Demographic situation in China: Convergence or divergence?

Irina Kalabikhina[*]**,**
Department of Population, Lomonosov Moscow State University (Russia)

Ekaterina Shatalova,
Data & Analytics Department, LLC Lamoda (Russia)

Lieming Fang,
Shandong Youth University of Political Science (Jinan, China)

Abstract

The purpose of this study is to locate the presence of convergence in the demographic development of Chinese provinces during the end of the demographic transition at the turn of the millennium. We have estimated sigma and beta convergence in fertility, mortality, urbanization, and population ageing basing on the official Chinese statistics for 31 provinces of China. Our results show that the regional convergence in the above indicators has not been sustainable. It was observed only in certain periods, except for the urbanization process. Convergence was accompanied by a catching-up effect in such periods when "lagging" provinces were passing the demographic transition relatively quickly. The paper can serve as a contribution to the regional demographic and economic policy of China, since the issue of the dynamics of the regional demographic development differentiation is the basis for demographic and economic projections and development of local policy measures. The demographic divergence that we discovered in the last decade can determine an obstacle to the sustainable development of the country in the near future.

Keywords: China, China's regions, demography, convergence, fertility, mortality, urbanization, ageing.

JEL: J11, J13, R12, Y10.

1. Introduction

China has demonstrated a significant differentiation in regional demographic indicators. The differences decreased from the mid-1990s to the late 2000s, then they grew again in

---
* E-mail of the corresponding author: ikalabikhina@yandex.ru

the second decade of the new millennium. For example, maximum value of life expectancy at birth in the provinces exceeded its minimum value 1.23 times in 1995, 1.18 times in 2010 and 1,29 times in 2015. These differences for old dependency ratio were 3.05 (1995), 1.88 (2005) and 2.82 (2018) times.

The purpose of this study is to locate the presence of convergence in the demographic development of Chinese provinces during the end of the demographic transition at the turn of the millennium. We intend to answer the following questions. Was there regional demographic convergence in fertility and mortality in China at the end of the demographic transition at the turn of the millennium? Have the provinces of China become closer in the process of urbanization? Was there convergence in such an important consequence of the demographic transition as population ageing? Was it stable in any processes? Was the convergence of the demographic situation in the provinces of China accompanied by a catching-up effect when "lagging" regions moved faster along the path of demographic transition in the process of convergence with "advanced" regions? If the answers to our questions are negative, and if in the final stage of the demographic transition we still maintain (or increase?) differences, it seems to us that population projections will take into account the slowdown of changes, and population policies will contain a regional component to support sustainable development of the country.

2. Literature review

Extensive literature on convergence in economic development, from the so-called "convergence clubs" according to the Solow model (Solow, 1956) to modern works (Barro & Sala-i-Martin, 1995; Tomljanovich & Vogelsang, 2002), attracted attention of demographers who began to study the issues of convergence in fertility (Dorius, 2008), mortality (Vallin & Meslé, 2004), health (Loi & Hale, 2019), and marriage (Stankuniene et al., 2009) in relation to regional groupings and individual countries.

Convergence analysis is intrinsically integrated into demographic works, since the idea of convergence is embedded in most theories of demographic transitions (Coleman, 2002; Korotayev et al., 2015), from the demographic transition theory (Landry, 1987) to epidemiological transition (Omran, 1971). Demographic variations in development have always been of interest to the authors of articles on demographic trends. Watkins (1990), for instance, pointed at an increase in demographic homogeneity within countries during the 19th and 20th centuries.

The authors show that periods of convergence of fertility are often replaced by periods of divergence or stability (Franklin, 2003; Lanzieri, 2010), and convergence of mortality prevails (Vallin & Meslé, 2004; Corazziari et al., 2014). However, as far as fertility is concerned, its rate of convergence may overtake the rate of convergence in mortality (Wilson, 2011).

Studies are conducted both at the level of regional associations (from formal associations like EU countries (Lanzieri, 2010) and informal associations in terms of development,

pace of economic growth, or socio-economic type (Wilson, 2011; Corazziari et al., 2014) to individual countries (Tomka, 2002; Franklin, 2003)). Some works emphasize strengthening of the demographic convergence within associations and the divergence between them.

Economic convergence in China is also taking place within specific "clubs". The study of industrial and agricultural "clubs" of China (Pääkkönen, 2012) led to the conclusion of convergence with positive consequences within the framework of the industrial club and lack of convergence within and beyond the agricultural club.

In this article we pay attention to the demographic convergence of China.

3. Data and methods

We use official demographic data for 31 provinces of China, data from the World Bank, and some literature sources. In most cases, the period of reviewing the dynamics of the indicators is 1995–2010, but in some cases, we have information on the provinces of China from 1975 to 2018 (due to limited access to long-term regional population data for all the indicators we are interested in, for example, the total fertility rate for provinces is not publicly available after 2010). The article proposes an attempt to look at the dynamics of regional differentiation of demographic development, focusing on the period when the demographic transition in China has entered its final stage, changes in fertility and mortality have become slow, and the issue of convergence has attracted more attention.

We review the regional convergence in the main processes that characterize the demographic transition (that is fertility and mortality of the population); that accompany the demographic transition or are one of its causes (i.e., urbanization); and the inevitable consequence of the demographic transition — the process of population ageing.

The logic of presenting the material is as follows. According to these indicators in the World Bank data set, we analyze the national dynamics from the 1960s to the present. Next, basing on China's official statistics, we consider the regional differentiation of indicators at two points: in the 1990s and in the 2010s. Mapping of these variables clearly demonstrates the demographic "Balkanization" of China (see also the Appendix on additional maps on regional differentiation of the economy and demography of China's provinces). Then we estimate the sigma and beta convergence in indicators of demographic development.

The approach of sigma (σ) and beta (β) convergence (Barro & Sala-i-Martin, 1995; Sala-i-Martin, 1996; Lanzieri, 2010) is used to study changes in the level of regional differentiation of separate demographic indicators and its dynamics. The presence of sigma-convergence of demographic indicators between regions is expressed in a decrease in dispersion, coefficient of variation or other statistical measures of variation. Sigma-convergence is observed if the values of these figures in the previous selected period are higher than in the current one. We took the change in the coefficient of variation as a measure of sigma-convergence:

$$V = \frac{\sigma}{\bar{x}}, \tag{1}$$

where σ is the average variation of a random variable, and $\bar{x}$ is its mean value.

It shows the share of the average variation of the random variable from its mean value, expressed in percentage. Since it does not depend on dimension and scale, it is convenient to use it when simultaneously studying different demographic indicators. A coefficient of variation over 33% indicates heterogeneity.

Beta-convergence studies the catching-up effect and suggests convergence between regions as a result of differences in the average growth rate. It checks for a negative correlation between the growth rate and the initial level of demographic development of the regions. At the end of the demographic transition, demographic processes in the most "advanced" regions are slower, and the "lagging" regions catch up with them at a higher rate of change. We use the Barro regression for empirical verification of absolute beta-convergence of a certain process:

$$\frac{1}{T}\left(ln\frac{F_{i,t+T}}{F_{i,t}}\right) = a + b * \ln F_{i,t} + \varepsilon_{i,t}, \tag{2}$$

where $\frac{1}{T}\left(ln\frac{F_{i,t+T}}{F_{i,t}}\right)$ is the mean annualized growth rate of variable F in region i in the period $(t, t + T)$; $F_{i,t}$ is its value at the initial time t. $\varepsilon_{i,t}$ are the corresponding residuals.

