For Comments Only

The Efficient Size of an Urban Population: a Multiregional CGE Model Approach (draft version)

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ABSTRACT
This paper explores whether the population size of the Seoul Metropolitan Area (SMA) of Korea is efficient in terms of national economy. To undertake this analysis, we develop a recursively dynamic Interregional Computable General Equilibrium (ICGE) model with a population module. In this general equilibrium framework, explicit costs and benefits due to population growth are estimated as the inflation functions and industrial value added by region. This counter-factual analysis finds that the de-concentration of the SMA population is desirable for the national economic growth of Korea. The GDP would be maximized if the population share of the SMA to nation were at 39% in the short term and 35% in the long term. The SMA itself, however, has a regional interest in maintaining a 40% population share, if it is to maximize regional, as opposed to national, per capita income.

KEY WORDS: Optimal Size; Urban Population; CGE model; Agglomeration

1. Background

Korea's compressed economic development over the last five decades has not only resulted in the concentration of population and economic resources in the Seoul Metropolitan Area (hereafter, SMA), but has also led to political conflict due to this unbalanced regional development. For example, the SMA currently accounts for 47% of the national population, but only 12% of the total land area. In addition, the SMA accounts for the headquarters of over 85 percent of all major Korean enterprises and 90 percent of all national government offices. If this were an early stage of national economic development, this could be considered acceptable (Henderson, 2002). Local actors in the rest of Korea (hereafter, ROK), however, have claimed that the overwhelming economic dominance of the SMA is evidence of government favoritism for the capital city during a period of relatively high economic development. These critics have been particularly concerned with Korea's recent history of offering a circular causation process for spatial development.

In response to the heavy demand for a balanced regional development within the nation, the Korean government has carried out both growth-control measures for the SMA and growth pole policies for the ROK (Lee, 2009). To promote growth in the ROK, the Korean government has implemented land use restrictions prohibiting the construction and expansion of population-inducing facilities, such as manufacturing plants, commercial centers, and universities in the SMA (Kim et al, 2003). Due to this prohibition and the implementation of various financial and developmental incentives, such as tax exemptions and land use deregulation in the ROK, these policies have led to the dispersion of manufacturing plants, government agencies, and state-run enterprises from the SMA. At the same time, however, the government has begun to restructure the SMA towards a more service-oriented economy, complete with the agglomeration of the information and technology industries, so as to compete with other Northeast Asian city-regions, including Beijing, Shanghai and Tokyo (Kim, 2011); suggesting competing national and regional economic motives.

If the SMA is currently experiencing a diseconomy of agglomerations, then this push for the de-concentration of economic resources could be considered rational. That is, if the SMA is over-populated in terms of economic efficiency, it would be reasonable to believe that the region has become too costly to live in and that, hence, the government should intervene by placing heavier regulation on the SMA. In contrast, if the national economic benefits of living in the SMA are higher than the costs, then the government should continue to promote the SMA economy at the expense of widening regional disparity. As such, the plan for regional development of the SMA should be based upon whether the marginal net benefit of the population is positive, and if that population size is operating within an efficient range. That said, while the relationship between an optimal and efficient population size and regional economic growth has been traced out in terms of urban economics since the early 1970s, it has been difficult to find empirical evidence offering an estimated ideal population size for maximizing the positive ratio of the aggregated costs and production of a given region.

Hence, this paper develops a recursive interregional Computable General Equilibrium (ICGE) model with a population module based on Kim et al. (2011), so as to explore whether the population size of the SMA is efficient in terms of national economy. In this general equilibrium framework, explicit costs and benefits due to population growth are estimated as the inflation functions and industrial value added by region. From this, an efficient size is computed according to the likelihood for a population to positively contribute to the economic growth of the entire nation as opposed to only that of the SMA. The optimal size, alternatively, is regarded as that population most likely to maximize the GDP without regard to regional equity. By taking into account these competing and sometimes complementary scenarios, the ICGE model can offer a suggestion for maximizing the difference between the aggregate agglomeration costs and benefits.

