INTER-CITY MIGRATION AND POLICY

Hannu Laurila
Department of Economics and Accounting
FI-33014 University of Tampere
hannu.laurila(at)uta.fi

Abstract. The seminal Buchanan-Ng club model is used to analyze optimal allocation of population between cities. Because of externalities, migration cannot alone ensure efficiency and policy intervention is needed. In principle, a first-best optimum is achievable either by purely local or purely centralized policy, but it is difficult to implement in practice. Consolidation of central and local policies is more promising, because theoretical calculations of externalities caused by migration can then be omitted and policy can be based on individual welfare experiences.

Key words: **A**gglomeration, club theory, exit and voice

JEL classification: R12, R23

1 Introduction

Cities attract people because of direct and indirect welfare effects. Direct welfare effects arise from multiple consumption choices, rich social relationships and other stimulations of city life. Indirect welfare effects, mediated by the price mechanism, originate from low transaction costs, cost-sharing in the construction of housing and infrastructure, specialization in work, effects of scale and scope in business etc. Yet, uncontrolled growth, overly dense construction, traffic congestion, environmental damage and other such malfunctions cause inevitable inconveniences, too. Therefore, optimal city size and efficient allocation of people between cities are among the key issues in the literature on urban economics (Richardson, 1973; 1978; Combes et al., 2005).

In this paper, a club theoretic city model is applied to enable strict evaluations of efficiency in the presence of externalities. The focus of the paper is on the efficient allocation of people between cities with special emphasis on policy implications. The concept *exit* is used to refer to purely private choices between the local economies through migration, and the concept *voice* is used to refer to collective decision-making within the local public economy (Bailey, 1999). The basic market mechanism behind the formation and development of cities and urbanization in general is based on the exit decisions made according to locally determined benefits and costs. Local policy via voice is necessary but not always sufficient to drive the development in the socially optimal manner. Therefore, also centralized policy intervention is needed.

The paper proceeds as follows. In Section 2, a city application of the seminal club theoretic model of Buchanan (1965) amended by Ng (1973) is presented. In Section 3, the model is used to examine the capability of free migration to produce efficient outcomes between two asymmetric cities. Section 4 examines the efficacy of local and centralized policies. The superiority of a combination of local and national policies is attested. Section 5 concludes.

2 The model

A city is a club that consists of its residents who derive utility from consumption of the club good that is the consumption bundle including all elements of everyday life, both private and public. The club nature of the city involves also technological externalities which make utility depend on club size that is the population in the city. City size can be measured by population taken that the geographical area of the city is fixed. Individual's utility from belonging to the city thus reads

$$u = u(q,N), \tag{1}$$

where q is the amount of consumption and N is population. The club good q is assumed a normal good with declining marginal utility. Taking population fixed, $u_1 > 0$, $u_{11} < 0$.

Furthermore, individuals are assumed to benefit from city growth up to a certain congestion point after which further growth becomes harmful. Thus, fixing q and taking

N variable, the graph of the individual utility function (1) has an inverse U shape reflecting a representative citizen's direct benefit of, or willingness to pay for city life. Assume that, at earlier stages of city growth, the benefits rise because of increased freedom of choice, decreased time costs of transport, improved quality of work and leisure time etc. However, when the city gets overly congested, the negative effects eventually start to dominate the positive ones because of pollution, noise and other disturbances and because of the again-increasing time costs of urban transportation.

On the other hand, belonging to the club that is living in the city necessitates cost, too. It is simply assumed that the total cost function

$$C = C(q) \tag{2}$$

with $C'>0$, $C''>0$ applies for all private and public costs of city life. In particular, it is assumed that there are no externalities in production caused by city size. Assuming identical tastes and equal cost-sharing for the city residents, individual costs read

$$c = \frac{1}{N} C(q). \tag{3}$$

Taking q fixed, the net benefit of an individual city resident

$$\varphi = u - c \tag{4}$$

is maximized when

$$\frac{du}{dN} = -\frac{c}{N} \tag{5}$$

Equation (5) says that the disutility from city growth must be just balanced by the gain from cost-sharing. This is the classical *within-club* result (Cornes & Sandler, 1986). From the *total-economy* viewpoint emphasized by Ng (1973), the net benefit of the whole city

$$\Psi = N\varphi \tag{6}$$

must be maximized. Using (1) and (3) this yields

$$\frac{d\psi}{dN} = u + N\frac{du}{dN} = 0. \tag{7}$$

Equation (7) says that the city should grow until the marginal net benefit caused by an additional resident for the whole city goes to zero. Figure 1 below illustrates the model and the two conditions for optimal city size.

(Figure 1 here)

In Figure 1, *Panel a* depicts the total utility function $U = Nu$, the total cost function (2) and the total net benefit function (6). *Panel b* of the Figure depicts the individual utility function (1), individual cost share function (3), the individual net benefit function (4) and the marginal net benefit function (7), denoted by θ. By (7), function θ intersects the u function at its maximum point from above. Likewise, by (6), the θ function intersects also the φ function at its maximum point from above. A marginal migrant does not anticipate the externalities that he causes to other citizens and therefore does not take into account his impact on the total net benefit and on the individual net benefit. Before the top point of the net benefit curve, marginal effects exceeding the average value make the average benefit increase while the reverse happens after the top point of the average benefit curve.

