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ECONOMIC CONVERGENCE, CAPITAL ACCUMULATION, AND INCOME TRAPS: EMPIRICAL EVIDENCE

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This paper examines the factors that increase the likelihood of economic transition to higher income status, thereby attempting to answer the question of why some economies move to a higher income country group while others do not. Using a quintile income distribution approach, we identify 62 economies that moved to a higher quintile income group in each decade from 1960s to the 2010s out of a sample of 182 economies. Our findings show that higher physical and human capital growth and oil revenues are significantly associated with a greater probability of transitioning to higher quintile income group, although their effects vary not only across income groups within a sample period but also across different periods. Our results indicate that economies that have attained substantial capital accumulation (either physical or human, or combination thereof) and/or are blessed with natural resources have avoided income traps and demonstrated a successful and often steady transition to higher income groups.

JEL Codes: O10, O11, O40

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1. Introduction

Economic convergence in per capita income has been studied by economists for several decades. The neoclassical growth model implies that countries with low per capita income would grow faster than countries with high per capita income, and over time will converge independent of their initial conditions. However, empirical evidence on this "absolute convergence" has been elusive as considerable variations in per capita income between different countries have persisted. The consensus in development economics now points to either "conditional convergence", where countries converge to their country-specific long-run equilibria based on their structural characteristics independent of their initial conditions, or "club convergence", where income levels of countries converge to one another in

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the long-run provided that their initial conditions and structural characteristics are similar.[1]

One would have thought that the debate on economic convergence in the 1980s and 1990s has been settled by now. But since Gill and Kharas (2007) introduced the term "middle-income trap" to describe selected East Asian economies that had not reached high-income level status by the 2000s despite their remarkable growth rates in the previous decades, a renewed policy debate on how to avoid or escape the middle-income trap has emerged. It is important to stress that both economic convergence and income traps are conceptually related as whether economies surpass or get stuck in an income trap may simply depend on the economic convergence path they are following. For instance, economies that escape the middle-income trap could exhibit a higher economic convergence path, while those that get stuck could exhibit a lower economic convergence path. Questions remain as to what enables economies to follow any specific economic convergence path.

A growing literature has attempted to explain the phenomenon and find evidence of a middle-income trap. Eichengreen *et al*. (2011 and 2014) argue that once countries reach a certain level of income, they tend to experience a sudden growth slowdown. While they suggest that the inflection levels could be $10,000–$11,000 and $15,000–$16,000 (at 2005 US dollar purchasing power parity), they argue that "slowdowns are less likely in countries where the population has a relatively high level of secondary and tertiary education and where high-technology products account for a large share of exports." Aiyar *et al*. (2013) also define a middle-income trap as a sudden deceleration in growth. The authors argue that countries in the middle-income category, like some Asian and Latin American emerging market economies, are disproportionately more likely to experience growth slowdowns. They examine factors that cause a sudden drop in growth rates, such as the role of institutions, demographic structures, infrastructure, the macroeconomic environment, and output and trade structures.[2] Implicit in these studies is the notion that most countries find it difficult to achieve a higher convergence path as their growth rates slow.

Felipe *et al*. (2012) study historical transitions across income groups to identify economies caught in the middle-income trap, those that take longer than the median number of years to cross the high-income threshold. In a follow-up study, Felipe *et al*. (2017) refute the idea of a middle-income trap as a permanent state and argue that economies simply differ in their pace of transition from middle to high-income. Im and Rosenblatt (2015) examine historic transition phases in the cross-country distribution of income using both absolute and relative income thresholds. Their analysis of the transition matrix offers little support for the notion of a middle-income trap, as they find no systemic pattern for a

[1]See Barro (1991), Barro and Sala-i-Marin (1992), Barro (1996), Cohen (1996), Galor (1996), Romer (1990), Sachs and Warner (1995), Solow (1956), Solow and Samuelson (1953), and Swan (1956) for the literature on economic convergence and endogenous growth theory.

[2]Eichengreen *et al*. (2014) and Bulman *et al*. (2014) consider sources of the middle-income trap from growth perspective, such as diminishing returns to capital and total factor productivity. In contrast, Gill and Kharas (2007 and 2015) and Aiyar *et al*. (2013) look into structural characteristics of economies—such as demographics, infrastructure, institutions, and economic structure—in relation to the sources of growth slowdowns.

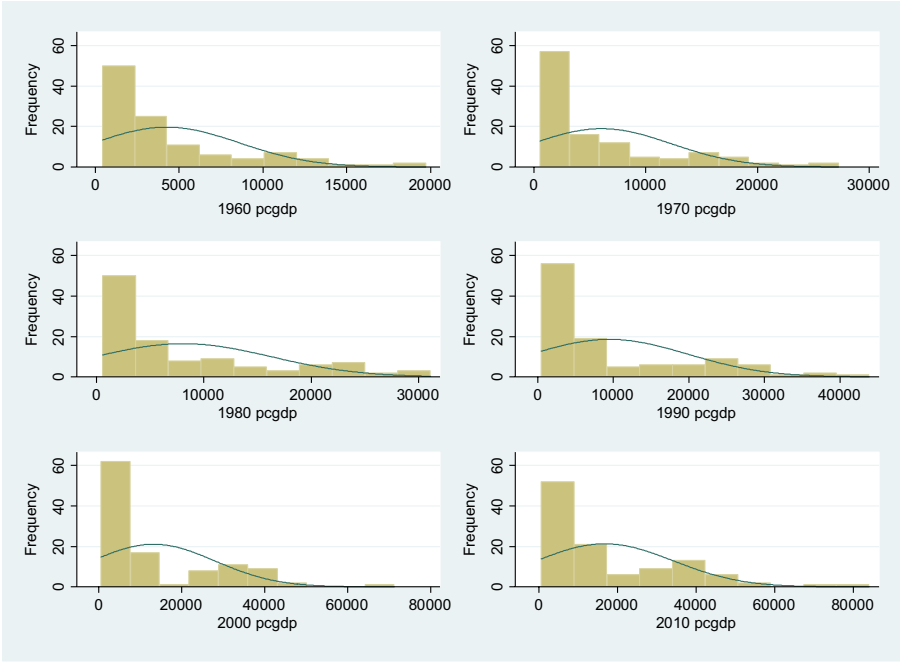

Figure 1. Cross-Country Per Capita Income Distribution.

Notes: Values refer to the number of economies belonging to a per capita income range. Values for 2010s are average figures from 2010 to 2014. Data are based on decade average values of real GDP per capita at constant US dollar purchasing power parity.

Source: Data based on Penn World Tables 9.0 accessed January 2017. [Colour figure can be viewed at wileyonlinelibrary.com]

middle-income economy to stay in the same income bracket.[3] Han and Wei (2017) also reject the middle-income trap by using a transition matrix analysis, similar to Im and Rosenblatt (2015). They argue that relative growth depends on different country fundamentals and policy factors such as the size of the working-age population, financial development, and macroeconomic stability.

However, there are noticeable differences in what researchers directly or indirectly refer to as a middle-income trap.[4] These differences pertain to both the definition of "trap" and what constitutes a "middle-income" country.[5] More

[3]Using individual country transitions to and from various income levels for a sample of economies, the authors find that, on average, middle-income countries have a 30 percent probability of moving to a higher income group.

[4]Most studies suffer from the limitation of somewhat arbitrary assumptions in setting thresholds for middle-income economies in addition to a range of empirical problems such as: sample selection bias; data availability and consistency; and measurement and specification errors. See Gill and Kharas (2015) and Glawe and Wagner (2016) for an extensive literature review on the concepts, methodologies, and causes of the middle-income trap.

[5]Semantics aside, a "trap" refers to a position or situation from which it is difficult or impossible to escape (Merriam-Webster Online). Based on this definition, a "trap" is the "difficulty" or "impossibility" of middle-income economies from moving up to high-income status. A rejection of the idea certainly implies that it is *not impossible* for middle-income economies to reach high-income status. However, it disregards that fact that most middle-income countries are finding it *difficult* to do so.

importantly, these studies differ in their approach and methods in identifying and analyzing cross-country variation; and on whether the middle-income trap is about growth slowdowns (Aiyar *et al*., 2013; Bulman *et al*., 2014; Eichengreen *et al*., 2014) or about the transition to high-income status (Felipe *et al*., 2012 and 2017; Im and Rosenblatt, 2015; and Han and Wei, 2017).

Figure 1 presents cross-country per capita income distribution for each decade from 1960s to 2010s. It shows that majority of economies experienced an increase in their per capita income, but their per capita income levels do not converge over time. Furthermore, it indicates that majority of the economies remain at the bottom of the per capita income distribution even with the passage of time. The cross-country income and associated non-income disparity continues and widens even more. In fact, the dispersion among country income levels has increased over six decades.[6] This provides motivation on using distributional approach in classifying economies by income levels.

Empirical regularities also suggest that most economies grow positively and, therefore, eventually reach a certain high-income threshold. Even if a country's economic growth slows, as long as growth is sufficiently positive, the country will reach a high-income status given sufficient time. In this context, most middle-income traps are temporary and what matters only is the speed of convergence. However, while most countries are benefiting from positive growth, perhaps thanks to technological advances and better policies, these growth gains are not necessarily in an equitable manner. The finding that some economies continue to move ahead of others—even if they all reach some high-income status given time—is still problematic from a policy view.

From a theoretical viewpoint, it is more important to distinguish patterns of economic convergence; whether all countries converge to a unique equilibrium or different groups of countries converge to different equilibriums. The former concept would not allow for public policy to play a role in steering a country transition to a higher income status. But if multiple steady states in economic convergence exist, it would be important to understand what makes a country follow a higher convergence path. For instance, Galor and Zeira (1993), Galor (1996), and Galor and Moav (2004) proposed multiple equilibria theoretical framework where initial income distribution matters for club convergence. In Asia, Ito (2017) argues that there are three convergence paths: low-income, middle-income, and high-income. A shift from one path to a higher one requires implementing economic and political reforms that generate innovation. Without reform, economies may stay in a low-income steady state or a middle-income trap.

Agenor (2017) has also noted that the debate over definition and empirical evidence of the middle-income trap "does not invalidate the middle-income trap as a useful concept in understanding the experience of individual countries and the policy challenges that productivity slowdowns, and the transition to high-income status present. Therefore, a pragmatic approach would be to assess how growth patterns may change across countries with different income levels and identify some of the key structural features that are consistent with various stages of economic

[6]This is consistent with the finding of Wodon and Yitzhaki (2005) on the lack of sigma convergence across economies over a period of time.

development." Bulman *et al*. (2014) argue that the determinants of growth at the low-income level are different from those at the high-income level. Their model implies that a transition from low to high-income status can be smooth if a country redirects its resources to factors that are important for achieving high-income growth.

Economic growth is a dynamic process. Growth patterns vary not only across countries but are also likely to evolve over time even in the same country. That is, drivers of economic catch up would change over time and across different income groups. First, different technologies and institutions generally now available but absent from earlier decades may make a difference; for example, information and communications technology was unavailable in the 1960s and 1970s. Second, countries in higher income groups may need different economic factors and policies to move up. For instance, some Asian economies successfully pursued export-driven growth based on abundant low-cost labor in the early stage of development (Ozawa, 2005). However, with growing income, these economies will likely lose the competitiveness derived from low wages and need innovation or more sophisticated human capital.

