



Structural Change Rediscovered: The Role of Human and Physical Capital

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Changes in economic structures are an essential feature of development. But how are these brought about? A growing body of evidence underscores the transformative role that human and physical capital can have in enhancing and sustaining economic growth. Investments in education, health, and economic infrastructure need to be at the core of national policy agendas.

Introduction

It has long been established that structural change is a key characteristic and driver of economic and social development (Kuznets 1966). However, the concept is not well understood and is notably under-researched. Structural change emphasizes the central role of productivity in the development process from a specific viewpoint: while productivity improvements within economic sectors are crucial to support economic growth, changes in economic structures are essential to ensure that those efforts can be enhanced and sustained. Much of the research to date has focused on assessing the pace and pattern of structural change across countries and regions. A few studies have attempted to uncover an even more pertinent gap in knowledge about the process: what are the key determinants of structural change and how can they be enhanced?

Neoclassical and Structuralist Perspectives on Economic Growth

The literature on economic growth has largely relied on theoretical models underpinned by an aggregate production function, such as Solow's neoclassical growth model. These one-sector models emphasize the role of economy-wide factor accumulation and productivity—as they imply strong homogeneity across economic sectors. They have provided a theoretical foundation for countless empirical studies investigating the determinants of economic growth through econometric methods and growth accounting frameworks. In particular, the seminal work of Barro (1991) on cross-country growth regressions opened a vast and prolific field of empirical research. However, several studies have shown that the empirical results tend to be sensitive to model specification, sample data, and estimation method; for example, see Levine and Renelt (1992) and Pritchett and Summers (2014). This lack of robustness might be partly due to one-sector models not accounting for the large heterogeneity across sectors that is characteristic of developing economies. The aggregation of heterogeneous sectors in cross-country growth regressions can have a considerable impact on inference, as Eberhardt and Teal (2013) demonstrate.

These critiques have contributed to a renewed interest in dual-economy models and the role of structural change in the growth process (McMillan and Heady 2014). While one-sector growth models were originally conceived with developed economies in mind, it can be argued that structural (dual-sector) models provide a better representation of developing economies. Temple (2005), for instance, asserts that dual-economy models should take center stage in the analysis of economic growth in developing countries. Recent examples include studies by Herrendorf, Rogerson, and Valentinyi (2014), who develop a multisector extension of the one-sector growth model that is consistent with the stylized facts of structural change; Duarte and Restuccia (2010), who use a general equilibrium model to investigate the role of sectoral labor productivity in explaining structural change; and Temple and Wößmann (2006), who develop empirical growth models suitable for dual economies.

These models assume the coexistence of a relatively “advanced” sector and a “lagging” sector in the economy, such as modern versus traditional, industry versus agriculture, capitalist versus subsistence, or formal versus informal (Fields 2007). More importantly, they acknowledge that productivity gaps across sectors are an important source of economic growth through the reallocation of factors of production (Lewis 1954). These gaps can be seen as allocative inefficiencies and thus opportunities to catalyze growth.

The reallocation of labor across sectors assumes particular importance in these models. Nonetheless, these employment shifts ought to be complemented by greater sectoral dynamism to ensure that sectors with above-average productivity can absorb workers without sacrificing

productivity growth. In this regard, industrial upgrading (such as through improvements in factor endowments) plays a key role in facilitating structural change; see Lin (2011) and Ju, Lin, and Wang (2015).

Structural change is important not only for boosting productivity and average incomes, but can also ensure that economic gains are equitably distributed across society—because workers in a “lagging” sector are unlikely to experience significant increases in living standards. This insight is particularly important given concerns that recent economic growth patterns have not been inclusive or sustainable. For example, Loayza and Raddatz (2010) find evidence that the composition of economic growth matters for poverty reduction, with strong contributions from unskilled labor-intensive sectors, such as agriculture, construction, and manufacturing. In sum, empirical studies focusing on structural change can provide valuable complementary insights to the mainstream economic growth literature.

Rediscovering Structural Change: Concepts and Methodologies

The early literature on structural change dates to the 1950s and 1960s. Kuznets (1957), Chenery (1960), and Chenery and Taylor (1968) uncover important stylized facts on the relationship between a country's economic structure—namely, production—and its income level. This literature posits that structural change is a key feature and driver of economic development. In fact, the historical experience of developed and emerging economies confirms that sustained economic development requires structural change.