In Figure 1, the within-club optimum condition (5) is satisfied at N_w while the total-economy optimum condition (7) is satisfied at N_t. City size N_w is optimal from the point of view of an individual citizen. Yet, in a purely private sense (via *exit*) the choice variable N can be optimized only by moving to a city of exactly this size. Thus, there must be lots of options and the migrant must be continuously on the move, because other people's contemporary choices affect the optimality condition. Therefore, optimal N can be chosen only collectively, through local democracy (*voice*) so that the city itself acts as a market agent that optimizes on its own size (Laurila, 2008).

Total net benefit in the city can be measured by three ways in Figure 1. First, it is shown in *Panel a* by ψ_w for the within-club solution and ψ_t for the total-economy solution the latter being clearly higher. In *Panel b* of the Figure, the total net benefit can be measured either by the area beneath the θ curve or by the product of population and individual net benefit. The last measure at the within-club solution is $N_w \times \varphi_w$ which is smaller than

$N_t \times \varphi_t$ at the total-economy solution. The decline from φ_w to φ_t is more than compensated by the increase of people calculated into the total product up to the population level N_t.

For further purposes, the key concepts of the model are the φ and θ curves of Figure 1, *Panel b*. The inverse U shaped φ curve captures the net effects of positive and negative agglomeration economies that affect people's everyday wellbeing in the city. Thus, it reflects people's true experiences of welfare and can be labeled as *average welfare curve*. The θ curve, labeled as *marginal welfare curve*, represents a more theoretical concept and sets the solid condition for efficiency from the point of the whole economy.

3 Migration between cities

Assume that people are perfectly mobile and that they have perfect foresight of local differences concerning the factors of their welfare. Thus, people make rational welfare maximizing choices on their location. If there are differences between places in terms of welfare, there also occurs systematic migration towards those places with higher welfare levels. Thus, people make market type exit decisions between the alternatives.

Assume that the economy consists of two cities, city A and city B. In both cities, the goods and factor markets operate competitively. The citizens in city A and city B have identical preferences, and the firms have identical production technologies. The cities are composed on the basis of local market areas. The cities also operate as local public economies which provide all public goods. In this respect, the operation is conducted by efficiently working local democracy (voice) within the cities. It is assumed that only the current citizens of a city can participate in the collective decision-making.

The production factors of the economy are land, capital and labour. The stocks of land and capital are taken fixed and immobile between the cities. Labour, measured in population N is also fixed, but mobile through migration of people (inter-city commuting is excluded). Assume that the endowments of the immobile factors differ between the cities so that there are differences in their potential capacity to create welfare to their residents. In this respect, city A is assumed to be better equipped.

In Figure 2, the average and marginal welfare curves are drawn for both cities so that the length of the horizontal axis equals the total population of the economy. For city A, the curves are drawn from left to right, and for city B, the curves are drawn from right to left.

(Figure 2 here)

In Figure 2, the cities are so big that the φ and θ curves intersect on the decreasing range. Free and costless migration produces a stable market allocation N_e since starting from left or right of that implies a welfare gap that causes systematic migration towards N_e. Yet, N_e is not an efficient solution. The total-economy efficiency condition is fulfilled at N_ε where the condition (7) applies with the baseline being the positive marginal welfare offered by the alternative location,

$$\theta^A = \theta^B. \tag{8}$$

Condition (8) says that the marginal welfare effects must be equal in both ends of the migration flow. The dead weight loss in the migration equilibrium is measured by the area *εe'e"*.

Second, assume that the total population of the economy is initially so small that at least one of the cities is always operating on the range of increasing average welfare. Figure 3 below illustrates the effects of migration between the cities A and B in that case.

(Figure 3 here)

In Figure 3, the φ curves intersect on the increasing range in point e. At that point, average welfare is equal in the cities so that systematic migration should not exist. However, any exogenous impulse to either direction opens a welfare gap thus motivating systematic migration to the same direction. Therefore, the solution at e is not stable. As a matter of fact, migration can produce a stable equilibrium only in a corner solution where the whole population of the economy lives in either of the cities, depending on direction of the initial shock. Efficiency of the allocation of population is given by the condition (8) holding in point ε where the θ curves intersect. The problem is that ε is not stable either.

4 Policy considerations

4.1 Local policy

Quite evidently, migration as such cannot lead to efficiency whether the asymmetric cities are big or small, and some kind of collective action must be taken. One possibility is that the cities themselves intervene either from the within-club or from the total-economy viewpoint.

From the within-club viewpoint the cities optimize their sizes by controlling migration so that average welfare in the city is maximized. The policy instruments include land use and planning decisions, dimensioning of social housing, sizing of public good and service provision etc. Yet, these instruments are effective only in growing cities - immigration can be stopped but emigration cannot be induced by them.

In the case of big cities of Figure 2, the within-club optimum can be reached only if the initial situation lays either to the left from N_a or to the right from N_b. In the former case the result is N_a and in the latter case the result is N_b. The dead weight losses are *aεa'* and *εbb'*, respectively, which are quite extensive.