If the coefficient b is significant and has a negative sign, then the hypothesis of absolute beta-convergence is accepted. A positive sign of b indicates divergence.

The process of beta-convergence is characterized by two indicators:
- the rate of convergence (β), which shows how many units the gap between regions decreases over a single period of time. It has a sign opposite to that of coefficient b, that is, if the latter is negative, the speed is greater than zero
- the time it takes for regions to get halfway to a sustainable state (τ)

These figures can be calculated by estimating coefficient b, which can be expressed as (Sala-i-Martin, 1996):

$$b = -\frac{1 - e^{-\beta\tau}}{T}. \tag{3}$$

Accordingly, speed and time are as follows:

$$\beta = -\frac{ln(1 + bT)}{T}. \tag{4}$$

$$\tau = \frac{\ln 2}{ln(1 + \beta)}. \tag{5}$$

Hypotheses of beta-convergences and sigma-convergences are interrelated but not equivalent. Absolute beta-convergence also indicates that there is a narrowing tendency in the gap of variables, but given the catching-up effect of the lagging group of regions. Absolute beta-convergence does not directly imply sigma-convergence. Beta-convergence is a necessary but not sufficient condition for the existence of sigma-convergence; in

turn, sigma-convergence is a sufficient but not necessary condition for beta-convergence (Sala-i-Martin, 1995).

Using formulas (1)−(5) and analyzing the dynamics of variation coefficients, we consider the regional convergence (divergence) in fertility, mortality, urbanization, and population ageing processes according to the following indicators: total fertility rate; infant mortality rate; life expectancy at birth; share of urban population; and old dependency ratio.

The Barro regression masks any variation within the period under examination (Lanzieri, 2010). Sometimes the period under examination is broken down into sub-periods to assess breaks for the examined variable.

The econometric calculations were carried out in the GRETL package (GNU Regression, Econometrics and Time-series Library).

4. Findings

4.1. Change of stages of fertility divergence and convergence

Fertility in China was declining dramatically from the mid-1960s to the early 1980s, then, from the late 1980s to the mid-1990s, the decline was slowing down (Figure 1).
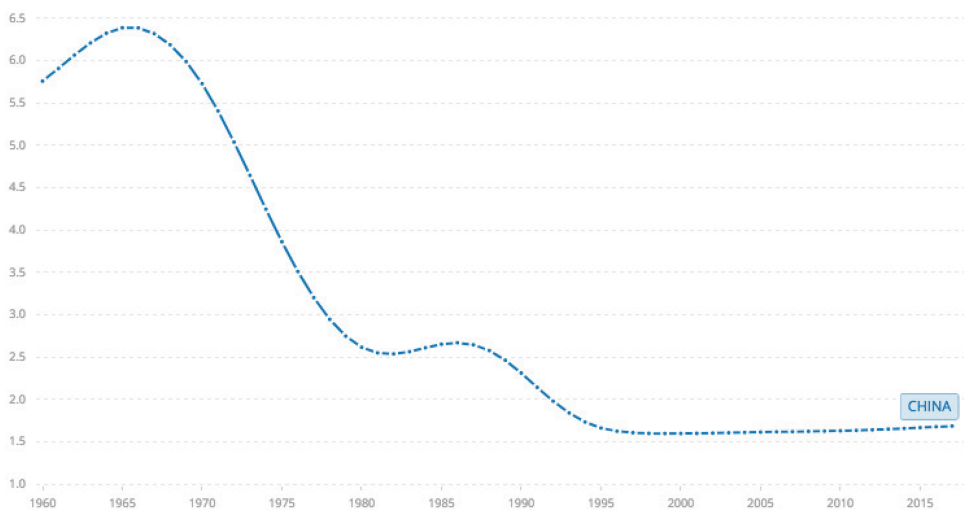

Source: World Bank data.

Figure 1. Fertility rate, total (births per woman), China, 1960−2017

Since the 1990s, the total fertility rate (TFR) has declined from replacement to ultra-low fertility. In the relatively stable years 1995−2010, there were also changes at the regional level (Figures 2a, b). Has there been a convergence in the regional fertility during these years? And was there a catching-up effect when the "lagging" West caught up in this process with the Eastern provinces where fertility was already very low by 1995?
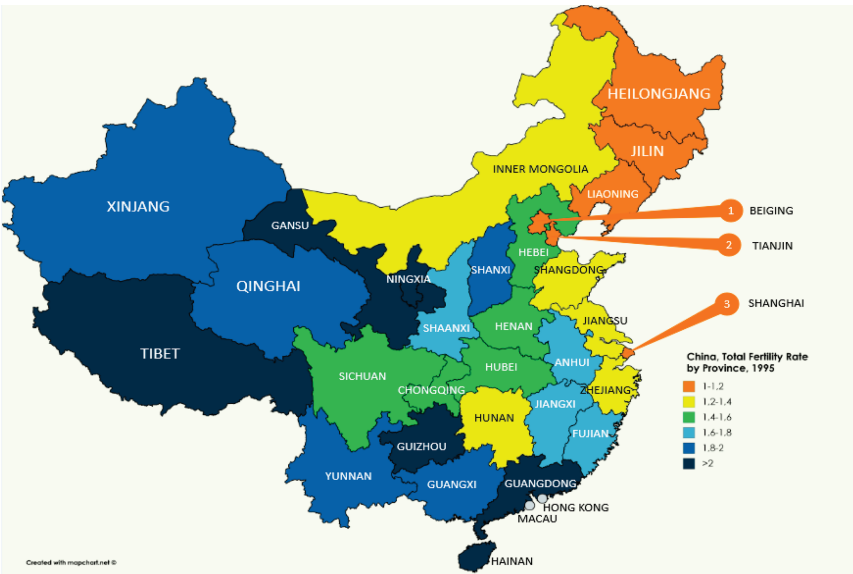
Source: Performed by the authors according to China Statistical Yearbook 1996, China Statistical Yearbook 2016.
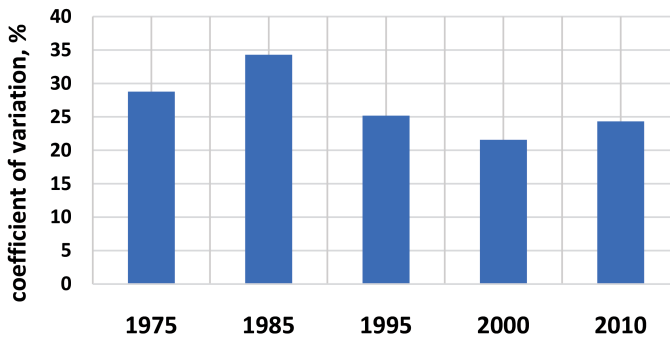
Figure 2a. Total fertility rate by province, China,1995
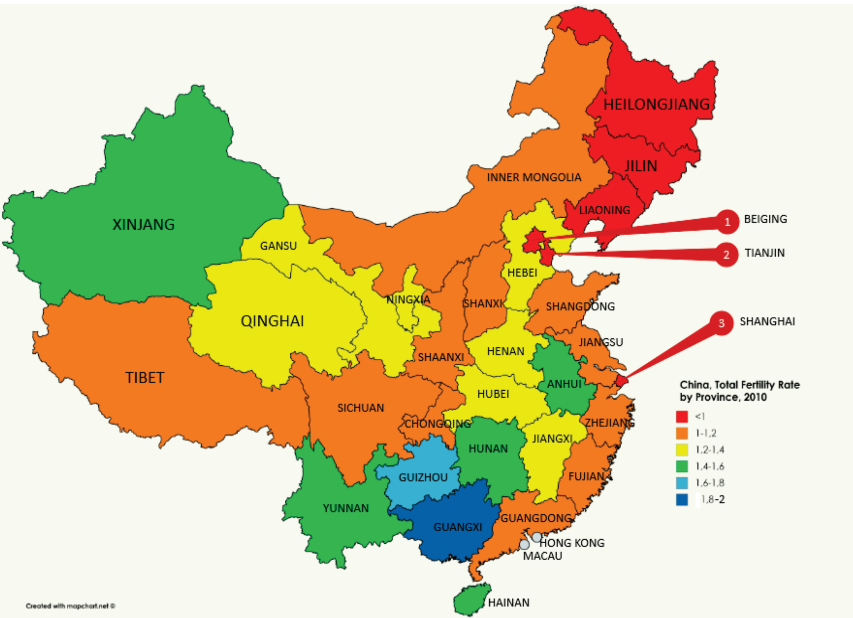
Source: Performed by the authors according to China Statistical Yearbook 1996, China Statistical Yearbook 2016.