In this paper, we tie together economic convergence, the middle-income trap, and sources of economic growth by considering which factors have allowed successful countries to move to a higher-income group. Specifically, this paper asks: 1) *which countries have made successful transitions to a higher income country group*; 2) *what factors are significant in explaining cross-country variation in their likelihood of moving to the higher income group in each sample period*; and 3) *do these factors change over time and across different income levels*?

Addressing these questions will inform both researchers and policy makers on several important points. First, we propose a new methodology to identify which economies have moved to higher income groups in any given time period. Identifying successful candidates is the very first step in understanding what factors enabled them to raise their income. Second, knowing which factors are significantly related to a greater likelihood of moving to a higher income group at any given time period will help in designing and implementing economic policies that support the catch-up process and/or in avoiding growth slowdowns.[7] Lastly, these questions highlight the need to understand cross-country variations in growth dynamics, not only in the context of varying stages of economic development, but also over time. For instance, factors that are significant in increasing the likelihood of moving up to a higher income group change across different periods of time. This adds another dimension to growth dynamics.

To address these questions, we proceed as follows. In Section 2, we provide a conceptual framework where we identify potential determinants which allow economies to transition to higher income group. Section 3, we adopt a new methodology to identify the "movers": i.e. the economies that transitioned to a higher income group in any given period. Instead of using an absolute income threshold in identifying country income groups, we use a quantile income distribution approach, where we group countries in order of their income quintiles. In Section 4,

[7]In this regard, we are referring to absolute convergence such that middle-income countries would aspire to achieve high-income status.

we present our empirical specification using a pooled and cross-sectional regressions to help identify which factors are significant in explaining cross-country variation on the probability of moving to higher quintile income groups. We test factors based on theory and empirical evidence. Section 5 presents our results on the determinants of moving to a higher quintile income group across period, regardless of which income group the transition occurred. This allows us to assess the relevance of growth drivers and structural characteristics across periods. Next, we consider the determinants of transitioning to a higher income group across period conditional on being in a quintile group. This allows us to assess the factors relevant for moving up the income ladder at a certain income level. Lastly, Section 6 provides concluding remarks and policy implications.

Our study differs from previous literature in several aspects. First, our paper specifically looks at which factors are relevant for those countries that have successfully transitioned to higher income levels. This differs from Eichengreen *et al*. (2014) and Aiyar *et al*. (2013), who viewed the middle-income trap in the context of economic slowdowns. Our study focuses more on which factors increase a country's likelihood of moving up the income ladder. In this regard, our paper is more in line with Hausmann *et al*. (2005), where they link policy and structural variables to the occurrence of growth acceleration episodes.[8] Our proposed method of modelling per capita income transitions using quintile distribution is nearly identical to the growth acceleration approach of Hausmann *et al*. (2005) as economies which experiences growth acceleration for over 8 years is likely to switch or transition to higher quintile income group over a decade. Second, instead of using an absolute cut-off threshold in identifying middle-income countries, we use distributional approach based on income quintiles.[9] Using this approach, we allow all countries to grow positively and reach a high-income status given a sufficient time frame, but examine the speed and the patterns of economic convergence at any given period. Lastly, unlike Felipe *et al*. (2012 and 2017), Im and Rosenblatt (2015) and Han and Wei (2017), who implicitly assume a universal growth pattern based on the concept of the middle-income trap, our paper recognizes growth as a dynamic process whose patterns will differ across countries and evolve over time even in the same country.

Using an income quintile distribution approach, we identified 62 economies that have moved to a higher income quintile group in each decade. The identified economies are a highly heterogeneous group, i.e. they differ substantially in economic size, natural resource endowment, geographic region, and economic and political structures. Considering various sources of growth and economic characteristics, our results show that physical and human capital growth and oil revenues are significantly associated with a greater likelihood of moving to higher income quintile groups. Our results also show that the factors relevant for income transition vary in their significance not only across different sample periods, but also across different country income groups. These findings are robust to sensitivity tests.

[8]They defined growth acceleration as an increase in per capita income growth of 2 percentage points, conditional that it lasted for 8 years and the post-acceleration growth has to be at least 3.5 percent per year.

[9]See Glawe and Wagner (2016) for a review of previous studies which used either absolute or relative approach in identifying middle-income countries.

2. Conceptual Framework

We frame our analysis based on a neoclassical growth model where output is determined by a Cobb-Douglas production function with constant returns to scale and diminishing returns to factor inputs. The production function takes the standard form:

$$Y = F(N,K,H,A) \tag{1}$$

where Y is the output of economy; N is labor; K is physical capital; H is human capital; and A is the level of technology. Following Galor and Moav (2004), we include human capital in the production function, which is subject to individual diminishing returns due to physiological constraints. Nonetheless, the aggregate stock of human capital would be larger if human capital accumulation is more widespread in the economy.

Since that the level of technology is labor-augmenting,

$$Y = F(AN,K,H) \tag{2}$$

output per effective labor is then given by:

$$y = \frac{Y}{AN} = f(\frac{K}{AN},\frac{H}{AN}) \tag{3}$$

where output per effective labor depends on physical and human capital per effective labor. As in the case of neoclassical growth models, investment per effective labor depends on saving (s) such that:

$$\frac{I}{AN} = sf(\frac{Y}{AN}) = sf(\frac{K}{AN},\frac{H}{AN}) \tag{4}$$

and the level of investment is given by:

$$I = (\delta_k + g_A + g_N)K + (\delta_H + g_A + g_N)H \tag{5}$$

The steady-state condition, where investment is equal to required investment, is:

$$sf(\frac{K}{AN},\frac{H}{AN}) = (\delta_K + g_A + g_N)\frac{K}{AN} + (\delta_H + g_A + g_N)\frac{H}{AN} \tag{6}$$

where δ_K is the depreciation rate of the physical capital; δ_H is the depreciation rate of human capital due to physiological constraints; g_A is productivity growth; and g_N is the population growth.

Conditional convergence dictates that countries that are identical in their technology, population growth, physical and human capital depreciation, and savings rate converge to a steady-state regardless of their initial level of output per capita. In contrast, club convergence could be modelled following Galor (1996) where saving rate from wage income differs from saving rates from interest income. This happens when we impose the assumption of imperfect capital market wherein borrowing rate is higher than lending rate due to likelihood of default. In other words, multiple equilibria can give rise due to heterogeneity of the savings rate which determines investment per effective worker, such that:

$$s^w f(\frac{K}{AN},\frac{H}{AN}) + (s^r - s^w) f(\frac{K}{AN},\frac{H}{AN}) \tag{7}$$

where s^w is the savings rate from wage and s^r is the savings rate from interest rate; and $s^w \neq s^r$. But heterogeneity on savings rate between wage and interest income can be reinforced by dominant sectors of an economy. For instance, economies that are rich in natural resources, such as oil exporters, might generate more savings from interest income than wages. Hence, countries with higher non-wage saving would end-up having higher per capita income, all else equal. Likewise, differences in savings rate could be reinforced by the openness of an economy such that savings rate from interest income would be higher than savings rate for wages. These extend the model of Galor (1996) where differences in savings rate due to default probability could be extended to account for structural characteristics of an economy such as whether they are commodity exporters and/or more open to foreign trade and finance.

Consequently, we model the law of motion of per capita income, and hence, transitions to higher per capita income groups, following Galor (1996) and Pittau *et al*. (2010):

$$y_{t+1} = \phi(y_t, s_t, \varepsilon_t) \tag{8}$$

where y_t is per capita income, s_t is structural characteristics which are slowly varying or time-invariant country characteristics, and ε_t which is the transitory shocks to an economy. Equation (8) captures the growth dynamics, economic convergence allowing for multiple equilibria, and transitions to higher income groups. Specifically, transitioning to higher per capita income level depends on: 1) the determinants of output including labor, physical and human capital, savings and depreciation rates, and level of technology provided by the production function with constant returns to scale and diminishing marginal returns; 2) structural characteristics of an economy such as differences in savings and depreciation rates; institutional quality, economic reforms, income inequality, market structures, commodity exporters, trade and financial openness following Galor (1996) and Hausmann *et al*. (2005); and 3) transitory shock such as demand and nominal price shocks.[10]

3. Economic Catch-Up And Stylized Facts

This section addresses the first question set out in this paper on which economies have exhibited convergence. It first discusses the absolute and relative approach in defining country income groups; and then presents the quantile income distribution approach.

3.1. *Absolute or Relative Income Threshold Approaches*

Previous studies on the middle-income trap often relied on absolute income thresholds in identifying transitions to higher income groups. Several studies have used "absolute" income thresholds or cut-off points based on average per capita income (usually expressed in constant prices, US dollar, and at purchasing power parity). These thresholds are often consistent with the World Bank classifications

[10]Positive supply shocks will enter the model in the production function of the economy.

on low-income, low middle-income, high middle-income and high-income economies. For instance, Eichengreen *et al*. (2011 and 2014) identified the middle-income range as greater than $10,000 (at 2005 constant international prices) using Penn World Tables 6.3 and 7.1 for 1957–2010. In contrast, Felipe *et al*. (2012) used $2,000 to $11,750 (in constant 1990 US dollar prices at purchasing power parity) using the Maddison and IMF datasets for 1950–2010.

Recognizing the arbitrariness of the absolute income thresholds, other studies evaluate the income of countries relative to a reference country, such as the United States, or a group of countries. The idea behind this "relative" approach is to assess economic catch-up or convergence. For instance, a relative share of 0.60 would mean that the country's income level is about 60 percent of the reference economy. If the share goes up, to say 70 percent, then that country has exhibited convergence as its income share relative to reference income level has increased. This approach has been taken by Agenor and Canuto (2012), Bulman *et al*. (2014) and Im and Rosenblatt (2015), among others. An advantage of this approach is that middle-income countries would be defined by relative share to a reference country or group, which in itself is a moving target: i.e. the reference economy's per capita income is also increasing over time. Im and Rosenblatt (2015) divide middle-income countries into three groups, those with 15–30 percent; 30–45 percent and 45–60 percent of income relative to the United States. However, if the reference country or group is fixed, this approach may not necessarily capture the true income transition. That is, there is no guarantee that the reference country will continue to be the reference country over a long-time horizon i.e. the US economy may give a way to another economy for the top income country in 100 years. Then, the countries that caught up with the US economy may not have reached the high income.

Figure 2 presents the decade average per capita income (in constant US dollars at purchasing power parity from Penn World Table 9.0) for a sample of countries over six decades.[11] The figure illustrates several points. First, the cross-country variation in per capita income growth patterns is considerable. Some economies have attained a significant increase in income level, while others have not. For instance, Taipei, China and Korea have achieved rapid and consistent increases in per capita income from their low bases in the 1960s. In fact, Korea has reached the same average per capita income as Spain in 2010s, although it started from a much lower average per capita income than Spain in the 1960s. In contrast, the Philippines has made a very slow income progression. Second, the choice of income thresholds will lead to arbitrary classification of economies into different income groups. For example, if we take economies with less than $5,000 average real per capita income in the 1960s as middle-income countries and set $10,000 as the cut-off level in defining middle-income countries in 2000s, then Brazil and Thailand would still be in the middle-income group. However, if we set the cut-off to $15,000 in 2010s, then both countries will not belong in the middle-income group.

[11]Data for the 2010s refers to the per capita income average from 2010 to 2014, based on Penn World Table 9.0.