As it relates to this study, the ICGE model is calibrated to account for three industrial sectors within two regions, namely the SMA and the ROK. The model specifies the economic behaviors six producers, two regional households, two regional governments, a national (central) government, and the rest of the world. This model is applied to eight regional population alternatives of the SMA for twelve different periods. With the total national population size operating at a constant, the model can estimate the effect of a marginal increase or decrease in the relative share of the SMA upon the national and regional income growth. From this, the model offers an estimate for the efficient population size of the SMA and its optimal size dependent upon the various scenarios. The results of this suggest that de-concentration of the population is desirable for the national economic growth of Korea. In the following section, the ICGE model structure is discussed briefly; whereas the third section deploys the model to explore the effects of the various population alternatives. The fourth section summarizes the approach and suggests future directions.

2. Model

As discussed in the prior section, the optimal size of an urban population is defined as that population level most capable of maximizing the aggregate utility levels for residents and profits for firms. Its theoretical background is rooted in the optimal city size theory, the supply-oriented dynamic approach, and the network city paradigm (Royuela and Suriñach, 2005). However, since the 1970s, only a few studies have been undertaken towards practically estimating an optimal city size; moreover, there are two different approaches for empirically estimating the optimal and efficient size of an urban population.

The first approach attempts to calibrate the optimal size of an individual city through an assessment of the costs and benefits of increasing that city's size. This approach assumes that up until a certain urban size, the marginal effect of a population on production output will be positively correlated; after that threshold has been crossed, however, further population growth carries a negative effect due to unremitted congestion effects and diseconomies of scale. This equilibrium between marginal costs and marginal benefits implies that a given population has an optimal urban size. Therefore, if the costs and benefits are identical for all cities, each city should share the same optimal size. In general, however, a given city's size depends on the functional characteristics of that city and the levels of network integration within the urban system, including externalities, productivities, environmental quality, and congestion (Capello and Camagni, 2000; Henderson, 1985).

Capello and Camagni (2000) suggested that different levels of network integration, regional size, and urban function have effects upon aggregate city benefits (due to location) and urban overload costs (also due to location). In their study of 58 Italian cities, they found that the expansion of a city's physical dimension mitigated the effects of urban overload in terms of lower rates of unemployment and social disease in very small cities; while the urban overload effect was minimized at the population size of 55500. Alternatively, for large cities, an expansion in city size raised the level of overload costs by generating more environmental damage than medium-sized ones. Zheng (2006) measured optimal city sizes for Japanese metropolitan areas, using a surplus function approach. The surplus function was defined as the difference between the total disposable income and the total expenditure of the households working and living in the metropolitan areas. The optimal city size of Japanese metropolitan areas in the year 2000 was a population of about 18 million to maximize the surplus. It implies that Tokyo metropolitan area with nearly 32 million inhabitants was obviously too large. Yezer and Goldfarb (1978) estimated the marginal benefit with urban agglomeration economies and marginal cost by increases in the number of urban residents. The migration to American cities with populations of around 1.5–2.5 million had external costs higher than external benefits, which implies that the efficient size of cities was more than 2.5 million people. Kanemoto *et al.* (1996) estimated the magnitudes of agglomeration economies from aggregate production functions for metropolitan areas in Japan. The estimates were used to identify whether Tokyo was too large. They found the agglomeration economies were small for small cities but fairly large for cities with population larger than 200,000. Cities with population between 200,000 and 400,000 have especially large agglomeration economies. They argued that Tokyo was not too large in terms of the Henry George Theorem for optimal city size, and this result is opposite to Zheng (2006). Tolley, Gardner, and Graves (1979) showed that the social marginal costs of increasing city population in large cities exceeded the marginal benefits.