In the case of small cites of Figure 3, starting leftwards from point *e*, city A would stop immigration at N_a thus causing the welfare gap *aa"*. Starting rightwards from *e*, city B would stop immigration at N_b causing the welfare gap *bb"*. Whether these solutions are better or worse than the corner solutions remains an empirical issue, but they are certainly worse than the solution at N_ε given by condition (8). The policy of city A causes the dead weight loss *εa'a* and that of city B the dead weight loss *bb'ε*.

Another alternative would be that the total-economy viewpoint is taken in local policy. From this viewpoint, the marginal welfare concepts of the cities should be perfectly anticipated and used to evaluate the externalities caused by the migrants to each other. In Figure 4, the big-city setting of Figure 2 is redrawn for policy considerations.

(Figure 4 here)

In Figure 4, two kinds of local policy options are considered. First, the cities are assumed to take the traditional action of internalizing externalities. In this respect, both cities calculate the negative externality of immigration at the optimal allocation N_ε and internalize that to average welfares by setting corrective Pigou-taxes. For city A the tax is t_A and for city B the tax is t_B. Average welfares are equalized by pressing the average welfare curves downwards to φ_t^A and φ_t^B. Since the intersection of the shifted φ curves appears on the decreasing regime, the result is stable, Furthermore, taking into account the tax revenues $t_A \times N_\varepsilon$ and $t_B \times (N-N_\varepsilon)$, the result is also efficient.

Second, the setting of Figure 2 may be seen as bargaining over residents by recruitment. To the left from N_e, city B's willingness to pay for the recruitment of marginal migrants, that is θ_B, exceeds that of city A, that is θ_A, up till N_ε. People move from A to B as far as B can compensate more to the marginal migrant than A is able to pay to retain him.

Precluded that the financing of the recruitment compensations (the area $\varepsilon'\varepsilon''\varepsilon$) can be done against the benefits from increasing size, this will also lead to the efficient outcome.

The case of small cities is more complicated. As is evident by Figure 3, internalization of positive externalities at N_ε would prelude Pigou-subsidies to shift the φ curves upwards to intersect in point ε. The financing of the subsidies would be problematic in the present framework. Moreover, pressing the intersection of the rising φ curves upwards to ε by the subsidies would not evoke stability into the system.

The only possibility of total-economy viewed local policy is bargaining on recruitment. In Figure 3, to the left of point ε, city A is willing to pay more of a new resident than city B, and to the right of the point ε city B is able to beat the offer of city A. This means that, to the right from N_e, as systematic migration draws people from city B to city A, city B can stop emigration at point ε' by compensating the difference of average welfares $\varepsilon'\varepsilon''$ to the marginal emigrant. The bargaining solution is stable and efficient provided that the financing of the recruitment compensations can be done against the benefits. This may be troublesome, particularly if the initial migration flow should go to the right from N_e.

4.2 Centralized policy

There are good reasons to question the feasibility of first-best policy-making on the local level. First, the competence of the local policymakers in estimating the marginal welfare curves in order to set the first best policy goal can be challenged because of the very abstract nature of the concepts. Not only the θ curve in the own city but also that in the other one must be calculated properly in order to set N_ε as the policy goal. This would necessitate perfect anticipation of the full curvatures of the two θ curves.

Second, financing of local policy may be problematic particularly in the case of small cities. Pigou-type correction of externalities by subsidies is financially cumbersome, and so is the financing of the welfare-equalizing recruitment compensations.

An third, in the presence of externalities, there is the fundamental conflict between average and marginal concepts. For example, in the case of small cities of Figure 3, any departure form point *e* opens welfare gaps that not only attract individually minded people to exit but also motivate individually minded citizens in the growing city to use voice to allow immigration until maximal average welfare is reached. This brings up the key question of the nature of voice: it seems quite unreasonable to assume that utility maximizing people base their exit choices on the average welfare concepts, but their voice choices on the marginal welfare concepts, which they do not even anticipate by definition (Laurila, 2008). As a matter of fact, the assumption that only the current citizens can use voice blocks out the application of condition (8) and thus the possibility of the first best solution.

Therefore, consider the polar case of purely centralized policy concerning the allocation of population. Referring to the former discussion about the difficulties in estimating the abstract marginal welfare concepts in order to set first-best policy goals, a common view is that a central social planner should have better vision in this respect. The central government can use administrative and economic instruments as corrective measures.

Administrative measures can be tried to force the cities to use first-best policy. This can be done by setting limits to their planning and land use, social housing and public goods provision etc. There are some constraints, however. For example in Figure 3, the initial allocation of population should be between N_e and N_ε so that migration to city A can be stopped at N_ε by regulating city A. Otherwise, systematic migration draws away from the optimum and people cannot be forced to move backwards against their will. Even if the optimum N_ε is once reached, its policy-induced stability may be questionable, because the welfare gap $\varepsilon'\varepsilon''$ implies that there are willing emigrants from city B and motivated citizens in city A to surpass the regulation in order to increase their own welfare.

