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POLICY CONSIDERATIONS

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Optimal Formation of Cities: Policy Considerations

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Abstract: *Club theoretic analysis of migration between profoundly asymmetric cities shows that centralized policy intervention is necessary to ensure efficient allocation of people between cities. Quantity rationing and equalizing lump sum transfers are compared as the policy instruments of the central government. The instruments turn out to be different in their effects on residential allocation and welfare. This is because lump sum transfers pool up the welfare creating potentials of the cities thus affecting the optimality condition. Therefore, lump sum transfers are superior, and they accelerate rather than stabilize the spatial evolution.*

Key words: agglomeration economies, city size, club theory

JEL Classification: H77, R51

1 Introduction

Urban surroundings quite indisputably offer the most fertile soil for the modern market economy. This is because spatial proximity lowers transaction costs and creates externalities and other agglomeration economies that have direct and indirect effects on locally generated welfare. Therefore, welfare experienced in a city depends on city size. An increase in size yields benefits and cost savings, but eventually it also leads to falling benefits and increasing costs.

Cities being so central in the market economy, it should be natural that the market also would steer the formation of the city structure in efficient manner. Free mobility of people based on local welfare differentials creates the main private element of the market mechanism of the formation of cities. However, as private choices of location cannot lead to optimal population in the cities, local governments must have an active role in this respect to complement the market mechanism.

A common understanding is that collective optimization of city size by the local governments suffices to make the mechanism perfect in purely economic sense. Centralized policy intervention is needed only if there are notable inter-city spillovers. This paper aims to show, however, that centralized policy intervention may be necessary to secure efficiency in the formation of the city system even without inter-city spillovers.

The paper studies the working of the market when the cities are profoundly asymmetric with respect to their long-term capability to create welfare. The paper proceeds as follows. Section 2 sets the club theoretic framework of the spatial evolution of the economy driven by systematic migration of people between two asymmetric cities. Section 3 investigates the need and effects of centralized policy and compares the administrative and economic policy instruments. Section 4 concludes.

2 Migration between asymmetric cities

In practice, there are considerable differences in the cities' absolute capability to create welfare for their residents. This is because of exogenous variation in geography and climate, natural resources, industrial structure, national infrastructure and networks, administrative hierarchy, transport and trade connections, etc. Therefore, the question about the working of the formation mechanism of the system consisting of asymmetric cities is most important.

The welfare that a city generates to its individual residents can be described by the concept of average welfare derived as the net sum of private benefits and costs experienced in everyday life (Laurila, 2004). Agglomeration economies and diseconomies affect both the benefits and the costs so that the average welfare depends on city size. Average welfare reflects the welfare of a representative household and it can be actually monitored from the pattern of systematic migration. The decisions of the non-representative households belong to the purely stochastic element of migration.

Assume that the economy consists of two cities, city A and city B. Fix the total population in the economy to unity so that the populations in A and B sum to 1. In Figure 1 below, the AW curves present the size dependent average welfares in the two cities. The curves are superimposed on each other so that the average welfare in city A denoted by AW_A is presented from left to right and that in B denoted by AW_B from right to left.

(Figure 1 here)

In Figure 1, the inverted U shape of the AW curve is because agglomeration diseconomies start to dominate agglomeration economies at the culmination point. It is also assumed that city A is more

prosperous than city B because it has an absolute advantage in generating welfare. Therefore, the AW_A curve reaches a higher peak value than AW_B both reflecting the long-term potential of the cities. The MW curves present the marginal effects of migration to individual welfare. They are also inverted U shaped, and they dissect the AW curves from above at their top points.

In Figure 1, the AW curves are drawn to intersect in two points, a and b , in order to illustrate possible market solutions of equal welfare in cities A and B. Start by considering the situation around point a , where the population in city A is n_a , that in city B is $I-n_a$ and $AW_A^a = AW_B^a$. With this allocation of population, the small but prosperous city A benefits from agglomeration economies while the much bigger but less prosperous city B suffers from agglomeration diseconomies.

Suppose now that a stochastic movement occurs from city A to city B, that is the allocation of population changes to the left from point a . If so, a welfare gap opens in favor of city B thus motivating systematic migration from A to B. On impact, the solution is drawn further to the left in accelerating speed until A becomes totally deserted. If the stochastic movement had occurred from B to A, that is if the allocation had changed rightwards from point a , the welfare gap would have opened in favor of city A. In this case systematic migration would draw the solution further to the right. Therefore, point a is not a stable solution and it thus cannot be an outcome of free migration.

