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**CAN WELFARE BE
IMPROVED BY RELOCATING
FIRMS? THE CASE OF
THE CONSTRUCTED
CAPITAL MODEL**

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CAN WELFARE BE IMPROVED BY RELOCATING FIRMS? THE CASE OF THE CONSTRUCTED CAPITAL MODEL

Egle Tafenau*

Abstract

In the literature of new economic geography several authors have shown that a benevolent social planner would choose a different spatial distribution of economic activity than the one achieved through market forces. So far little has been done to evaluate the welfare effects of specific redistribution policies. This is the main contribution of the paper. We look at two policy schemes: location permits policy and a tax-subsidy policy in the context of the constructed capital model (due to Baldwin 1999). It is shown that with a tax on final consumption expenditures and a capital subsidy there is more room for welfare improvement than under the location permits policy due to increased variety of goods. Nevertheless, relying on the numerical simulations, no situation is possible where the residents of both regions would gain from the policy. Also compensated Pareto improvements are unachievable.

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1. Introduction

Regional policy is gaining importance due to the widespread opinion that in the globalising world competition will less and less take place between national states, but rather between regions (see e.g. OECD 2001). The importance of regional development policy has also been increasing during the recent decades in response to deepening integration as seen e.g. from the increasing expenditures on regional issues in the budget of the European Union.

The new economic geography literature has been booming since the beginning of 1990s, started with the works of Paul Krugman (1991*a*, 1991*b*). Several models have been developed, being distinguished by the assumptions about the consumer preferences (Cobb-Douglas vs. quasilinear utility functions), the interregional and intersectoral mobility of production factors and the types of production factors. As acknowledged and warned by Neary (2001), the field has potential for policy analysis, but has so far not been actively used for it. The most important exception here is the book by Baldwin et al. (2003) analysing several policy fields in the context of different NEG models. In some contributions the models have been used for finding whether the equilibrium spatial distribution of economic activity achieved through free functioning of market forces differs from what a benevolent social planner would choose. It has been found that depending on the level of trade costs, the market can offer the optimal extent, too much or too little agglomeration (see e.g. Ch. 11 in Baldwin et al. 2003, Ottaviano et al. 2002). Nevertheless, these authors do the analysis without implementing a specific policy. Moreover, the attention has usually been at symmetric regions or countries, having full agglomeration and full dispersion of the mobile economic activity as the only possible outcomes.

The aim of this paper is to investigate the welfare consequences of regional redistribution of economic activity. We consider two

policy schemes. First we implement a location permits policy, where the social planner simply decides the distribution of firms and everything else has to adapt respectively. Secondly, we implement a market-oriented regional policy. This policy scheme is similar to that in Dupont & Martin (2006). They introduced into the so-called footloose capital model (due to Martin & Rogers 1995) a uniform tax rate on expenditures and a subsidy on the operating profits (i.e. capital return) for the firms locating in the smaller region. They show that such a policy tends to benefit the capital owners at the expense of the workers as the capital revenue increases in response to the policy.

We use the two-region constructed capital model due to Baldwin (1999) as the basis for the analysis. Differently from the footloose capital model, the capital stock changes in response to the policy instead of the capital return. In the constructed capital model the steady-state capital return cannot respond to the policy, as it is fixed by the equality of the present value of a unit of capital and its production costs.

The analysis could be considered as a critical view at the European regional policy. We consider the two regions as being part of one country or of one planning unit (e.g. the EU). Moreover, some important assumptions of the model are quite realistic. First, it is well-known that labour mobility in Europe is low (see e.g. Faini 1995, Braunerhjelm et al. 2000, European Foundation ... 2006). This is reflected in the constructed capital model by assuming immobile labour. The second important assumption is capital immobility: once a unit of capital has been constructed, it cannot be moved to another region. Assuming immobile capital is realistic insofar as physical capital like housing is considered. Alternatively, Baldwin & Martin (2004) have argued that immobile capital can be interpreted as human capital if people are immobile.

The analysis shows that it is possible to improve welfare by implementing policy measures if utilitarian welfare functions are used as the criterion. Nevertheless, no Pareto improvements are possible when the above mentioned policies are implemented. The residents of the region that gains additional industry always win from the policy. This comes partially at the expense of the residents of the other region that loses industry in response to the policy measures. When looking at the compensated Pareto criterion, it is usually not possible to say whether the market equilibrium or implementing the policy should be preferred. Only in case of very low trade barriers the market equilibrium with all of the industry concentrated in the larger region should clearly be preferred.

The paper is structured as follows. The following Section 2 introduces the basic constructed capital model. After that the capital subsidy and a tax on expenditures are added into the model and the results for basic variables like spatial distribution of industry and expenditures are compared to those of the basic model. Section 4 discusses the welfare effects based on utilitarian social welfare functions. In Section 5 the analysis of compensation mechanism is applied for evaluating the welfare effects. The final section concludes.

2. The constructed capital model

2.1. Basic assumptions

The constructed capital model, due to Baldwin (1999), is an analytically tractable NEG model delivering similar results as the basic core-periphery model of Krugman (1991*b*). It belongs to the so-called DCI (Dixit-Stiglitz monopolistic market for industrial goods, CES utility functions and iceberg trade costs) family of NEG models. Another model from this family and the most

similar one to the constructed capital model is the footloose capital model by Martin & Rogers (1995). The most important distinguishing feature of the model is the assumption of depreciable capital and endogenous construction of capital stock. Other specific assumptions consider the mobility of the production factors. Moreover, in this model the economic agents differ only with respect to their residence, there are no pure labour and capital owners.

The NEG models are usually applied to symmetric regions. Here we assume that the regions are of unequal size. In the following representation of the basic constructed capital model we use the notation of Baldwin et al. (2003).

There are two regions, we call them a large and a small region, two sectors (called agriculture and industry) and two production factors: physical capital K and labour L . Share s_K of the capital stock and share s_L of labour is owned by the residents of the large region; the shares owned by the residents of the small region are $s_K^* = 1 - s_K$ and $s_L^* = 1 - s_L$, respectively (also in the following the starred variables refer to the features of the small region). Labour and capital are both immobile across regions, but labour is mobile between sectors.

The agricultural or traditional sector produces a homogeneous output with a constant returns to scale technology, needing a_A units of labour per a unit of output. The units of the good are chosen such that one unit of labour is needed per unit of the agricultural output ($a_A = 1$). There are no trade costs incurred neither in case of intra- nor in case of interregional trade of the agricultural good. Moreover, this good is taken as the numeraire ($p_A = 1$), fixing thus also the labour wage $w_L = 1$. Due to the costless trade the labour wage is identical in the two regions.¹

¹This holds if no region is large enough for satisfying alone the demand for the agricultural good, i.e. agricultural production takes place in both regions.

The technology and market structure of the manufacturing sector are identical to that of the footloose capital model:

- Each firm produces a different good; each firm produces only one good
- Increasing returns to scale due to fixed costs in production
- Dixit-Stiglitz monopolistic competition in the output market
- Capital is used only for covering the fixed costs (units of capital are chosen such that one unit of capital is needed per variety)
- Labour is used for covering the variable costs (a_M units of labour per a unit of variety)
- Intraregional sales are costless
- In case of interregional trade, iceberg trade costs are assumed: $\tau > 1$ units of the good have to be shipped in order to supply one unit of the good at its destination.