Figure 2b. Total fertility rate by province, China, 2010.

To estimate the dynamics of regional fertility differentiation, we also use total fertility rate (TFR) for a period. Let us consider the sigma-convergence of TFR over the broader period of 1975–2010. After an increase in the regional TFR differentiation in 1985 compared to 1975, there was a convergence in the regions of China from 1985 to 2000, the coefficient of variation decreases from 34% to 21.5% (Figure 3). However, in 2010, we observe an increase in the differentiation in the birth rate again.

Source: Calculated by the authors.

Figure 3. Sigma-convergence in the Total fertility rate (TFR), China, 31 provinces, 1975–2010

We tested the beta-convergence model for the periods 1995–2000 and 1985–2000 when the sigma-convergence in fertility was observed in the regions of China. Over a long period, we recorded an active fertility decline and a relatively stable stage, in short, only a relatively stable stage. The presence of sigma-convergence over the given period could also lead to beta-convergence.

Over the short and long period, we noted the catching-up effect: regions with higher fertility rates have a higher rate of decline than those with originally lower fertility rates (Table 1). However, the pace of convergence changed. Since 1995, the convergence in regional fertility has slowed down. In 1995–2000, the differentiation in the level of regional fertility decreased by 4.3% per year, and in 1985–2000 — by 12% per year. In the short period before the regions fully converged in terms of the overall fertility rate (if the situation remained the same as at that time), there were about 33 years left, and in 1985–2000 there were 10 years left.

Table 1. Indicators of beta-convergence in regional fertility in China

| Period	b-coefficient	Betta-convergence rate, %	Halfway convergence time τ, years
1995–2000	−0.0387 (meaning at a 1% level)	0.0043	16.46
1985–2000	−0.0316 (meaning at a 1% level)	0.12	5

Source: Calculated by the authors.

In 2000−2010, there was an increase in the coefficient of variation, and as a result, the b coefficient was not relevant when testing the corresponding equation, which confirms the existence of divergence between regions over this period.

Thus, against the background of declining fertility in China from replacement to low fertility rate, there was a convergence in regional fertility, and with a catching-up effect at that. By 2010, the weakening of convergence was replaced by divergence processes.

According to the regional data on sex ratio at birth (Dejian, 2005; Hu et al., 2015), differentiation of Chinese provinces in terms of sex ratio at birth (and violation of biologically determined sex ratio at birth is an acute problem in China) is low, but it increased from 2 to 4% during the period from 2000 to 2015.

4.2. Divergence of regional infant mortality and convergence of life expectancy in China

Infant mortality (IMR) has been steadily declining in China for half a century (Figure 4).
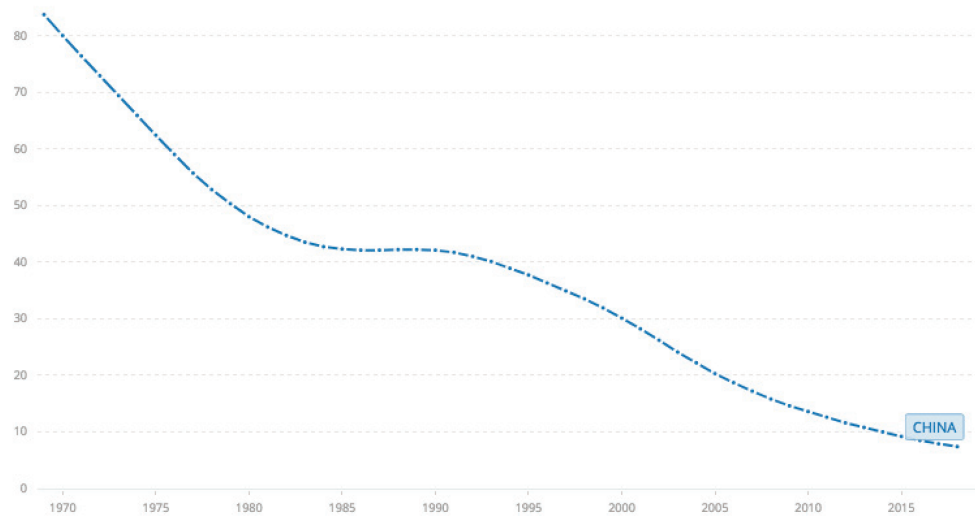
Source: World Bank data.

Figure 4. Mortality rate, infant (per 1,000 live births), China, 1969−2018

We considered the sigma-convergence of the infant mortality rate (IMR) for both sexes for the period 1990−2010 according to the estimation of regional IMR in (Dejian, 2005; Hu et al., 2015). The coefficient of variation increased from 54 to 82% in 20 years that demonstrates extremely high heterogeneity of regions for this indicator and increasing heterogeneity growth in 2000−2010 (Figure 5).
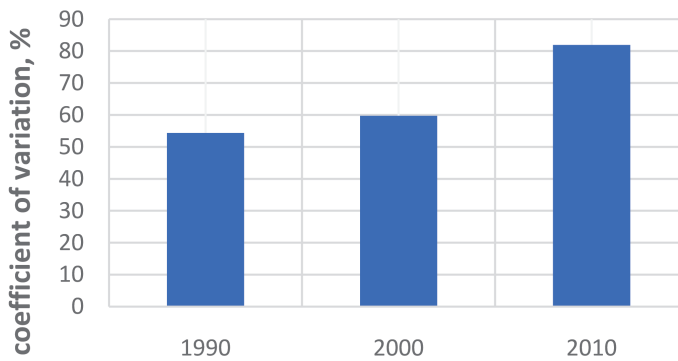
Source: Calculated by the authors.

Figure 5. Sigma-convergence in the infant mortality rate (IMR), China, 31 provinces, 1990−2010

Testing of the hypothesis of beta-convergence in the infant mortality rate in the absence of sigma-convergence is not implied. Thus, against the background of the general decrease in infant mortality, there is a divergence (discrepancy) of this variable in a number of regions in the period 1990−2010.