Follow the path rightwards from point a to see where the systematic migration based on the increasing welfare differential will lead. The next interesting position is at point d along AW_A saying that welfare in city A is at its maximum. Assuming that the cities optimize on their population according to the within-club rule (Ng, 1973; Cornes & Sandler, 1999), the population allocation $n_d/(I-n_d)$ becomes a stable market solution by the local policy-making of city A. The policy is

feasible, because an in-migration city can easily close doors for further immigrants by traditional policy measures such as city planning, dimensioning of service provision and social housing, public transport etc. even though there are willing immigrants attracted by the welfare gap $AW_A^d > AW_B^d$ (Laurila, 2004). The welfare in city A is n_d times AW_A^d and that in city B is $1-n_d$ times AW_B^d . Thus, the social welfare of the local optimization solution is measured by

$$SW^d = n_d AW_A^d + (1 - n_d) AW_B^d.$$

However, if city A does not, for some reason, implement the optimal policy, systematic migration can continue in response to the welfare gap. The allocation of population eventually reaches the stage, where the average welfare in city B is at its maximum at point e . However, optimizing of population in city B is not feasible because out-migration cities seldom have ample policy instruments for stopping emigration. Because $AW_A^e > AW_B^e$ it is quite plausible that migration will continue further.

The welfare differential motivates migration from city B to city A until the second intersection point b with the allocation $n_b/(1-n_b)$ is reached. Around point b , the more prosperous city A is excessively congested while the less prosperous city B is small and would benefit from growth. Yet, the welfare equalizing solution b is stable: stochastic movement to the left from point b makes city A attractive for systematic immigration from city B drawing the solution towards b . The opposite is true on the right side of the point. Thus, point b is a genuine market equilibrium of free migration. Social welfare of the stable migration solution amounts to

$$SW^b = AW_A^b = AW_B^b.$$

Neither of the two market allocations considered above is socially optimal. The socially optimal solution is at point E , where the MW curves intersect reflecting the economy-widely optimal mix of utilization of agglomeration economies in city B and suffering of agglomeration diseconomies in city A. The population allocation is $n^E/(1-n^E)$, and the optimal social welfare is measured by

$$SW^E = n^E AW_A^E + (1-n^E)AW_B^E.$$

Compared to the social optimum, the allocation $n^d/(1-n^d)$ is not efficient because of the welfare loss measured by the area cdE in Figure 1. The stable market solution at point b is not efficient either because of the welfare loss Efg . Therefore, $SW^d < SW^E > SW^b$, but no general conclusions can be made whether SW^d is higher or lower than SW^b .

Because the socially optimal solution is reached neither by migration alone nor by migration complemented by local policy, and particularly because the optimum implies a sustaining welfare differential $AW_A^E > AW_B^E$, it is obvious that centralized policy intervention is needed on efficiency grounds.

3 Policy considerations

The standard policy instruments consist of administrative and economic measures. Their difference is that administrative measures concern quantitative terms thus operating along the horizontal axis while economic instruments concern monetary issues thus operating along the vertical axis of Figure 1. The conventional wisdom concerning the instruments is that their effects should be equal horizontally and vertically so that the market solution is symmetrically affected.

The administrative quantity rationing uses rules, standards, constraints and other such legislative tools in order to make the social welfare maximizing allocation $n^E/(1-n^E)$ sustainable. Practical implementation of the policy means that people are allowed to move from city B to city A until the optimal allocation is reached. In this planning solution the welfare difference $AW_A^E - AW_B^E > 0$ between the cities is maintained at the optimal social welfare level SW^E . This kind of a policy is feasible if the instruments for the optimization of population are in the hands of the central level so that it can nullify or rule out the local optimization policy.

By the administrative instruments, the economy is divided into better-off and worse-off cities, thereby violating both the intertwined principles of free migration and regional equity. But if these principles should be respected, the administrative instruments are obviously out of the question. Instead, economic instrument could be used to level out the welfare differences thus making the market solution based on free migration sustainable.

Assume now that the central government transfers income from the more prosperous to the less prosperous city by undistortive lump sum transfers so as to equalize the welfare levels in city A and city B. In practice, the policy concerns transfers of income that is they affect through people's budget constraints and leave the benefit sides unaffected. In any case, the effect is that the welfare schedules are altered. Figure 2 illustrates the effects of such policy.

(Figure 2 here)

The policy is supposed to be implemented in two stages in Figure 2. First, a Pigouvian tax measured by the tax wedge $\alpha\beta$ is imposed on the citizens of city A thus pressing the AW_A curve downwards. As a result, the migration solution is steered to the stable solution in point α . Second, the tax income

is returned evenly ($\alpha\varepsilon=\varepsilon\beta$) to people in city A and city B so that the AW_A and AW_B curves shift both upwards crossing at point ε .

The lump-sum transfers from city A to city B press the AW_A curve flatter and to the right and the AW_B curve taller and to the left. The transfers being equalizing in nature the result is a joint average welfare curve, which is presented by the dashed AW_{AB} curve just between the original AW_A and AW_B curves in Figure 2. Between points a and b the transfers go from city A to city B, and beyond the points the other way round.

