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Demographic age structure and economic development: Evidence from Chinese provinces

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ABSTRACT

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In this paper, we examine the economic implications of demographic age structure in the context of regional development in China. We extend the development accounting framework by incorporating age structure and apply it to a panel data set of 28 Chinese provinces. We find that changes in age structure, as reflected by shifts in both the size and internal demographic composition of the working-age population, are significantly correlated with provincial economic growth rates. During our study period 1990–2005, the evolution of age structure accounts for nearly one-fifth of the growth in GDP per capita, of which more than half is attributable to shifts in the internal demographic composition of the working-age population. Differences in age structure across provinces also explain more than one-eighth of the persistent inter-provincial income inequality. *Journal of Comparative Economics* **xxx** (xx) (2014) xxx–xxx. Center for Labor Economics and Public Policy and School of Public Affairs, Zhejiang University, China; Department of Economics, The Chinese University of Hong Kong, Hong Kong.

1. Introduction

The role of population demographics in economic development is one of the oldest themes in economics, dating back to Thomas Malthus's Essay on the Principle of Population (1798). Early demographic–economic literature highlights the role of population growth in economic development. On the theoretical front, there are contentious debates over the role of population growth in economic development.[1] On the empirical side, however, more often than not, research has failed to find a significant association between population growth and the pace of economic growth (e.g., Kelly, 1988; Temple, 1999). The lack of a conclusion in the early empirical literature is due in part to its exclusive focus on population growth and common neglect of the underlying demographic components of population dynamics, the critical dimension of which is changes in age structure. Since World War II, almost every country in the world has been undergoing a demographic transition from high to low rates of mortality and fertility (Lee, 2003). The radical changes in age structure accompanying this demographic transition can affect

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[1] Pessimists (e.g., Coale and Hoover, 1958; Forrester, 1971; Meadows et al., 1972) argue that rapid population growth hinders economic development as it exerts unsustainable pressure on capital accumulation, food production, natural resources, and the environment, whereas optimists (e.g., Boserup, 1965; Simon, 1981) see it as a stimulus to technological and institutional innovation that, accordingly, boosts rather than hinders economic growth.

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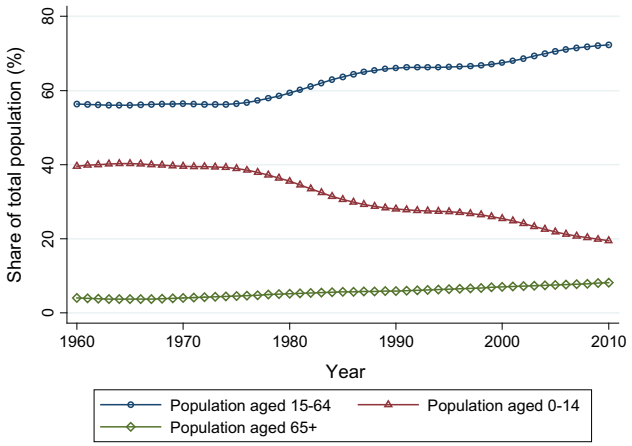

Fig. 1. Population share by age group, 1960–2010. *Source:* World Development Indicators 2012 (World Bank, 2012).

output per capita for several reasons. First, a per capita change in the number of working-age (15–64 years) individuals has an accounting effect on output per capita, as it translates output from per-worker into per-capita terms (Kelly and Schmidt, 2005). Second, as people's human capital, productivity, labor force participation, savings, and consumption are all inherently age-specific, changes in age structure can also affect output per capita through age-specific variations in productivity and behavior (Bloom et al., 2003). Third, the age structure of the workforce may have an effect on the upgrading of industry in an economy through its correlation with industry-specific human capital, and thus affect average worker productivity (Han and Suen, 2011).

Since the late 1990s, a body of empirical literature examining the connection between age structure and economic growth has emerged. One strand of this literature incorporates demographic variables into the convergence growth model (e.g. Barro, 1991; Barro and Sala-i-Martin, 2004) to assess the effects of demographic transition on economic growth. For example, Bloom and Williamson (1998) examine the connection between demographic transition and East Asia's economic miracle during the period 1965–1990 and find that the region's spectacular demographic transition – with the working-age population growing persistently faster than the overall population – can explain about one-third of its growth miracle.[2] The other strand of the literature examines the demographic–economic relationship under the accounting framework and highlights the influences of age structure on different determinants of productivity. For example, in a cross-country study adopting the accounting framework, Kögel (2005) finds the youth dependency ratio to have a negative effect on total factor productivity (TFP) and thus to be detrimental to economic growth.

However, despite the important role that age structure plays in the process of economic development, the majority of the empirical work has focused exclusively on the imbalanced growth between the dependent and working-age population or on changes in the dependency ratio, whereas the internal demographic composition of the working-age population has been relatively neglected. Lindh and Malmberg (1999), Feyrer (2007), and Gómez and Hernánadez de Cos (2008) are a few notable exceptions that give attention to the link between changes in the composition of the working-age population and economic growth.[3] Lindh and Malmberg (1999) examine the effects of age structure on economic growth in the OECD during the period 1950–1990 and find a positive correlation between the initial share of the upper middle-aged group (50–64 years) and the growth rate in the subsequent period.[4] Using a large panel of 87 countries, Feyrer (2007) also finds a strong and significant correlation between changes in workforce age structure and growth in worker productivity, with movement into the 40–49 age group from any other age group being associated with higher worker productivity. Unlike the detailed age group breakdowns used in the two earlier studies, Gómez and Hernánadez de Cos (2008) employ only two demographic variables to measure demographic maturity – the ratio of the working age to the total population and the ratio of the prime age (35–54 years) to the working age – and show that demographic maturation has contributed to nearly half of the evolution in global GDP per capita since 1960.

China's demographic transition over the past three decades has probably been the most pronounced in the world because of its distinct family planning policy (or the so called "One-Child Policy").[5] Fig. 1 illustrates the evolution in the country's proportion of youth (0–14 years), working-age (15–64 years), and elderly (65+ years) population from 1960 to 2010. After remaining stable for nearly two decades, the share of the working-age population began to rise steadily from 0.578 in 1978 to 0.728 in 2010, leading to a concomitant decline in the total dependency ratio,[6] which fell from 72.4 to the historic low of 38.2 over the

[2] See also Bloom et al. (2000), Bloom and Finlay (2009), and Macunovich (2012).

[3] More recently, researchers have extended the line of investigation to examine the effect of age structure on business cycle volatility. Jaimovich and Siu (2009) first connect age structure to the magnitude of the business cycle using a panel data of G7 countries and find a large proportion of youth workers to be associated with periods of greater cyclical volatility. He et al. (2011) and Lugauer (2012) present similar evidence using a panel of Chinese provinces and US states, respectively.

[4] Lindh and Malmberg (2009) extend the investigation to a longer time series from 1950 to 2004 and reconfirm the positive effects of the 50–64 age group.

[5] The total fertility rate in China decreased from 2.91 in 1978 to 1.60 in 2010 (World Bank, 2012).

[6] The total dependency ratio is defined as the number of dependent population younger than 15 or older than 64 per 100 working-age persons.

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