The crucial assumption distinguishing the constructed capital model from the footloose capital model is that the capital can depreciate and it is possible to construct new capital. Capital is either in perfect working order or useless. At every moment of time each capital unit turns useless with probability δ . If a capital unit turns useless, also the manufactured variety to which the capital unit is associated vanishes. Due to the continuum of varieties, the share of capital stock disappearing in each period is equal to δ .

A new unit of physical capital can be constructed from labour. The assumptions for the capital constructing intermediate sector are following:

- The sector is perfectly competitive

- a_I units of L are needed for producing one unit of capital
- The amount of capital constructed is L_I/a_I with L_I denoting the amount of labour employed in the capital construction sector.

Thus, the intermediate sector's technology is

$$F = w_L a_I \text{ and } Q_K = \frac{L_I}{a_I} \quad (1)$$

with F denoting the cost of a new unit of capital and Q the intermediate sector's output (the flow of newly constructed capital).

Capital works in the same region as its owner, i.e. the share of firms located in a region coincides with the share of capital owned by the residents of that region: $s_n = s_K$. We assume that if it is profitable to invest into the capital construction in a region, all residents of the respective region do it, so that everybody owns a proportionate share of the capital. Therefore, if there is some capital in the region, everybody earns the capital income, as also labour income.

The preferences of the consumers residing in the large region are given by

$$\begin{aligned} \max U &= \int_{t=0}^{\infty} e^{-\rho t} C_M^\mu C_A^{1-\mu} dt, \\ C_M &= \left(\int_{i=0}^{n^w} c_i^{1-1/\sigma} di \right)^{\frac{1}{1-1/\sigma}}; \\ &0 < \mu < 1 < \sigma. \end{aligned} \quad (2)$$

Thus, the utility is drawn from consuming the agricultural goods C_A and the composite of manufactured goods, C_M , whereby the latter is a standard CES composite over all available varieties.

n^w stands for the mass of manufactured varieties available in the economy and equals to the total capital stock K^w .² c_i is the demand for an manufactured variety i in the large region:

$$\begin{aligned} c_j &= \frac{p_j^{-\sigma} \mu E}{n^w \Delta}, \\ n^w \Delta &\equiv \int_{i=0}^{n^w} p_i^{1-\sigma} di, \\ E &= \pi K + w_L L, \end{aligned} \tag{3}$$

where p_i is the price of variety i in the large region, E the large region's final consumption expenditures, K the capital stock and π the capital return in the large region. Finally, L is the labour available in that region. Isomorphic equations hold for the small region with the region-specific variables being replaced by their starred counterparts.

This preference structure implies that consumers' utility is the higher the more varieties of the manufacturing good are available. This becomes evident through the price index: the perfect price index P decreases with the number of varieties:

$$P = p_A^{1-\mu} (n^w \Delta)^{\frac{\mu}{1-\sigma}}. \tag{4}$$

2.2. Short-run results

In the short run analysis the spatial distribution of firms (s_n and s_n^*) and the national capital stock K^w are fixed.

²The w in the notation refers in the literature often to the world (assumed to consist of two countries). In our case, it refers to the whole economy (the sum of the two regions: the national economy).

As mentioned above, the agricultural good is chosen as the numeraire and this fixes also the labour wage in both regions to 1. Due to the assumption of Dixit-Stiglitz monopolistic competition the industrial firms use mill pricing and the price is a mark-up over the marginal cost. If a variety is sold in another region than the region where it was produced, the price of the variety includes also the trade cost, i.e. is multiplied with τ . Moreover, choosing the units of the manufactured goods such that the technology parameter $a_M = (\sigma - 1)/\sigma$, we get the prices of typical manufactured varieties as

$$p = 1 \text{ and } p^* = \tau, \quad (5)$$

where the star refers to the price of an manufactured good produced in the large region (the small region) and sold in the small region (the large region). Thus, the price index in the large region is under these assumptions

$$P = (s_n K^w + s_n^* K^w \tau^{1-\sigma})^{\frac{\mu}{1-\sigma}}. \quad (6)$$

Operating profit is the return to the capital. Using Eq. (5) and the demand functions derived from the utility functions, the operating profits are

$$\pi = bB \frac{E^w}{K^w}, \quad \pi^* = bB^* \frac{E^w}{K^w}; \quad b \equiv \frac{\mu}{\sigma} \quad (7)$$

with

$$\begin{aligned} B &\equiv \frac{s_E}{\Delta} + \phi \frac{s_E^*}{\Delta^*}, & B^* &\equiv \phi \frac{s_E}{\Delta} + \frac{s_E^*}{\Delta^*}; \\ \Delta &\equiv s_n + \phi s_n^*, & \Delta^* &\equiv \phi s_n + s_n^*. \end{aligned}$$

E^w denotes the national expenditures, K^w the national capital stock, s_E is the large region's share of expenditures, $s_E^* = 1 - s_E$ and $s_n^* = 1 - s_n$. $\phi = \tau^{1-\sigma}$ is used for simplifying the notation and interpreted as a measure of trade freeness. If $\phi = 0$, the

trade costs are restrictively high for any trade to take place (i.e. $\tau \rightarrow \infty$ or $\sigma \rightarrow \infty$; the latter means that the goods are very close substitutes such that any price difference would mean consuming only the cheapest, that is the home-produced varieties). The profits are then larger in the region that has a higher share of final consumption expenditures.³ In case of $\phi = 1$, trade is without any restrictions, i.e. $\tau = 1$ or $\sigma = 1$. For profits this means that they are always equal in the two regions, the share of firms in each region does not matter.

In the constructed capital model final consumption expenditure does not equal income, as some of the resources are invested in constructing capital. For final consumption expenditures the national spending on new capital has to be subtracted from the national income. National income is the sum of the labour and capital income: $E^w = w_L L^w + bE^w$. Spending on new capital is $w_L L_I^w$. Thus, using the normalisation $w_L = 1$, national final consumption expenditure is

$$E^w = L^w + bE^w - L_I^w \Rightarrow E^w = \frac{L^w - \delta K^w a_I}{1 - b}, \quad (8)$$

where we have used that the necessary amount of investment goods for maintaining the national capital stock is δK^w and the amount of labour necessary for producing it $L_I = \delta K^w a_I$. The total expenditures are, needless to say, the higher the larger the economy is. In addition, a low depreciation rate of capital δ and a small input requirement a_I in the intermediate sector leave more money for the consumption expenditures. Larger capital stock decreases the expenditures as the depreciated capital stock has to be exactly replaced by newly constructed capital, reducing thus the money left for final consumption.

³The long-run equilibrium would require the profits to be equal in the two regions and thus, under no trade each region's share of capital should equal its share of final expenditures.

The large region's expenditure E can be expressed as

$$E = s_L L^w + s_n b B E^w - s_n \delta K^w a_I, \quad (9)$$

where the first term is labour income, the second capital income according to Eq. (7) and the last term comprises the investments costs necessary for keeping the region's capital stock constant. Dividing Eq. (9) with Eq. (8) and simplifying the result gives the large region's share of final expenditures

$$s_E = \frac{b\phi s_n / \Delta^* + (1 - b) \frac{s_L L^w - s_n \delta K^w a_I}{L^w - \delta K^w a_I}}{1 - b s_n / \Delta + \phi b s_n / \Delta^*} \quad (10)$$

Therefore, the relative market size is dependent on the endogenous variables s_n and K^w . Moreover, it rises with the region's share of labour and slightly with its share of capital.