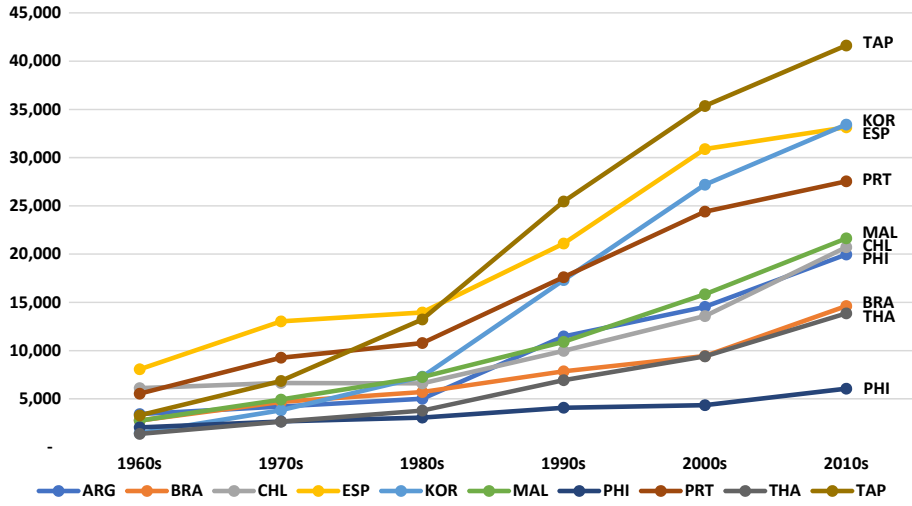

Figure 2. Average Per Capita Income ($).

Notes: Values refer to the decade average of real GDP per capita at constant US dollar purchasing power parity. Data for 2010s refer to average per capita income from 2010 to 2014. ARG = Argentina; BRA = Brazil; CHL = Chile; ESP = Spain; KOR = Korea, Rep. of; MAL = Malaysia; PHI = Philippines; PRT = Portugal; THA = Thailand; and TAP = Taipei, China.

Source: Penn World Tables 9.0 accessed January 2017. [Colour figure can be viewed at wileyonlinelibrary.com]

Instead, Figure 3 shows the relative per capita income of selected economies on the median per capita income of the top 20 percent income group. The data are based on the decade average values of per capita income using Penn World Table 9.0 data at constant US dollar purchasing power parity. The figure plots relative income in the 1960s versus the 2010s. Countries along and below the 45-degree line are those which do not exhibit convergence relative to the top 20 percent income group. It is noticeable that a substantial number of countries have experienced stagnation in per capita income relative to the top 20 percent income groups. If we take 15–60 percent income share as the cut-off income to define middle-income countries, in line with Im and Rosenblatt (2015), then a significant number of countries would have been stuck at middle-income group for about five decades.[12] They would include Argentina, Chile, South Africa, and Mexico, among others.

3.2. *Quantile Income Distribution Approach and Stylized Facts*

We propose a quantile income distribution approach to capture different patterns of convergence within and across income groups. Statistically, quantiles divide a sample range into equal parts with equal probabilities. In this paper, we specifically divide our country sample into quintiles, five equal groups.[13] High income groups include economies classified in the 4th and 5th quintiles and they

[12]These countries lie around 0.15-0.5 in the x- and y-axes of the lower panel of Figure 3. They would include those economies below the 45-degree line.

[13]We ran sensitivity test using quartiles in Section 5, and our baseline results using quintiles hold.

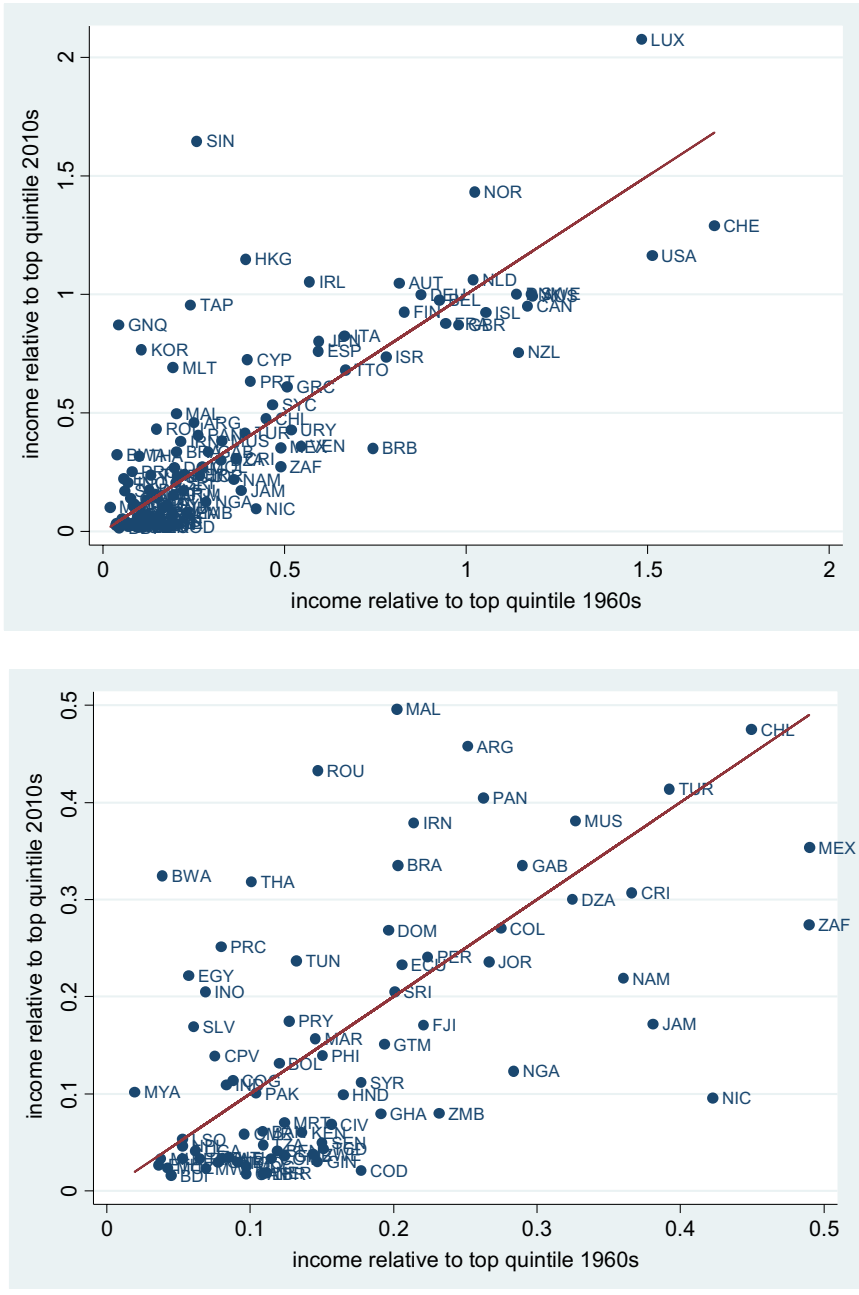

Figure 3. Income Relative to Top Quintile in 1960s and 2010s.

Notes: Values refer to individual country average per capita income relative to the average real income of the median country in the top (5th) quintile group in 1960s and 2010s. The second panel zooms in to 0.5 values for both axes. 2010s refer to average values from 2010 to 2014. Data are based on decade average values of real GDP per capita at constant US dollar purchasing power parity. X-axis refers to per capital real GDP relative to per capital real GDP of top quintile group in 2010 to 14.

Source: Data based on Penn World Tables 9.0 accessed January 2017. [Colour figure can be viewed at wileyonlinelibrary.com]

pertain to advanced economies and upper middle-income country groups. In contrast, low income groups include economies classified in the 1st and 2nd quintiles and they pertain to poor and developing economies. The middle-income group would be those in the 3rd quintile and they pertain to middle tier of middle income group.

An advantage of this approach is that the sample size and the number of quantiles will determine the cut-off income levels for each income group. This eases the need to justify where we set the per capita income thresholds.[14] Income classifications are now determined by the rank of individual economies in income distribution. In fact, when comparing the order of countries between income levels and relative shares, we find no difference between the two as the relative shares are simply scaled by a common value, which is the relative income value of the reference country or the group of countries. Another advantage of quantile distribution approach is that we can account for new economies entering the sample. Given that more economies are formed in Central and Eastern Europe in the 1990s, the likelihood of remaining or transitioning to a higher income group diminishes as more economies are ordered in the distribution. To transition to a higher quantile income group, given an increasing sample size, denotes sustained growth acceleration over the decade alongside the entry of new economies in the sample. Hence, this approach also relieves the need to have a balanced sample.

However, potential issues still exist. First, our approach addresses the issue of setting absolute or relative income thresholds, but it does not solve the issue on how many income groups to consider. We choose to use quintile distribution on the premise that economies within each quintile group would be more homogeneous than in a quartile group, and hence allow more reasonable comparison of their initial conditions when we try to identify the factors that influence the transition to higher income groups. Consequently, using quintile distribution is justified based on the assumption of conditional convergence.[15] Second, the cut-off values will depend on the sample size. Ideally, the larger the sample size the more stable the cut-off points. We address this problem by using the Penn World Table 9.0, which includes data for over 182 countries from 1950–2014.

From the Penn World Table 9.0, we use values on real per capita income (expressed in constant US dollars at purchasing power parity) starting in 1960 and take the decadal average to construct the income quintile distribution for 182 countries over six sample periods.[16] Table 1 presents the per capita income quintile classification of our

[14]In contrast, using an absolute threshold approach in identifying middle-income group requires the need to justify why values are set within an income range.

[15]An alternative approach would be to follow Kourtellos *et al*. (2013) where they used threshold regression to account for multiple regimes. However, their approach is subject to endogeneity issues. More importantly, allowing the data to identify the thresholds sets the country groups into two i.e. either above or below the threshold. It does not account for several regimes such as per capita income groupings.

[16]We use 1960 as our start date because out of the sample of 182 countries, less than 90 have data for the 1950s. We have 111 countries with data available from the 1960s, which increases the number of usable observations.

sample. The highest income group is assigned the number (5) as it pertains to the highest quintile income group, and the lowest is assigned the number (1).

Based on Table 1, we can identify the economies that moved up to a higher quintile income group between 1960 to 2014. Several observations can be made. First, some countries stayed in the same quintile income group for over five decades, regardless of whether they are in the highest or lowest quintile income group. For example, Malawi stayed in the first quintile group throughout the sample period, while Ecuador remained in the third quintile group. Second, countries can move up and down across income quintiles over different time periods. The cases in point are Iran and Iraq. This again highlights an advantage of using the income rank rather than specific income levels, whether absolute or relative. Classification by income rank makes the identification of movers less sensitive to arbitrary decisions about the income level or the reference country. Third, some countries move up or jump only once, while others make steady progress (or multiple jumps) over time. For instance, Korea moved up several times throughout the sample period, while Thailand moved up to third quintile group in the 1980s then stayed there. Equatorial Guinea jumped from the first quintile to fourth quintile in the 2000s primarily due to its large oil revenues starting in the 1990s. Lastly, some countries moved down one or several times. Senegal moved down to second quintile group from third quintile group in the 1970s and then moved down to the lowest income group in the 2000s. These observations clearly reflect the diversity in growth dynamics of countries.