Although there is no universally agreed definition of structural change, it is possible to categorize existing perspectives into three broad groups: (1) a very narrow (production) focus; (2) a narrow (productivity) focus; and (3) a broad (socioeconomic) focus. The first group assesses structural change merely in terms of shifts in the structure of output (see, for example, Dabla-Norris et al. 2013). Structural change happens when the economy shifts toward the production of goods and services associated with higher value added, which in turn stimulates economic growth. This usually entails a relative decline in agriculture and a concomitant increase in the share of industry and/or services. It is implicitly assumed that the market will automatically and efficiently facilitate any required reallocation of resources across sectors, including capital, labor, and land.

The second group evaluates structural change in terms of labor shifts from lower-productivity sectors to higher-productivity sectors (see, for example, McMillan, Rodrik, and Verduzco-Gallo 2014). This reallocation of labor raises workers' productivity, which helps accelerate aggregate productivity and thus economic growth. This dynamic is typically assessed by decomposing output per worker growth into “between-sector” effects (a proxy for structural change) and “within-sector” effects (labor productivity improvements within a specific sector).

While the same sectoral patterns are expected, the explicit focus is on labor productivity rather than production alone. This emphasis on labor productivity stems from the observation that changes in the structure of employment often lag shifts in production. The reallocation of labor (toward more productive sectors) is necessary for structural change to happen, but resource reallocations may not always induce structural change—especially if they occur within sectors or firms. Within-sector improvements are often achieved through enhanced skills, complementary capital, improved technology, better management practices, and resource reallocations.

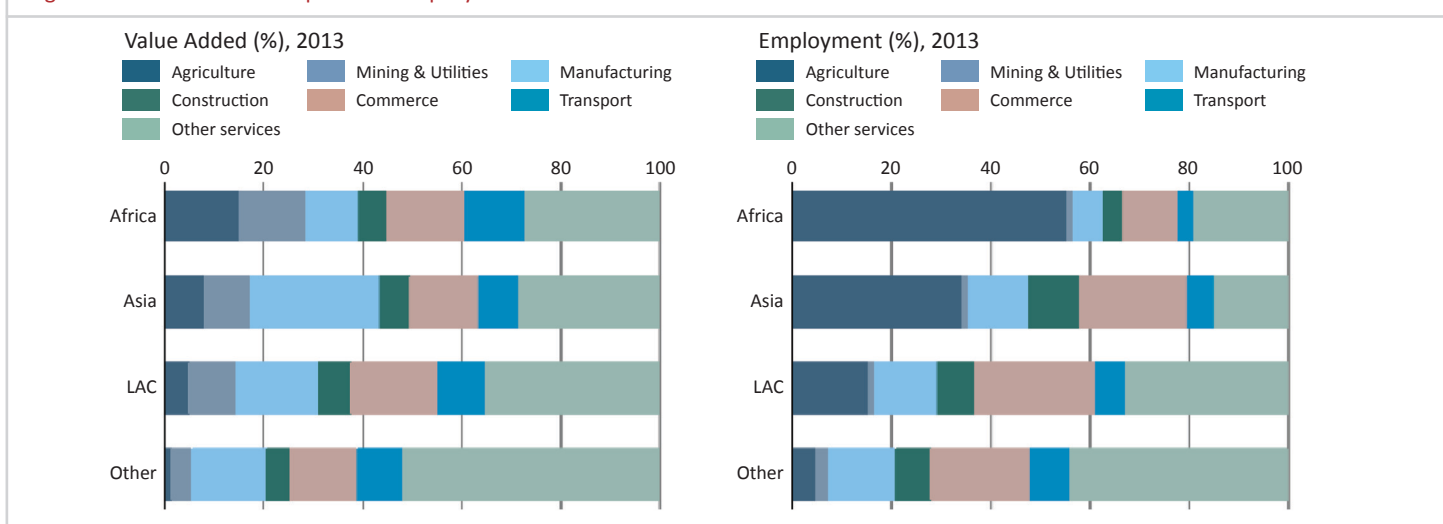
The third group goes beyond changes in the economic structure—such as production and employment—by also considering changes in other aspects of society (see, for example, Martins 2019). For instance, structural change may entail a demographic transition (through lower fertility rates), changes in