2.3. Long-run results

In the long run, the capital stock in each region and the spatial distribution of capital can change. The equilibrium capital stocks are achieved if the cost of constructing a unit of capital equals exactly the present value of the expected flow of operating profits (i.e. the present value of the capital). In the steady-state equilibrium the new capital is used only for replacing the depreciated capital. If the capital construction costs are equal to the expected return in both regions, capital construction would take place and manufacturing firms would locate correspondingly in both regions, so that there would arise an interior equilibrium with $0 < s_n < 1$. Alternatively the above condition is fulfilled in only one of the regions. In the other one then the present value of a unit of capital would not cover the construction costs. In that case there would emerge a core-periphery pattern with full agglomeration in the first region.

Formally, the location condition is given by:

$$\begin{aligned} v &= F, v^* = F^*; 0 < s_n < 1 \\ v &= F, v^* < F^*; s_n = 1, \end{aligned} \quad (11)$$

where v is the present value of an extra unit of capital and F its construction cost. From Eq. (1) we have that $F = F^* = a_I$ in internal equilibrium as $w_L = 1$ and the regions are assumed to have identical capital construction technology.

The present value of a unit of capital is⁴

$$v = \frac{\pi}{\rho + \delta}, v^* = \frac{\pi^*}{\rho + \delta}. \quad (12)$$

The variables π and π^* are here the steady-state operating profits in the large region and the small region, respectively.

From (11) and Eq. (12) follows, that at any interior equilibrium $\pi = \pi^*$. This is also the equilibrium condition in the footloose capital model. Therefore, it is not surprising that in the constructed capital and the footloose capital model the distribution of firms in an interior equilibrium is given by an identical expression:

$$s_n = \frac{1}{2} + \left(\frac{1 + \phi}{1 - \phi} \right) \left(s_E - \frac{1}{2} \right). \quad (13)$$

In case of identical regions ($s_L = s_L^* = 1/2$), also the firms are distributed equally between the regions. If one region is larger than the other, measured by the share of workers, its share of the manufacturing firms is more than proportionally larger. This effect increases with decreasing trade costs (these effects are called home market effect and its magnification by Baldwin et al. 2003). Moreover, $s_n = 0$ if $s_E \leq \frac{\phi}{1+\phi}$ and $s_n = 1$ if $s_E \geq \frac{1}{1+\phi}$.

⁴See Baldwin (1999) for the derivation.

In order to find the steady-state spatial distribution of expenditures, the stock of national capital has to be found. As discussed above, at any long-run equilibrium all the capital earns identical income (either $\pi = \pi^*$ in case of an interior equilibrium⁵ or all of the capital is located in just one of the regions and earns, thus, π or π^*). Thus, the capital reward is bE^w/K^w , i.e. the average reward across the regions. If there is capital in a region, it follows from Eq. (11) and Eq. (12) that its reward has to be

$$\pi = \pi^* = a_I(\rho + \delta). \quad (14)$$

Rearranging Eq. (7) gives $K^w = \frac{bE^w}{a_I(\rho+\delta)}$. Solving together with Eq. (8) results in

$$K^w = \frac{\beta L^w}{(1 - \beta)\rho a_I}, \quad E^w = \frac{L^w}{1 - \beta} \quad (15)$$

where $\beta \equiv \frac{b\rho}{\rho+\delta}$. The equations say that the economy is the richer (the more final consumption expenditures and the more capital) the higher are the share of manufacturing goods in the consumption basket and the time preference rate. If the elasticity of substitution between the manufactured varieties, capital's probability to turn useless, and the the input requirement of the intermediate sector are high, the economy has smaller capital stock and expenditures.

In case of a steady state interior equilibrium spatial distribution of manufacturing firms (s_n) B from Eq. (7) solves to unity if substituting in Eq. (15) and Eq. (14). Therefore, $E = s_L L^w + s_n bE^w - s_n \delta K^w a_I$. Using (15) we get for the distribution of the expenditures

$$s_E = \frac{1}{2} + \beta \left(s_n - \frac{1}{2} \right) + (1 - \beta) \left(s_L - \frac{1}{2} \right) \quad (16)$$

⁵In that case $B = B^*$

or $s_E = \beta s_n + (1 - \beta)s_L$. Therefore, a region's share of expenditures is a weighted average of the region's share of manufacturing firms and labour.

Substituting this into Eq. (13) enables us to solve for the spatial distribution of the manufacturing firms and final expenditures in closed form:

$$s_n = \frac{1}{2} + \frac{(s_L - \frac{1}{2})(1 - \beta)}{\frac{1-\phi}{1+\phi} - \beta}, \quad (17)$$

$$s_E = \frac{1}{2} + \frac{(s_L - \frac{1}{2})(1 - \beta)}{1 - \beta \frac{1+\phi}{1-\phi}}. \quad (18)$$

These equations are valid only for trade freeness below

$$\phi_f = \frac{(1 - \beta)s_L^*}{s_L + \beta s_L^*}, \quad (19)$$

where ϕ_f denotes the critical level of trade freeness above which full agglomeration in the larger region occurs. Above this critical level ($\phi > \phi_f$), the large region ($s_L \geq 1/2$) gets all of the manufacturing firms and its share of expenditures is $s_E = \beta + (1 - \beta)s_L$. In the small region there are then no manufacturing firms and its share of expenditures is $s_E = (1 - \beta)s_L$.⁶ For the symmetric

⁶This issue is discussed differently in Baldwin (1999). Even though he calculates the level of trade freeness at which full agglomeration occurs in case of asymmetric regions (Eq. 19), he states that Eq. (17) is valid only if it produces $0 \leq s_n \leq 1$, and outside of that range $s_n = 1$ ($s_n = 0$) if the result is larger than unity (smaller than zero). This is not always true, as according to Eq. (17) s_n goes to infinity at $\phi = (1 - \beta)/(1 + \beta)$ and switches its sign after that. Thus, Baldwin's interpretation would mean that in case of extremely high trade freeness ($(1 - \beta)/(1 + \beta) < \phi \leq 1$) all manufacturing firms should locate in the smaller region. This is not true intuitively; also, we can see from the profit equa-

case, $\phi_f = \frac{1-\beta}{1+\beta}$ marks the trade freeness at which catastrophic agglomeration occurs in either of the regions (i.e. it is the break-and sustain point). Above this level of trade freeness, the stability of the symmetric equilibrium is broken and full agglomeration is sustainable.

3. Effects of taxes and subsidies on the spatial distribution of capital

In the following we augment the above discussed model by Baldwin (1999) with the assumption that final consumption (consumption expenditure) is taxed with a uniform tax rate t . The tax revenues are used for subsidizing capital in the smaller region in the form of a proportional operating profit subsidy. Similar tax-subsidy system has been used by Dupont & Martin (2006) in the footloose capital model.