The second approach explores the optimal and efficient size of an urban population by calibrating the primary city's ratio of urban concentration so as to maximize either national or regional incomes. The level of urban concentration recommended is adjusted according to such factors as the national land size, stage of economic development, and national political processes; the resulting ratio is an inverted U-shape, with predicted income levels similar to that of the optimal city size theory (Henderson, 2000). By placing a city's economy in conjunction with that of the larger nation, this approach suggests that for a given level of development and country size there is a an optimal ratio of urban concentration for maximizing national productivity growth (Henderson, 2003), as opposed to only that of the city. This resonates with Suh's (1991) suggestion that the optimal size of a given city ought to correspond with the location of that city's productivity within the national hierarchy. Since cities do not always operate according to their suggested values of the optimality index, Suh sought to understand to what degree and for what major reasons cities departed from their optimum population size. One reason, perhaps can be found due to conflicts in national and regional economic policy. For instance, Au and Henderson (2006) explored the net urban agglomeration economies of China's cities, and found that the ability for these cities to reap agglomeration benefits were hindered due to the China's strong migration restrictions. This is unfortunate as they argued that urban agglomeration benefits are valuable in the sense that real income per worker grows with that of an increase in city size; functioning as an inverted U-shape of real income per worker against city employment.

Taking into account both the first and second approaches for exploring urban optimal and efficient population sizes, we developed an ICGE model to assess the economic impacts of a city's population on regional income disparity and national growth. This ICGE model accounts for the economic behavior of producers and consumers on the real side economy, following the neoclassical elasticity approach of Robinson (1989), such as that of market-clearing prices, the maximization of a firm's profit, and a household's utility. Three major economic regions constitute our ICGE model: the Seoul Metropolitan Area (SMA), the rest of Korea (ROK), and one representing the rest of the world (ROW). It is assumed that economic agents, including both producers and households, select an optimal set of factor inputs and commodity demand sets under the maximization principles of constrained profit and private utility, thereby responding to various sets of commodity and factor prices. The commodities for economic agents are composed of intraregional supplies, regional imports, and foreign imports in terms of the product origin, whereas the regional products are spatially distributed among intraregional supplies, regional exports, and foreign exports in terms of the product destination. Commodity price is assumed to adjust towards a balance between supply and demand in terms of factor inputs and commodity markets.

The question of an efficient population size is addressed by integrating two regression models of the costs and benefits of a given population with the traditional CGE framework. The first regression analysis is designed to estimate the marginal contribution of a regional population to economic benefits using the value-added functions. The value-added by region and industry is assumed to be dependent upon available labor and capital stock, with the linear and quadratic form of the regional population variable serving as a proxy for the urbanization economy. As far as the agglomeration effects are concerned, the marginal benefit from a population in this equation shows an increasing movement up to a specific point and then a decreasing one afterwards. The parameters of α_2 and α_3 are positive and negative respectively in (1). The second regression analysis measures the marginal cost of a given population using the price inflation function. While in the general CGE model the price inflation rate is regarded as a composite index derived from each sector price level endogenously determined, the rate in this paper is regressed with four cost factor variables: the foreign exchange rate, the land price, the ratio of regional demand to supply, and the regional population. The values of all the variables are positive in (2), as expected.

$$\log(\text{value added}) = \alpha_0 + \alpha_1 \log(\text{labor}) + (1-\alpha_1)\log(\text{capital stock}) + \alpha_2 (\text{population}) + \alpha_3 (\text{population})^2 \quad (1)$$

$$\log(\text{consumer price index}) = \beta_0 + \beta_1 \log(\text{foreign exchange rate}) + \beta_2 \log(\text{land price}) + \beta_3 \log(\text{demand / supply}) + \beta_4 \log(\text{population}) \quad (2)$$

Our production structure model is composed of three-stages. At the top of the structure, the gross output by region and sector is determined via a two-level production function of value-added and composite intermediate inputs; that is, in accordance with the Leontief production function, the producer coordinates the level of intermediate demands and value-adding elements against a fixed proportion of gross output. The intermediate inputs are derived from interregional input-output coefficients, whereas the value-added element is determined by a Cobb-Douglas production function of the labor and capital inputs combined with the total factor productivity level.