Life expectancy at birth (LE_0) has grown over the past 60 years (Figure 6), which is also evident at the regional level. The obtained data allow us to estimate these changes over a quarter of a century (Figures 7a, b).
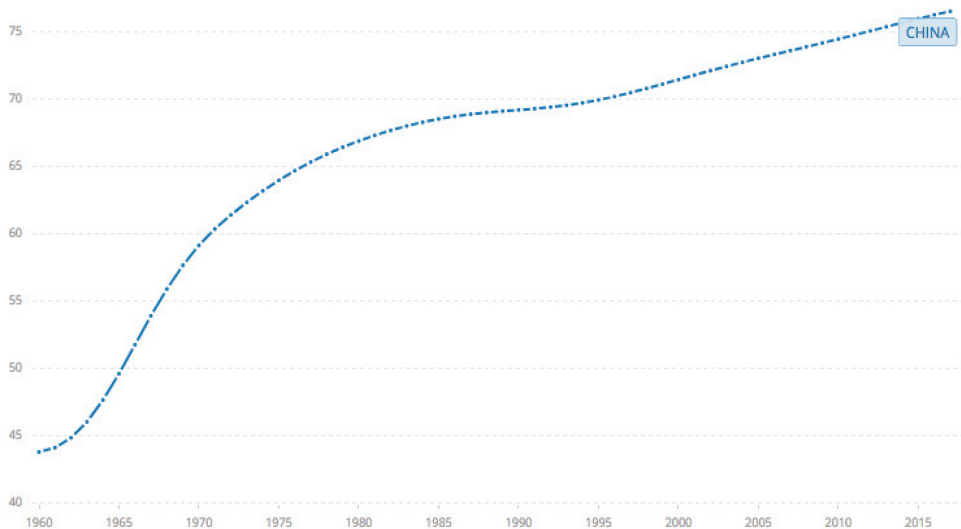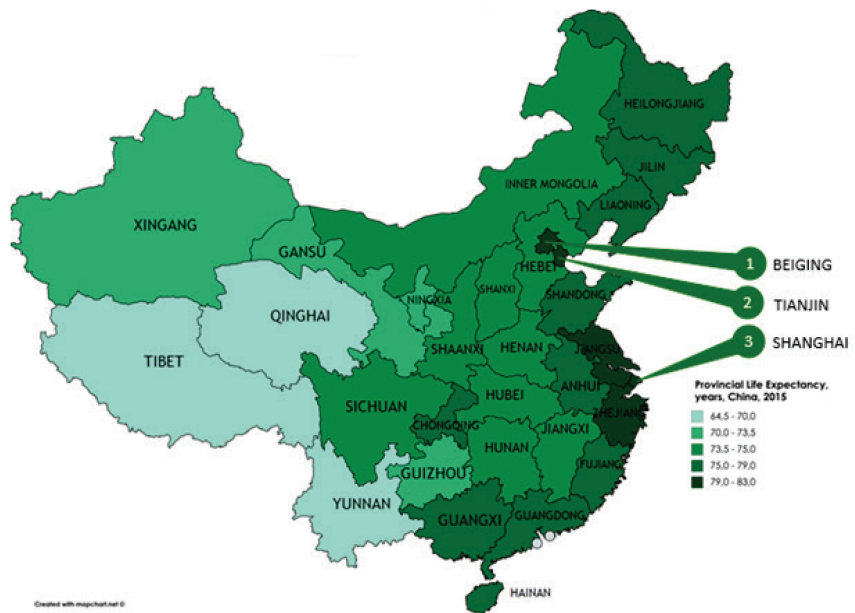

Source: World Bank data.

Figure 6. Life expectancy at birth, total (years), China, 1960−2017
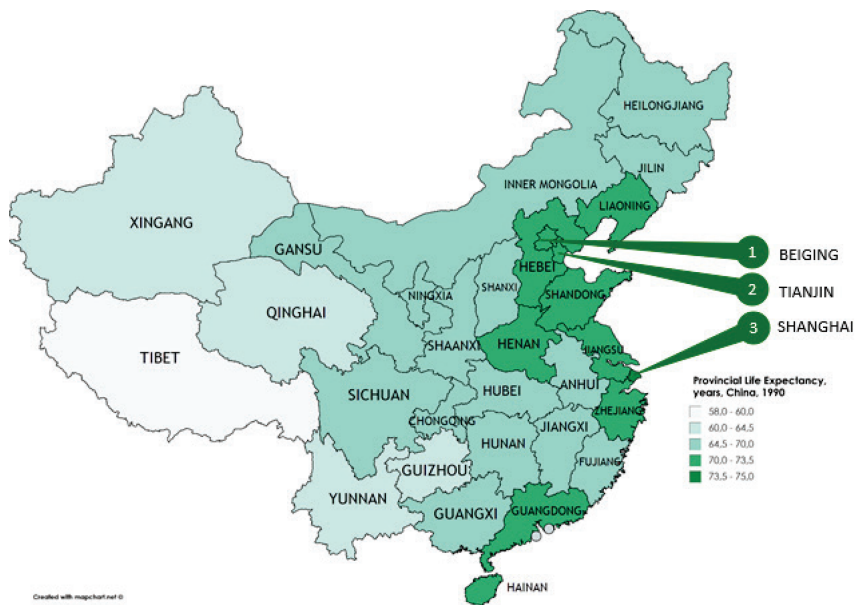
Source: Performed by the authors according to China Statistical Yearbook 1996, China Statistical Yearbook 2016.

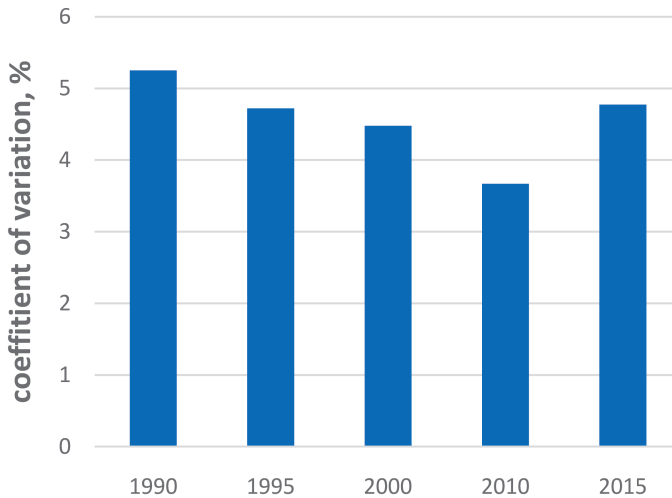**Figure 7a.** Life expectancy at birth by province, China, 1990

Source: Performed by the authors according to China Statistical Yearbook 1996, China Statistical Yearbook 2016.

Figure 7b. Life expectancy at birth by province, China, 2010

But in the case of LE_0's sigma-convergence test, we see very low differentiation values, which declined in 1990−2010, especially sharply between 2000 and 2010, and grew slightly in 2010−2015 (Figure 8).

Source: Calculated by the authors.

Figure 8. Sigma-convergence in life expectancy at birth ($LE_{(0)}$), China, 31 provinces, 1990−2015

We also considered the beta-convergence in LE_0 for the period 2000−2010. The coefficient b was significant at the level of 1% with a value of -0,0201, the values of speed and time were $\beta = 0{,}0224$, $\tau = 31.23$ years. Accordingly, if there had been no increase in the coefficient of variation after 2010, it could be assumed that there was convergence between regions at a rate of 2.24% per year, and in 62 years there would be an alignment between regions (while maintaining the convergence).

Thus, while life expectancy has continued to rise in China since the mid-1990s, we have seen very little regional differentiation, with a catching-up effect at least in the first decade of the new millennium.

4.3. Distinctive convergence in China's regional urbanization

The start of the "One Family-One Child" demographic policy coincides with the beginning of urbanization in China, but only by 2010, half of China's population did live in cities (Figure 9).