A standard economic measure of first-best policy is to use Pigou-taxes and transfers under the budget constraint

$$N_\varepsilon \times t_A = (N-N_\varepsilon) \times s_B \qquad (9)$$

so that the policy levels the welfare gap at the optimal allocation thus making the migration solution coincide at that allocation. As illustrated by Figure 5, the policy is operative in the case of big cities.

(Figure 5 here)

In Figure 5, the central government is supposed to issue a lump-sum taxe t_A on the residents of city A and deliver the collected tax revenue to the residents of city B in the form of a lump-sum transfer s_B. The tax in city A shifts the φ^A curve downwards and the transfer in city B shifts the φ^B curve upwards so that average welfares are equalized. The new intersection point of the φ_t^A and φ_s^B curves is in point ε' at the efficient allocation N_ε. Since both curves still remain declining, the solution is also stable.

In the case of small cities the transfer policy does not operate as Figure 6 illustrates.

(Figure 6 here)

In Figure 6, the central government is supposed to impose a lump sum tax t_A to the citizens in city A and gives a lump sum subsidy s_B to the citizens of city B so that the φ curves shift to φ_t^A and φ_s^B making them intersect in point ε'. By the policy, average welfares are equalized at N_ε, but the policy does not function, because systematic migration draws away from point ε'. The policy cannot evoke stability to the originally instable situation along the rising φ curves.

There seems to be slight chance to reach first-best optimality by administrative instruments whereas economic instruments are less useful. In the case of small cities, economic instruments can be used only to level the welfare differences at the administratively produced optimum thus easing the pressure of immigration to the wealthier city. Therefore, administrative and economic instruments do not have identical effects, which is against the common consent. Second, another common view is that equalization should stabilize migration. Figure 6 shows that this is not necessarily true either.

4.3 Consolidation of local and centralized policy

It seems that it is not easy to reach first-best solutions by purely local or purely centralized policy, at least not when the cities are initially small. However, the dichotomy brings forth a third possibility in which both policies work contemporarily. Assume that this consolidated policy package consists of welfare equalizing inter-city transfers operated by the central government, and within-club size optimization conducted by the cities. Figure 7 illustrates the working of the policy package in the case of big cities.

(Figure 7 here)

In Figure 7, assume that the initial allocation is N_e, given by free migration. Now, it suffices that the central government is able to anticipate the direction of the efficient solution so that there is no need to know the exact curvatures of the θ functions. The central government can then start to iterate the tax-transfer scheme thus shifting the φ curves so that their momentary intersection points occur on the dashed line starting leftwards from point e. In effect, the dashed line constitutes a new φ^{AB} curve common to both cities. The locus not only describes the momentarily equalized average welfares in the two cities but also creates a new φ^{AB} curve common to both cities which gives the relevant welfare measure for people in both cities. The φ^{AB} curve reaches its maximum value in point ε*. The iteration can be stopped at point ε* where city B is observed to stop immigration along the φ^{AB} curve from the within-club viewpoint. The result is stable and efficient.

Figure 8 below illustrates the respective case of small cities.

(Figure 8 here)

Start by assuming that city A has optimized on its size at allocation N_a in Figure 6. The solution is stable by the policy of city A, but there is a welfare gap between the cities. To equalize the gap, the central government imposes a lump-sum tax on the citizens of city A and grants a lump-sum transfer to the citizens in city B under the budget constraint (9). The transfer policy shifts the φ^{A} curve downwards and the φ^{B} curve upwards so that average welfares are momentarily equalized in the intersection of the shifted curves. However, the intervention breaks the stability of the solution, because local policy of city A can only stop immigration, but not prevent emigration. Thus, systematic migration starts sooner or later towards city B. During the phase of migration, time consistent transfers under the budget constraint (9) at any allocation to the left from N_α would produce momentary solutions along the dashed line leftwards from point α.

Starting from the allocation N_b optimal from the point of view of city B, equalization of the welfare difference by centralized lump-sum transfer policy under the budget constraint (9) leads to the momentary instable equilibrium in point β from which migration eventually starts towards city A. All momentary welfare equalizing solutions along this migration pattern form the dashed line drawn rightwards from point β.

In Figure 6, the time-consistent transfer policy that obeys the budget constraint (9) at any population allocation yields the locus $\beta e \alpha$. The locus describes the momentarily equalized average welfares in the two cities thus creating a new φ^{AB} curve common to both cities with its maximum value in point ε*. Migration is stopped by local policy at the allocation N_ε not depending on the side from which it is approached. When the central government notes this kind of local policy, it can simply stop the iteration of the policy parameters at the values t_A* and s_B*.

The policy package leads to first-best efficiency. This is because the time-consistent centralized policy that affects the φ curves also shifts the θ curves so that they intersect in point ε* in Figure 6. Thus, total welfare is maximal. Lump-sum transfers pools the exogenously constrained welfare creation potentials of the cities. The policy yields stability because of its welfare equalizing nature and because the result is optimal for both cites at the same time. Corner solutions are also quite unlikely, at least if the total population in the economy is big enough to support two cities with inverse U-shaped φ schedules. Again, equalization rather motivates than stabilizes migration. This is because the working of the consolidated policy package is based on inducing migration towards the optimal solution. Therefore, equalization induces stability only on the long term, after the phase of induced short-term migration.

