

# Youth dependency and total factor productivity

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## Abstract

Recent literature shows empirical support for an effect of demographic age structure on economic growth. This literature does not give attention to the possibility that age structure might also have an effect on total factor productivity. Much of the recent literature on economic growth has stressed that an understanding of cross-country differences in output per worker is needed. That literature argues that the most important determinant of international differences in output per worker is differences in total factor productivity. This paper finds empirical evidence in cross-country data for the thesis that the youth dependency ratio (the population below working age divided by the population of working age) reduces ‘residual’ growth, which measures total factor productivity growth. For this reason, the paper demonstrates that age structure has an effect on the most important determinant of international differences in output per worker.

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## 1. Introduction

Using cross-country regressions, [Mankiw et al. \(1992\)](#) find that the neoclassical growth model, when augmented by human capital accumulation, explains 78% of the differences among global outputs per worker. Meanwhile, [Young \(1995\)](#) uses growth accounting calculations to determine that input accumulation accounts for most of the East Asian growth miracle. However, there has been recent opposition to these findings. Many believe

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that input accumulation cannot explain the majority of cross-country differences of output per worker. In this thesis, the level of the ‘residual’ and therefore total factor productivity (TFP) must account for the differences. A ‘residual’ represents the part of international output differences that input cannot explain.<sup>1</sup>

Prescott (1998) calibrates variants of the neoclassical growth model and shows that no form of capital (physical, human, or intangible) can account for most income differences within the world economy. He concludes that TFP must account for these differences and argues the need for further theorizing on this phenomenon. Hall and Jones (1999) and Klenow and Rodriguez-Clare (1997) both apply recent development accounting methods to global data. Their findings are consistent with Prescott’s that differences among the levels of the ‘residual’ accounts for most of the variation in output per worker by country.

Also consistent with recent literature, Hendricks (2002) shows that only a model wherein cross-country income differences are due to differences in TFP can explain the large gains in earnings observed for immigrants in the United States. Hsieh (2002) recently questioned Young’s theory that factor accumulation accounts for most of the East Asian growth miracle (Young, 1995). Hsieh argues that national account statistics (which Young uses) lead to substantial underestimation of TFP growth for East Asia countries, particularly for Singapore. Hsieh instead uses factor prices and finds a much larger contribution of TFP growth to East Asian growth.<sup>2</sup>

A demographic transition accompanied economic growth in East Asia. Following World War II, diffusion of international advances in health care enabled a rise in Asian health standards, including a dramatic reduction in infant mortality (Bloom and Williamson, 1998). A time difference between the reduction in infant mortality and an associated reduction in fertility meant that the age structure of the population underwent a transition. Until the mid-1960s, the growth rate of the total population exceeded the growth rate of the population of working age. Since the mid-1970s, the growth rate of the total population was lower than the growth rate of the working age population (Bloom and Williamson label this latter phase a ‘demographic gift’ phase). The ‘demographic gift’ phase coincides significantly with the rise in economic growth throughout East Asia. Bloom and Williamson (1998) and Bloom et al. (2001) argue that the ‘demographic gift’ was a major contributing factor to this East Asian economic growth miracle.

According to this view, the ‘demographic gift’ leads to opportunities for growth of output per capita for two reasons. First, there is an accounting effect because a rising ratio of the working age population to the total population increases the ratio of ‘producers’ to ‘consumers’ in an economy. Obviously, this contributes positively to growth of output per capita. Second, there might also be ‘behavioral’ effects on growth of output per worker. Bloom and Williamson stress that, on the one hand, a rising labor force leads to capital dilution, i.e., a reduction of the capital–labor ratio. On the other hand, a rising ratio of the working age population to the total population implies a falling dependency ratio (the population below and above working age divided by the population of working age). In turn, a falling dependency ratio allows the working age population to save a larger

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<sup>1</sup> For a demonstration within a single country, see Solow (1957).

<sup>2</sup> However, Young (1998) defended himself imputing Hsieh’s results (in the working paper version of Hsieh, 2002) to computational and methodological shortcomings.

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