Each regional labor input is assumed to be homogeneous and possess inter-sectoral mobility, whereas it is assumed that capital stock cannot move from one region to another. The labor demand by various regions and industry is derived from the producers' value-added maximization of the first order condition, whereas labor supply relies on the participation rates and the total regional population size. Under the neoclassical closure rule for the labor market, the labor participation rate is derived by balancing out total labor demand against total labor supply. If the population flows among the regions are not exogenous to the model, then in–migration is assumed to be in response to interregional differences between origin and destination regions in terms of wage per capita and unemployment rate, as well as the physical distance between the regions. Hence, the population of a given region is the sum of the natural growth of the native population combined with the net gain (or loss) of migrant populations.

For the second stage, intermediate demands are transformed into demands for domestic products and foreign imports. We use the Armington approach to distinguish among commodities by place of origin, so as to emphasize the imperfect substitutability between various commodities. Moreover, cost minimization with the Armington approach accounts for an optimal ratio of foreign imports to domestic sales. The demand for foreign imports relies on three variables of domestic sales: the price of the domestic product relative to the domestic price of the foreign import, and the two key parameters of share and elasticity of substitution.

At the final stage, demand for the intraregional product is determined by the price and total demand for domestic products under the Cobb-Douglas function. However, profit maximization according to the two-level Constant Elasticity of Transformation (CET) function determines the optimal allocation of the gross output via two competing commodities: the domestic supplies and the foreign exports. These domestic supplies include both intraregional supplies and regional exports. The ratio of foreign exports to gross output depends on the relative ratio of domestic product price to the foreign export price, the share parameter, and the elasticity of transformation under revenue maximization.

The total demand for goods and services consists of intermediate demands, total consumption expenditures for households, government consumption expenditures, and investment practices. Total household income consists of wage, capital income, and any exogenous subsidies from the government.

The total consumption expenditures are linear functions of the total household income, the direct tax rates of the regional and national governments, and the marginal propensity to save. After paying income taxes and allocating for savings, the household assigns total consumption expenditures to each commodity. Household savings are linearly dependent on household disposable income with a fixed marginal propensity to save.

Two tiers of government structure are specified in the model: two regional governments and one national government. Government expenditures consist of consumption expenditures, subsidies to producers and households, and savings. Revenue sources include taxation of household incomes, value-added, and foreign imports. With regard to the macroeconomic closure rule for the capital market, aggregate savings determines investments. There is one consolidated capital market, consisting of household savings, corporate savings of regional production sectors, private borrowings from abroad, and government savings. There are no financial assets in the model, so overall consistency requires equating total domestic investment to net national savings plus net capital inflows. The sectoral allocation of total investment by destination is endogenously determined by the capital price from each sector and the allocation coefficient of investment. This is transformed into the sectoral investment by origin through a capital coefficient matrix. This price adjustment is required for the Walrasian equilibrium condition, and every price is measured in a relative scale.

The ICGE model is a recursive and adaptive dynamic model, and is composed of a within-period model and a between-period model. The within-period model determines equilibrium quantities and prices under objectives and constraints for each economic agent, in which the balance between supply and demand is achieved in a perfectly competitive market. The between-period model finds a sequential equilibrium path for the within-period model over the multiple periods by updating the values of all exogenous variables, such as government expenditures, from one period to another. For example, the current capital stock is expanded with new investment but also reduced with a constant depreciation rate. The within-period model is a square system of equations with 204 equations and 239 variables; a unique solution can be found because the number of endogenous variables is the same as the number of the equations under convexity. The exogenous variables include world market prices and government expenditures. The numeraire of the model is set as the consumer price index. In addition, we calibrated a Social Accounting Matrix (SAM) as a benchmark for the development of the ICGE model. The SAM consists of six accounts—factors, households, production activities, government, capital, and the rest of the world—and is treated as an initial equilibrium for the ICGE model. Values of some parameters are adjusted to replicate the equilibrium conditions for the base year, 2005.

