Contents lists available at ScienceDirect

Journal of Asian Economics

JOURNAL OF
Asian
Economics

Human capital, technological progress and trade: What explains India's long run growth?

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ARTICLE INFO

ABSTRACT

Using data for the period 1950–2010, this paper seeks to explain the importance of human capital, technological progress, and trade in determining India's long run growth. This paper uses an improved growth accounting framework and ARDL-based co-integration techniques to identify the factors that drive long run productivity growth. The results suggest that both domestic technology capability building and foreign technology spillovers are important forces in determining India's long run growth. Human capital has turned out to be the most important factor. Trade plays a facilitating role by making available frontier technology in an embodied form from the rest-of-the-world. Although the analysis does not explicitly test any endogenous growth models, our findings are consistent with the recent endogenous growth literature.

1. Introduction

India has been experiencing a rising GDP growth since the last quarter of the twentieth century and, according to some predictions,[1] the prospect of the economy is optimistic, with growth expected at an average of 7% in the first quarter of this new century. This follows a quantum rise in India's GDP growth during the 1980s and its sustenance in the period thereafter.[2] By the end of the twentieth century, India had emerged as one of the fastest growing economies globally, particularly after the 1990s (Ahmed & Varshney, 2012). While such improvements in growth performance are often explained in terms of wide-ranging reforms undertaken during this period, there are debates regarding the timing of the trend breaks in India's growth performance.

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[1] See, for instance, Rodrik and Subramanian (2004).

[2] See Kotwal, Ramaswami, and Wadhwa (2011) for an exhaustive survey on India's overall growth transition. While Wallack (2003) finds a break in trend in 1980, later studies (including Balakrishnan and Parameswaran (2007a, 2007b)) using a formal econometric test show a rising trend in GDP since 1979/80 and a further rise in the average growth rate since 1991. Rodrik and Subramanian (2005) support the evidence of growth acceleration since 1980, while Ghate and Wright (2012) provide evidence on growth turnaround in mid-1980s.

In favour of economic policy changes bringing about a growth turnaround, Panagariya (2004) and Ahmed and Varshney (2012) argue that the reforms undertaken in the 1990s led to India's dramatic growth performance in the new century.[3] On the contrary, De Long (2003), Kohli (2006), Ahluwalia (2008), and Ghate and Wright (2012) demonstrate that the policies introduced in the 1980s are more noteworthy for causing changes in India's growth performance.[4] Similarly, Sinha and Tejani (2004) mark 1980–81 as the breakpoint, which they demonstrate as mainly due to advancements in labour productivity growth supported by import of technology-embodied capital goods. On the other hand, Sen (2007) argues that the main reasons for India's growth turnaround are not changes in the state's attitudes towards private businesses in the 1980s or 1990s; instead, the growth is related to policy changes during late 1970s, which include financial deepening, rise in public investment, and a fall in the relative price of equipment. Finally, Hatekar and Dongre (2005), and Nayyar (2006) argue that neither 1980s nor 1990s reforms are significant for changing India's growth path, compared with early 1950s. They argue that it is not that the period following 1950s demonstrates exceptional growth, but that poor performance before 1950 creates a clear demarcation between the periods before and after India's independence.

While acknowledging this debate surrounding the exact date of a growth turnaround in the post-independence era, the main focus of this paper is to explore the plausible factors underlying India's economic growth in the long run. We do not provide evidence on the timing of the turnaround, which is already much debated in previous literature. Instead, we adopt a growth accounting framework to investigate the factors that underlie India's long run growth performance. In particular, we show that domestic internal capability-building factors, such as human capital and domestic innovative activity, are critical for explaining India's productivity growth and growth in per capita income. Once the threshold domestic capability to absorb foreign technology is built, the effects of technology import through trade become important for sustaining higher productivity growth in the long run.