Compared to the basic constructed capital model, the equations for operating profit have to be amended: the national expenditures have to be replaced with the after-tax national expenditures. For the location condition, we need to equalise the profits of the non-subsidised region with the profits in the subsidised region, taking into account the rate of the subsidy z^* :

$$\pi = (1 + z^*)\pi^*. \quad (20)$$

Solving this equation for the spatial distribution of firms, s_n , using the operating profit equations (7), where the expenditures have

tions (Eq. 7), combined with Eq. (16) that $\pi > \pi^*$ if $s_n = 1$ for $\phi_f < \phi < 1$. Therefore, the critical level of trade freeness above which full agglomeration occurs has to be included in the interpretation, in order to keep the results for the spatial distribution of manufacturing firms consistent with the results from comparing the profit equations.

been replaced with after-tax final consumption expenditures E_{AT}^w and, correspondingly, the share of final consumption expenditures with the share of after-tax final consumption expenditures (still denoted by s_E), we get

$$s_n = \frac{s_E (1 - \phi^2) - \phi (1 + z^* - \phi)}{(1 - \phi) [1 + z^* - \phi - z^* s_E (1 + \phi)]}. \quad (21)$$

This expression for the spatial distribution of firms in case of a profit subsidy and proportional taxes is the same as in the foot-loose capital model (see Dupont & Martin 2006). The distribution of firms does not depend directly on the tax rate, it depends on the distribution of after-tax expenditures, the subsidy and the trade freeness. The share of firms in the large region increases with its share of consumption expenditures and the trade freeness. As can also be seen at Figure 1, a high rate of subsidy to the manufacturing firms locating in the small region implies decrease in the large region's share of firms. In case of high trade costs the effect of the subsidy is negligible. Nevertheless, if a certain threshold has been exceeded, the subsidy motivates the firms to move to the subsidised region, such that in case of very free trade all firms agglomerate in the smaller region.

The equilibrium operating profits corresponding to that distribution of firms and capital are

$$\begin{aligned} \pi &= b \frac{E_{AT}^w}{K^w} \frac{(1 + z^*)(1 - \phi)(1 - \phi + z^*(1 - s_E - s_E \phi))}{(1 + z^* - \phi)(1 - \phi - z^* \phi)} \\ &= b \frac{E_{AT}^w}{K^w} \frac{1 + z^*}{1 + s_n z^*}, \end{aligned} \quad (22)$$

which is again identical to the corresponding equation in the foot-loose capital model with profit subsidies and proportional income or expenditure taxation. *Ceteris paribus*, the subsidy increases the capital return in the large region, i.e. this is the short run effect of the subsidy. This motivates to invest into constructing new capital

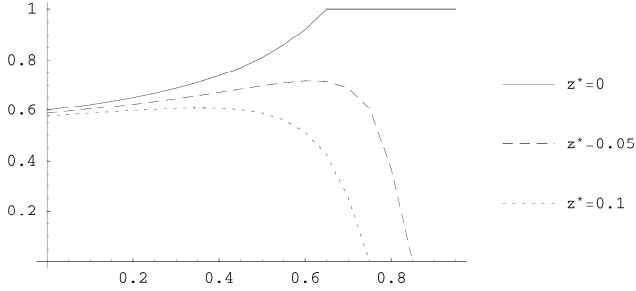


Figure 1. The ‘tomahawk’ diagram for the constructed capital model with uniform taxes on expenditures. Assumptions: $\mu = 0.3$, $\sigma = 6$, $\rho = 0.05$, $\delta = 0.1$, $s_L = 0.6$.

until the present value of the expected revenue flow equals again the production costs.

Imposing a uniform proportional tax rate on final expenditures (i.e. on incomes less the investment into capital construction), the national after-tax final consumption expenditures can be expressed as

$$E_{AT}^w = (1 - t)(wL^w + \pi K^w - \delta K^w a_I), \quad (23)$$

where π is now the adjusted capital return taking into account the subsidies.

The factor markets have to be kept in equilibrium after imposing the tax. Capital market is automatically in equilibrium due to the assumption that there are as many manufacturing firms and varieties as capital units. For labour market, the following constraint has to hold:

$$L^w = (1 - \mu)E_{AT}^w + \mu \left(1 - \frac{1}{\sigma}\right) E_{AT}^w + \delta K^w a_I. \quad (24)$$

The terms at the right hand side are the national labour employment in the traditional sector, in the modern sector and in the capital construction sector, respectively. Substituting in the after-tax expenditure from Eq. (23) gives after rearranging

$$L^w = (1 - b)(1 - t)(L^w + \pi K^w - \delta K^w a_I) + \delta K^w a_I. \quad (25)$$

In case of the footloose capital model the adjustment takes place through an increase in the capital return (see Dupont & Martin 2006). Here, as known from the basic model, in the long run $\pi = a_I(\rho + \delta)$, which has to hold also if taxes and subsidies are introduced to the economy. In the above equation, there is only one variable that can change in response to the taxes, the national capital stock. It has to increase in order to keep the labour market in equilibrium. The response of the capital stock to the taxes can be shown to be

$$\frac{\partial K^w}{\partial t} \Big|_{dL^w=0} = \frac{(1 - b)(L^w + (\pi - a_I \delta)K^w)}{(1 - b)(1 - t)(\pi - a_I \delta) + a_I \delta} > 0, \quad (26)$$

as $0 \leq t < 1$, $0 < b < 1$ and $\pi > \delta a_I$.

Solving the labour market equilibrium condition (Eq. 24) for the after-tax expenditures gives

$$E_{AT}^w = \frac{L^w - a_I \delta K^w}{1 - b}. \quad (27)$$

This equation is identical to that of the national final consumption expenditures in the basic model. However, as the policy results in an increased capital stock K^w , the after-tax consumption expenditures have to be smaller than the consumption expenditures in case of no policy.

The tax rate for financing the subsidy is solved from the government budget constraint

$$\frac{t}{(1 - t)} E_{AT}^w = z^* \pi^* (1 - s_n) K^w \quad (28)$$

with $\pi^* = \frac{\pi}{1+z^*}$.

Substituting into the above equation profits from Eq. (22) and solving for the equilibrium tax rate results in

$$t = \frac{bs_n^*z^*}{1 + s_nz^* + bs_n^*z^*}, \quad (29)$$

which is identical to the expression for the tax rate in case of the uniform income taxation in the footloose capital model (see Dupont & Martin 2006). The equilibrium tax rate increases of course with the rate of the subsidy. The share of manufacturing goods in the consumption expenditures and the share of manufacturing firms locating in the small region have as well a positive impact on the tax rate.

In order to find the distribution of after-tax expenditures, we need to know the size of the equilibrium capital stock. For this purpose we equalize the capital return from Eq. (14) to the capital return corresponding to the equilibrium spatial distribution of economic activity (Eq. 22) and get

$$K^w = \frac{\beta L^w}{(\Omega - \beta)\rho a_I}, \quad (30)$$

where $\Omega = (1 + s_nz^* + bs_n^*z^*)/(1 + z^*)$.

Substituting this expression into the national after-tax expenditures equation (27) and rearranging the result gives

$$E_{AT}^w = \frac{1 + s_nz^*}{1 + z^*} \frac{L^w}{\Omega - \beta}. \quad (31)$$

Comparing these results to those of the basic model (Eq. 15), it is possible to show that $E_{AT}^w < E^w$ and the capital stock is larger

than in case of no policy as $b > \beta$ and $b < 1$. Therefore, as argued above, the subsidy augments the capital stock. This is beneficial for the consumers due to their preference for variety. On the other hand, they have less income for consumption expenditures, due to taxes and higher share of income that has to be invested into constructing new capital.

