
Thailand	87	32	7
China, People's Republic of	*90*	*61*	*5*

Note: See Appendix for time periods and the method of calculation.

Source: Authors' calculations based on data from Barro and Lee (2010).

Differences in educational attainment between high- and middle-income economies present a rather mixed picture. Traditional high-income economies have a higher

average level of primary education but lower levels of secondary and tertiary education. Average attainment for recent high-income economies is, however, similar to that of middle-income economies—for secondary education the averages are, in fact, the same (53% of the population). This may not be so surprising given that access to schooling has expanded around the world in more recent decades and we are using different time periods for the three economy groups.

As a result, the two tests show no significant differences between the recent high-income and the middle-income groups. They do show, however, significant differences between all high-income economies and middle-income economies. These differences for secondary and tertiary education stem from higher educational levels in middle-income economies than in traditional high-income economies. As a result, they run counter to the idea that rich economies have a more educated workforce (or had higher levels in the run up to graduation).

Differences in the quality of education are much more significant and follow the expected intuition. Here we use data on student performance from the triennial survey of the Programme for International Student Assessment or PISA (OECD 2014). The survey assesses the performance of 15-year-olds in science, mathematics, and reading, and provides a basis for making international comparisons. Here we find that high-income economies score much higher than middle-income ones (Tables 19 and 20).[12] In the 2012 survey, the highest performing economy in science was Finland and the other 22 economies that scored above the OECD average of 501 points were all high income.[13]

In mathematics, the Republic of Korea; the PRC (Shanghai); Singapore; and Hong Kong, China were the top performers.[14] Twenty economies with mean performances significantly above the OECD average were all high income. In reading, the PRC was the top performer followed by the Republic of Korea; Finland; and Hong Kong, China. Thirteen other economies, all high income, scored significantly above the OECD average of 493 points.

[12] Around 510,000 15-year-old students from 65 economies participated in PISA 2012 (OECD 2014). The following middle-income countries in our sample did not participate: Belarus, Lebanon, Syria, Morocco, South Africa, Philippines, Malaysia, Bolivia, Costa Rica, Dominican Republic, El Salvador, Guatemala, and Paraguay.

[13] Australia; Belgium; Canada; Estonia; Germany; Hong Kong, China; Hungary; Ireland; Japan; Republic of Korea; Liechtenstein; Macau, China; Netherlands; New Zealand; Poland; the PRC; Singapore; Slovenia; Switzerland; Taipei,China; the United Kingdom; and the United States.

[14] For the PRC, only students in Shanghai were tested.

Table 19: Quality of Education, High- versus Middle-income Economies

	Mean PISA Scores, 2012		
	Science	**Mathematics**	**Reading**
Group Average (mean)			
High income in/before 1965	508	500	504
High income after 1965	501	497	495
Middle income	415	403	417
Kruskal-Wallis, p-value			
All HI vs. MI	0.00	0.00	0.00
Recent HI vs. MI	0.00	0.00	0.00
t-test, p-value			
All HI vs. MI	0.00	0.00	0.00
Recent HI vs. MI	0.00	0.00	0.00

HI = high-income economies, MI = middle-income economies.

Notes: See Appendix for time periods and the method of calculation. OECD average scores are 501 for science, 496 for mathematics, and 493 for reading.

Source: Authors' calculations based on data from OECD (2014), accessed 15 July 2014.

Table 20: Quality of Education, Selected Economies

	Mean PISA Scores, 2013			Percentage of Students below Proficiency Levels in Mathematics
	Science	**Mathematics**	**Reading**	
High Income				
Finland	545	519	524	12.3
United States	497	481	498	25.8
Canada	525	518	523	13.8
Israel	470	466	486	33.5
High Income after 1965				
Japan	547	536	538	11.1
Korea, Rep. of	538	554	536	9.1
Taipei,China	523	560	560	12.8
Russian Federation	486	482	475	24.0
Middle Income				
Brazil	405	391	410	67.1
Argentina	406	388	396	66.5
Mexico	413	424	415	54.7
Thailand	444	427	441	49.7

Notes: See Appendix for time periods and the method of calculation. OECD average scores are 501 for science, 496 for mathematics, and 493 for reading.

Source: OECD (2014).

Testing for differences between our economy groups, we find consistently low p-values indicating that the differences between high- and middle-income economies are significant (Table 18). The scores for individual economies also confirm the large disparity in the quality of education between the two groups (Table 19).