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Figure 1. Structure of Output and Employment



Source: Martins (2019).
Note: Economic sectors correspond to the following ISIC revision 3.1 sections (in parentheses): agriculture & fishing (A and B); mining & utilities (C and E); manufacturing (D); construction (F); commerce (G and H); transport (I); and other services (J–P). LAC = Latin America and the Caribbean.

labor participation (through changing social preferences), and a spatial reorganization of the population (through rural-urban migration). Some of these additional insights can be provided by decomposing output per capita growth into three components: changes in output per worker (that is, labor productivity); changes in the employment rate; and changes in the relative size of the working-age population (that is, demographic change). The first component can then be further decomposed into the traditional within-sector and between-sector productivity effects. A stepwise Shapley decomposition approach can be employed to calculate the proportion of output per capita growth that can be attributed to each of these components. For further technical details, see World Bank (2012); for a practical application, see Martins (2019).

The recent emphasis on structural change has led to a rapidly expanding body of theoretical and empirical work. Datasets have been compiled to document regional patterns, with varying degrees of sectoral disaggregation and country coverage. However, most studies have small country samples and there have been very few attempts to empirically assess the determinants of structural change in developing countries. Martins (2019) attempts to bridge this gap by constructing a comprehensive dataset comprising 169 countries and conducting an original empirical exercise on the determinants of structural change.

The Pace and Pattern of Structural Change

Economic Structure and Labor Productivity

Economic structures vary considerably across regions (Figure 1). In 2013, manufacturing contributed 26 percent of total gross value added (GVA) in Asia, but only 11 percent in Africa. Other services accounted for 52 percent of total GVA in developed countries, but less than 30 percent in Africa and Asia. The disparities are even starker regarding employment. Agriculture employed more than half of Africa's workers, but accounted for less than 5 percent of total employment in developed countries. Economic structures also vary substantially within regions. As noted in the early literature on structural change, differences in economic structure are partly responsible for the large income gaps observed across countries.

The concept of structural change is intrinsically linked to labor productivity, which is usually measured by GVA per worker. Agriculture is often found to be the sector with the lowest labor productivity level, while labor productivity gaps appear to be negatively related to income levels—as larger gaps are found in poorer regions (such as Africa). The share of employment in agriculture declined in all regions between 1991 and 2013—especially in Asia, where it dropped by 21 percentage points (Figure 2). Ideally, agricultural labor should move to sectors that have above-average (and growing) levels of labor productivity. Hence, sectors with rising employment shares should have “relative labor productivity” above zero. Between 1991 and 2013, labor shifted mainly toward other services— except for Asia, where employment moved toward construction, commerce, and also other services. Regions also shed a considerable amount of manufacturing jobs, especially developed countries. Overall, the sectors where employment is expanding the most have labor productivity levels that are similar to (or are

even below) the aggregate average, which limits the impact of labor reallocations. Since the highest-productivity sectors tend to be capital intensive and are thus less able to absorb large numbers of workers, the key for accelerating structural change might be in increasing the dynamism of manufacturing, commerce, and other services.