Regional differentiation in urbanization before (less than 50% in 2000) and after (more than 50% in 2015) the urbanization median is presented in Figures 10a, b.

This is the only indicator under consideration which shows constant sigma-convergence in the proportion of urban population in the provinces of China. Over the period 2000−2015, the coefficient of variation decreased almost twofold — from 42 to 23% in 15 years (and continues this trend, for example, to 19.6% by 2018) (Figure 11).
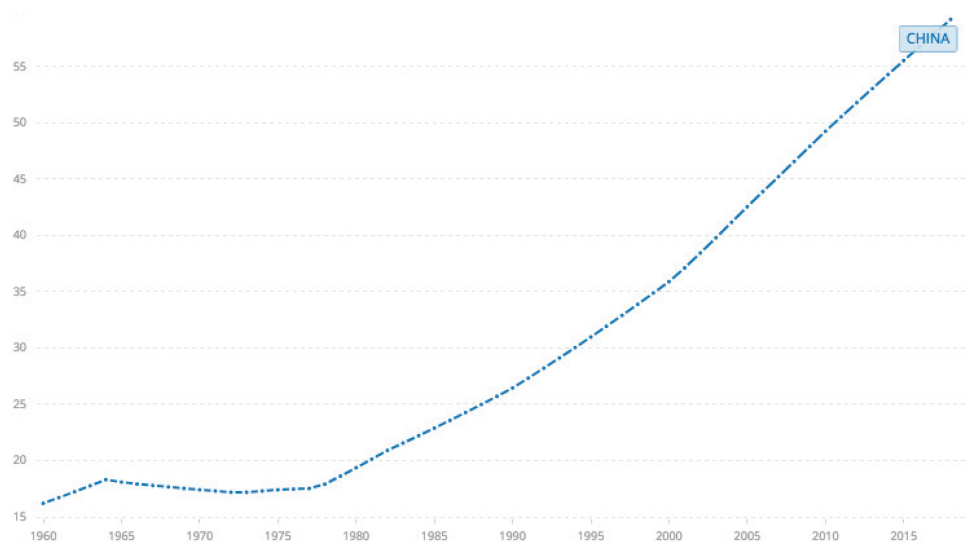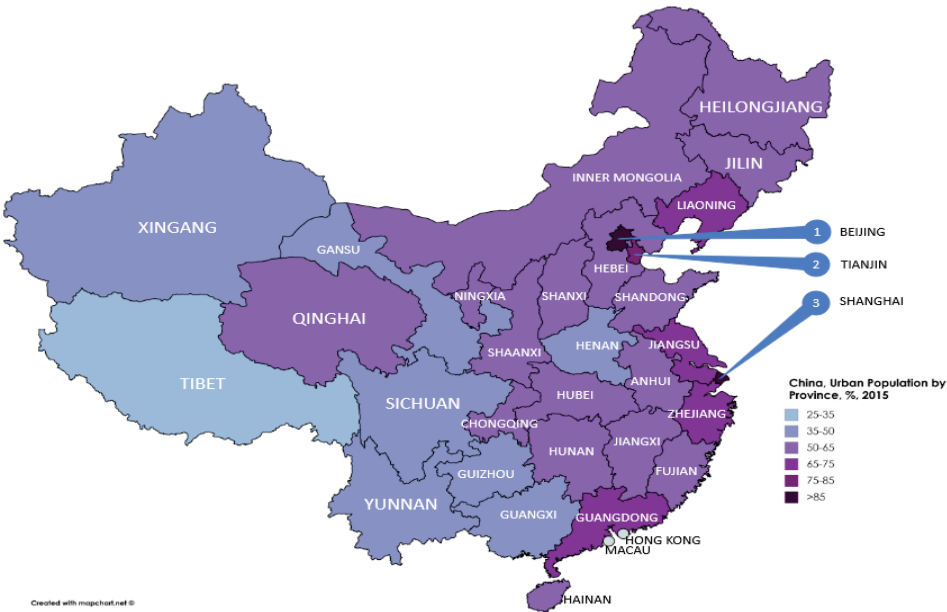
Source: World Bank data.

**Figure 9.** Urban population (% of total population), China, 1960–2018
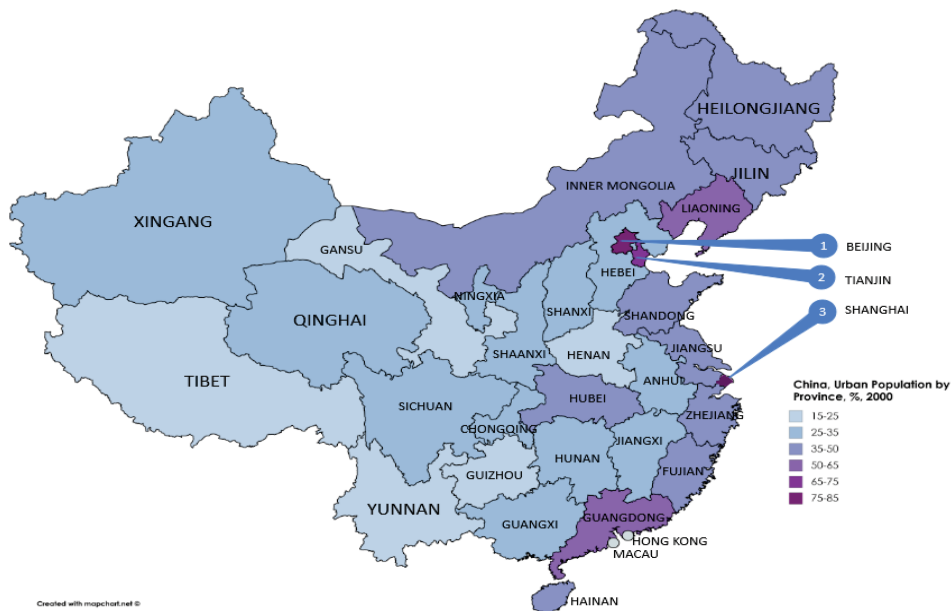
Source: Performed by the authors according to China Statistical Yearbook 1996, China Statistical Yearbook 2016.

Figure 10a. Urban population rate by province, China, 1995

Source: Performed by the authors according to China Statistical Yearbook 1996, China Statistical Yearbook 2016.

**Figure 10b.** Urban population rate by province, China, 2015
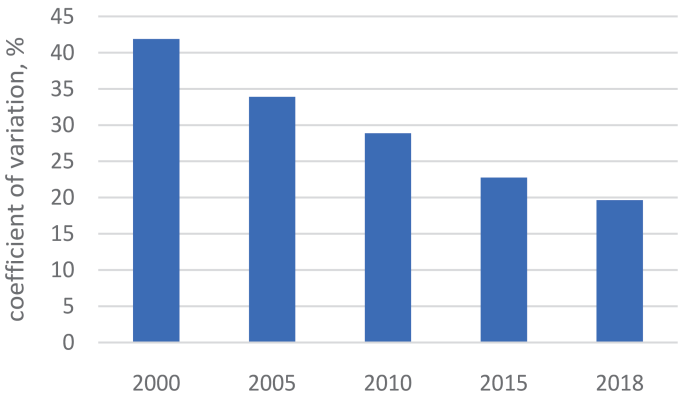
Source: Calculated by the authors.