4.10 Infrastructure

Infrastructure, notably for transportation and electrical power, facilitates exchange, including moving people and goods to markets, and providing the energy for

production. Infrastructure is an important public good that underlines the industrialization process, but developing countries tend to lack good infrastructure.

Infrastructure has both quantity and quality elements and we assess indicators for both. Three variables relate to the quantity of infrastructure (road density, electricity consumption, and telephone line density) while four other variables provide a measure of quality, including an overall score. The results show that middle-income economies have less infrastructure per population or geographical area and that the infrastructure is of lower quality. This is true for all seven variables. Furthermore, the results of the two statistical tests indicate that all differences are statistically significant (Table 21).

Table 21: Infrastructure, High- versus Middle-income Economies

	Quality of Overall Infrastructure Scale of 1–7	**Road Density** Km of road per km^2 of area	**Quality of Roads** Scale of 1–7	**Paved Roads** As % of all roads	**Electricity Consumption** kWh per 100 people	**Quality of Electricity Supply** Scale of 1–7	**Telephone Lines** Per 100 population
Group Average (mean)							
High income in/before 1965	5.8	149	5.5	80	101	6.5	46
High income after 1965	5.2	127	4.8	70	55	6.0	37
Middle income	4.0	25	3.7	44	19	4.4	14
Kruskal-Wallis, p-value							
All HI vs. MI	0.00	0.00	0.00	0.01	0.00	0.00	0.00
Recent HI vs. MI	0.00	0.00	0.01	0.07	0.00	0.00	0.00
t-test, p value							
All HI vs. MI	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Recent HI vs. MI	0.00	0.00	0.00	0.00	0.02	0.00	0.00

HI = high-income economies, km = kilometer, km^2 = square kilometer, kWh = kilowatt-hour, MI = middle-income economies.

Note: See Appendix for time periods and the method of calculation. For quality of roads and overall infrastructure, 1 = extremely underdeveloped, 7 = extensive and efficient by international standards. For quality of electricity supply, 1 = insufficient and suffers frequent interruptions, 7 = sufficient and reliable.

Source: Authors' calculations, based on World Bank (2014a), accessed 15 July 2014, and WEF (2014).

Road density in middle-income economies is only about a quarter of what it is in high-income economies. For example, in Japan, which is mountainous, there are 315 kilometers (km) of roads for every square kilometer (km^2) of land (Table 22). In the Philippines and Costa Rica, which are also partially mountainous but middle-income economies, the density is far lower, at near 70 km/km^2. There are economies for which the figures may not be a reliable basis for comparison as they contain large areas that are not suited for human habitation or indeed economic activity aside from resource extraction. They may be cursed with extreme heat, cold, or dryness, or an otherwise inhospitable topography. These areas reduce an economy's overall road density.

Table 22: Infrastructure, Selected Countries

	Quality of Overall Infrastructure	Road Density	Quality of Roads	Paved Roads	Electricity Consumption	Quality of Electricity Supply	Telephone Lines
	Scale of 1–7	Km of road per km^2 of area	Scale of 1–7	As % of all roads	kWh per 100 people	Scale of 1–7	Per 100 population
High Income							
France	6.5	192	6.6	100	73	6.7	63
Belgium	5.9	504	5.4	78	80	6.7	42
United States	5.7	67	5.7	..	132	6	46
Sweden	6.1	129	5.7	23	140	6.7	47
High Income after 1965							
Japan	6	90	5.8	..	78	6.5	51
Korea, Rep. of	5.9	106	5.8	80	102	6.4	60
Chile	5.5	10	5.7	24	36	5.8	19
Hungary	4.8	216	4	38	39	5.9	29
Middle Income							
Bolivia	3.4	7	3	12	6	4	9
Costa Rica	3.6	83	2.5	26	18	5.6	22
Philippines	3.4	..	3.1	..	6	3.4	4
Thailand	4.7	..	5	..	23	5.5	10
PRC	*4.2*	*38*	*4.4*	*53*	*25*	*5.5*	*25*

km = kilometer, km^2 = square kilometer, kWh = kilowatt-hour.

Note: See Appendix for time periods and the method of calculation. For quality of roads and overall infrastructure, 1 = extremely underdeveloped, 7 = extensive and efficient by international standards; for quality of electricity supply, 1 = insufficient and suffers frequent interruptions, 7 = sufficient and reliable.

Source: Authors' calculations, based on data from World Bank (2014a), and WEF (2014), accessed 15 July 2014.