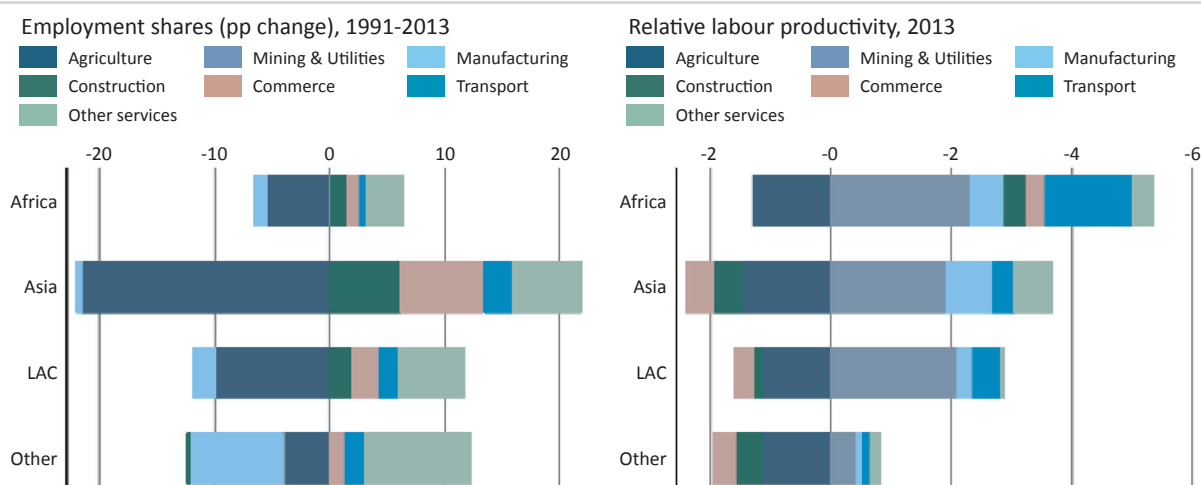
Pace of Structural Change

Most empirical studies seeking to measure the pace of structural change decompose output per worker growth into within-sector and between-sector effects; examples include McMillan, Rodrik, and Verduzco-Gallo (2014); McMillan and Harttgen (2014); Timmer, de Vries, and de Vries (2014); UNCTAD (2014); and Roncolato and Kucera (2014). Martins (2019) provides additional insights on demographic change and employment rates, as well as a subregional perspective.

Overall, the evidence suggests that within-sector productivity effects are the strongest driver of aggregate labor productivity growth. Nonetheless, the contribution of structural change is often sizeable and growing in importance. This is particularly noticeable since the early 2000s, when economic performance improved in many developing countries. For instance, Martins (2019) finds that within-sector productivity improvements played a major role in accelerating output per capita growth in most of the 13 subregions spanning the developing world that were analyzed—and was consistently larger than between-sector effects in all subregions but one (Figure 3). However, structural change was also a key contributor to the improved economic performance in several subregions, especially in Eastern and Western Africa, as well as Central, Eastern, and Southern Asia. Some studies report negative structural change for some regions—that is, labor reallocations toward a lower-productivity sector—but mostly in earlier periods. For example, McMillan, Rodrik, and Verduzco-Gallo (2014) find growth-reducing structural change in Africa and Latin America during the 1990–2005 period; McMillan and Harttgen (2014) suggest the same for Latin America in 2000–2005; as do Timmer, de Vries, and de Vries (2014) for Latin America in 1990–2010. A range of factors might explain these discrepancies, such as differences in country samples, time frames, level of sectoral aggregation, data sources, and empirical methodologies. For instance, McMillan, Rodrik, and Verduzco-Gallo (2014) include only nine countries from Africa and nine countries from Latin America when reporting negative structural change in these regions.

Changes in demographic structures were found to have a positive effect on per capita growth, while the impact of employment rates tends to vary considerably (Martins 2019). However, these two components play a relatively minor role when compared to productivity growth. Demographic trends were particularly important in Asian subregions, while employment rates were relatively more important in Latin America. The positive impact of demographic change is unlikely to be automatic because investments in skills and adequate job creation are required to seize a demographic dividend. The impact of employment rates varies considerably across countries, partly because declines may suggest an investment in future generations, as young people stay longer in education.

Figure 2. Changes in Employment and Labor Productivity Gaps



Source: Martins (2019).

Note: Relative labor productivity is calculated as the natural logarithm of the ratio of sectoral productivity to aggregate productivity. Large productivity gaps are represented by wider bar areas. If the width of a bar measures 1 unit, then the sector's productivity is 10 times higher than the average (if positive) or one-tenth of the average (if negative). "pp" stands for percentage point.

Patterns of Structural Change

In terms of sectoral dynamics, services are often identified as the main driver of economic performance and the key catalyst for structural change—especially as labor typically moves from agriculture to services. However, the services sector is highly heterogeneous; it comprises both dynamic modern activities and informal activities with limited productivity growth potential. Although many studies provide some level of disaggregation—sometimes four or five services subsectors—further scrutiny is needed. Martins (2019) finds that the share of employment in agriculture has dropped in all subregions, while the largest relative increases in employment has occurred in services. Because agriculture generally has the lowest level of labor productivity, the reallocation of workers from agriculture to other sectors leads to positive structural change—which helps boost aggregate productivity and thus economic growth. In fact, there is a clear negative relationship between agricultural employment and average incomes, both within and across regions. It also seems that the faster labor moves out of agriculture, the larger is the increase in output per capita, suggesting that accelerated economic development depends on the rate at which production resources are reallocated to more efficient uses. Despite this, raising agricultural productivity remains crucial for eradicating poverty—through structural change within the sector (see Divanbeigi, Paustian, and Loayza 2016). Moreover, manufacturing is found to have had a limited impact in enhancing structural change, even though it has provided strong contributions to within-sector productivity growth—especially in Asia. This is partly because employment in manufacturing has been declining in relative terms. The sector could play a more important role if employment and labor productivity are simultaneously increased.