The marginal welfare curves shift accordingly to MW_A' for city A and to MW_B' for city B. The curves strike through the joint average welfare curve at ε at the top of AW_{AB} . That the transfers shift the marginal welfare curves means that the optimality condition given by the intersection of the MW curves is affected. In Figure 2, the policy makes the intersection point shift leftwards from E to ε . The optimal allocation is thus different from that without policy - city A should be smaller and city B bigger than without policy. The optimal allocation of people is $n^\varepsilon/(1-n^\varepsilon)$, and the social welfare is

$$SW^\varepsilon = AW_A^\varepsilon = AW_B^\varepsilon,$$

which is the highest attainable welfare level. In particular, $SW^\varepsilon > SW^E$. This is because the equalizing lump sum transfer in effect redistributes prosperity in the economy so that the existing resources and other preconditions come to be utilized more efficiently. The reshaping of the AW curves means that agglomeration economies are increased and diseconomies decreased in the economy and that both cities are of optimal size in this respect in the equilibrium.

4 Conclusions

In the practically relevant case of profoundly asymmetric cities, a stable and efficient market solution is not achievable even with collective optimization of population by the local governments. The first conclusion of the paper is that centralized policy intervention is necessary to ensure efficiency in practice.

Two instruments of centralized policy are studied, namely administrative measures in the form of quantity rationing and economic measures in the form of equalizing lump sum transfers. The paper shows that both measures produce a superior outcome to that yielded by migration alone or by migration complemented by local level policy-making.

The use of administrative policy measures implies that the efficient allocation of people is maintained in spite of the existing welfare differentials between cities. The principle of regional equity is thus violated. Such measures may also be difficult to implement in a market economy because they necessitate constraints on free mobility. Lump sum transfers from more prosperous to less prosperous cities can be used to equalize the welfare differentials thus making the free migration solution sustainable.

The final result of the paper is that lump sum transfers yield both different allocation of population and higher social welfare than quantity rationing. The result contradicts the conventional wisdom that administrative and economic measures should have symmetric effects, and that inter-regional transfers should, as they level out the welfare differentials, stabilize migration. In this model equalizing lump-sum transfers rather accelerate than stabilize migration. This is because the policy effectively pools up the welfare creating potentials of the cities thus changing the efficient residential pattern from that without transfers.

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Figure 1: Possible solutions of allocation of residents between cities

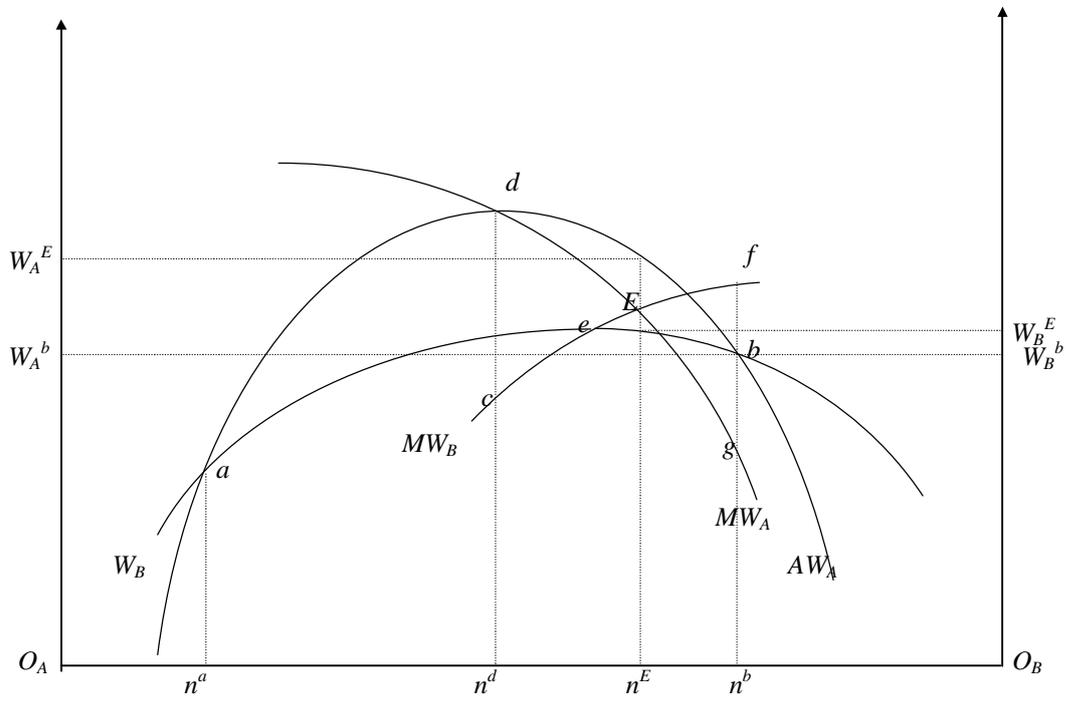


Figure 2: Equalizing lump-sum transfers between cities