The proportion of an economy's roads that are paved may provide a better sense of infrastructure development as it is a quality measure. Again, we find significant differences, with the proportion of paved roads in high-income economies nearly double that in middle-income countries (44% compared to 70%–80%). The quality of roads is also lower, with a mean score of 3.7 out of 7.0 for middle-income economies, compared to 4.8 or above for high-income economies.

A reliable supply for electrical power is also an important input for an industrialized economy. Consumption per person is four times higher in traditional high-income economies, and twice as high in recent high-income economies, as it is middle-income ones. The differences are statistically significant (Table 21). The quality of electrical power, in terms of providing a sufficient and reliable supply, is also significantly lower in middle-income economies. Businesses find it difficult to operate continuous production lines and may induce them to take the costly step of providing their own generation.

Telephone density is also significantly higher in more developed economies. This is interesting given that the comparison is made between high-income economies in previous decades (1960s and 1970s) with middle-income economies today. However, the data is based on landlines and does not account for mobile phones, which have become more popular worldwide over the past 2 decades.

5. OVERALL PICTURE

The preceding analysis has compared the middle-income and high-income economies across a range of variables. We have discussed the importance of each variable to the growth process and its possible influence on contributing to the middle-income trap. We have not attempted to rank the factors that are most critical to overcoming the middle-income trap. That would require more rigorous statistical manipulation, but could build on the current results. It may also be true that some of the variables that were tested might be seen more as symptoms than causes.

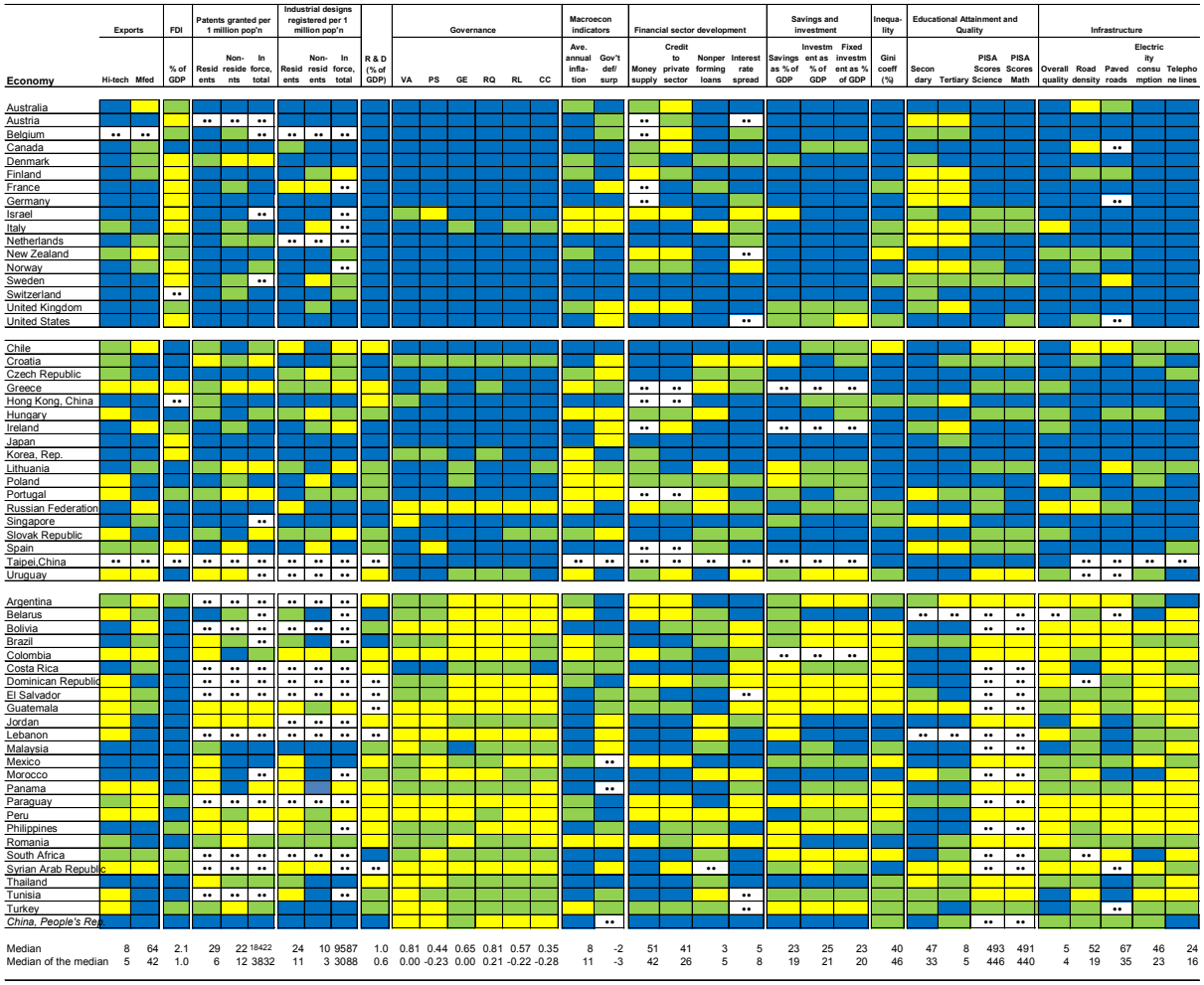
What we can provide, however, are two approaches to see more clearly the differences between the economy groups. The results of the first approach are presented in Figure 1. We calculated the median value for each variable across all economies. Then we calculated the median value for all the values that lie between the median and the lowest value. We call this the "median of the median." From this we were able to classify each economy's result for each variable as either: i) above the median; ii) below the median but above the median of the median; or, iii) below the median of the median. Each result is shaded blue (dark), green (medium), or yellow (light), respectively. Missing data cells are indicated by two black dots. The approach means that there are twice as many blue cells as either green or yellow ones and that the number of green and yellow cells is equal.[15]