Table 2 Panel A presents the summary statistics of quintile groups, including the reference income levels, for in 2010s using the quintile income distribution approach. The first quintile group has a maximum annual income of $3,231 and a median income of $1,568. The second quintile group has an income range of $3,445 to $9,400 with median of $6,050. The table presents the same summary statistics for the third, fourth, and fifth quintile income groups. Among five different quintile groups, the third quintile group—with an income range of $9,550 to $17,652 and a median income of $12,699—roughly corresponds to the middle-income levels identified by previous studies i.e. its cut-off income levels are similar to those identified as the middle-income thresholds suggested by Eichengreen *et al.* (2014). Also noteworthy is that the first and fifth income groups have the highest variation in per capita income levels, whereas the third and fourth income groups have the lowest. These suggest that income variation is greater at the extreme end of the sample distribution, and smaller at the middle. Table 2 Panels B and C show the median per capita and change in median per capita income across income groups and decades. The values suggest that per capita income growth has varied across income groups and periods. For instance, economies in the first quintile experienced negative income growth in the 1980s and 1990s, while both first and fifth quintile income groups witnessed slowdown in income growth in the 2010s. This also shows the presence of substantial decadal variation across income groups.

Table 3 indicates the list of the economies that demonstrated economic catch-up or convergence by moving up in higher income quintiles. The table

TABLE 1
Per Capita Income Quintile Classifications

Economies	Code	1960s	1970s	1980s	1990s	2000s	2010s
Albania	ALB	...	3	3	2	3	3
Algeria	DZA	4	4	4	3	3	3
Angola	AGO	...	3	2	2	2	2
Anguilla	AIA	...	4	4	5	4	4
Antigua and Barbuda	ATG	...	3	4	4	4	4
Argentina	ARG	3	3	3	4	4	4
Armenia	ARM	...	...	...	2	2	2
Aruba	ABW	...	4	5	5	5	5
Australia	AUS	5	5	5	5	5	5
Austria	AUT	5	5	5	5	5	5
Azerbaijan	AZE	...	...	...	2	2	3
Bahamas	BHS	...	4	5	5	4	4
Bahrain	BHR	...	5	4	4	5	5
Bangladesh	BAN	2	1	1	1	1	1
Barbados	BRB	5	5	4	4	4	3
Belarus	BLR	...	...	...	4	3	4
Belgium	BEL	5	5	5	5	5	5
Belize	BLZ	...	3	3	3	3	2
Benin	BEN	2	2	1	1	1	1
Bermuda	BMU	...	5	5	5	5	5
Bhutan	BTN	...	1	2	2	2	2
Bolivia	BOL	2	2	2	2	2	2
Bosnia & Herzegovina	BIH	...	...	...	2	3	2
Botswana	BWA	1	1	3	3	3	3
Brazil	BRA	3	3	3	3	3	3
British Virgin Islands	VGB	...	4	4	5	5	4
Brunei Darussalam	BRN	...	5	5	5	5	5
Bulgaria	BGR	...	4	4	4	3	3
Burkina Faso	BFA	1	1	1	1	1	1
Burundi	BDI	1	1	1	1	1	1
Cabo Verde	CPV	1	1	2	2	2	2
Cambodia	CAM	...	1	1	1	1	1
Cameroon	CMR	2	2	2	2	2	1
Canada	CAN	5	5	5	5	5	5
Cayman Islands	CYM	...	5	5	5	5	5
Central African Rep.	CAF	2	1	1	1	1	1
Chad	TCD	3	2	1	1	1	1
Chile	CHL	4	4	3	4	4	4
China	PRC	1	1	2	2	2	3
Colombia	COL	4	3	3	3	3	3
Comoros	COM	2	2	2	2	1	1
Congo	COG	1	2	2	1	2	2
Costa Rica	CRI	4	4	3	4	3	3
Cote d'Ivoire	CIV	3	2	2	2	1	1
Croatia	HRV	...	...	...	4	4	4
Curacao	CUW	...	...	...	...	4	4
Cyprus	CYP	4	4	4	5	5	4
Czech Republic	CZE	...	...	...	4	4	4
D.R. of the Congo	COD	3	2	2	1	1	1
Denmark	DNK	5	5	5	5	5	5

Please refer to Table 1 Online Appendix for complete list.

Notes. … = data unavailable. 1 refers to the bottom quintile or bottom 20% of income groups. 5 refers to the top quintile or top 20% of income groups. Data based on decade average values of real GDP per capita at constant US dollar purchasing power parity. Data for 2010 refer to the average values from 2010 to 2014.

Source: Authors' calculations using Penn World Tables 9.0 accessed January 2017.

TABLE 2
Descriptive Statistics
A. Statistics for Quintile Income Grouping in the 2010s

Quintile	Obs	Min	Max	Mean	Median
1	37	701	3,231	1,787	1,568
2	36	3,445	9,400	6,147	6,050
3	37	9,550	17,652	12,833	12,699
4	36	17,805	33,144	24,373	23,586
5	36	33,428	147,749	52,849	43,613

Notes: Obs = number of countries in the quintile income group. Min = minimum; Max = maximum; Data based on decade average values of real GDP per capita at constant US dollar purchasing power parity.
Source: Authors' calculations using Penn World Tables 9.0 accessed January 2017.

B. Median Per Capita Income, By Quintile Income Grouping And By Decade

Quintile	1960s	1970s	1980s	1990s	2000s	2010s
1	825	1,202	1,102	1,051	1,432	1,568
2	1,556	2,006	2,188	3,029	3,751	6,050
3	2,731	4,359	4,759	6,584	9,306	12,699
4	5,419	8,390	11,179	12,058	18,507	23,586
5	13,601	20,189	23,860	29,921	39,424	43,613

Notes: Data based on decade median values of real GDP per capita at constant US dollar purchasing power parity.
Source: Authors' calculations using Penn World Tables 9.0 accessed January 2017.

C. Change In Median Per Capita Income, By Quintile Income Grouping And By Decade

Quintile	1960s	1970s	1980s	1990s	2000s	2010s
1	…	45.71	(8.27)	(4.64)	36.22	9.52
2	…	28.88	9.10	38.42	23.84	61.27
3	…	59.66	9.16	38.35	41.34	36.46
4	…	54.82	33.24	7.86	53.49	27.44
5	…	48.44	18.18	25.40	31.76	10.62

Notes: Values are decade-on-decade growth rate. Data based on decade mean values of real GDP per capita at constant US dollar purchasing power parity.
Source: Authors' calculations using Penn World Tables 9.0 accessed January 2017.

columns indicate which decade the countries moved up, while the rows indicate which quintile income group they move into. For instance, Korea moved up to the third quintile group in the 1970s from the second quintile group in the 1960s. It then moved to the fourth quintile group in the 1980s and stayed there until moving to the highest income group in the 2010s. In total, we identified 62 economies which moved to a higher income quintile during the sample period. This is roughly one-third of the sample. However, we note that countries do not necessarily transition to only higher quintiles. For example, Spain has moved to the highest income group in the 1970s, and then moved back up again in 2000s. This suggests that at some point between 1970s to 2000s, Spain has moved down to a lower quintile income group. Table 1 confirms that this is indeed the case for Spain as it moves down from the fifth income group in the 1970s to the fourth income group in the 1980s and 1990s.

The table also shows the economies that moved to a higher income group are varied in size and structure. The group includes small economies like Aruba,

TABLE 3
TRANSITIONS TO HIGHER QUINTILE INCOME GROUPS

Quintile	1970s	1980s	1990s	2000s	2010s
2nd Quintile	Congo, Rep. of	Bhutan Cabo Verde China Indonesia Mongolia	Egypt	Congo, Rep. of El Salvador India Lao PDR Nigeria Syria Viet Nam Yemen	Myanmar Sudan Zambia
3rd Quintile	Korea Romania Tunisia	Botswana Paraguay Swaziland Thailand	Grenada Iran Maldives Morocco Zimbabwe	Albania Bosnia & Herzegovina	Azerbaijan China Egypt Iraq Jordan Mongolia
4th Quintile	Iran Malta Singapore Taipei,China	Antigua & Barbuda Korea Malaysia Saint Kitts & Nevis Turks & Caicos	Argentina Chile Costa Rica Mauritius	Equatorial Guinea Iran	Belarus Kazakhstan Romania Turkmenistan Uruguay
5th Quntile	Spain	Aruba Bahamas Hong Kong, China Macau, China	Anguilla British Virgin Islands Cyprus Ireland Singapore Taipei,China	Bahrain Spain	Equatorial Guinea Korea Oman Saudi Arabia

Notes: The table lists the countries which moved to higher quintile income group by decade. For instance, Korea moved from second quintile income group in 1960s to third quintile income group in the 1970s, to fourth quintile income group in the 1980s and to fifth quintile income group in 2010s. Data based on decade average values of real GDP per capita at constant US dollar purchasing power parity.

Source: Data based on country classifications shown in Table 1.

Bahamas, Malta, Turks and Caicos, among others.[17] Oil exporters such as Bahrain, Equatorial Guinea, Oman, Saudi Arabia, Iran, and Iraq are also included, suggesting that natural resources play an important role in per capita income increases. The identified economies also vary in region, government structure, demographic characteristics, and other factors. In summary, this group is highly heterogeneous.[18] This further motivates identifying the factors which allowed these economies to transition to higher quintile income group.

4. Empirical Specifications And Data Sources

We identified in the previous section the economies that moved up to a higher quintile income group. However, these "movers" do not appear to share any clear characteristics. To test the significance of growth drivers and structural characteristics on the likelihood of moving to higher quintile income group, we estimate the following specification:

$$P(m_{i,t}=1)=\beta' x_{i,t}+\varepsilon_{i,t} \tag{9}$$

where $m_{\mathrm{i,t}}$ is a binary variable which takes the value of 1 if the economy has moved to a higher quintile income group from the previous decade; and 0 otherwise. β' is a column vector of coefficients. $x_{\mathrm{i,t}}$ is a row vector of determinants in a given decade, and ε_{i} is the error term. The row vector of determinants pertains to the within decade growth or average values.

To address the second question on the significance of the determinants of growth drivers and structural characteristics on the likelihood of moving to higher quintile income group across time, we estimate Equation (9) using both pooled and cross-section specification. The pooled estimation allows us to assess which regressors are significant for the entire country and period (decade) sample.[19] In contrast, the cross-section estimation focuses on specific periods or decades. It captures cross-country variation within each decade, allowing us to examine the relevance of the determinants by period as some factors might be significant in the pooled estimation, but in fact, are only significant for specific decades or periods. In both estimations, the dependent variable is a binary variable which takes the value of 1 if the economy moves to a higher quintile income group from the previous decade

[17]We include small economies as the classification and cut-off levels of income groups depend on the sample size. Unfortunately, Penn World Tables 9.0 does not report values for Pacific economies. Ideally, they should be included.

[18]To see whether our list of movers exhibited economic catch up, we regressed catch-up rate on initial per capita income level and lag per capita income growth. Our catch-up rate is computed as $CU=100\times\frac{\Delta(y_{i,t}-y_t^*)}{\Delta(y_{i,t-1}-y_{t-1}^*)}$, where y* refers to the median per capita income of the top quintile income group (European Commission 2004). If the initial level of per capita income and lag per capita income growth are significantly negative, then economies would exhibit catching-up relative to the median income of top quintile income group. The results show that almost half of our 62 movers have significantly reduced their income differential with respect to the median income level of the top income quintile. Results are available from the authors by request.