Human capital and technological progress are two key inputs in all endogenous growth models (see Aghion & Howitt, 2009). The initial cohort of endogenous growth models, popularly known as AK models (Rebelo, 1991), considers the level of technology and capital in the broad sense, accounting for human capital to arrive at equilibrium growth.[5] Human capital is accumulated through either voluntary resource investment to acquire skills or through learning-by-doing (Lucas, 1988). In these models, knowledge produced through learning-by-doing or public research is instantaneously diffused and there is an absence of diminishing returns to capital. Galor and Weil (2000), and Galor and Moav (2004) use a unified growth theory to argue that the returns to human capital in initial industrialization phases increases to such an extent that it gives parents a strong incentive to care for the education of their off-spring. With sustained income growth, the replacement of physical capital accumulation by human capital accumulation can act as a prime engine of growth. Empirical evidence shows human capital to be a significant factor determining growth across a range of countries or explaining cross-country productivity differences (Ang, Madsen, & Islam, 2011; Barro, 1991, 2013; Goldin, 2001; Madsen, Islam, & Ang, 2010).[6]

While human capital directly increases labour efficiency, technological progress affects productivity growth both directly and indirectly. The R&D based growth models assume that returns to R&D take form of monopoly rents in imperfectly competitive product markets. This literature adopts two approaches to product innovation, depending on whether the innovative product bears a vertical or a horizontal relationship to existing products. As the literature shows,[7] innovation leads to an increase in either product variety or product quality. More recent R&D-based endogenous growth models, such as the Schumpeterian growth theory (Aghion & Howitt, 1998; Dinopoulos & Thompson, 1998; Howitt, 1999; Peretto, 1998; Peretto & Smulders, 2002), demonstrate the importance of continuous rise in level of research intensity in the economy for sustainable growth over time.[8] As these models assume, R&D activity requires the existence of human capital and a stock of scientific knowledge. The non-appropriable benefits from R&D add to the existing stock of knowledge and, thereby, sustain economic growth. Thus, technological progress is generated through firm-level investment in R&D (Aghion & Howitt, 1992; Grossman & Helpman, 1991a, 1991b; Romer, 1990a, 1990b) and externalities develop through the non-rival character of knowledge and related technology spillovers.[9]

The aforementioned endogenous growth literature often postulates that trade facilitates firms' R&D investment in several ways, including import competition, export, technology import, and trade-related technology spillovers. The literature

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[3] See Kotwal et al. (2011) for an exhaustive survey on India's overall growth transition. While Wallack (2003) finds a break in trend in 1980, later studies (including Balakrishnan and Parameswaran (2007a, 2007b)) using a formal econometric test show a rising trend in GDP since 1979/80 and a further rise in the average growth rate since 1991. Rodrik and Subramanian (2005) support the evidence of growth acceleration since 1980, while Ghate and Wright (2012) provide evidence on growth turnaround in mid-1980s.

[4] In sharp contrast to exclusive supply side explanations, Nell (2013) provides evidence on demand-side factors explaining higher growth in the 1980s and 1990s.

[5] Kohli (2006) argues that the Indira Gandhi government augmented the growth process by shifting political economy towards state and business alliance. Ghate and Wright (2012) state that the Indian growth turnaround in the mid-1980s is due to a common "V-factor" over time, suggesting it to strongly correlate with a common cause, such as trade liberalisation. On the contrary, Hausmann, Pritchett, and Rodrik (2005) use a cross-country study to show that a vast majority of growth acceleration episodes are not produced by standard determinants, such as investment, trade, and instances of economic reforms. Basu and Maertens (2007) show the importance of political economy, institution, and other microeconomic factors, along with macroeconomic factors for determining India's growth.

[6] An elaborate discussion of these models is available in Barro and Sala-I-Martin (1995).

[7] Bils and Klenow (2000) provide nuanced cross-country evidence on schooling and economic growth.

[8] See Grossman and Helpman (1991a).

[9] Empirical studies in this genre include Ha and Howitt (2007), Madsen, Saxena, et al. (2010), Ang and Madsen (2011), Madsen (2008), Madsen, Ang, et al. (2010), Banerjee (2012), and Ang, Banerjee, and Madsen (2013).