5 Conclusions

Migration has a big role in the allocation of resources between regions and industries. Assuming that the economy consists of cities, that the labour input is the only mobile factor and that the price information of competitive markets steers people's decisions effectively, the question of allocative efficiency can be reduced to the question of optimal division of people between the cities.

It is evident that efficient division of people between cities cannot happen without policy intervention, local and/or centralized. A reasonable argument would be that allocatively efficient interior solutions could be produced by local optimization of city size. However, this precludes that the cities should operate from the total-economy viewpoint, not from the viewpoint of its individual citizen. This orientation may not match either the spirit of the present model or the origins of local democracy. In practice, local policy based on individual preferences is a more relevant alternative, because the policy can then be based on maximization of average welfare that is the everyday welfare experienced by people

It might be argued that the total-economy viewpoint and thus first-best optimality fits better to centralized policy. The fact still is that first-best optimization necessitates evaluation of very abstract marginal welfare concepts. Moreover, in the relevant case of small cities, the efficacy of purely centralized policy remains poor.

The combination of local and centralized policies turns out to be most promising scheme in terms of efficiency and practical implementability. Centralized equalization of local welfares by lump sum inter-city transfers pools the exogenous circumstances between cities thus fulfilling the first-best condition of optimality. Given that the cities simultaneously optimize their size by the within-club rule, the policy produces also a stable solution.

The main virtue of the consolidated scheme is that efficiency can be gained without tedious evaluation of external effects. The marginal welfare concepts can be omitted and the policy can be based on people's observations of their own welfare monitored by experience. All that the central government must do is to react to cities' collective actions based on these observations.

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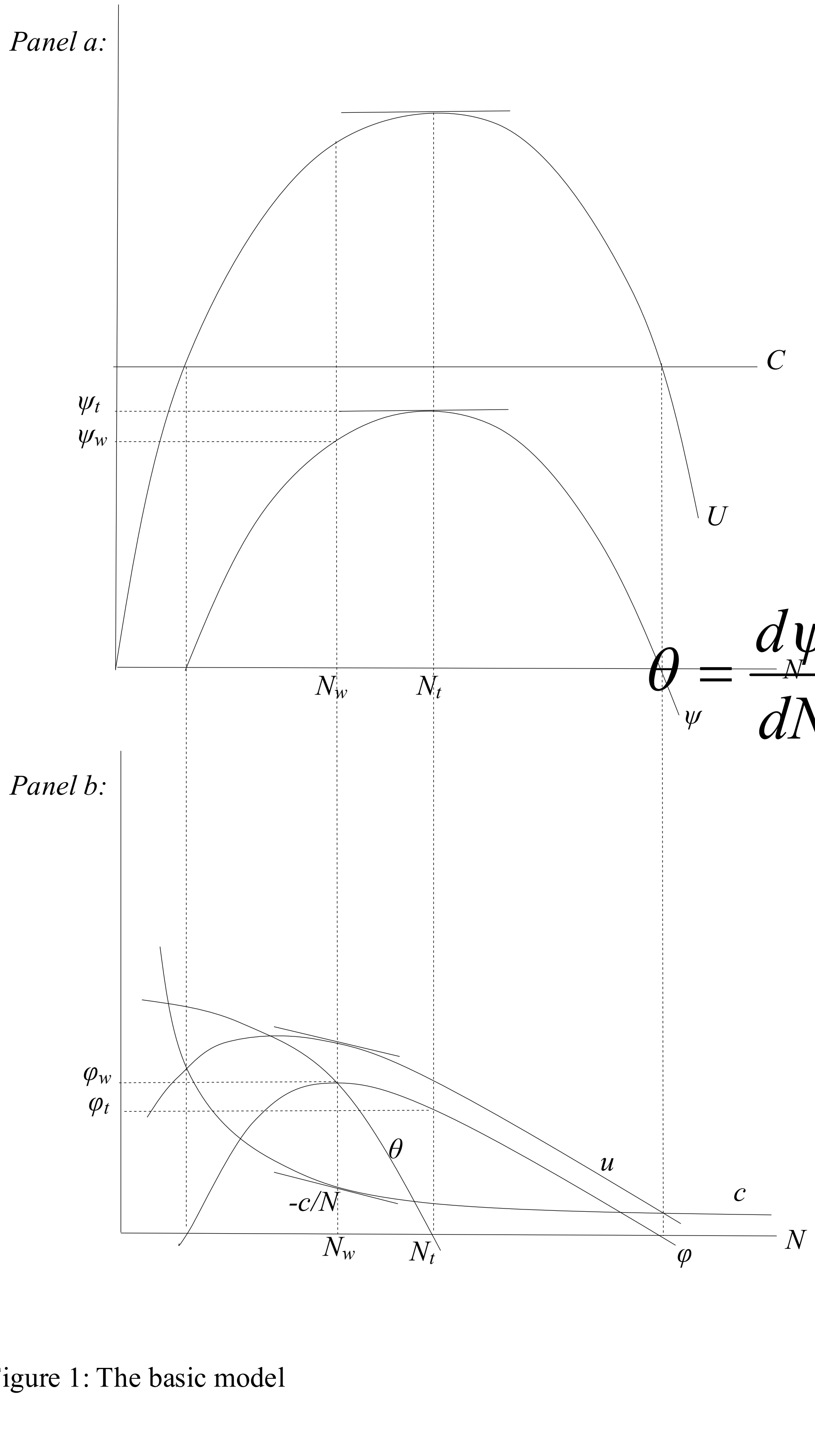