[19]The time element in the pooled regression pertains to decade average or growth values from 1960s to 2010s.

regardless of which quintile income group it belongs; and 0 otherwise. The idea behind this estimation approach is to test the significance of determinants that support countries' moving to higher quintile income group across time periods without accounting for the fact that countries are transitioning from varying quintile income groups. This enables us to identify whether growth drivers and time-varying structural characteristics are relevant throughout the sample period or only for specific periods within the sample. For example, if a growth driver is significant, this implies that the factor is relevant in explaining transition to a higher quintile group, whether the economy is moving from the first, second, third, or fourth quintile groups. As such, this addresses the second question in this paper.

To address the third question on whether the relevant regressors change over time as well as across different quintile income group, we also estimate Equation (9). However, we spilt the sample both by period and by income groups. This extends the previous approach as it controls for which quintile income group the transition occurred. For periods, we divide the sample into three. Period 1 corresponds to 1960s-70s; period 2 for 1980s-90s; and period 3 for 2000s-10s. This enables us to pool the data, thereby increasing the sample size of each quintile income group, while we trace the significant regressors. More importantly, we spilt the sample by quintile income groups. We combine the first and second quintile income groups as low-income countries, while quintile 3 strictly pertains to middle-income country group. Through our second estimation approach, we can evaluate the significance of factors across time and across income groups, thereby accounting for varying stages of economic development. The dependent variable is also a binary variable which takes the value of 1 if the economy moved to a higher quintile income group from the previous decade *conditional* on being in a specific quintile income group in the previous decade; and 0 otherwise. Our second estimation approach addresses the third question in this paper.

For both estimation specifications, we use lagged values of the regressors to reduce potential endogeneity concerns. The dependent variable of 1 tells us that a country has transitioned to a higher quintile income group based on the values of the regressors in the previous decade. We also present results with fixed effects by adding period (decade) dummy variables to account for period specific factors. In addition, given that there are only few movers in each decade, we use maximum likelihood complementary logarithmic (cloglog) estimation, which uses a cumulative distribution function to account for the fact that less than 10 percent of our dependent variable has a value of 1; i.e. the distribution is highly asymmetrical.

Our independent variables include the following. First, we take the log value of the initial per capita income level at the start of each decade. This acts as a control when we do not impose conditionality as to which quintile income group a country is coming from in some of our specifications. Second, we include within decade population growth, physical capital growth, productivity growth, and human capital growth.[20] Neoclassical and endogenous growth theory predicts that higher popula-

[20]Ideally, we should be using the labor force growth rate. However, given data unavailability, we are restricted in using overall population growth. The two measures should be highly correlated based on the assumption that the population growth rate moves in the same direction as the employment growth rate.

tion growth will reduce the economic growth rate, while physical capital growth, productivity growth, and human capital growth will increase it.[21] These factors account for the sources of economic growth given by the production function which were discussed in Section 2. Data on initial per capita income, population, physical capital, productivity, and human capital are taken from the Penn World Table 9.0.

Third, we include a measure of civil liberties, taken from the Freedom House Country Ratings and Status index from 1973 to 2016. We chose to use the Civil Liberty Index, instead of Political Rights Index, as it includes "rule of law" which is indicative of the degree of contract enforcement. We denote a value of 7 for the highest rank and 1 for the lowest rank. Values pertain to decadal mean. Since our sample period begins in 1960s and data from Freedom House is available from 1973 onwards, we use 1973 data for the 1960s. Previous studies (including Aiyar *et al*., 2013; and Han and Wei, 2017) have noted that quality institutions, governance, and rule of law provide a sound environment for investments and hence foster economic growth. This pertains to time-varying structural characteristics, s_t, of an economy as included in Equation (8) in Section 2.

Fourth, we include decade average values of the saving-investment gap, which is basically the current account balance in percent of nominal GDP. This accounts for economies who are either external borrowers or lenders. We expect high saving-investment gap (a positive current account balance) to be associated with either higher or lower per capita income. The expected sign will depend on whether current account deficits translate to productive investments which lead to higher growth; or increase foreign liabilities which could trigger financial crisis and hence lower growth (Ghosh and Ramakrishnan, 2012; and Huasmann *et al*., 2005). Data are taken from World Bank's World Development Indicators and External Wealth of Nations (Lane and Milesi-Ferretti, 2011).

Fifth, some countries we identified as movers in Table 3 are oil exporters. We include the decade average values of oil rent in percent of nominal GDP from the World Bank's World Development Indicators to test for the impact of oil revenues. For countries with unavailable data, we treat them as zeros if no oil production or extraction is taking place. Resource rich countries might show higher likelihoods of moving to a higher quintile income group by benefiting from the windfall gains of high commodity prices resulting to varying savings rate between wage and interest income as discussed in Section 2.[22] This also pertains to time-varying structural characteristics, s_t, of an economy as included in Equation (8) in Section 2.

We include structural characteristics that are time-varying or that slowly change over time such as civil liberties as proxy for institutional quality, saving-investment gap as proxy for economic openness, and oil rents as proxy for natural

[21]Physical capital growth could lead to lower economic growth due to diminishing returns to capital. However, the inclusion of productivity growth and human capital growth could lead to increasing returns to capital, as pointed out by Romer (1990), Barro (1991), Barro and Sala-i-Marin (1992), Barro (1996), Howitt and Aghion (1998), Mankiw *et al*. (1992), and Stokey (2015). See Schiopu (2015) on theoretical framework focusing on the impact of skill bias in the convergence process.

[22]A good example would be Equatorial Guinea, which has seen a dramatic increase in per capita income due to oil discovery and extraction from the 1990s onwards. This has allowed the economy to jump from first to fourth quintile income growth as shown in Table 1. See Nguyen and Nguyen-Van (2016) on resource impact on endogenous growth model.

resource abundance. We do not include structural characteristics that are time-invariant such as geographical location, climate, and colonial history.

Lastly, we include a measure of inflation volatility, which is the within decade standard deviation of inflation. The data refers to the GDP deflator taken from the Penn World Table 9.0. Inflation volatility can be a proxy for mismanaged macroeconomic environment and policy, following Aiyar *et al*. (2013) and Han and Wei (2017). In addition, higher inflation volatility accounts for transitory nominal shocks in Equation (8) in Section 2. We expect that countries with higher inflation volatility would have lower likelihood of moving to higher quintile income group (Lopez-Villavicencio and Mignon, 2011).

5. Results

5.1. *Transitions to Higher Quintile Income Group*

Table 4 presents the results on the significance of growth drivers and time-varying structural characteristics in explaining the likelihood of moving to a higher quintile income group from the previous period, regardless of the specific quintile income group the transition occurred to. For instance, Korea and Spain might have moved to a higher quintile income group in a period (decade), although Korea moved to the third quintile income group while Spain moved to the fifth quintile income group. As such, the results test the significance of determinants for any country that has successfully moved to a higher income group during the full sample period. We present two results, where we include productivity and human capital growth in one specification but not in the other.[23] We note several findings.

First, we find that higher physical capital growth significantly increases the likelihood of moving to a higher quintile income group in the following decade. This is true with or without the inclusion of productivity growth and human capital growth. In fact, among the variables, capital accumulation appears to be the only significant determinant which explains cross-country variation across all sample periods. The estimates show that an increase in physical capital growth by 1% significantly increases the likelihood of moving to a higher quintile income group by 0.5 percent for the entire sample period, all else held constant. Across sample periods, a 1 percent increase in physical capital growth significantly raises the likelihood of moving to higher quintile income group by around 1.3 percent in the 1960s but around 0.5 percent in 2000s.[24]

Second, aside from physical capital growth, higher human capital and productivity growth, and oil share significantly increase the likelihood of transitioning to a higher quintile income group for the entire sample period. In contrast, higher per capita income and population growth significantly reduces the likelihood of

[23]We split the results into two, not only because of data availability for productivity and human capital growth, but also to differentiate between the standard neoclassical growth model from augmented-neoclassical and endogenous growth models.

[24]The coefficients are interpreted as follows: supposing that physical capital grew by 1 percent within a decade, this will increase the likelihood of moving to a higher quintile income group in the next decade by 0.5 percent in 2000s, all else held constant.

TABLE 4
DETERMINANTS OF MOVING TO A HIGHER QUINTILE INCOME GROUP

VARIABLES	(1) Pooled	(2) Pooled	(3) Fixed Effects	(4) Fixed Effects	(5) Move 60-70	(6) Move 60-70	(7) Move 70-80	(8) Move 70-80	(9) Move 80-90	(10) Move 80-90	(11) Move 90-00	(12) Move 90-00	(13) Move 00-10	(14) Move 00-10
Per capita income	-0.323***	-0.340***	-0.336***	-0.322***	-0.394**	-0.561	-0.538***	-1.049**	-0.520***	-0.364*	-0.405***	-0.461*	-0.101	-0.133
	(0.060)	(0.073)	(0.085)	(0.089)	(0.199)	(0.464)	(0.147)	(0.481)	(0.165)	(0.194)	(0.131)	(0.246)	(0.120)	(0.159)
Population growth	-0.466***	-0.384**	-0.481***	-0.418**	-0.522	0.270	0.048	0.736	-0.164	-0.246	-0.486	0.033	-1.212**	-0.943**
	(0.145)	(0.165)	(0.146)	(0.171)	(0.680)	(1.220)	(0.300)	(0.704)	(0.336)	(0.463)	(0.376)	(0.949)	(0.507)	(0.474)
Physical capital growth	0.578***	0.487***	0.614***	0.530***	1.279***	1.267***	0.747***	1.005*	0.669**	0.104	0.646**	0.467	0.452**	0.480**
	(0.100)	(0.132)	(0.102)	(0.133)	(0.424)	(0.413)	(0.207)	(0.565)	(0.294)	(0.348)	(0.255)	(0.315)	(0.194)	(0.221)
Productivity growth		0.012**		0.012**		0.040		0.035		0.016		0.002		0.003
		(0.006)		(0.006)		(0.049)		(0.028)		(0.018)		(0.018)		(0.010)
Human capital growth		0.046**		0.038*		0.177		0.192*		0.037		0.075		-0.047
		(0.019)		(0.020)		(0.170)		(0.104)		(0.029)		(0.096)		(0.054)
Civil liberties	-0.090	-0.166	-0.080	-0.169	-0.566***	-0.872**	0.208	0.131	0.256	0.113	-0.152	-0.165	-0.434**	-0.346
	(0.091)	(0.113)	(0.098)	(0.113)	(0.196)	(0.353)	(0.183)	(0.386)	(0.228)	(0.295)	(0.231)	(0.380)	(0.220)	(0.271)
S-I gap	0.008	0.009	0.009	0.009	-0.053	0.070	0.047	0.140**	0.009	-0.010	-0.036*	0.015	0.018	-0.020
	(0.010)	(0.014)	(0.011)	(0.014)	(0.039)	(0.198)	(0.029)	(0.061)	(0.017)	(0.040)	(0.019)	(0.046)	(0.018)	(0.034)
Oil share	0.049***	0.051**	0.049***	0.053**	5.822*	6.872	-0.062	-0.172	0.011	0.030	0.123***	0.077**	0.049***	0.089***
	(0.013)	(0.022)	(0.014)	(0.022)	(3.232)	(6.831)	(0.049)	(0.148)	(0.050)	(0.066)	(0.025)	(0.036)	(0.019)	(0.032)
Inflation volatility	-0.001	0.006	-0.001	0.007	0.014	-0.008	-0.023	0.019	0.009	0.008	-0.011***	-0.011	0.030	0.016
	(0.003)	(0.007)	(0.003)	(0.006)	(0.013)	(0.025)	(0.038)	(0.021)	(0.006)	(0.005)	(0.003)	(0.009)	(0.028)	(0.076)
No. of movers	67	41	67	41	6	5	15	7	14	12	14	6	18	11
Observations	716	466	716	466	81	55	141	80	148	100	172	115	174	116

Notes: The dependent variable is a dummy variable which takes a value of 1 if a country has moved to a higher quintile income group from the previous decade regardless of which quintile income group it belongs; and 0 otherwise i.e. Korea moving to Quintile 3 and Spain moving to Quintile 5 in a decade will both have a value of 1. Columns (1) to (2) pooled the dataset, while columns (3) and (4) add period (decade) dummy variables. Columns (5) to (14) split the sample by decade i.e. Columns (5) and (6) include both Korea moving to Quintile 3 and Spain moving to Quintile 5 in the 1970s having a value of 1. Regressors are in lagged values. Per capita income refers to log value of real GDP per capita. Population, physical capital, productivity, human capital growth rates refer to within decade growth rates. Civil liberties is an index. S-I Gap, or saving-investment gap, and oil share are in percent of GDP. Inflation volatility refers to within decade standard deviation of inflation. Robust standard errors are used. ***, **, and * significant at 1%, 5% and 10%, respectively.