Drivers of Change: Human and Physical Capital

The pace of structural change can be influenced by several plausible factors—many of which emerging from the theoretical and empirical literature mentioned earlier. Among these are countries' initial conditions. For instance, given the large productivity gaps usually observed between agriculture and other economic sectors, countries with a high share of employment in agriculture would have greater scope to benefit from employment reallocations. Moreover, resource-rich countries may have limited incentives to diversify their economic structures, especially when high demand and prices for natural resources reinforce their comparative advantage and specialization. Macroeconomic instability—measured through fiscal deficits, public debt, inflation, and current account deficits—may undermine structural change through greater economic uncertainty. Openness to international trade and a competitive real exchange rate may facilitate structural change if they lead to output and employment growth in higher-productivity sectors. High real interest rates undermine credit expansion to the private sector, which may in turn restrict production and employment growth in dynamic sectors. Given that employment plays a central role in inducing structural change, human capital is likely to be of vital importance. Workers need improved skills to gain access to higher-productivity jobs, while skills and knowledge are also key to promote

entrepreneurship, creativity, and dynamism—thus affecting both labor supply and demand. Health outcomes can also be important, since good physical health and cognitive functions are key for workers to seize better job opportunities. Physical capital can also be critical to enhance structural change, since improving basic infrastructure—such as energy, water and sanitation, transport, and telecommunications—can significantly enhance a country's competitiveness. Finally, good governance and strong institutions can provide a more conducive environment for accelerating structural change.

There are few empirical studies on the determinants of structural change, and even fewer using estimates on the labor reallocation effect as a proxy for structural change. McMillan, Rodrik, and Verduzco-Gallo (2014) do this for a relatively small cross-sectional dataset that can explain differences across countries. Their findings suggest that a higher share of employment in agriculture, a lower share of raw materials in total exports, an undervalued exchange rate, and greater labor market flexibility all contribute to growth-enhancing structural change.

Martins (2019) uses a large panel dataset that can also explain accelerations in the pace of structural change—that is, changes within countries. The study uses principal components analysis (PCA) to isolate common elements in highly correlated determinants and a panel fixed-effects estimator to improve robustness. The findings provide strong evidence of the key role of human and physical capital—namely, education and infrastructure—in enhancing structural change. As expected, the initial share of employment in agriculture is positively related to structural change, given the greater scope to benefit from productivity gaps.