Table 2–1 Major Equations in ICGE Model

Output	Output = Leontief (Value added, Intermediate demand)
Value added	Value added = Total Factor Productivity*CD (Capital stock,)
Total factor productivity	Total factor productivity = TFP(Population, $Population^2$)
Supply	Output = CET (Foreign exports, Domestic supply)
Domestic supply	Domestic supply = CET (Regional exports, Intraregional supply)
Demand	Demand = Armington (Foreign imports, Domestic demand)
Domestic demand	Domestic demand = Armington (Regional imports, Intraregional supply)
Labor demand	Labor demand = LD (Wage, Value added, Net price)
Wage	Wage = WA (Lagged wage rate, Inflation rate)
Labor supply	Labor supply = LS (Labor market participation rate, Population)
Population	Population = Natural growth of previous year's population + Net population inflows
Regional incomes	Regional incomes = Wage + Capital returns + Government subsidies
Migration	Migration = TODARO (Incomes and Employment opportunities of origin and destination, Distance between origin and destination)
Government revenues	Government revenues = Indirect tax + Direct tax + Tariff
Government expenditures	Government expenditures = Government current expenditure + Government savings + Government investment expenditure + Government subsidies
Consumer price index	Consumer price index = CPI(Foreign exchange rate, Land price, Excessive demand, Population)
Labor market equilibrium	Labor demand = Labor supply
Capital market equilibrium	Private savings = Total investments
Commodity market equilibrium	Supply of commodities = Demand of commodities
Government	Government expenditures = Government revenues
Capital stock	Capital stock = Depreciated lagged capital stock + New investments

3. Policy Simulation

The ICGE model is applied so as to identify the optimal or efficient size of the population of the SMA by measuring the effects of population change on incomes and the spatial distribution of these transformations. Ten alternatives were analyzed regarding the population share of the SMA, from 35% to 50% of the nation. The baseline assumes that the regional population share follows the projected trend outlined by the National Statistical Office of Korea from 48.5% in 2006 to 51.1% in 2015. In these simulations, the exogenous population size of the SMA is expected to affect the total productivity levels for the industrial sectors of two domestic regions, but whether the effect on the GDP is positive or negative (agglomeration economies or diseconomies) is unclear. The patterns and magnitudes depend upon the marginal contributions of the regional population on costs and benefits, with the benefit function operating in a linear and quadratic form, while the cost function is that of a linear population growth or decline. Such population changes can generate a set of new equilibrium values for regional production and prices, satisfying the price normalization rule. Counterfactual simulations are performed for a ten-year span for each alternative. The results of each alternative are compared with the base case (which is defined as a sequential path of economic behavior following an inter-temporal consistency) for periods under existing circumstances.

According to the model, adjustments in the population share of the SMA evidence a relative change in the GDP compared with that of the base line (Table 3-1). With the same population level, the economy could produce a greater output level if the regional share of the SMA fell below 40%. In periods 1-4, GDP optimization occurred at a 39% SMA population share. The optimal level would fall to 38% for periods 5-9 and 35% for period 10 as the national economy grows. It suggests that the de-concentration and dispersion of the national population is needed so as to promote sustainable economic development within Korea.

Table 3-1 Changes in GDP by the Population Share of the SMA (base line = 100)

	35	**36**	**37**	**38**	**39**	**40**	**45**	**48**	**49**	**50**	Pop. Share of Baseline (%)
1	112.75	113.82	114.47	115.11	115.29	115.16	109.21	101.60	98.52	95.22	48.53
2	115.03	115.97	116.53	117.09	117.22	117.03	110.73	102.76	99.54	96.10	48.86
3	117.36	118.17	118.64	119.11	119.19	118.95	112.30	103.97	100.62	97.06	49.19
4	119.67	120.35	120.74	121.13	121.15	120.87	113.87	105.20	101.74	98.06	49.50
5	121.94	122.49	122.81	123.12	123.09	122.75	115.43	106.45	102.87	99.10	49.79
6	124.15	124.58	124.81	125.04	124.96	124.58	116.96	107.70	104.02	100.16	50.08
7	126.24	126.55	126.70	126.86	126.73	126.31	118.44	108.94	105.18	101.23	50.35
8	128.23	128.41	128.49	128.57	128.39	127.94	119.86	110.15	106.32	102.31	50.62
9	130.09	130.15	130.15	130.16	129.93	129.45	121.20	111.33	107.44	103.39	50.87
10	131.74	131.81	131.67	131.60	131.33	130.82	122.46	112.46	108.53	104.44	51.12