Source: Authors' estimates.

moving to higher income group for the full sample period. These findings offer additional support for the importance of human capital and productivity as growth drivers although in the context of per capita income transitions.

Third, the significance of determinants varies across decades. For instance, population growth is significant only in the 2000s, i.e. higher population growth reduces the likelihood of moving to higher income group in the following decade, although it is significant in the full sample specifications in Columns (1) to (4). Higher human capital growth significantly increases the probability of moving to a higher quintile income group in the next period, but only in the 1970s. Civil liberty is also significant in the 1960s and 2000s, but it is insignificant in pooled estimation. The results capture the countries with high civil liberty such as the US, UK, and Germany which tend to have lower likelihoods of moving to a higher income group. Since these countries already have high income status as they are in the 5th quintile, their likelihood of moving up is significantly lower or even zero. This explains the significance but negative sign. The saving-investment gap is significant both in 1970s and 1990s. However, its effects differ in these periods. It is significantly positive in the 1970s, reflecting higher surpluses due to the commodity price booms in that decade, but significantly negative in the 1990s, reflecting persistent foreign borrowing in some developing and emerging economies, which led to several crises. Consequently, it has insignificant overall effect for the entire sample period. Oil revenues have positive and significant impacts in the 1960s, 1990s, and 2000s, while inflation volatility is marginally significant only in the 1990s as tougher stance against inflationary pressures are put in place as evidence of macroeconomic stability. In summary, while population and human capital growth, oil revenues, and inflation volatility show the expected impact, their relevance varies across different decades. In contrast, civil liberties and saving-investment gap show contradicting or opposing impact across different periods.

Taken together, the results in Table 4 point to varying relevance and impact of growth drivers and structural characteristics on the likelihood of transitioning to a higher quintile income group. This implies that, except for physical capital accumulation, different decades require different factors for an economy's transition to higher income group. Tracing the evolving significance and impact of growth drivers and structural characteristics uncovers the true growth dynamics that changes over time, which is hidden in full sample period regressions.

The baseline results presented in Table 4 hold against several sensitivity tests. First, removing civil liberties, saving-investment gap, and inflation volatility does not change the baseline findings. Second, we dropped the economies that moved both up and down over the sample period and instead focus on those which have moved only upwards and remained in a higher quintile income group in the next decades. As a result, the number of movers has declined but the baseline results also hold. Third, we apply quartile income distribution, where we divided the sample into four instead of five equal groups. This addresses the issue on whether the number of income groups would affect the results as discussed in Section 3. Consequently, some of the countries identified in Table 3 are no longer included in the sample of movers, while some countries are now included based on the new cut-off income levels for the quartile distribution. For instance, Iran drops out of the sample, while Malta and Czech Republic have entered the list of movers. The estimates indicate

that capital accumulation remains significant across all sample periods and human capital growth now appears significant both in 1960s and 1980s. In addition, oil share also remains significant for 1990s and 2000s with the expected sign. Overall, the main results remain intact. Lastly, Johnson *et al*. (2013) show that Penn World Table data revisions could account for substantial changes in growth estimates. To test whether the baseline findings will hold if we use an earlier version of Penn World Table, we re-run the results using Penn World Table 8.1. Our baseline findings are the same, although we note that productivity growth is highly significant in the pooled and panel specifications, which is not the case in the baseline results.

Aside from the sensitivity tests, we also conducted several extensions of the baseline analysis. First, the results shown in Table 4 do not account for the difference between transitioning to a higher quintile income group coming from low-income quintile groups and middle-income quintile group. Identifying similarities and/or differences between the relevant factors explaining low- and middle-income quintile transitions differentiate between these types of transitions. Table 5 presents the pooled and fixed-effects regressions on the significance of various factors in explaining low- and middle-income quintile group transitions. The striking difference between the two income groups is that for low-income quintile groups, human capital growth is significant for the transitioning to higher quintile income group in the following period; whereas for middle-income quintile group, productivity growth is highly relevant. This implies that the significance of human capital and productivity growth varies between transitions of low- and middle-income quintile groups.

Next, we consider the effects of interaction term between population growth, and physical and human capital growth, instead of treating them separately. Table 6 shows the results on whether growth in the augmented capital-labor ratio, which accounts for increasing returns to scale in the endogenous growth model, is relevant in explaining the probability of moving to higher quintile income group across sample periods. Our findings show that movers have higher augmented capital-labor ratio growth such that the combined impact of physical and human capital growth (while accounting for population growth) is significant and positive for the entire sample period in columns (1) and (2). We also find that the growth in augmented capital-labor ratio is positive and significant in the 1960s and 1970s, such that higher growth in augmented capital-labor ratio increases likelihood of moving to higher quintile income group in the following decade. While the findings are consistent with the baseline results, the interaction term is significant only in the 1960s and 1970s. We offer two possible explanations for this. First, financial crises in the 1980s and 1990s eroded capital stocks and negatively affected physical capital accumulation while decline in population growth offsets the increase in capital leading to a stable capital-labor ratio in 2000s. Second, the augmented capital-labor ratio does not capture the quality of human capital.[25]

[25]We use mathematics and science average test scores from the National Center for Education Statistics (NCES) Trends in International Mathematics and Science Study (TIMSS) in the 1990s and 2000s for selected economies in Table 7 as proxy for the quality of human capital. The results show movers tend to have higher quality of human capital than non-movers in specifications (1) and (3), which is consistent with conventional view on impact of the quality of human capital on economic growth and convergence. However, we flag caution in interpreting specifications (1) and (3) as they are based on small sample size.

TABLE 5
DETERMINANTS OF MOVING TO A HIGHER INCOME GROUP (LOW-INCOME QUINTILE GROUP AND MIDDLE-INCOME QUINTILE GROUP)

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
VARIABLES	**Pooled LIC**		**Fixed Effects LIC**		**Pooled Quintile 3**		**Fixed Effects Quintile 3**	
Per capita income	-0.380***	-0.345***	-0.351***	-0.250*	-0.211*	-0.408*	0.028	-0.217
	(0.091)	(0.133)	(0.107)	(0.144)	(0.124)	(0.217)	(0.175)	(0.209)
Population growth	-0.475**	-0.036	-0.526**	-0.276	-1.176***	-0.640	-1.718***	-1.681***
	(0.222)	(0.487)	(0.217)	(0.524)	(0.420)	(0.426)	(0.460)	(0.493)
Physical capital growth	0.738***	0.626***	0.806***	0.590***	0.446*	0.497	0.408	0.905**
	(0.140)	(0.224)	(0.146)	(0.228)	(0.257)	(0.303)	(0.292)	(0.381)
Productivity growth		0.001		-0.003		0.036***		0.051***
		(0.011)		(0.011)		(0.012)		(0.017)
Human capital growth		0.071*		0.084**		-0.005		-0.028
		(0.040)		(0.039)		(0.036)		(0.043)
Civil liberties	-0.021	-0.223	0.038	-0.214	0.071	0.117	0.078	0.145
	(0.146)	(0.195)	(0.148)	(0.198)	(0.240)	(0.345)	(0.210)	(0.324)
S-I gap	0.004	0.046	0.005	0.032	0.086***	-0.001	0.084***	-0.021
	(0.015)	(0.031)	(0.015)	(0.029)	(0.032)	(0.046)	(0.031)	(0.064)
Oil share	0.058***	0.059**	0.072***	0.066**	0.027	0.090*	0.045	0.115*
	(0.015)	(0.027)	(0.017)	(0.028)	(0.048)	(0.052)	(0.047)	(0.067)
Inflation volatility	-0.011	-0.024*	-0.014	-0.017	0.002	0.011**	0.005	0.012**
	(0.009)	(0.014)	(0.010)	(0.011)	(0.003)	(0.005)	(0.003)	(0.005)
No. of movers	38	19	38	19	16	12	16	12
Observations	295	138	295	138	147	94	147	94

Notes: The dependent variable pertains to a dummy variable which takes a value of 1 if a country has moved to a higher quintile income group from the previous decade; and 0 otherwise. Low-income quintile group includes economies which are in Quintiles 1 and 2. Middle-income quintile group specifically refers to the economies in Quintile 3. Fixed effects include period (decade) dummy variables. Regressors are in lagged value. Per capita income refers to log value of real GDP per capita. Population, physical capital, productivity, human capital growth rates refer to within decade growth rates. Civil liberties is an index. S-I Gap, or saving-investment gap, or saving-investment gap, and oil share are in percent of GDP. Inflation volatility refers to within decade standard deviation of inflation. Robust standard errors are used. ***, **, and * significant at 1%, 5% and 10%, respectively.

Source: Authors' estimates.