Figure 11. Sigma-convergence in the urban population ratio (UPR), China, 31 provinces, 2000–2018

We also observed beta-convergence over the period 2000−2015 (before and after 50% of urban population). The coefficient b was significant at the level of 1% with a value of *-0.0288*. Accordingly, the rate and time of convergence for this period of pivot was as follows: β = 0.038 at 3.8% the proportion of urban population between regions became closer for 1 year; τ = 19.07, it will therefore take 38 years before the indicators of urbanization are fully converged (while maintaining the rate of convergence).

## 4.4. Convergence of population aging at the turn of the century and unstable convergence of new times

As a measure of population ageing, we took a variable of the old dependency ratio, which was growing from the mid-1960s to the present, accelerating in the new millennium (Figure 12).
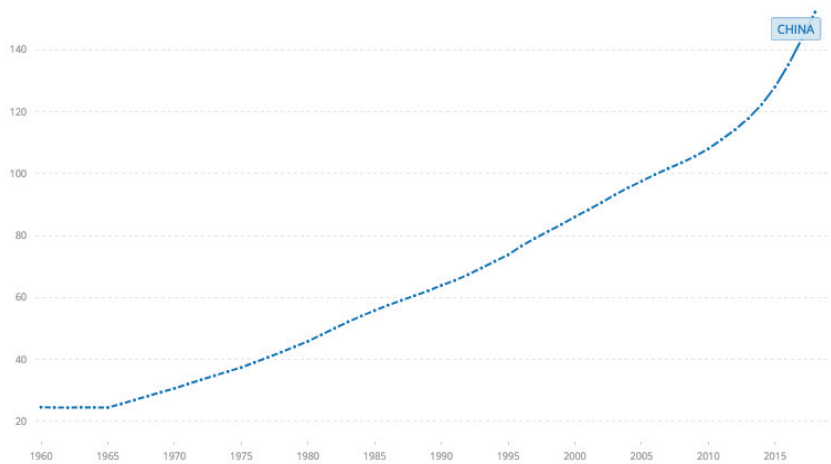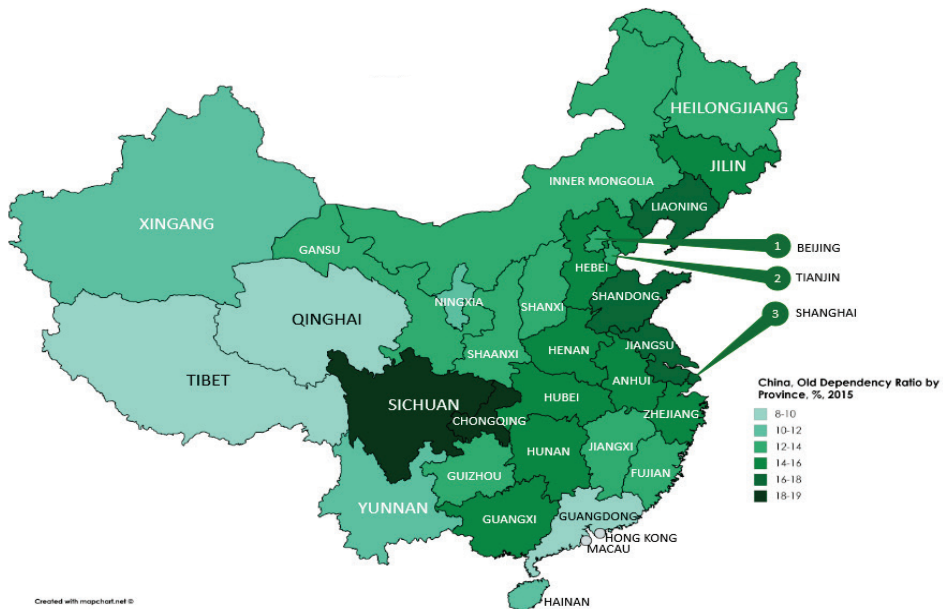

Source: World Bank data.

Figure 12. Population aged 65 and above, total, China, 1960−2018

The regional variation of this indicator in 1995 and 2015 can be seen in Figures 13a, b.
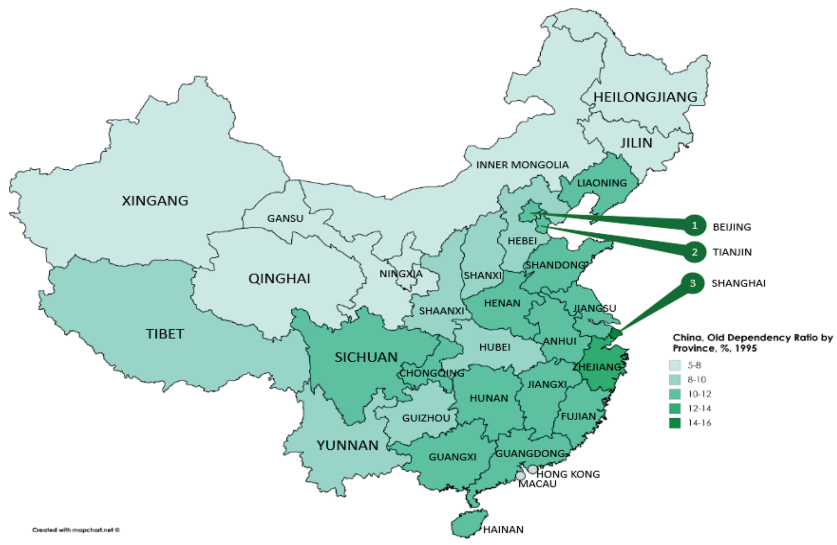
Source: Performed by the authors according to China Statistical Yearbook 1996, China Statistical Yearbook 2016.

Figure 13a. Old dependency ratio by province, China, 1995

Source: Performed by the authors according to China Statistical Yearbook 1996, China Statistical Yearbook 2016.

Figure 13b. Old dependency ratio by province, China, 2015

Sigma-convergence in the ageing process (old dependency ratio variable) for the period 1995−2018 was observed from the mid-1990s to the mid-2000s (from 23 to 18%). After that, five-year periods of divergence and convergence in ageing replace each other (Figure 14), and the coefficient of variation is generally low (23.5% in 2018).
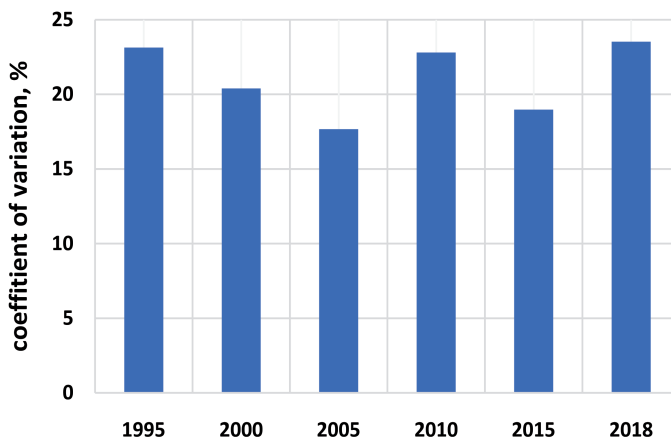
Source: Calculated by the authors.

Figure 14. Sigma-convergence in the old dependency ratio in 31 regional subdivisions of China, 1995−2018

Is there a catching-up effect during the last short period of sigma-convergence in the ageing process in 2010–2015? The coefficient b was significant at the level of 1% with a value of -0.0508, the values of speed and time were $\beta = 0.058$, $\tau = 12.17$ years, indicating the presence of a catching up effect (if there was no increase in the coefficient of variation after 2015, it would be assumed that there was convergence between regions at a rate of 5.8% per year, and in 24 years there will be an alignment of this indicator between regions).

