



# Population dynamics and economic growth in China



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## ABSTRACT

This paper focuses on two major elements of China's population dynamics—the rising proportion of workers in the population and the shift of rural workers from agriculture into industry and services—in a provincial-level analysis of per capita income and productivity growth during the last three decades. We measure the ‘mechanical’ contributions of these dynamics to per capita income as revealed by growth decompositions, before assessing the determinants of per capita income and productivity growth in a series of regressions that include the growth of the working-age to total population (WAP) ratio and a measure of sectoral employment change. Our results indicate that sectoral change has made a significant positive contribution to both per capita income growth and aggregate productivity growth, stemming from its positive impact on agricultural productivity growth—as predicted by the Lewisian dual economy model. However, the negative impact of sectoral change on productivity growth in the industrial and service sectors, combined with the negative impact of growth of the WAP ratio on both per capita income and aggregate productivity growth, suggests that the benefits of China's population dynamics during the last three decades have been overstated.

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## 1. Introduction

There is now widespread recognition that demographic change can have a profound and positive impact on economic growth, during the period in which declining mortality and fertility rates underpin a rising share of the working-age population and hence a boost to per capita income growth, known as a ‘demographic dividend’ (Asian Development Bank, 2011; Bloom & Williamson, 1998; Coale & Hoover, 1958). Nowhere has this seemed clearer than in China, where a dramatic demographic transition has coincided with equally dramatic economic reforms and rapid economic growth. Estimates of the contribution of China's demographic dividend to per capita GDP growth between the early 1980s and early 2000s lie in the range of one-sixth to one-quarter, which is by no means negligible (Bloom et al., 2010; Cai & Wang, 2005; Wang & Mason, 2007; Wei & Hao, 2010). As China now finds itself in the challenging position of ‘getting old before getting rich’—with the share of the working-age population entering into a phase of decline—a clear answer to the question of how the country's changing age structure impacts on its economic performance has become all the more pressing.

An alternative line of enquiry focuses not on the changing age structure of China's population, but on the changing composition of employment, highlighting the growth impetus provided by the large-scale movement of surplus labour from agriculture to industry, as depicted by the well-known Lewis (1954) dual economy model (Gong, Kong, Li & Meng, 2008; Islam & Yokota, 2008; Minami & Ma, 2010). This Lewisian story also resonates clearly with China's growth experience during the last three decades, with numerous studies

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demonstrating that sectoral employment change has made sizeable contributions to per capita income and aggregate productivity growth (Bosworth & Collins, 2008; Ding & Knight, 2012; Ercolani & Wei, 2011). As the Chinese government embarks on its National New-type Urbanisation Plan 2014–2020 that aims to significantly raise the number of Chinese people living and working in urban areas, understanding how changes in sectoral employment impact on productivity growth has become equally pressing.

Given the (presumed) importance of these population dynamics for China's past and future economic growth, it is surprising that so little research has examined them in combination. In particular, none of the provincial-level econometric studies focusing on the impact of growth in the working-age share of the population on per capita income growth have included changes in sectoral employment in the set of independent variables (for examples, see Cai & Wang, 2005; Wei & Hao, 2010). Meanwhile, studies on sectoral change have tended to use national-level growth decompositions that overlook the changing age structure of the population (such as Bosworth & Collins, 2008; Kuijs & Wang, 2006). In the only example of a provincial-level econometric study that focuses on sectoral change as a key (and highly significant) variable, the age structure of the population is likewise excluded (Ding & Knight, 2012).

To our knowledge, Bloom et al. (2010) is the only study to simultaneously examine the impact of both the rising share of the working-age in the total population and the reallocation of labour out of agriculture on China's (and India's) per capita income growth, using national-level data for both growth decompositions and regression analysis. Their growth decompositions for China indicate that the growth of the working-age to total population (*WAP*) ratio and the reallocation of workers across sectors accounted for 7.4 and 16.0%, respectively, of per capita GDP growth over the period 1980 to 2000.<sup>2</sup> However, in their (cross-country) regressions, they find the growth of the *WAP* ratio to be an insignificant determinant of per capita GDP growth, while the coefficient on sectoral change is significant and positive but of a magnitude that implies a negligible contribution to economic growth over the same period of analysis. These findings lie in stark contrast with the mainstream views about the large and positive impacts that China's changing age and sectoral employment structures have had on its growth performance to date.

Against this backdrop, this paper examines these two major elements of China's population dynamics in a provincial-level analysis of per capita income and productivity growth during the last three decades. Following the method of Bloom et al. (2010), we first decompose provincial growth of per capita GDP between 1980 and 2010 into productivity growth (output per worker), growth of the *WAP* ratio and growth in labour force participation (labour force divided by the working-aged population). We further decompose productivity growth into its within-sector (agriculture, industry and services) and cross-sector components to assess the contribution of sectoral changes in employment.

While providing a useful starting point, growth decompositions are essentially *mechanical*, leaving many questions unanswered regarding the channels through which age and employment structures impact on long-run economic performance. To move beyond these mechanical impacts, we turn to regression analysis. In particular, we build on the work of Kelley and Schmidt (2005), who develop a flexible framework for modelling the impact of population dynamics on economic growth that includes an 'enriched' set of demography variables in a series of per capita income and productivity growth regressions—namely, dependency levels, population size and population density. We take their analysis to an even deeper level by separately analysing the determinants of productivity growth in the agriculture, industry and service sectors (as well as in aggregate), and by including a measure of sectoral employment change in our analysis.

Our results indicate that sectoral change has made a positive contribution to China's growth performance, both in a 'mechanical' sense—accounting for 18.7% of national-level per capita GDP growth over the period 1980–2010—and as a highly significant variable in the per capita income and aggregate productivity growth regressions. This latter finding can be attributed to the highly significant and positive impact of sectoral change on agricultural productivity growth, consistent with the predictions of the Lewisian dual economy model. However, its significant *negative* impact on industrial productivity growth—China's dominant source of productivity growth through the period under analysis—combined with its significant *negative* impact on service sector productivity growth suggests that the growth benefits of sectoral change may have been overstated. Similarly, while growth in the *WAP* share has contributed positively to China's growth in a mechanical sense—accounting for 8.6% of per capita GDP growth between 1980 and 2010—its highly significant and *negative* coefficient in the per capita income and aggregate productivity growth regressions indicates that China's 'demographic dividend' may also have been exaggerated in the past.

## 2. Rationale

The first variable for consideration in any kind of analysis linking population dynamics and economic performance is population growth itself. The idea that a slowdown in the rate of population growth provides a boost to rates of per capita income growth dates back to Thomas Malthus's classic *An essay on the principle of population*, first published in 1798. This population pessimism is incorporated into the standard neoclassical growth model, in which slower population growth raises capital per worker and hence increases per capita income growth or, more accurately, slower labour force growth raises capital per worker and hence increases growth of output per worker (since the model also assumes that all of the population is gainfully employed).<sup>3</sup>

In reality, however, the labour force makes up a fraction of the total population that changes over time, impacted by fertility, mortality and labour force participation rates. In particular, a decline in population growth triggered by declining mortality rates and subsequent fertility decline initiates a 'demographic transition' in which youth dependency falls and the proportion of the working-age population rises. This provides a boost to the standard neoclassical impact of slower population growth on per capita

<sup>2</sup> See Bloom et al. (2010), Tables 1 and 4.

<sup>3</sup> See Solow (1956) and Swan (1956) for details. For a detailed discussion of this population pessimism in the case of China and India, see Golley and Tyers (2012a,b).

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