$$\theta = \frac{d\psi}{dN} = 0$$

Figure 1: The basic model

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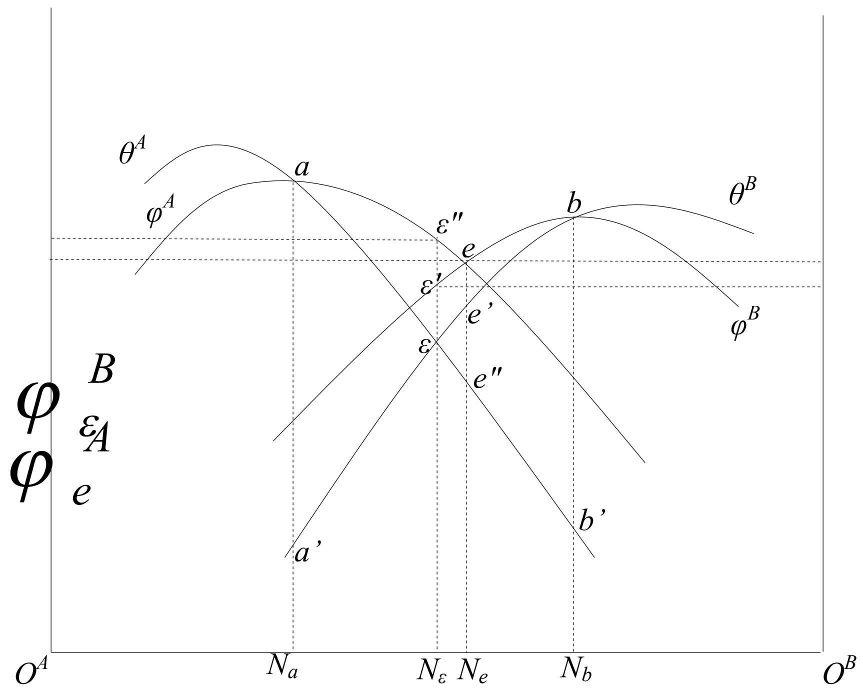