TABLE 6
DETERMINANTS OF MOVING TO A HIGHER INCOME GROUP (USING INTERACTION TERM FOR POPULATION, AND PHYSICAL AND HUMAN CAPITAL GROWTH)

VARIABLES	(1) Pooled	(2) Fixed Effects	(3) Move 60-70	(4) Move 70-80	(5) Move 80-90	(6) Move 90-00	(7) Move 00-10
Per capita income	-0.293***	-0.276***	-0.213	-0.603**	-0.387**	-0.412	-0.115
	(0.072)	(0.092)	(0.224)	(0.298)	(0.178)	(0.276)	(0.144)
Productivity growth	0.013**	0.013**	0.041*	0.025	0.018	0.000	0.009
	(0.006)	(0.005)	(0.024)	(0.021)	(0.019)	(0.016)	(0.011)
Interaction K/L*HC	0.065***	0.062***	0.193**	0.242***	0.034	0.105	-0.002
	(0.019)	(0.020)	(0.086)	(0.082)	(0.026)	(0.067)	(0.041)
Civil liberties	-0.192	-0.204	-0.948***	-0.082	0.144	-0.184	-0.403
	(0.124)	(0.128)	(0.338)	(0.317)	(0.277)	(0.410)	(0.297)
S-I gap	0.009	0.008	0.058	0.129*	-0.008	0.012	-0.015
	(0.013)	(0.013)	(0.095)	(0.074)	(0.040)	(0.035)	(0.029)
Oil share	0.031	0.031	6.850	-0.141	0.027	0.065*	0.058*
	(0.023)	(0.023)	(4.428)	(0.107)	(0.070)	(0.034)	(0.031)
Inflation volatility	0.002	0.003	-0.014	0.010	0.008	-0.014	-0.009
	(0.007)	(0.007)	(0.011)	(0.016)	(0.005)	(0.010)	(0.066)
No. of movers	41	41	5	7	12	6	11
Observations	466	466	55	80	100	115	116

Notes: The dependent variable is a dummy variable which takes a value of 1 if a country has moved to a higher quintile income group from the previous decade regardless of which quintile income group it belongs; and 0 otherwise i.e. Korea moving to Quintile 3 and Spain moving to Quintile 5 in a decade will both have a value of 1. Column (1) pools the dataset, while column (2) adds period (decade) dummy variables. Columns (3) to (7) split the sample by decade i.e. Column (3) includes both Korea moving to Quintile 3 and Spain moving to Quintile 5 in the 1970s having a value of 1. Regressors are in lagged value. Per capita income refers to log value of real GDP per capita. Productivity growth refers to within decade growth rates. The interaction terms is computed as physical capital growth minus population growth plus human capital growth. Civil liberties is an index. S-I Gap, or saving-investment gap, and oil share are in percent of GDP. Inflation volatility refers to within decade standard deviation of inflation. Robust standard errors are used. ***, **, and * significant at 1%, 5% and 10%, respectively.

Source: Authors' estimates.

TABLE 7
DETERMINANTS OF MOVING TO A HIGHER INCOME GROUP (USING QUALITY OF HUMAN CAPITAL)

	(1)	(2)	(3)	(4)
VARIABLES	**Pooled**	**Fixed Effects**	**Move 90-00**	**Move 00-10**
Per capita income	–1.490**	–1.489**	–4.790***	–1.551
	(0.728)	(0.73)	(1.115)	(1.1)
Population growth	0.109	0.115	0.519	0.23
	(0.407)	(0.38)	(1.113)	(0.419)
Physical capital growth	–0.032	–0.05	0.103	0.048
	(0.342)	(0.327)	(0.731)	(0.376)
Productivity growth	–0.000	–0.007	–0.165***	–0.011
	(0.012)	(0.013)	(0.05)	(0.019)
Quality Human Capital	1.550*	1.503	3.263**	1.738
	(0.899)	(0.922)	(1.509)	(1.511)
Civil liberties	0.237	0.196	3.629***	0.196
	(0.422)	(0.39)	(1.171)	(0.468)
S-I gap	–0.031	–0.03	0.084	–0.042
	(0.036)	(0.034)	(0.057)	(0.041)
Oil share	0.138***	0.122**	0.766***	0.119*
	(0.051)	(0.048)	(0.242)	(0.062)
Inflation volatility	–0.015	–0.01	–0.076	–0.017
	(0.025)	(0.026)	(0.072)	(0.114)
No. of movers	9	9	2	7
Observations	104	104	52	52

Notes: The dependent variable is a dummy variable which takes a value of 1 if a country has moved to a higher quintile income group from the previous decade regardless of which quintile income group it belongs in the current decade; and 0 otherwise i.e. Korea moving to Quintile 3 and Spain moving to Quintile 5 in a decade will both have a value of 1. Column (1) pools the dataset, while column (2) adds period (decade) dummy variables. Columns (3) to (4) split the sample by decade. Regressors are in lagged value. Per capita income refers to log value of real GDP per capita. Population, physical capital, and productivity growth rates refer to within decade growth rates. Human capital quality refers to the log value of decade average math and science scores based on the National Center for Education Statistics (NCES) Trends in International Mathematics and Science Study (TIMSS) data. Civil liberties is an index. S-I Gap, or saving-investment gap, and oil share are in percent of GDP. Inflation volatility refers to within decade standard deviation of inflation. Robust standard errors are used. ***, **, and * significant at 1%, 5% and 10%, respectively.

Source: Authors' estimates.

The estimates presented in Table 4 address the varying significance of growth drivers and structural characteristics on the likelihood of moving to higher quintile income group. But as pointed out in Section 4, the regression specification does not differentiate between transitions from different quintile income groups as it includes transitions from all quintile groups. To assess whether the importance of growth drivers on the likelihood of moving to higher quintile income group vary not only across periods but also across quintile income groups, we estimate Equation (9) conditional on being in a quintile income group.[26] Table 8 shows the estimates on the determinants of moving to a higher income group conditional on being in a low-income quintile group (Quintiles 1 and 2) and on being in middle-income quintile group (Quintile 3) in the previous period. We pool the data across three

[26]We consider population and physical capital growth as well as oil share in our specifications due to data limitations of including structural characteristics. We include oil share to account for oil exporters in our sample of movers.

sub-periods. Period 1 corresponds to 1960s-70s; period 2 for 1980s-90s; and period 3 for 2000s-10s. In contrast, Table 9 presents the results across different quintile income groups across several periods i.e. those for the Quintile 1 implies transition to Quintile 2 across periods and so on. Several observations are noteworthy.

First, growth drivers vary in significance across quintile income groups at a given period. For instance, stronger population growth significantly reduces the chance of transitioning to higher income group for Quintile 3 in the 1960-70s, but not for low-income quintile groups as presented in Table 8. Physical capital growth is significant for low-income quintile group in 1980-90s and 2000-10s but not for middle-income quintile group. In fact, Table 9 indicates that the impact of capital accumulation can even be significantly negative for Quintile 3 in 2000-10s but positive for Quintile 1 in the same period. Oil revenues is significant for Quintile 1 in 1980-90s and 2000-10s but not for Quintile 3. These results imply that the relevance of various factors changes across quintile income groups even at the same period. Second, not only do the determinants vary across quintile income groups at a given period, they also differ across decades. For instance, larger capital accumulation significantly increases the probability of moving to Quintile 4 from Quintile 3 in the 1960-70s, but significantly lowers the likelihood in 2000-10s. In contrast, strong physical capital growth raises the likelihood of moving to Quintile 5 from Quintile 4 in the 1960-70s, but significantly lowers the likelihood in 1980-90s. Moreover, capital accumulation is insignificant for transitioning to Quintile 5 from Quintile 4 in 2000-10s as presented in Table 9. In summary, Tables 8 and 9 suggest that at any given time, the countries' development stages matter for growth drivers; that is, countries with different income levels would require different economic factors to sustain growth; and these factors also change over time.[27]

5.2. *Analysis of Results*

Our empirical results show that physical capital growth significantly increases the likelihood of moving to a higher quintile income group. That is, capital accumulation appears to be a crucial factor in pushing an economy up to a higher income level, whether it is from a low- or a middle-income group. This result is consistent with Maynard (2015). A crucial assumption under the neoclassical growth theory is that physical capital exhibits diminishing marginal returns, such that capital accumulation could not sustain long-term growth. However, endogenous growth theory, which spurs from empirical evidence from the 1980s, points to increasing marginal returns to capital augmented by human capital which we have controlled for in our specification. Furthermore, diminishing returns of capital implies output growth does not depend on capital accumulation, however capital accumulation still determines the level of per capita income in the long-run.

Our results also point to the importance of human capital growth in the transition process. Table 4 shows that countries with higher human capital growth tend to have greater likelihood of moving to higher quintile income group at any initial

[27]We also run the estimates on the transition across quintile income group by decade. We find that higher capital accumulation significantly increases the probability of moving to Quintile 2 and 5 in 2000s, as opposed to moving to the Quintile 2, 3 and 4 in the 1970s. These illustrate that the determinants vary not only across quintile income group, but they also differ across decades.

quintile group. We also find that higher human capital growth increases the probability of moving to a higher quintile group when we use quartile income distribution and exclude economies that moved up and then down in our list of movers using the quintile groups. More importantly, we find that the quality of human capital appears more important than physical capital accumulation in our restricted sample period and data set. Overall, these findings support the importance of human capital growth in explaining cross-country differences in the catching-up process.

The estimates also highlight the positive impact of oil income for countries which derive significant savings from interest income based on oil revenues. This complements capital accumulation. The results are robust specifically in the 1990s and 2000s. The results may reflect (i) revenues for oil exporters may have increased perhaps due to growing demand for oil in emerging and developing countries in these decades, and (ii) oil exporters have adopted better policies to manage the revenues in recent decades. Furthermore, Tables 8 and 9 show the time-varying nature of growth drivers. Growth drivers vary not only across different income groups within a sample decade but also across different decades. In Table 8, capital accumulation is shown to be significant for moving up across different periods for Quintile 1 but only in the 1960-70s in Quintile 3.

Lastly, we find evidence that civil liberty, the saving-investment gap, and inflation volatility matter in explaining cross-country variation in the probability of moving to higher quintile income group. In fact, in some cases, their relevance appears robust. However, their importance varies depending on the decade and model specification, consistent with the observation of time-varying growth patterns and time-varying structural characteristics of economies. Among the variables we have tested, productivity growth rarely appears significant across specifications and sensitivity tests. While there may be misspecification or measurement issues of productivity growth, it is also possible that physical and human capital growth might have already captured the growth effect of increased productivity as capital accumulation and innovation are complementary determinants of long-run growth (Howitt and Aghion, 1998, and Stokey, 2015).

6. Summary And Policy Implications

In this paper, we aim to identify the factors that positively influence the likelihood of moving up in economic ranking given the dynamic evolution of global per capita income. Unlike previous studies, we adopted a quantile income distribution approach, where we divided our sample of 182 economies into five income groups. Using this approach, we identified 62 economies that moved to a higher quintile income group from 1960 to the 2010s. These movers are highly heterogeneous. They differ in economic size, region, structure, sources of growth, and country characteristics.

Employing pooled and cross-sectional estimation, our findings show that higher physical and human capital growth (or a combination thereof) and oil revenues significantly increases the likelihood of transitioning to a higher quintile income group, although their significance not only varies across income groups within a sample period but also across different periods. These findings are robust

TABLE 8
DETERMINANTS OF MOVING TO A HIGHER INCOME GROUP (BY PERIOD AND INCOME GROUP)

VARIABLES	(1) LIC 1960-70s	(2) LIC 1980-90s	(3) LIC 2000-10s	(4) Quintile 3 1960-70s	(5) Quintile 3 1980-90s	(6) Quintile 3 2000-10s
Per capita income	8.977	-0.498***	-0.280***	1.155	-0.194	-0.479***
	(6.629)	(0.105)	(0.075)	(2.391)	(0.126)	(0.143)
Population growth	-0.781	-0.104	-1.000***	-2.272***	-0.482	-3.540***
	(0.947)	(0.435)	(0.333)	(0.657)	(0.486)	(1.302)
Physical capital growth	2.518**	0.772***	0.629***	2.702***	0.265	-0.134
	(1.116)	(0.210)	(0.189)	(0.603)	(0.369)	(0.486)
Oil share	114.531	0.057	0.071***	-22.159**	-0.137	0.302***
	(77.539)	(0.040)	(0.017)	(10.824)	(0.091)	(0.100)
No. of movers	4	15	20	7	9	6
Observations	42	125	145	23	63	73

Notes:. The dependent variable is a dummy variable which takes a value of 1 if a country has moved to a higher quintile income group from the previous period, conditional on being in a low-income (Quintile 1 and 2) or middle-income (Quintile 3 and 4) country group; and 0 otherwise. Regressors are in lagged values. Per capita income refers to log value of real GDP per capita. Population and physical capital growth rates refer to within decade growth rates. Oil share is in percent of GDP. Robust standard errors are used. ***, **, and * significant at 1%, 5% and 10%, respectively.