5. Conclusion

We summarize the results of our calculations, including the sub-periods, so as to assess breaks for the examined variable (Table 2).

Table 2. China's demographic convergence indicators

	Sigma-convergence	V_t	V_{t+T}	Beta-convergence (coefficient b)	Beta-convergence rate, %	Halfway convergence time τ, years
$TFR_{1975\text{-}1985}$	no	28.76	34.30	no	-	-
$TFR_{1985\text{-}2000}$	yes	34.30	21.56	-0.0316[1]	0.120	5.00
$TFR_{1995\text{-}2000}$	yes	25.17	21.56	-0.0387	0.043	16.46
$TFR_{2000\text{-}2010}$	no	21.56	24.32	no	-	-
$SRB_{2000\text{-}2015}$	no	2.34	3.91	no	-	-
$IMR_{1990\text{-}2010}$	no	54.34	82.00	no	-	-
$LE_{(0)1990\text{-}2010}$	yes	5.25	3.67	-0.0180	0.021	33.38
$LE_{(0)2000\text{-}2010}$	yes[2]	4.48	3.67	-0.0201	0.022	31.23
$LE_{(0)2010\text{-}2015}$	no	3.67	4.77	no	-	-
$UPR_{2000\text{-}2015}$	yes	27.10	15.50	-0.0288	0.038	19.07
$ODR_{1995\text{-}2005}$	yes	23.13	17.67	-0.0649	0.242	3.20
$ODR_{2010\text{-}2015}$	yes	22.80	18.97	-0.0508	0.058	12.17

Source: Calculated by the authors.
Notes: 1. TFR — total fertility rate, SRB — sex ratio at birth, IMR — infant mortality rate, $LE_{(0)}$ — life expectancy at birth, UPR — urban population ratio, ODR — old dependency ratio.
2. Sex ratio at birth and infant mortality rate convergence were estimated by the data in (Dejian, 2005; Hu et al., 2015).

The following is our brief summary:
1. At the turn of the century and in the first decade of the new millennium, a steady convergence between the provinces of China was observed only in the process of urbanization.

---

[1] The coefficient b hereafter is significant at a the level of 1% if there is convergence.

[2] Sigma-convergence in $LE_{(0)}$ was observed for the longer period of 1990–2010 (but was weak in 1990–2000).

2. Convergence in fertility, mortality, and population ageing was not sustainable; convergence was observed only in certain periods (with the exception of infant mortality that showed sustainable growth of divergence).

3. Convergence in such periods was accompanied by a catching-up effect of varying degrees. Using fertility as an example, we observed a decrease in the level of convergence as the natalistic transition and transition to ultra-low fertility were completed.

4. Over the last decade, measured demographic indicators have shown a divergence at the provincial level in China. We believe that the growing degree of differentiation of the regions of China in the key demographic indicators creates new challenges for sustainable development of the country in the near future. An analysis of the impact of the specifics of demographic convergence in the Chinese provinces on economic growth seems to be a promising area of research.

Appendix 1. Regional differentiation of the economy and demography of the Chinese provinces on maps (additional maps)
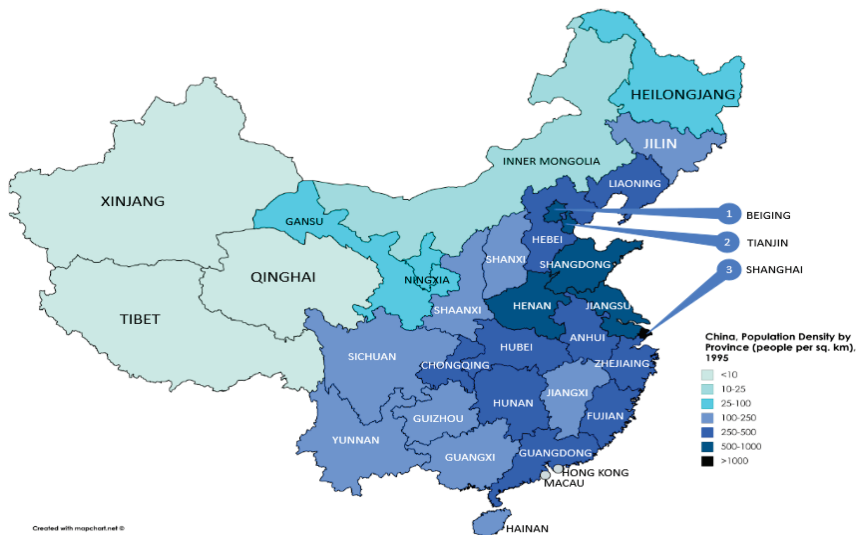
Source: Performed by the authors according to China Statistical Yearbook 1996, China Statistical Yearbook 2016.
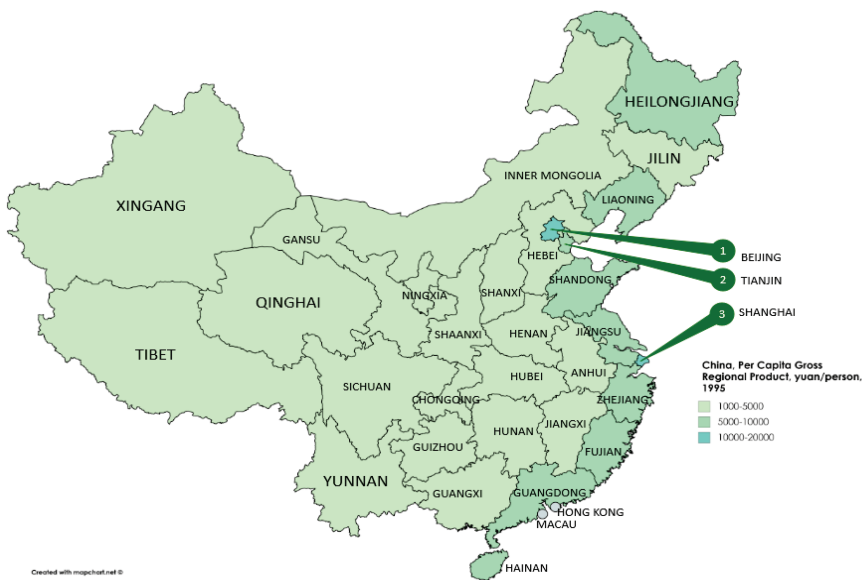
Figure A1a. Population density by province, China, 1995