Figure 2: Optimal allocation of population between big asymmetric cities

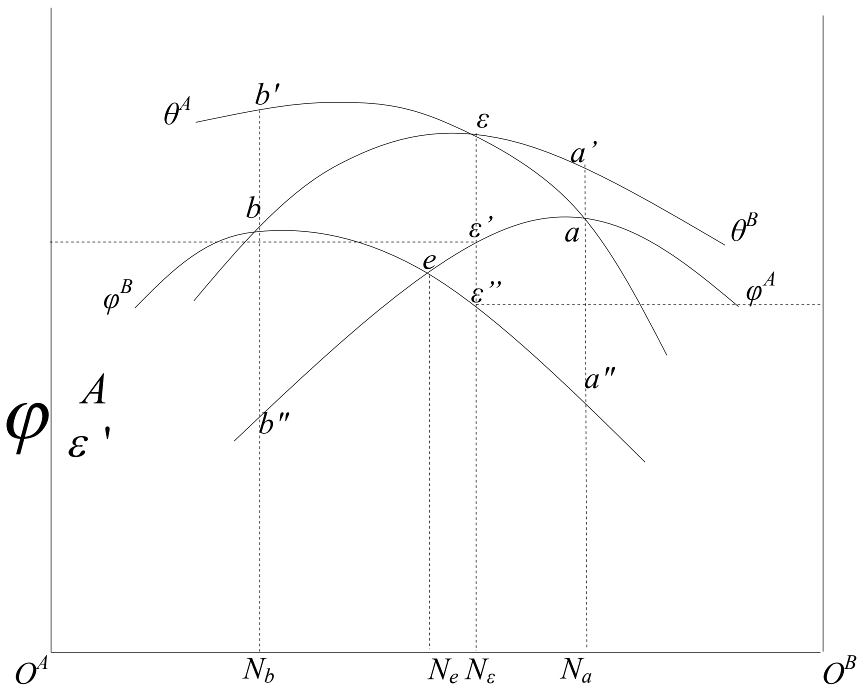

Figure 3: Optimal allocation of population between small cities

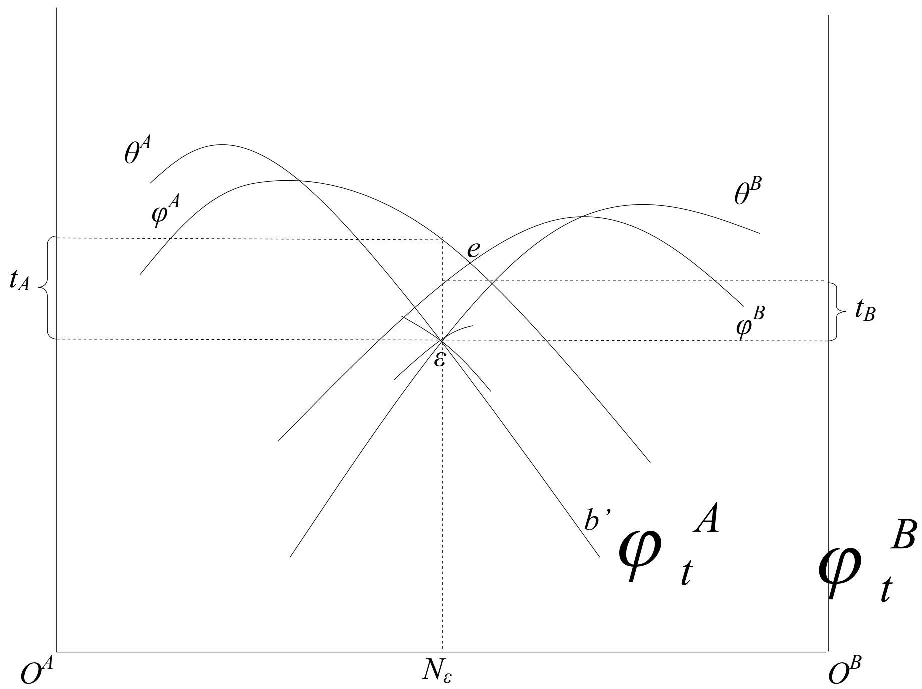

Figure 4: Local policy by the total-economy rule with big cities

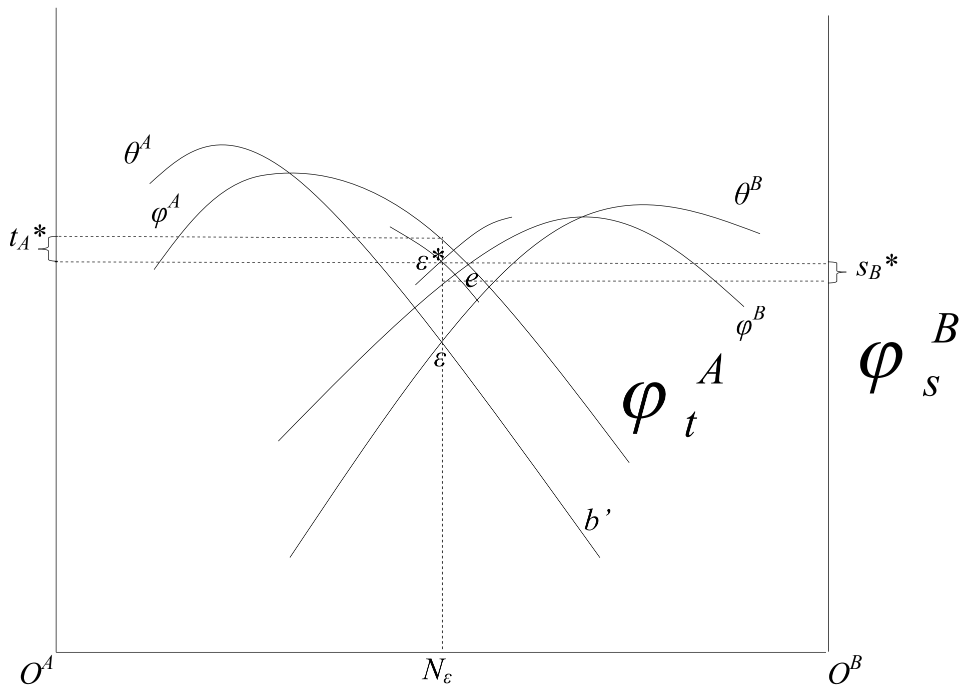