The total number of economies is 59, with high-income economies, recent and traditional, constituting over half of the sample (35) and the middle-income economies making up the rest (24). If all of the traditional high-income economies had scored better than all the other economies then the top part of the table would be uniformly blue. It is predominately blue but not uniformly so. Likewise, if the recent high-income economies had scored uniformly better than the middle-income group, the middle section of the figure would be dominated by blues but also include greens. This is generally the case but there are a number of yellows. Similarly, the bottom part of the table should contain all the yellows with some green. What we do see is that yellows dominate but blues and greens also appear.

Five results stand out. First, good governance, savings and investment rates, and R&D follow the expected patterns with higher levels in the high-income economies. This is denoted by the nearly uniform blue blocks in the upper part of the figure and a blue/green combination in the middle part. Second, infrastructure also follows the expected pattern, with the blues and greens falling mostly in the upper portions of the figure and yellows dominating in the lower part. Third, education quantity is an anomaly of the expected pattern, with many blue and green cells in the bottom portion of the figure, while education quality follows the expected pattern. Fourth, FDI is also an anomaly with higher levels found in middle-income economies; we have discussed why this might be so. And fifth, the macroeconomic and financial sector variables show no clear pattern, with blues, greens, and yellows scattered throughout the three parts of the figure.

[15] The authors thank Akiko Sakamoto for the idea of presenting the results in a table of this nature and using it as a basis for looking for trends.

Figure 1: Comparative Indicators



Notes:

Government deficit/surplus = % of GDP; high-tech exports = % of manufactured exports; manufactured exports = % of merchandise exports; FDI = foreign direct investment; VA = voice and accountability; PS = political stability; GE = government effectiveness; RQ = regulatory quality; RL = rule of law; CC = control of corruption; money supply and domestic credit to private sector = % of GDP; nonperforming loans = % to total loans; interest rate spread = %; educational attainment = % of population aged 15 and over; quality of overall infrastructure = scale of 1 to 7; road density = km/sq km; paved roads = % of all roads; electricity consumption = kWh/100 people; telephone lines = per 100 people.

Source: Authors' calculations.

These results may suggest that for economies to beat the middle-income trap, they need to improve governance, raise R&D, increase savings and investment levels, provide reliable infrastructure, and increase the quality of education.

The results of the second approach are provided in Table 23. In this case, we developed a ranking system based on the medians described above. For each variable, the economy received three points for being above the median, two points for being below the median but above the median of the median, and one point for being below the median of the median. The results were summed and divided by the number of variables for which there were data for each economy. Due to the large number of governance and infrastructure variables, these were treated slightly differently. Governance variables were rated at half of their value in the final summation for each economy (i.e., 1.5, 1.0, and 0.5 points instead of 3, 2, and 1 points). For infrastructure, we removed road quality and the quality of electricity from the summation because they are covered by "overall quality." The number of infrastructure variables was reduced from 7 to 5 as a result.

