

The role of agglomeration dynamics in the (extensive-form) growth process: Evidence from China

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ABSTRACT

Fueling the relative academic debate and providing insight to the evaluation of the relative policies, the evolution of regional inequalities is an issue of utmost importance. Hence, the study of regional inequalities is at the heart of regional science. From the policy viewpoint, the study of regional inequalities may interpret as a sign with respect to the evaluation of the effectiveness and the efficiency of the implemented regional policy mix. Regional policy aims, precisely, at reducing the level of regional inequalities in a growth-enhancing environment. From the theory viewpoint, the study of regional inequalities may serve as an empirical exercise with respect to the affirmation of regional development theories. Questioning the position of the neoclassical theory that inequalities are bound to diminish with growth through the activation of market-emanating convergence mechanisms in a policy-free environment, theories with sharply different policy implications, such as the endogenous / new growth theory and the new economic geography theory, stress the argument that growth is a spatially selective and cumulative process.

China (spanning 5 geographical time zones and bordering 14 countries) offers an interesting case-study. Currently (i.e., year 2025), in the world ranking, China holds the 2nd place in terms of population, the 1st place in terms of GDP, the 74th place in terms of per capita GDP, and the 83rd place in terms of population density. Under the conditions of the rapid market liberalization process that China has been experiencing, transitioning, since the late 1970s, from a state-dominated planned socialist economy to a mixed economy, questions of regional cohesion – and thus of regional inequalities – become increasingly salient. Especially from the mid-1990s, the elimination of regional inequalities became both a pre-condition and a core objective of the reforms aiming at market liberalization. Being at odds with the core of socialist ideology, regional inequalities may, indeed, pose serious challenges to societal stability, in a country that is highly centralized in principle but substantially decentralized in practice. If economic growth pattern in China is found to be regionally selective, this could be taken as signal of a wider regional disequilibrium, representing regional inequalities in economic opportunities, more generally. This may, ultimately, raise concerns as regards the success of the market liberalization process *per se*.

The paper provides a thorough study of regional inequalities in China, covering the period 2004-2019 and utilizing per capita GDP and population data obtained from the National Bureau of Statistics of

China (NBSC). Yet, instead of proceeding with a direct estimation of regional inequalities, the paper discusses whether – and to what extent – sub-national population change responds positively or negatively to agglomeration dynamics (i.e., population density), in ways that reinforce or, instead, equalize population concentrations across space. Examining processes of concentration and de-concentration of population goes beyond the demographic interest *per se*, as it may, also, shed light on questions concerning regional inequalities in the more general sense of understanding wider economic processes. Scholars both in the urban economics and the growth economics tradition have well-recognized that studying population growth offers a window through which to study the process of economic growth as the latter is systematically related to population growth through the trade-off between agglomeration economies and urban costs (i.e., commuting, housing, land use, environmental, *inter alia*). This is especially so in China given that productivity levels, capital deepening and levels of technology are rather low (compared to the corresponding levels of the EU and the USA), and thus economic growth is still very much of the extensive (i.e. increase in inputs, including labor) than the intensive form (i.e. increase in the productivity of each input and in total factor productivity). Moreover, given that China is still at low levels of economic development, spatial productivity differentials are predominantly along the lines of urban-rural (i.e., core–periphery) dichotomy, and thus very much related to patterns of population agglomeration (i.e., urbanization). In these conditions, measures of spatial disparity in population concentration act as a lower bound indicator of spatial disparities in terms of economic development, and this may be of acute analytical and policy interest.

Theoretically, the impact of agglomeration on population growth is examined within the traditions of new economic geography and urban / spatial economics. Empirically, agglomeration is, typically, specified on the basis of population density. The latter is, usually, combined with other measures capturing different aspects of agglomeration, such as product variety, spatial concentration of industrial activity, and concentration of human capital, *inter alia*. Equation 1 is a regional growth equation, where population growth is a function of agglomeration (i.e., population density). Equation 1 is fully equivalent to Equation 2, which is a simple unconditional convergence equation specified in terms of population density. Equation 3 comes as the combination of Equation 1 and Equation 2, given that area is fixed over time.

$\Delta P_{r,t} = \alpha + \beta A_{r,t-1}$ <i>r = region, t=time, ΔP = population growth, A = agglomeration (population density), α and β = model parameters</i>	Equation 1
$\Delta A_{r,t} = \alpha + \beta A_{r,t-1}$ <i>ΔA = population density growth</i>	Equation 2
$\Delta P_{r,t} = \ln P_{r,t} - \ln P_{r,t-1} - \ln L_r + \ln L_r = \ln \left(\frac{P_{r,t}}{L_r} \right) - \ln \left(\frac{P_{r,t-1}}{L_r} \right) = \Delta A_{r,t}$	Equation 3

$P = \text{population}, L = \text{land}$	
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Equation 1 can thus be discussed in terms of regional inequalities. Particularly, a positive β indicates that agglomeration contributes positively to population growth (i.e., high agglomeration regions become disproportionately denser over time; increase of regional inequalities), and a negative β indicates that agglomeration contributes negatively to population growth (i.e., high agglomeration regions tend to subside over time; decrease of regional inequalities).

The Constitution of China provides for a 5-tier administrative division of Chinese territory: the Provincial Level, the Prefectural Level, the County Level, the Township Level, the Basic Level Autonomy. Provincial Level is the 1st tier and consists of 22+1 Provinces (Taiwan is a claimed province), 5 Autonomous Regions, 4 Municipalities, and 2 Special Administrative Regions (these are Hong Kong and Macau). Provinces are subservient to the central government. Nevertheless, provinces enjoy large discretion with regard to economic policy. Prefectural Level is the 2nd tier and consists of 293 Prefecture-level Cities, 7 Prefectures, 30 Autonomous Regions, and 3 Leagues. County Level is the 3rd tier and consists of 954 Districts, 366 Country-Level Cities, 1,360 Counties, 117 Autonomous Counties, 49 Banners, 3 Autonomous Banners, 1 Special District, and 1 Forestry District. Township Level is the 4th tier and consists of 8,122 Subdistricts, 20,942 Towns, 9,660 Townships, 2 Country-controlled Districts, 985 Ethnic Townships, 152 Sums, and 1 Ethnic Sum. Basic Level Autonomy is the 5th tier and consists of 104,083 Residential Committees, and 558,310 Village Committees. The empirical analysis of the impact of agglomeration on population growth in China focuses on 281 regions, that correspond either to Provincial Level (1st tier) or to Prefectural Level (2nd tier). In year 2019 (i.e., the last year under consideration) Shanghai generated the highest GDP among Chinese regions, Shenzhen exhibited the corresponding highest per capita GDP, Hulunbuir was the largest Chinese region, Chongqing was the most populous Chinese region, and Shantou was the most densely populated Chinese region.

For the sake of robustness, the analysis is replicated in per capita GDP terms as it is specified in Equation 4.

$\Delta G_{r,t} = \alpha + \beta G_{r,t-1}$	Equation 4
$G = \text{per capita GDP}, \Delta G = \text{per capita GDP growth}$	

Specifically, Equation 4 replicates Equation 2 and, correspondingly, Equation 1.

The findings of the paper offer valuable insight into both academic theory and policy making.