In order to solve for the large region's share of after-tax expenditures s_E , we need to find the after-tax expenditures in the region. We substitute Eq. (30), (14) and (29) into the large region's after-tax expenditures $E_{AT} = (1-t)(ws_L L^w + \pi s_n K^w - a_I \delta s_n K^w)$, divide it with the national after-tax expenditures from Eq. (27) and rearrange to get for the large region's share of after-tax consumption expenditures

$$s_E = (1 + z^*)(\Omega - \beta)s_L + \frac{\beta}{\Omega}s_n. \quad (32)$$

Therefore, the large region's share of expenditures rises with its share of labour and capital. If the region's share of labour exceeds its share of capital ($s_L > s_n$), its share of after-tax expenditures rises also with the rate of depreciation and the elasticity of substitution, and decreases if the discount rate, the subsidy to the firms locating in the other region or the share of capital goods in expenditures increases.

Figure 2 is the scissors diagram for the case of taxing final expenditures in the constructed capital model. The curves have been plotted for three levels of trade freeness (ϕ): prohibitive trade costs, intermediate trade costs and very low trade costs. As the distribution of expenditures does not depend on the level of trade costs, the EE curve corresponding to Eq. (32) stays always at the same place. Therefore, the economy responds to the decrease in trade costs by relocating economic activity (the NN curve, cor-

responding to Eq. 21). It can be seen that for prohibitive trade costs ($\phi = 0$) the spatial distribution of expenditures and manufacturing firms corresponds exactly to the distribution of labour. In case of intermediate trade costs ($\phi = 0.5$) the assumed size of the subsidy is not sufficient to motivate capital construction in the smaller region and manufacturing is agglomerated in the large region. In case of high trade freeness ($\phi = 0.9$), in equilibrium the whole capital stock and thus, all firms would locate in the smaller region: with decreasing trade costs the effect of the subsidy increases.

Therefore, for each level of trade costs an appropriate rate of subsidy should be chosen if the government wants to achieve a specific spatial distribution of firms. The subsidy can have a noticeable direct effect on the spatial distribution of firms, but it has only a minor effect on the distribution of expenditures.

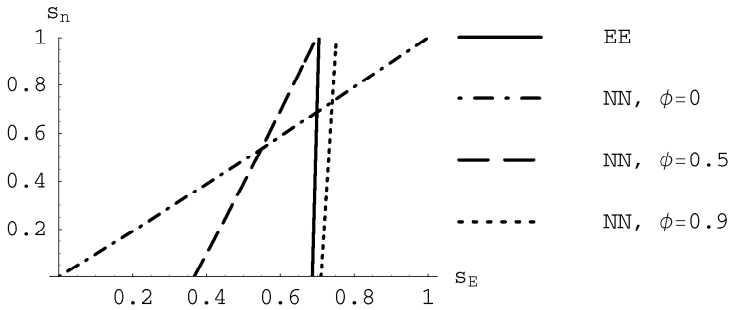


Figure 2. The scissors diagram for the constructed capital model with uniform taxes on expenditures. Assumptions: $a_I = 1$, $\mu = 0.3$, $\sigma = 6$, $\rho = 0.05$, $\delta = 0.1$, $s_L = 0.7$, $z^* = 0.05$.

4. Welfare analysis

4.1. Welfare under market solution

Dupont & Martin (2006) have shown for the footloose capital model that capital subsidies to firms locating in the smaller region and financed by proportional taxes on expenditures or incomes benefit mainly capital owners, whereby the workers bear the bulk of the tax burden. Therefore, the aim of reducing inequality might not be achieved, but rather worsened. It is possible to counteract this problem by taxing e.g. only the capital owners. However, the utility of the workers residing in the non-subsidised region would still decline due to the relocation of industry and the accompanying increase of the price index.

In case of the constructed capital model it is not possible to distinguish between capital owners and workers. In this model it is assumed that everybody owns a proportional share of the capital in the region of residence, as everybody would use some of its labour for producing capital goods and would, thus, own some of the capital. Therefore, there are only two groups of people in our model, distinguished by their region of residence. The disposable income of each consumer consists of labour and capital income, minus the contribution into capital construction and taxes, being equal to the after-tax expenditures of the region E_{AT} (E_{AT}^*) divided by its size L (L^*).

In the current model setting, the indirect utility of a representative agent in any region is given by his real disposable income (nominal disposable income divided with the price index of the region of residence). Using the prices, regional after-tax expenditures and the demand functions, the indirect utilities of the residents in

the two regions can be calculated as

$$\begin{aligned} V &= \frac{E_{AT}}{L} P^{-1} = \frac{E_{AT}}{L} K^{w \frac{\mu}{\sigma-1}} (s_n + \phi s_n^*)^{\frac{\mu}{\sigma-1}}, \\ V^* &= \frac{E_{AT}^*}{L^*} P^{*-1} = \frac{E_{AT}^*}{L^*} K^{w \frac{\mu}{\sigma-1}} (\phi s_n + s_n^*)^{\frac{\mu}{\sigma-1}}, \end{aligned} \quad (33)$$

where the constant $\mu^\mu (1 - \mu)^{1-\mu}$ has been omitted and P (P^*) is the price index.

Thus, a capital subsidy that induces the national capital stock to grow would be beneficial for the residents of both regions due to the preference for variety as a larger capital stock means more varieties. On the other hand, there are first potentially changes in the spatial distribution of expenditures. This comes from the changed spatial distribution of capital ownership. Because of capital immobility also the spatial distribution of the manufacturing firms changes. This, in turn, brings along changes in the price indices: the living cost rises in the non-subsidized region and decreases in the subsidized region. The residents of the subsidized region benefit and the residents of the other region lose due to this effect. I.e., taking the two effects together, the residents of the non-subsidized region might still lose. Moreover, if everybody has to finance the subsidy, also the disposable incomes are smaller than under no policy.

Substituting into Eq. (33) the relevant variables, we get for the no-policy case the indirect utilities

$$\begin{aligned} V^M &= \left(\frac{\beta s_n^M}{(1-\beta)s_L} + 1 \right) \left(\frac{\beta L^w \Delta^M}{\rho(1-\beta)a_I} \right)^{\frac{\mu}{\sigma-1}}, \\ V^{M*} &= \left(\frac{\beta s_n^{M*}}{(1-\beta)s_L^*} + 1 \right) \left(\frac{\beta L^w \Delta^{M*}}{\rho(1-\beta)a_I} \right)^{\frac{\mu}{\sigma-1}}, \end{aligned} \quad (34)$$

where the superscript M denotes the market equilibrium and s_n^M is from Eq. (17) if $\phi \leq \frac{(1-\beta)s_n^*}{s_L + \beta s_L^*}$ and $s_n = 1$ above ϕ_f .

From (34) it is evident that a person's utility increases in the share of firms locating in the region of his residence, the size of the region's labour force and the degree of trade freeness. Utility is smaller in case of larger labour input needed in the capital construction sector (a_I), the probability of the depreciation of a unit of capital (δ), the discount rate ρ and the share of labour in the region of residence. The latter reflects the issue that in case of a larger share of people in the region of residence, the regional income has to be shared with more people. If the indirect utility were written in terms of the overall after-tax expenditures in each region, it would be clear that each region's welfare is the larger, the more people there live.

From now on, we rely on numerical simulations as the algebraic solutions get too complicated for being interpretable. In illustrating the welfare issues, the assumptions about the parameter values are made as given in Table 1.