With this in mind, why do people move to the SMA when working in the ROK would be more beneficial to the nation's economic growth? Economic reasons for this population concentration can be found in Table 3-2. As the table illustrates, as long as the population share of the SMA remains within a range of 35-48%, the income level of the SMA will be higher than that of the ROK. In particular, at a population share of 40%, the SMA would experience its maximum levels of per capita income, which would be 15-17% higher than that of the national average. This suggests that what constitutes an optimal urban size for the SMA's own regional interest is different from that of Korea more generally speaking. Specifically, it is in the interest of the national government to keep the population share of the SMA to roughly 36% in the long run by utilizing various dispersion policies, whereas the SMA government has a regional interest in obtaining a 40% population share. Moreover, it is reasonable for the people of the ROK to be willing to migrate into the SMA up until the region possesses a 48% population share, as relocation offers the promise of higher income levels.

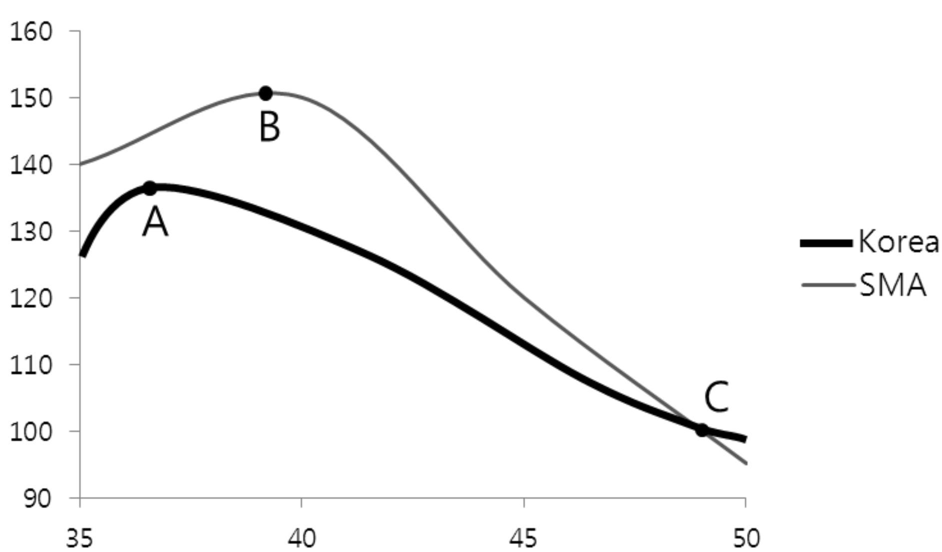
That said, economic incentives alone cannot account for the projected increase in population share for the SMA, from 48.5% in 2006 to 51.1% in 2015 (National Statistical Office of Korea). If the regional share increases beyond 49%, then the per capita income of the SMA would actually become lower than that of the ROK. In this case, non-economic factors may account for the projection of continued increases in population share.