Table 23: Overall Average of Scores and Rank

Economy	Overall Average	Rank
Switzerland	2.647	1
Japan	2.600	2
Korea, Rep. of	2.557	3
Germany	2.515	4
Singapore	2.500	5
Canada	2.471	6
Australia	2.457	7
Austria	2.433	8
Hong Kong, China	2.422	9
Netherlands	2.406	10
Czech Republic	2.400	11
United States	2.394	12
Denmark	2.371	13
China, People's Rep. of	2.359	14
Belgium	2.357	15
Sweden	2.353	16
Malaysia	2.333	17
Norway	2.324	18
United Kingdom	2.314	19
New Zealand	2.294	20
Finland	2.286	21
France	2.273	22
Taipei,China	2.250	23
Ireland	2.226	24
Slovak Republic	2.200	25
Spain	2.182	26
Israel	2.167	27
Poland	2.129	28
Italy	2.088	29
Hungary	2.086	30
Croatia	2.057	31
Chile	2.029	32
Thailand	2.029	33
Morocco	2.016	34
Portugal	2.000	35
Lithuania	1.971	36
Russian Federation	1.971	37
Belarus	1.889	38
Costa Rica	1.870	39
Mexico	1.838	40
Lebanon	1.833	41

South Africa	1.827	42
Turkey	1.818	43
Greece	1.800	44
Tunisia	1.783	45
Jordan	1.781	46
Panama	1.750	47
Romania	1.657	48
Brazil	1.652	49
El Salvador	1.640	50
Uruguay	1.638	51
Philippines	1.629	52
Bolivia	1.556	53
Argentina	1.448	54
Dominican Republic	1.440	55
Colombia	1.422	56
Peru	1.357	57
Syrian Arab Republic	1.346	58
Guatemala	1.313	59
Paraguay	1.222	60

high-income economies in 1965
high-income economies after 1965
middle-income economies

Note: See text for explanation of the method of calculation. Taipei,China has many missing variables (23 out of 35), which may affect its overall ranking.

Source: Authors' calculations.

This second approach provides a single overall measure of the economic, social, and governance attributes of the economies. A color scheme was again used to highlight differences. Blue (dark), green (medium) and yellow (light) were used to highlight traditional high-income, recent high-income and middle-income economies, respectively. The blues and greens are bunched at the top while the yellows are in the bottom half, as we might expect. There are three cases in which economies from the middle-income group rank higher than some high-income economies: Malaysia, Thailand, and Morocco. The PRC is currently a middle-income country but is not considered trapped according to our classification. Nonetheless, it already has many of the characteristics of a high-income economy, which augurs well for its ongoing transformation.

The analysis, in this subsection and the earlier ones on individual variables, suggests that economies that might be caught in the middle-income trap are not deficient in one or two areas only, but perform less well across a range of factors. Certainly many of the variables used in the analysis are related to each other (e.g., more effective governance would affect infrastructure quality; higher patent registration and R&D expenditure would affect export performance). The results do suggest, however, that middle-income economies may need to improve performance in a range of areas if they hope to join the club of rich economies in the coming years.

6. CONCLUSIONS

Progressing from low to middle income is challenging for many of the world's poorest economies. Exiting the low-income bracket requires that an economy's per capita income rise above $1,035. The road from middle- to high-income status may, however, require even greater effort, determination, and policy acumen. Only 18 economies have made the latter transition over the past 5 decades. To become a high-income economy, income per capita must rise enormously and surpass $12,615. The time it will take to grow to the high-income threshold will be counted in decades. For many economies, the possibility of making the transition at all remains a question. These economies may be caught in the middle-income trap.

Why economies might be caught in the trap is a complex question and one that goes to the heart of debates regarding the ingredients for successful economic growth and development. Our basic understanding is that to make the transition involves a structural transformation that allows for an increase in the value of goods and services an economy produces. This requires productive enterprises that are embedded in systems of local innovation and technological adaptation. Economies get caught in the trap when they are no longer competitive in producing low-value goods, and yet do not have the capacity to produce higher value ones. Our analysis suggests that to develop productive capabilities requires a number of supporting factors including: good governance, investment in R&D, high savings and investment levels, an educated workforce, reliable infrastructure, and moderate inequality.

There is no precise definition to determine whether an economy is or is not caught in the trap. Certainly, all middle-income economies are candidates but how long an economy needs to be in the middle-income stage to be considered "trapped" is not clear. The economies in our group were middle income for as far back as our current data shows, which is the early 1960s in most cases—a period of 50 years.