Parameter	Numerical value
μ	0.3
σ	6
ρ	0.05
δ	0.1
a_I	1
s_L	0.6
L^w	1

Table 1. Values of parameters

The utilities achievable in case of the market equilibrium are illustrated at Figure 3. It follows—as discussed above—that the utility of the residents of the large region is higher than that of those living in the other region. The utility of the residents of the large region increases with increasing trade freeness steadily up to the point where all manufacturing firms move to the larger re-

gion (the kink) and stays constant after that. In the small region the residents face for low levels of trade freeness slightly increasing utility level, but shortly before the kink their utility decreases, reaching a local minimum at the kink. After the kink, their utility increases again.

These effects occur due to changes in the price index and capital ownership. In case of high trade costs, for the small region the effect of decreasing prices for imported goods dominates over the small loss of manufacturing firms and capital income, such that the price index decreases with decreasing trade costs. Shortly before the kink, small changes in the level of trade costs induce many firms to move, such that it dominates over the gain from decreasing import prices. As the result, the price index increases. The large region, in turn, faces steadily decreasing price index due to cheaper imports, more firms producing in that region and more capital income. After the kink, there is no firm movement taking place, but the import prices decrease if trade continues to get cheaper. Thus, the price index in the small region decreases, while it stays constant in the large region, as it does not import any manufacturing goods.

Another issue to notice is that the utilities remain considerably different even for almost free trade. The reason for that is income difference. The residents of the large region earn in addition to the labour wage also capital return, whereas the income of the residents of the small region consists only of labour wage.

4.2. Welfare effects of location permits policy

Next we analyse whether it is possible to increase social welfare by just relocating the manufacturing firms. We call this policy location permits policy, indicating that the spatial distribution of

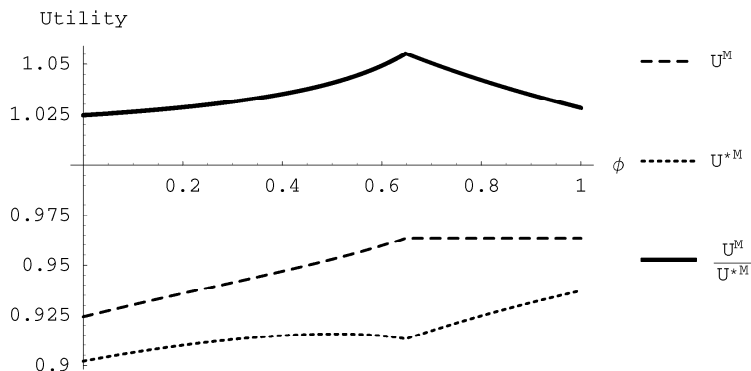


Figure 3. Utilities in case of the market solution

firms is achieved through the distribution of location permissions. In addition, in order to avoid complications due to income effects, we assume that operating profits are collected by the government and then distributed equally between the residents of each region, with the shares of the regions equal to their share of location permissions.

Figure 4 compares two cases of the utilitarian welfare function. At the left panel we assume the extreme form of utilitarianism: it is assumed that each unit of income is equivalent, independent whether it is received by a rich or a poor person (i.e. $W = LV + L^*V^*$). At the right panel of the figure, an income increase in the extent of 1 percent is socially considered to have an equivalent value (i.e. $W = L \ln V + L^* \ln V^*$). The grey areas at the figure correspond to the combinations of the level of trade freeness and the spatial distribution of manufacturing firms, which enable to achieve higher social welfare under the permits policy than under the market solution. Superscripts M and P refer to the market solution and the solution under the permits policy, respectively. Also the maximum achievable utility under the policy has been

plotted at the figure.

The figure shows that there is some room for a welfare improvement according to both welfare functions. In the case of the extreme utilitarianism the size of the larger region dominates and therefore a social planner would locate slightly more manufacturing firms into the larger region compared to the market equilibrium. In the case of the more egalitarian social welfare function (the right panel of Figure 4) the lower incomes of the residents of the smaller region dominate in the preferences of the social planner and, thus, the planner would locate some additional manufacturing firms into the smaller region. This effect gets especially large in the case of extremely low trade costs (ϕ almost equal to unity).

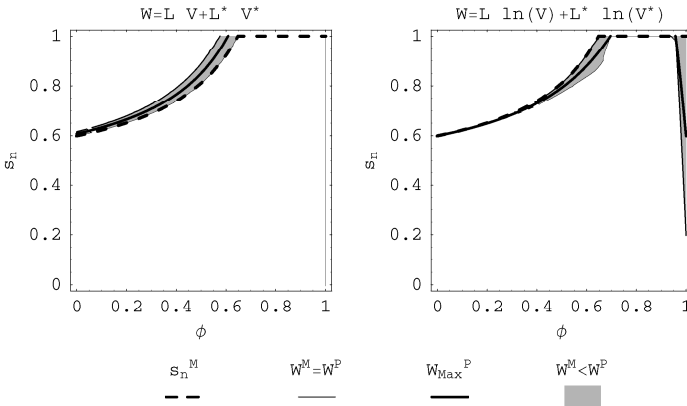


Figure 4. Utilitarian welfare functions: comparison of welfare under market solution (W^M) and permissions' policy (W^P).

4.3. Welfare effects of subsidies and taxes

Turning now to the welfare effects of subsidies and taxes, we first present the indirect utility functions. The indirect utility of a resident of the large region is

$$V^{UT} = \frac{1}{\Omega} \frac{(1 + s_n z^*)}{(1 + z^*)} \left(\frac{\beta s_n^{UT}}{(\Omega - \beta) s_L} + 1 \right) \left(\frac{\beta L^w \Delta^{UT}}{\rho (\Omega - \beta) a_I} \right)^{\frac{\mu}{\sigma-1}}, \quad (35)$$

and of a resident of the small region

$$V^{*UT} = \frac{1}{\Omega} \frac{(1 + s_n z^*)}{(1 + z^*)} \left(\frac{\beta s_n^{*UT}}{(\Omega - \beta) s_L^*} + 1 \right) \left(\frac{\beta L^w \Delta^{*UT}}{\rho (\Omega - \beta) a_I} \right)^{\frac{\mu}{\sigma-1}}. \quad (36)$$

$\Omega = (1 + s_n^{UT} z^* + b s_n^{UT*} z^*) / (1 + z^*)$ and the superscript UT denotes the policy of uniform taxation.

The achievable utility under the tax-subsidy policy depends on the spatial distribution of firms and the size of the subsidy, which is in turn a function of s_n . We assume that the subsidy is chosen such that it corresponds to the aimed spatial distribution of firms, i.e. s_n is the choice variable for the benevolent social planner. Thus, we need to solve for the subsidy z^* from Eq. (21) and (32) as a function of the aimed spatial distribution of firms. The resulting expression is too complicated to present here, but its behaviour with respect to the spatial distribution of firms and trade costs is shown at Figure 5.