Source: Performed by the authors according to China Statistical Yearbook 1996, China Statistical Yearbook 2016.
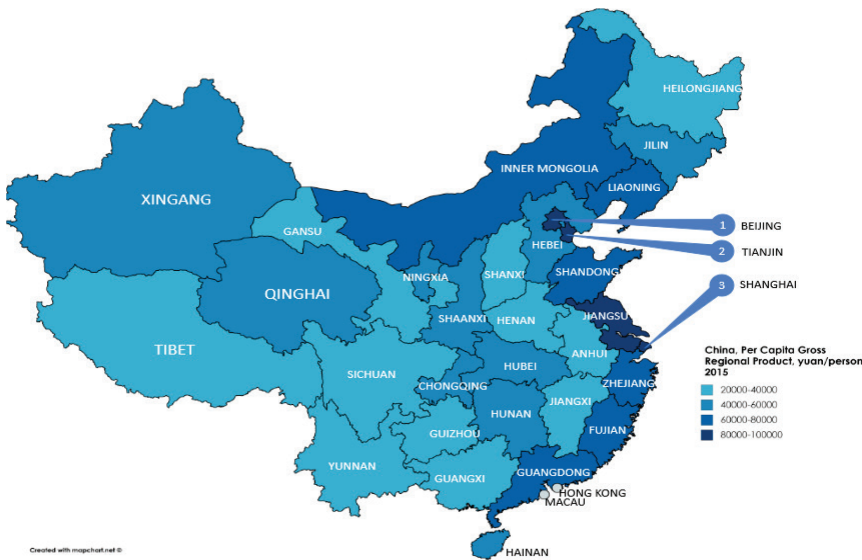
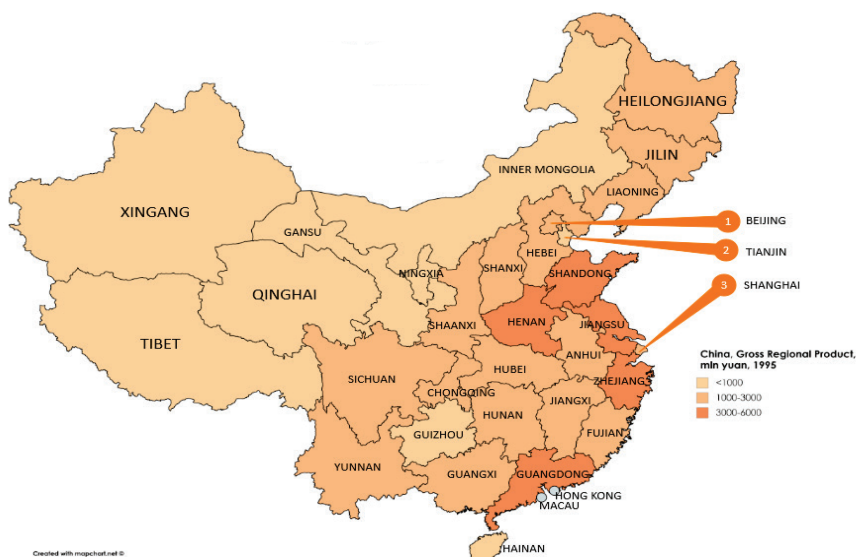**Figure A1b.** Population density by province, China, 2015

Source: Performed by the authors according to China Statistical Yearbook 1996, China Statistical Yearbook 2016.

Figure A2a. Gross regional product per capita by province, China, 1995

Source: Performed by the authors according to China Statistical Yearbook 1996, China Statistical Yearbook 2016.

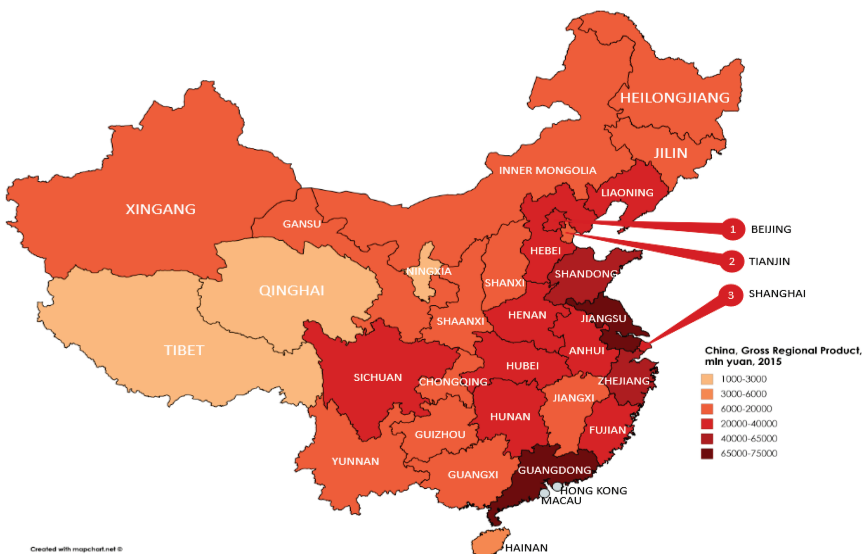**Figure A2b.** Gross regional product per capita by province, China, 2015

Source: Performed by the authors according to China Statistical Yearbook 1996, China Statistical Yearbook 2016.

Figure A3a. Gross regional product by province, China, 1995

Source: Performed by the authors according to China Statistical Yearbook 1996, China Statistical Yearbook 2016.

Figure A3b. Gross regional product by province, China, 2015

References

Barro, R. J., & Sala-i-Martin, X. (1995). *Economic growth*. McGraw Hill.

Colema, D. A. (2002). Populations of the industrial world. A convergent demographic community. *International Journal of Population Geography*, *8,* 319−344.

Corazziari, I., Gabrielli, G., Paterno, A., & Salvini, S. (2014). *Demographic trends in developing countries: Convergence or divergence processes?* Conference paper prepared for presentation at Population Association of America, Boston, 1−3 May 2014.

Dejian, L. (2005). Sex ratio at birth and infant mortality rate in China: An empirical study. *Social Indicators Research, 70*(3), 313−326.

Hu, S. B., Wang, F., & Yu, C. H. (2015). Evaluation and estimation of the provincial infant mortality rate in China's sixth census. *Biomedical and Environmental Sciences, 28*(6), 410−420.

Dorius, S. F. (2008). Global demographic convergence? A reconsideration of changing intercountry inequality in fertility. *Population and Development Review, 34*(3), 519−537.

Korotayev, A., Goldstone, J. A., & Zinkina, J. (2015). Phases of global demographic transition correlate with phases of the Great Divergence and Great Convergence. *Technological Forecasting & Social Change, 95,* 163−169.

Landry, A. (1987). *Adolphe Landry on the demographic revolution. Population and Development Review, 13(4), 731−740.*

Lehmijoki, U., & Pääkkönen, J. (2006). *Demographic clubs: Convergence within, divergence between.* Helsinki Center of Economic Research, Discussion Papers, 136.

Loi, S., & Hale, J. M. (2019). Migrant health convergence and the role of material deprivation. *Demographic Research, 40*(32), 933−962.

Omran, A. R. (1971). The epidemiologic transition: A theory of the epidemiology of population change. *Milbank Memorial Fund Quarterly*, *49*(4), 509−538.

Pääkkönen, J. (2012). Are there industrial and agricultural convergence clubs in China? *Journal of Chinese Economic and Business Studies*, *10*(1), 1−13.

Sala-i-Martin, X. (1996). The classical approach to convergence analysis. *The Economic Journal*, *106*(437), 1019−1036.

Solow, R. M. (1956). A contribution to the theory of economic growth. *Quarterly Journal of Economics*, *70,* 65−94.

Stankuniene, V., Zakharov, S.V., Baublyte, M., Maslauskaite, A., & Régnier-Loilier, A. (2009). *Transition to the new partnership formation pattern in Lithuania, Russia and France: Different paths to convergence?* Conference paper prepared for presentation at XXVI I USSP international population conference 27 September − 2 October 2009, Marrakesh, Morocco.

Tomka, B. (2002). Demographic diversity and convergence in Europe, 1918−1990: The Hungarian case. *Demographic Research*, *6,* 19−48.

Vallin, J., & Meslé, F. (2004). Convergences and divergences in mortality. A new approach to health transition, *Demographic Research, 2*(2), 11−44.

Watkins, S. C. (1990). *From provinces into nations: Demographic integration in Western Europe, 1870−1960.* Princeton University Press.

Wilson, C. (2011). Understanding global demographic convergence since 1950. *Population and Development Review, 37*(2), 375−388.