Source: Authors' estimates.

TABLE 9
DETERMINANTS OF MOVING TO A HIGHER INCOME GROUP (BY PERIOD AND QUINTILE INCOME GROUP)

VARIABLES	(1) Quint1 1960-70s	(2) Quint1 1980-90s	(3) Quint1 2000-10s	(4) Quint2 1960-70s	(5) Quint2 1980-90s	(6) Quint2 2000-10s	(7) Quint3 1960-70s	(8) Quint3 1980-90s	(9) Quint3 2000-10s	(10) Quint4 1960-70s	(11) Quint4 1980-90s	(12) Quint4 2000-10s
Population growth	-2.884**	-0.461*	-2.445***	-0.284	-1.168***	-1.386***	-2.374***	-0.769*	-0.681	-1.755***	-0.026	-0.089
	(1.290)	(0.259)	(0.654)	(1.993)	(0.309)	(0.386)	(0.852)	(0.422)	(0.586)	(0.606)	(0.155)	(0.734)
Physical capital growth	3.452***	-0.308	0.520**	1.541*	0.136	-0.305	2.660***	-0.172	-1.530***	2.418***	-0.432***	-0.863
	(1.337)	(0.289)	(0.233)	(0.836)	(0.276)	(0.195)	(0.534)	(0.244)	(0.506)	(0.892)	(0.167)	(0.572)
Oil share	…	0.300***	0.227***	151.897**	-0.071	0.046*	-21.147**	-0.147	0.077	-17.162	…	0.024
	…	(0.114)	(0.058)	(67.905)	(0.119)	(0.027)	(9.058)	(0.112)	(0.052)	(39.911)	…	(0.051)
No. of movers	1	7	12	3	8	8	4	9	6	1	10	6
Observations	18	63	73	22	62	72	23	63	73	23	35	69

Notes:. The dependent variable is a dummy variable which takes a value of 1 if a country has moved to a higher quintile income group from the previous period, conditional on being in a quintile income group; and 0 otherwise. Regressors are in lagged values. Population and physical capital growth rates refer to within decade growth rates. Oil share is in percent of GDP. Robust standard errors are used. ***, **, and * significant at 1%, 5% and 10%, respectively.

Source: Authors' estimates.

to several sensitivity tests. The results imply that a country could transition to a higher income group by maintaining strong physical and human capital growth as well as promoting proper utilization of proceeds from natural resources. Said convergence applies to both low- and middle-income economies, allowing them to surpass income traps, although the significance of these growth drivers vary across different stages of economic development.

Our findings have clear policy implications. First, transitioning to a higher income group requires continuous physical and human capital investment. Not only that the quality of human capital should increase through education and training, but more so that physical capital should grow and be productive. As shown in our results, countries that have made a successful transition to higher per capita income have high growth rates of physical capital. Unfortunately, the debt crises in the 1980s and emerging markets crises in 1990s have left a lasting impact on capital accumulation, i.e. investment growth has significantly declined for more than a decade. Consequently, investment slowdown limits capital accumulation and the chances of income transition. Second, our findings show that resource endowments, particularly oil, can enable economies to move up the income ladder during oil price booms. While the results suggest these economies were able to use the savings from interest income on oil revenues to contribute to capital accumulation, these economies need to learn how to efficiently manage resource revenues to build human capital to sustain their longer-term growth. Lastly, a sound macroeconomic environment, high quality institutions, and financial and trade openness still matter in economic growth and development process.

References

Agenor, P.-R., "Caught in the Middle? The Economics of Middle-Income Traps", *Journal of Economic Surveys*, 31, 771–91, 2017.

Agenor, P.-R. and O. Canuto, *Middle-Income Growth Traps*, Policy Research Working Paper No. 6210, World Bank, Washington, DC, 2012.

Aiyar, S., R. Duval, D. Puy, Y. Wu and L. Zhang, *Growth Slowdowns and the Middle-Income Trap*, IMF Working Paper No. 13/71, International Monetary Fund, Washington, DC, 2013.

Barro, Robert J. "Economic Growth in a Cross Section of Countries", *The Quarterly Journal of Economics*, 106, 407–https://doi.org/10.2307/2937943, 1991.

Barro, R., *Determinants of Economic Growth: A Cross-Country Empirical Study*, NBER Working Paper No. 5698. National Bureau of Economic Research, Cambridge, 1996.

Barro, R. and X. Sala-i-Martin, "Convergence," *Journal of Political Economy*, 100, 223–51, 1992.

Bulman, D., M. Eden and H. Nguyen, *Transitioning from Low-Income Growth to High-Income Growth: Is there a Middle-Income Trap?* World Bank Policy Research Working Paper No. 7104, World Bank, Washington, DC, 2014.

Cohen, D., "Tests of the 'Convergence Hypothesis': Some Further Results", *Journal of Economic Growth*, 1, 351–61, 1996.

European Commission, "Catching-Up, Growth and Convergence of New Member States," Chapter 2 in *The European Union Economy. Review*. European Commission, Brussels, 2004.

Eichengreen, B., D. Park and K. Shin, "When Fast Growing Economies Slow Down: International Evidence and Implications for China," *Asian Economic Papers*, 11, 42–87, 2011.

_____, "Growth Slowdowns Redux," *Japan and the World Economy*, 32, 65–84, 2014.

Felipe, J., A. Abdon and U. Kumar, " Tracking the Middle-Income Trap: What is it, Who is in it, and Why?," *SSRN Electronic Journal*, 2012.https://doi.org/10.2139/ssrn.2049330.

Felipe, J., U. Kumar and R. Galope, "Middle-Income Transition: Trap or Myth?," *Journal of the Asia Pacific Economy*, 22, 429–53, 2017.

Freedom House, 2016, https://freedomhouse.org/report/freedom-world/freedom-world-2016.

Galor, O., "Convergence? Inferences from Theoretical Models," *The Economic Journal*, 106, 1056–69, 1996.
Galor, O. and O. Moav, "From Physical to Human Capital Accumulation: Inequality and the Process of Development," *Review of Economic Studies*, 71, 1001–26, 2004.
Galor, O. and J. Zeira, "Income Distribution and Macroeconomics," *Review of Economic Studies*, 60, 35–52, 1993.
Ghosh, A. and U. Ramakrishnan, '*Current Account Deficits: Is There a Problem? Finance and Development*,' International Monetary Fund, Washington, DC, 2012.
Gill, I. and H. Kharas, '*An East Asian Renaissance*,' World Bank, Washington, DC, 2007.
_____, "*The Middle-Income Trap Turns Ten*," Policy Research Working Paper No. 7403, World Bank, Washington, DC, 2015.
Glawe, L. and H. Wagner, "*The Middle-Income Trap-Definitions, Theories, and Countries Concerned: A Literature Survey*," University of Hagen, Mimeo, 2016.
Han, X. and S.-J. Wei, "Re-Examining the Middle-Income Trap Hypothesis: What to Reject and What to Revive", *Journal of International Money and Finance*, 73(A), 41–61, 2017.
Hausmann, R., L. Pritchett and D. Rodrik, "Growth Accelerations," *Journal of Economic Growth*, 10, 303–29, 2005.
Howitt, P. and P. Aghion, "Capital Accumulation and Innovation as Complementary Factors in Long-Run Growth," *Journal of Economic Growth*, 3, 111–30, 1998.
Im, F.G. and D. Rosenblatt, "Middle-Income Traps: A Conceptual and Empirical Survey," *Journal of International Commerce, Economics, and Policy*, 6, 2015.
Ito, T., "Growth Convergence and the Middle-Income Trap,"*Asian Development Review*, 34, 1–27, 2017.
Johnson, S., W. Larson, C. Papageorgiou and A. Subramanian, "Is Newer Better? Penn World Table Revisions and Their Impact on Growth Estimates," *Journal of Monetary Economics*, 60, 255–74, 2013.
Kourtellos, A., T. Stengos and C. M. Tan, "The Effect of Public Debt on Growth of Multiple Regimes," *Journal of Macroeconomics*, 38, 35–43, 2013.
Lane, P. and G. M. Milesi-Ferretti, "External Wealth of Nations: Mark II," *Journal of International Economics*, 73, 223–50, 2011.
Lopez-Villavicencio, A. and V. Mignon, "On the Impact of Inflation on Output Growth: Does the Level of Inflation Matter?," *Journal of Macroeconomics*, 33, 455–64, 2011.
Mankiw, G., D. Romer and D. Weil, "A Contribution to the Empirics of Growth," *Quarterly Journal of Economics*, 107, 407–37, 1992.
Maynard, N., "Long-Run Growth Differences and the Neoclassical Growth Model," *The Review of Income and Wealth*, 62, 574–83, 2015.
Merriam-Webster Dictionary Online. https://www.merriam-webster.com/.
National Center for Education Statistics, Trends in International Mathematics and Science Study. TIMSS International Data Explorer. https://nces.ed.gov/timss/idetimss/.
Nguyen, M.-H. and P. Nguyen-Van, "Optimal Endogenous Growth with Natural Resources: Theory and Evidence," *Macroeconomic Dynamics*, 20, 2173–209, 2016.
Ozawa, T., *Asia's Labor-Driven Economic Development, Flying-Geese Style: An Unprecedented Opportunity for Poor to Rise*, APEC Study Center Discussion Paper No. 40, Columbia University, 2005.
Pittau, M. G., R. Zelli and P. Johnson, "Mixture Models, Convergence Clubs, and Polarization," *The Review of Income and Wealth*, 56, 102–22, 2010.
Romer, P., "Human Capital and Growth: Theory and Evidence," *Carnegie-Rochester Conference Series on Public Policy*, 32, 251–86, 1990.
Sachs, J. and A. Warner, *Natural Resource Abundance and Economic Growth*, NBER Working Paper No. 5398, National Bureau of Economic Research, Cambridge,1995.
Schiopu, I., "Technology Adoption, Human Capital Formation, and Income Differences," *Journal of Macroeconomics*, 45, 318–35, 2015.
Solow, R., "A Contribution to the Theory of Economic Growth," *Quarterly Journal of Economics*, 70, 65–94, 1956.
Solow, R. and P. Samuelson, "Balanced Growth under Constant Returns to Scale," *Econometrica*, 21, 412–24, 1953.
Stokey, N., "Catching Up and Falling Behind," *Journal of Economic Growth*, 20, 1–36, 2015.
Swan, T. W., "Economic Growth and Capital Accumulation," *Economic Record*, 32, 334–61, 1956.
Wodon, Q. and S. Yitzhaki, "Growth and Convergence: A Social Welfare Framework," *Review of Income and Wealth*, 51, 443–54, 2005.

Supporting Information

Additional supporting information may be found in the online version of this article at the publisher's web site:

Appendix
TableA.1: Per Capita Income Quintile Classifications