The rate of capital subsidy that has to be implemented for achieving a given spatial distribution of manufacturing firms is monotonically decreasing with trade freeness and increasing in the share of manufacturing firms in the subsidized region. In interpreting the figure, it has to be kept in mind that in the range $s_n > s_n^M$ the social planner aims higher concentration of economic activity in the

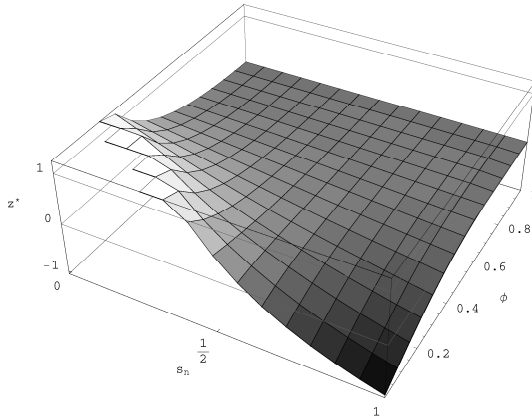


Figure 5. The size of capital subsidy in case of uniform taxation of final expenditures.

large region than obtained in the market equilibrium. Therefore, in that range a negative subsidy (i.e. a tax) to firms locating in the small region has to be applied or a positive subsidy has to be paid to the firms of the larger region.

Using now z^* in Eq. (35) and (36) and comparing the result to the utilities achievable in the market equilibrium reveals that a tax-subsidy policy increasing s_n (s_n^*) is favourable to the residents of the larger region (the smaller region), while at the same time decreasing the utility of the residents of the other region.

The range of welfare improving spatial distributions of firms is larger than in the case of permits policy (compare Figure 6 to Figure 4). Moreover, the maximum welfare achievable under the policy of uniform taxation of final consumption expenditures and operating profit subsidies to the firms locating in the smaller region is higher than the maximum welfare achievable under the permits policy for low and intermediate levels of trade freeness

(see Figure 7).⁷ This comes from the positive effect of the subsidies on the variety of manufactured goods supplied. There is only a small range of trade costs where the permissions' policy enables to achieve a slightly higher welfare than the tax-subsidy policy if the extreme form of utilitarianism is assumed.

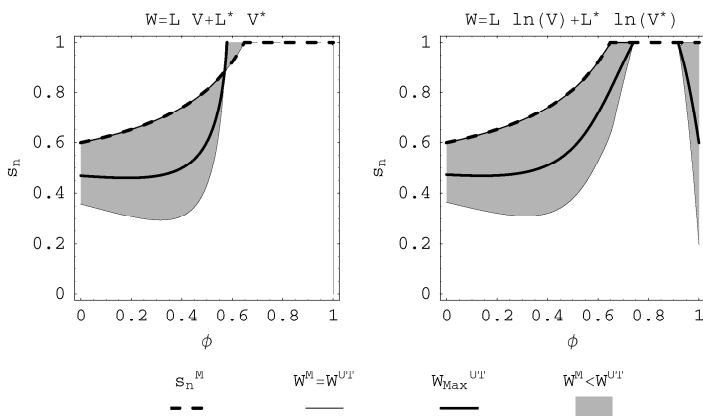


Figure 6. Utilitarian welfare function: comparison of welfare under market solution (W^M) and uniform taxation of final expenditures (W^{UT}).

5. Compensation mechanism

In the following we follow the approach of Charlot et al. (2006) in determining whether a policy is welfare improving. Specifically,

⁷For calculating the maximum achievable welfare under each policy, we found the distribution of firms equalizing the first derivative of the welfare function to zero for 31 levels of trade costs, ranging at equal steps from 0.00001 to 1, using the constraint $0 \leq s_n \leq 1$. Those values were then used for calculating the welfare.

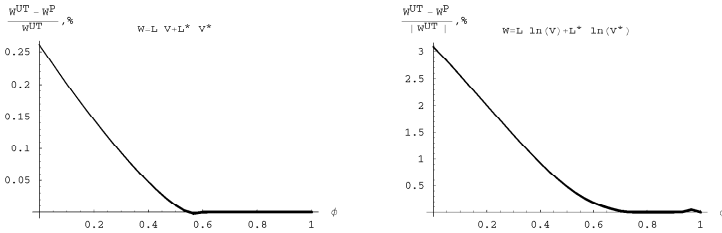


Figure 7. Comparison of maximum achievable welfare under uniform taxation of final expenditures (W^{UT}) and permits policy (W^P): percentage difference with respect to the welfare achievable under the uniform taxation policy.

we ask the following questions.

1. Are the winners (the residents of the small region) under the policy able to compensate the losers (the residents of the large region), such that the latter would attain the same utility level as in case of no policy and the former would still be better off compared to their utility under no policy?
2. Are the losers (the residents of the large region) unable to compensate the winners (the residents of the small region) under the market solution, such that the latter would attain the same utility level as in case of the policy and the former would be better off compared to their utility under policy?
3. Is the distribution after compensating such that all markets stay in equilibrium?

The first criterion was proposed by Kaldor (1939) and the second by Hicks (1940). Scitovszky (1941) has argued that a clear statement about which allocation should be preferred, is possible only in the following cases. First, the situation achieved by implementing the policy is considered to be socially preferred to the no policy case if the answer to all of the above questions is Yes.

Second, the market solution is socially preferred to the solution under policy if the answer to the first and the second question is No and to the third question Yes. In case of other combinations of answers there is no clear preference order.

Technically we need to find the expenditure functions under policy and no policy, substituting in the utility levels under no policy and policy, respectively. The resulting expenditures will then be compared to the final expenditures as given by the model under policy and no policy, respectively.

Finding the necessary compensation and available compensation gives for both policies—the location permits policy and the tax-subsidy policy—that the residents of the smaller (larger) region have under the policy excessive (deficient) resources compared to the market solution whenever $s_n < s_n^M$ and $z^* > 0$ (in case of the tax-subsidy policy). The opposite is true if by compensation the utility levels under policy are aimed.

In Figure 8 the compensation possibilities are illustrated in case of the tax-subsidy policy. As can be observed from panels (a) and (b), there are areas where financial compensation would be possible. Moreover, the panel (c) reveals an overlap-area where the residents of the smaller region would be able to compensate the residents of the larger region if the policy is implemented, but the residents of the larger region are not able to compensate for not implementing the policy. This would mean that the policy would be welfare improving in case of sufficiently high trade costs. However, also the material balance conditions should be studied. Differently from Charlot et al. (2006) who based their analysis on Krugman's (1991*b*) model and compared the preference order of full agglomeration and symmetric distribution in case of symmetric regions, we have to observe that any monetary transfer between the regions distorts the spatial distribution of expenditures, which has in turn an effect on the spatial distri-

bution of economic activity. Therefore, the distribution of firms under the tax-subsidy policy is not the same before and after the compensation. This means in turn that after the compensation the utility levels of the residents of both regions are not necessarily at least equal to those under the market equilibrium. Due to this, the spatial distribution of manufacturing firms under the tax-subsidy policy cannot be claimed to be preferred to the market solution.

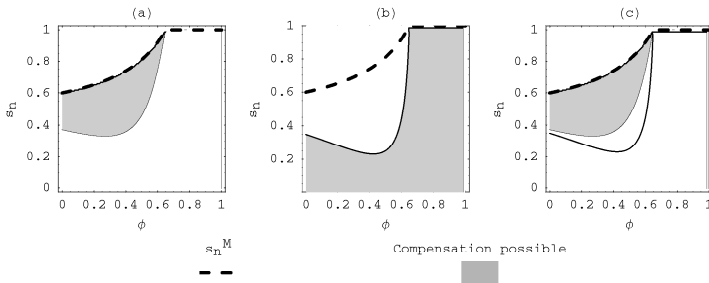


Figure 8. Compensation mechanism in case of the uniform taxation and profit subsidy: (a) Are the residents of smaller region able to compensate the residents of the larger region when the policy is implemented? (b) Are the residents of the larger region unable to compensate the residents of the smaller region for not implementing the policy? (c) Do the two criteria overlap?