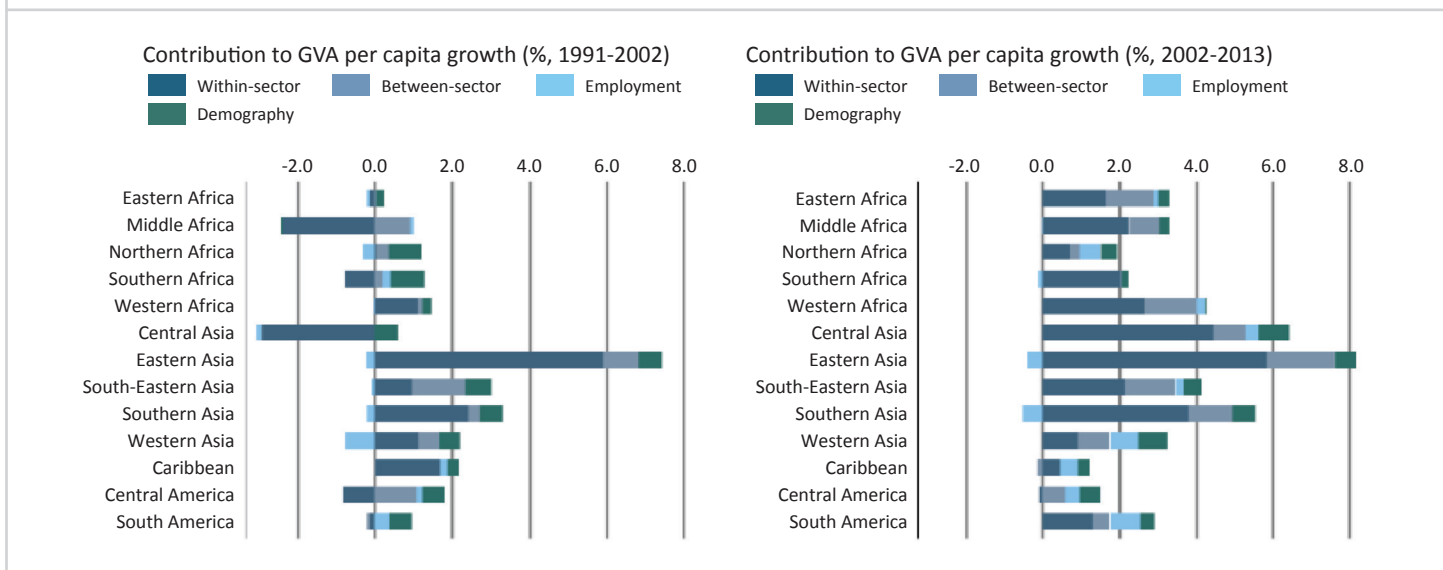
In addition, regional estimates provide further insights. For instance, the expansion of secondary education appears to be relevant in Africa, while tertiary education is pertinent in Asia and Latin America, which is not surprising given current levels of educational achievement. The share of mining in total output has a negative impact on Africa's structural change. Moreover, the exchange rate seems to matter in Latin America and the political regime in developed countries. Dabla-Norris et al. (2013) investigate the determinants of sectoral output shares in agriculture, manufacturing, and services, rather than structural change as measured by the employment reallocation effect. However, the authors also conclude that human and physical capital are important for structural change, in addition to a set of initial conditions such as natural resource dominance.

Overall, these findings complement the existing evidence on the broader link between productivity and economic growth, such as Kim, Loayza, and Meza-Cuadra (2016). Loayza (2016) also shows that capital accumulation contributes to structural change—in this case, defined as a shift from informality to formality.

Policy Implications

McMillan, Rodrik, and Sepúlveda (2017) posit that neoclassical and dual-economy models offer complementary perspectives on economic

Figure 3. Contribution to Output per capita Growth



Source: Martins 2019.
Note: Results from Shapley decompositions. Countries are grouped according to the United Nations (UN) regional classification.

growth: with neoclassical models explaining the growth process within modern sectors, mainly through broad-based physical and human capital accumulation, and dual-economy models explaining relationships and flows across sectors, through policies that ensure that resources flow to modern higher-productivity activities. McMillan, Rodrik, and Sepúlveda (2017) also claim that it is possible to have rapid structural change without significant improvements in the “fundamentals”—defined as infrastructure, education, and institutions.

However, there is growing evidence to suggest that physical and human capital also play an important part in promoting structural change. Stronger investments in education, health, and economic infrastructure can thus facilitate (growth-enhancing) labor reallocations, which is key to long-term economic and social progress. Overall, this supports the growing emphasis that is being placed on human capital, such as through the recently launched Human Capital Project (HCP). Announced in 2017 by the World Bank Group, the HCP is a program of advocacy, measurement, and analytical work to raise public awareness and accelerate (more and better) investments in people for greater equity and economic growth.

History suggests that governments have played an important role in facilitating structural change, and analytical frameworks have been developed to identify sectors with latent comparative advantage (Lin and Monga 2010). Whether broad-based improvements in human and physical capitals are less (or more) important than targeted measures is difficult to assess. Sector-specific policies are not easily captured, and even if they were, the sectors being targeted often vary from country to country. It is plausible that the unexplained variation in structural change within countries could be accounted by (unobserved) sector-specific interventions.

In sum, there is still much scope for accelerating structural change. Labor productivity gaps and employment shares in agriculture remain high in several parts of the world. While the past two decades have been unquestionably positive for developing countries, it is vital to improve the pace of structural change to fully seize its benefits. The key message emerging from recent research is that investments in education and economic infrastructure are critical to accelerating structural change—and thus aggregate productivity. Hence, the policy recommendations arising from both neoclassical and dual-economy models may not be as different as one may expect.

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