Figure 5: Centralized inter-city transfers with big cities

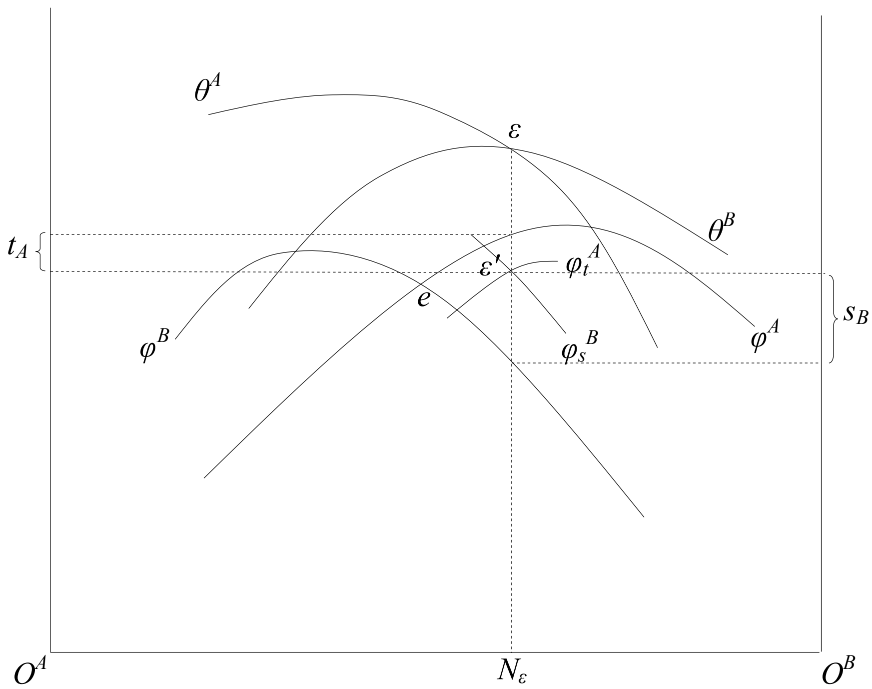

Figure 6: Ineffectiveness of inter-city transfers between small cities

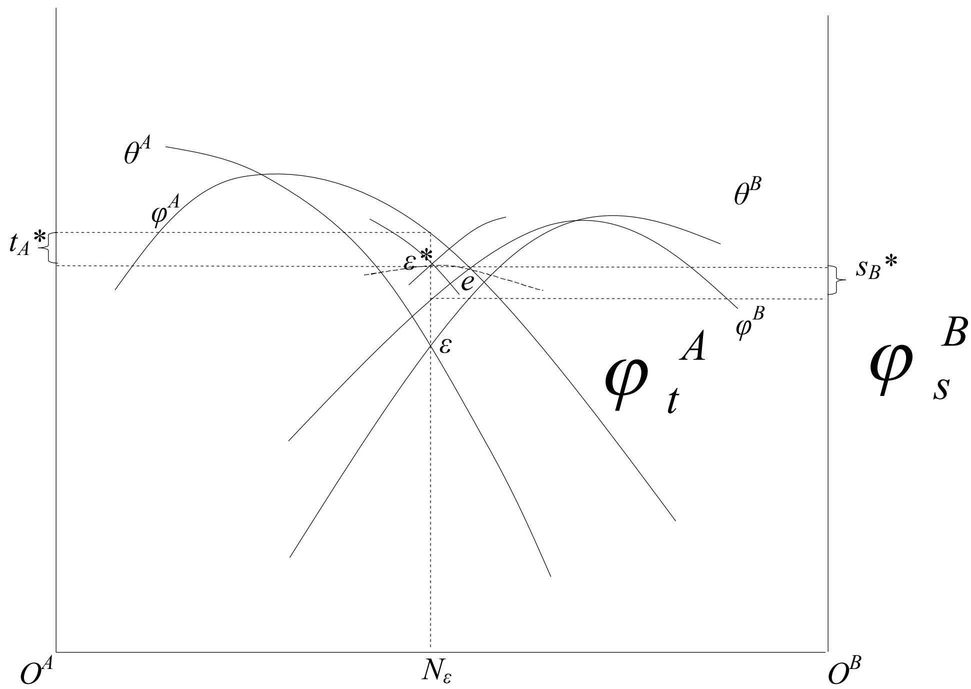

Figure 7: Consolidated policy with big cities

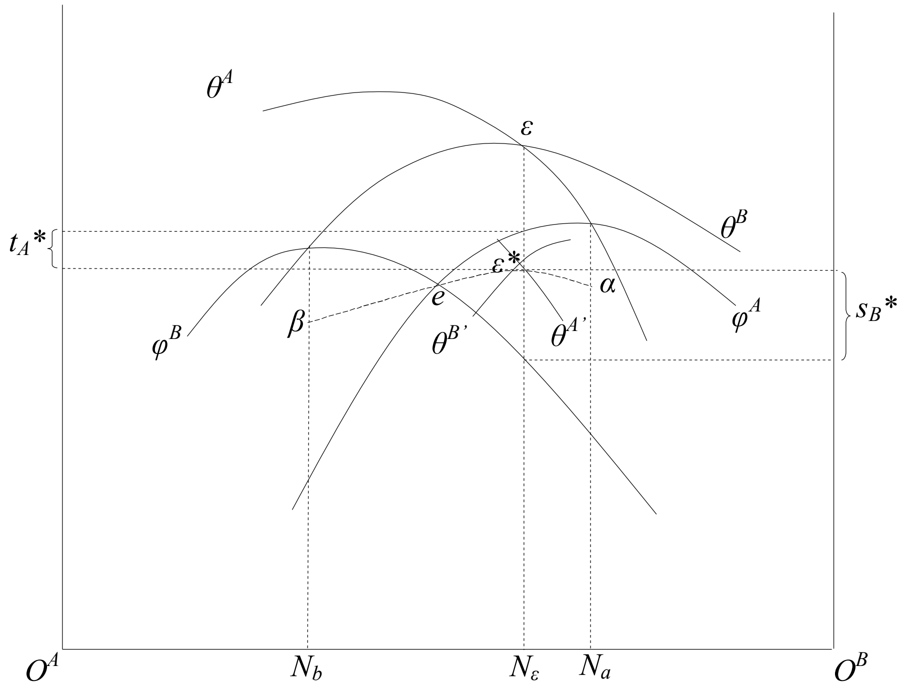

Figure 8: Consolidated policy with small cities