Turning the argument around and studying, whether we can then say that the market solution is preferred to the one achieved through implementing the policy, it appears, that this is indeed so in case of sufficiently low trade costs. As can be observed from panel (b) in Figure 8, for high trade freeness the residents of the larger region are able to compensate the residents of the smaller region for not implementing the policy. They are able to do it without distorting the spatial distribution of firms if the social planner is not aiming for a distribution where most of the firms locate in the small region. This is due to the observation that in this range of trade costs small changes in the distribution of after-tax

expenditures do not have a strong impact on the distribution of the manufacturing firms. We know from panel (a) of the figure that at this area the residents of the smaller region would not be able to compensate the residents of the larger region, if the tax-subsidy policy is implemented. Therefore, we come to the same conclusion as Charlot et al. (2006): in case of sufficiently low trade costs, agglomeration is preferred to any less unequal spatial distribution of economic activity.

We conducted the same exercise also for the permits policy. It appears that the residents of the small region are never able to compensate the residents of the large region for implementing the policy. Therefore, the permits policy is from that perspective not welfare improving. Moreover, the residents of the larger region are always able to compensate the residents of the other region if the social planner would locate more firms to the smaller region than given by the market solution. Nevertheless, due to the problem of changing income distribution, one cannot say that the market solution is always preferred over the one achieved by implementing the policy. Again, only in the range of trade costs where full agglomeration occurs, the market solution is preferred to the permits policy solution.

The differences in the compensation ability in case of the two policies result from the pure redistributive character of the location permits policy. The tax-subsidy policy has also the aim of redistribution, but it is in addition motivating additional capital accumulation. As discussed earlier in the paper, more capital is associated with more varieties and this increases in turn the utility of the consumers.

6. Conclusions

In the constructed capital model with utilitarian welfare functions, the spatial distribution of economic activity achieved through free functioning of market forces is not necessarily the socially optimal one. There are no win-win situations for the residents of the two regions of the economy when a relocation policy is implemented: no Pareto improvement is possible. That is why we have relied on specific welfare functions and on the compensation criteria in analysing the desirability of relocation policies.

A benevolent social planner has to decide which tools should be implemented for achieving a specific spatial distribution of economic activity. In the paper the case of location permits and a uniform tax on final consumption expenditures, combined with a capital subsidy, were analysed. With both policy programs it is possible to increase welfare according to the utilitarian welfare criterion. Nevertheless, when the compensated Pareto criteria are used for analysing the welfare effects of the policies, one comes to the conclusion that it is not possible to say whether the policy or market solution should be preferred. Even though there are ranges of trade costs where those who gain from the policy are able to compensate the losers, and the losers are at the same time unable to compensate the former for not implementing the policy, the market equilibrium conditions would not hold after compensation. This problem occurs because of the continuous character of the constructed capital model with asymmetric regions. The compensation changes the spatial distribution of after-tax final consumption expenditures almost for all levels of trade costs, such that after compensation the spatial distribution of manufacturing firms does not correspond to the aimed one. The only exception is very free trade, where, based on the compensation mechanism, one can say that the market solution is preferred to any intervention.

Comparing the welfare effects under the permits policy (i.e. just setting the spatial distribution of manufacturing firms) with those of expenditure taxation and capital subsidisation policy, the tax-subsidy policy brings better results in welfare terms. This is due to its positive effect on the overall capital stock and therefore, the variety of goods available for consumption.

All in all, the analysis in this paper shows that one has to be careful in implementing policies aiming to influence the spatial distribution of economic activity. Of course, in interpreting the results, one has to keep in mind that the constructed capital model is a very restrictive one in its assumptions and therefore, it should not be claimed that regional policies should not be implemented at all. For example in case of congestion costs (e.g. environmental pressure) it might be desirable to reduce concentration. Nevertheless, the choice of the policy tools needs to be thorough elaborated.

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SISUKOKKUVÕTE

Kas ettevõtete regionaalne ümberpaigutamine võimaldab saavutada heaolu tõusu? Teoreetiline analüüs toodetava kapitali mudeli alusel

Mitmed uue majandusgeograafia mudelid käsitlevad autorid on leidnud, et turujõudude toimimise tulemusena kujunev majandustegevuse ruumiline jaotus ei pruugi olla kooskõlas ühiskondlikult soovitatava. Peamiselt väljendub see ettevõtete liigeses kontsentratsioonis ühte piirkonda (nn tuuma), nii et teise, perifeerse, regiooni elanike heaolu on oluliselt väiksem tuumas elavate inimeste omast. Samas on vähe uuritud, missuguste meetmete abil oleks võimalik majandusaktiivsuse soovitud ruumilist jaotust saavutada ning milline on nende meetmete mõju heaolule.

Käesoleva toimetise eesmärk on leida, kuidas mõjutavad erinevad poliitilised meetmed majandustegevuse ruumilist jaotust ning ühiskondlikku heaolu. Poliitilistest meetmetest analüüsitakse paiknemislubade ning maksu-subsidiumi poliitikat. Esimehe tähendab, et heatahtlik ühiskondlik planeerija määrab, millises regioonis võib ettevõtte paikneda. Teine analüüsitav poliitika näeb ette väiksemas regioonis tegutsevate ettevõtete subsideerimist. Subsiidiumiks vajalik raha kogutakse käibemaksuna lõpptarbimiskulutustelt. Analüüsi aluseks on kaheregiooniline toodetava kapitali mudel.

Kui paiknemislubade poliitika puhul on selge, et kummaski regioonis on täpselt nii palju ettevõtteid, kui heatahtlik ühiskondlik planeerija lubab, siis maksu-subsidiumi poliitika puhul on tegemist turupõhise meetmega. Analüüsist selgub, et subsiidiumite abil on majandustegevuse soovitud ruumilist jaotust saavutada seda lihtsam, mida väiksemad on kahe regiooni vahelised kaubanduskulud. Kuna tegemist on kapitalisubsidiiumiga, suurendab subsiidium majanduses olemasolevat kapitali kogust, mis omakorda laiendab kaupade valikut ning suurendab seega heaolu.

Otsus, kas eelistada turutasakaalu või poliitilist sekkumist, ei ole siiski lihtne. Selgub, et poliitiliste meetmete kasutamine tekitab igal juhul olukorra, kus keegi majandusagentidest kaotab. Kasutades utilitaarset ühiskondlikku heaolufunktsiooni, saab näidata, et mõlema poliitika abil on võimalik ühiskondlikku heaolu suurendada, kusjuures maksu-subsiidiumi poliitika positiivne mõju on suurem. Võttes aga aluseks kompenseeritud Pareto kriteeriumi, on otsuse tegemine taas kord raskendatud. Vaid väga vaba kaubanduse korral on võimalik üheselt öelda, et turutasakaaluna saavutatud ettevõtete ruumiline jaotus on eelistatud poliitilise sekkumise tulemusena kujunenud jaotusele. Suurte ja keskmiste kaubanduskulude korral ei ole võimalik öelda, kas eelistama peaks turulahendit või sekkumise abil saavutatud jaotust.