Table 3-2 Per Capita Income of the SMA by the Population Share of the SMA

(National average = 100)

	35	**36**	**37**	**38**	**39**	**40**	**45**	**48**	**49**	**50**	baseline
1	110.29	112.09	113.31	114.42	114.92	115.00	109.71	102.80	99.99	96.93	101.34
2	110.43	112.30	113.56	114.71	115.23	115.31	109.88	102.77	99.87	96.73	100.28
3	110.56	112.49	113.78	114.96	115.49	115.57	109.98	102.68	99.71	96.49	99.13
4	110.69	112.67	113.98	115.18	115.71	115.78	110.03	102.55	99.51	96.22	97.92
5	110.83	112.84	114.16	115.38	115.91	115.96	110.04	102.40	99.30	95.95	96.70
6	110.96	113.01	114.33	115.56	116.08	116.12	110.04	102.26	99.10	95.70	95.47
7	111.09	113.16	114.48	115.73	116.24	116.27	110.05	102.14	98.94	95.49	94.29
8	111.21	113.30	114.63	115.88	116.39	116.40	110.06	102.05	98.81	95.32	93.15
9	111.32	113.43	114.75	116.01	116.52	116.52	110.09	101.98	98.71	95.19	92.05
10	111.42	113.54	114.87	116.13	116.63	116.63	110.12	101.94	98.64	95.10	91.00

Figure 3-1 Average National and Regional Per Capita Incomes of the Long-run (unit: thousand US$)



4. Summary and Issues

Using the ICGE model, we analyzed the effects of regional population concentration upon both national and regional economic growth. An optimal urban size corresponds to the trade-off a population experiences between the costs and benefits of regional living, such as that of agglomeration and congestion, and is that point where the marginal benefit of the population is in equilibrium with the marginal cost. We found that the de-concentration of a population may contribute to the national economic growth, in the sense that the optimal urban size of the SMA is 38% of the total population in the short run and 36% in the long run. The current SMA population share of about 50% in the 2000s is higher than both short term and long term recommended population shares.. The SMA, however, requires a 40% population share if it is to maximize its own regional per capita income, and 48% if it is to achieve maximum economic efficiency. This implies that, as long as the SMA population share remains under 48%, a rational person would move from the ROK to the SMA since the SMA's regional income per capita would be higher than that of the ROK. This quantitative analysis suggests that because the SMA is oversized from both national and regional economic perspectives, higher population concentration results in lower economic growth. This evidence resonates with traditional ideas regarding regional convergence over time, such as Wheaton and Shishido (1981) study that urban concentration increases in the first stage of national economic growth, but decreases later as a result of national incomes rises.

The field of economics has experienced few attempts in empirically quantifying the optimal size of a spatial unit through using a general equilibrium structure. As such, a few points need mentioning regarding the prospect of further research on optimal size issues. First, the suggested optimal population size is derived from the economic context of specific domestic regions. As international competition grows stronger among major city-regions, such as Beijing, Shanghai, and Tokyo in the Northeast Asian countries, an optimal population size will need to be recalibrated to account for these international economic developments. For example, reducing the SMA's population share for the sake of improving the economic efficiency of the Korean domestic market may simultaneously hinder the ability for the SMA to compete within the Northeast Asian economic region.

Second, it appears possible to take into account the various external costs and benefits in the modeling process. This paper was focused only on pecuniary economies, such as labor wages and values, in measuring the costs and benefits of agglomeration. However, decisions regarding migration and the relocation of economic production could be more dependent on consumption externalities and locally specific amenities, such as the quality of commercial and medical services, education, neighborhood, and even climate. Another extension of the present work would be to modify the cost and production functions by developing a channel of technical changes and innovation in a dynamic framework. The current model has some dynamic specifications, such as capital stock-investment, flows of the capital accumulation, and migration-natural growth for the population module, but it cannot accommodate parameter changes within the production module. For example, the introduction of new transportation modes and improvement in the logistics can lead to flatter slopes of cost and benefit functions for a population, which may result in a higher optimal population share than suggested by this paper's findings.

Last, it would be interesting to measure the efficient and optimal size of a working population according to age, since aging is an issue faced by many countries. Shifts towards an aging demographic may mean that the total size of a given population will come to matter less for urbanization economies due to negative economy-wide effects such as a reduction in savings and increases in private consumption and public pension payments.

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