We looked for differences between middle- and high-income economies across a range of variables. For many of these variables, high-income economies performed better than middle-income ones and the differences between these groups were statistically significant. This suggests that there may not be one or two factors that differ between these economies but, rather, that the middle-income trap is a pathology that is connected to many different and related factors, all linked to building productive capacity.

The PRC became a lower-middle-income country in the late 1990s, which is much too recent to consider it as being trapped. It continued to growth rapidly in the 2000s and became an upper-middle-income country in 2010. Growth has slowed recently, however. Based on our analysis it already has many of the characteristics of a high-income country, the key exceptions being governance and possibly inequality.

Research on the common constraints affecting middle-income economies is fairly recent. The term "middle-income trap" was coined only in the late 2000s and there are serious questions about whether economies do indeed fall into a "trap" from which it is difficult to extricate themselves. Instead, it may be more a question of experiencing a growth slowdown. In either case, the factors involved, including the relationship between labor costs and value added, would benefit from further empirical analysis. Such analysis should also grapple with the question of causality, and not merely correlation, which is a key limitation of the current paper.

APPENDIX: DATA ANALYSIS

A. Country/Economy Groups

Section 2 contains the criteria used to select the sample of economies used in the analysis throughout the paper. The three groups are known as follows:

Group 1 = Traditional high-income economies = HI in 1965
Group 2 = Recent high-income economies = HI after 1965
Group 3 = Middle-income economies = MI

In addition, the two high-income groups are often combined: All HI = Groups 1 and 2

The statistical analysis regularly makes two comparisons:
All HI (Groups 1 and 2) versus MI
Recent HI (Group 2) versus MI

B. Year of Graduation for Recent High-income Economies

Ireland	1967	Czech Republic	2005
Japan	1968	Slovakia	2005
Greece	1970	Hungary	2007
Spain	1973	Croatia	2007
Singapore	1975	Poland	2009
Hong Kong, China	1977	Lithuania	2012
Taipei,China	1988	Russian Federation	2012
Portugal	1989	Chile	2012
Korea, Rep. of	1994	Uruguay	2012

Source: Authors' calculations. See text.

C. Time Periods

Unless otherwise indicated, we use 10-year annual economy averages for computing means and for the Kruskal-Wallis and t-tests. The 10-year economy averages are averaged to obtain the group averages.

The time periods differ for each economy group. Unless otherwise indicated, the **standard approach** to time periods is as follows:

Group 1: 1961–1970. This period is used because much of the data is from World Development Indicators (World Bank 2014a), which begins with 1960.

Group 2: The year in which the economy graduated to high-income status along with the preceding 9 years are used. Thus each period is specific to the economy. The year these economies became high income is provided above.

Group 3: The most recent 10-year period for which data is available is used, usually 2004–2012.

This periodization allows us to compare middle-income economies today with the characteristics of Group 2 high-income economies in the run-up to graduation and with Group 1 economies in the earliest period for which we have data.

Tables	Subject	Standard Approach	Exceptions from Standard Approach
2, 3	Exports and foreign investment	Yes	High-tech exports of high-income economies use 1988–1997 data
4	Research and development		1996–2012 data. High-income economies use earliest available data; middle-income economies use latest available data
5, 6	Patents and designs		2012 data for all economies
7, 8	Governance		Groups 1 and 2: 1996–2005 Group 3: 2004–2013
9, 10	Macroeconomic stability	Yes	PRC data is for 2000–2013
11, 12	Financial development		Various, depending on data availability for each economy
13, 14	Savings and investment	Yes	Group 1: 1965–1974 Group 2: standard approach except Spain and Ireland use 1970–1974; Japan uses 1970–1974 for capital formation but standard approach for savings Group 3: standard approach
15, 16	Inequality	Yes	Based on average of the country studies reported by WIDER in 10-year period
17, 18	Educational attainment	Yes	Using average of last two data points, which are at 5-year intervals
19, 20	Education quality		2012 data for all economies
21, 22	Infrastructure	Partially	Road density: 2004–2013 for all economies Paved roads: 1999 for all economies Electricity consumption: standard approach Telephone density: standard approach except: Group 1 and Japan, Ireland, and Spain use 1970; Hong Kong, China, 1975–78. Overall quality, quality of roads and quality of electricity: 2009–2010 for all economies For PRC all data for latest year available, which is 2007, 2008, and 2009

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