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The political economy of interregional competition for firms

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56/2016

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Abstract

This paper studies interregional competition for firms when the bidding is decided upon majority voting. We model the competition as an auction under full information between two asymmetric regions inhabited by low- and high-skilled individuals. We derive two results: First, the location decision is inefficient in most cases, especially when the median voter is high-skilled. Second, winning the auction is harmful for the region if the political process and a strong competition lead to subsidies which exceed the surplus created by a firm's location. This implies that restricting interregional competition for firms, e.g. regulating subsidies, may enhance welfare. Furthermore, our model shows that countries with high redistributive taxes and a low-skilled majority have an advantage to attract foreign firms.

JEL classification: H23, H25, H31, P16, R11

Keywords: median voter, political economy, subsidy competition, spillover

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We thank Johannes Becker, Melanie Krause, Andrea Schneider, Melanie Steinhoff, John D. Wilson and participants at conferences and workshops in Halle, Lisbon, Perth, Münster, Lake Tahoe and Augsburg for helpful comments. The usual disclaimer applies.

1 Introduction

Local governments often attract firms by offering state aids (e.g. subsidies) in order to create long-term jobs, tax revenue, and spillover effects. Each year, for instance, states, counties and cities spend about 80 billion US-Dollar on tax rebates or cash grants and loans in the United States (Story et al. 2012). This extensive usage of tax and non-tax incentives raises the question whether the resulting bidding competition between regions leads to efficient results.[1] The rules on granting state aid differ across countries. In the United States incentives are not regulated, whereas member states of the European Union are generally not allowed to provide aid for large firms.[2] The EU state aid rules are based on the following three arguments. First, subsidies are considered as harmful interventions because they distort competition and, therefore, contradict the idea of a functioning common market. Second, bidding competitions pose the risk of wasteful public spending. Third, allowing for state aids may lead to greater divergence within the European Union as richer countries have higher spending capacities (European Commission 2014). In contrast, the literature provides arguments in favour of granting incentives. Bond and Samuelson (1986) interpret subsidies as a signal for a high productive region and thus as a solution to the information problem between firms and regions. Black and Hoyt (1989) show that subsidies internalise external effects caused by a firm's location and consequently enhance welfare even under full information. We reconsider this argument by relaxing their strong assumption of monolithic regions and derive contradicting results.

Therefore, this paper adds a new argument in favour of restrictive rules for granting subsidies by considering a political process. We show that subsidies determined by majority voting may lead to an inefficient location decision.

In our model, the competition for a firm among two regions is designed as an auction under full information. Both regions are inhabited by low-

[1] For anecdotal evidence see Davies (2005) and Story et al. (2012).

[2] The sole exceptions are aids being compatible with the internal market. For more details see Art. 107 of the Treaty on the Functioning of the European Union (TFEU).

and high-skilled individuals and differ in their production technology. A lump-sum transfer, financed by a proportional tax, redistributes income from high-skilled to low-skilled individuals within a region. A new firm's location increases productivity and wages for the high-skilled.[3] The low-skilled individuals benefit from the location via higher transfers due to redistribution of income, albeit to a lesser extent since their wages are not affected.

In order to analyse the role of a political process, we start by considering the Black and Hoyt (1989) case as a benchmark. As stated before they show that the firm's location decision remains efficient when allowing for a bidding competition. This finding is based on the strong assumption that a social planner is able to offer the region's aggregate willingness to pay by collecting all individual gains resulting from the location. As stated by Oates and Schwab (1988), conflicting interests of a heterogeneous population may distort allocations. These authors consider a government which takes the utility of the representative voter into account when deciding on a capital tax rate and environmental quality. In the spirit of Oates and Schwab (1988), we model a political process to account for a heterogeneous population. However, we apply a median voter framework to determine the offers in a bidding competition.

Our main results are the following: First, the firm locates in the region that benefits less in most cases, especially when the median voter is high-skilled. This result is driven by the potential disparity between the firm's surplus effect and the offers in the bidding competition. The bids are determined by the benefit the median voter derives from the location. Since redistribution increases (decreases) a low-skilled (high-skilled) median voter's willingness to pay different levels of redistribution between regions may distort the location decision. Moreover, due to the political process a high-skilled median voter is able to impose a contribution to the subsidy on the low-skilled that is larger than their individual willingness to pay. As low-skilled individuals can be exploited by the high-skilled majority, a

[3]This assumption is in line with empirical findings. See e.g. Girma and Görg (2007), Huttunen (2007) and Heyman et al. (2011) who show that high-skilled benefit more from a firm's location.

firm's location is beneficial for high-skilled, whereas it may be detrimental for low-skilled.

Second, paradoxically, the winner of the auction may turn out to be the loser. This occurs when the successful bid exceeds the surplus created by the firm and, thus, the loss in income of the low-skilled cannot be compensated by the increased income of the high-skilled.[4]

There is an abundant literature that analyses diverse reasons in favour of attracting firms by granting subsidies.[5] In our paper, regions compete for a foreign firm that generates positive spillover effects on the productivity of domestic firms.[6] Barrios et al. (2005) find empirical evidence for spillover effects on the productivity of domestic firms in Ireland, Greenstone et al. (2010) for the United States, Zhou et al. (2002) and Hu and Jefferson (2002) for China. In our model, the increase in productivity is the basis for higher wages and, thus, for the surplus effect, i.e. the region's benefit created by a firm's location. This assumption of increasing wages is in line with empirical findings, see e.g. Aitken et al. (1996), Greenstone and Moretti (2003) as well as Lipsey and Sjöholm (2004). The latter show that the wage bill increases in those US counties where new firms locate.

Our paper is closely related to Fumagalli (2003), who argues that banning subsidies increases social welfare if the heterogeneity between competing regions, measured by the degree of technological disparity, is sufficiently small.

In contrast, we concentrate on the role of political processes. Meltzer and Richard (1981) show that the median voter's position in the income distribution and, thus, her preferences for redistribution may explain the size of the government. Persson and Tabellini (1992) and Fuest and Huber (2001) apply a political economy approach with heterogeneous individuals to

[4] A similar result is derived by Greenstone and Moretti (2003) who show that politicians overbid if they derive a private benefit from granting subsidies.

[5] Haufler and Wooton (1999) and Fumagalli (2003) analyse increased competition. Haufler and Wooton (2010), Becker and Fuest (2010) and Bjorvatn and Eckel (2006) model positive effects on consumer surplus.

[6] See e.g. Olsen and Osmundsen (2003) who analyse competition for FDI between two regions within a tax competition framework.

analyse the effect of majority voting on a region's fiscal policy in a standard tax competition model. In line with these studies, we assume that the level of subsidies granted to a firm is subject to majority voting. Taking a political process into account, our paper extends the existing literature on subsidy competition (see e.g. Black and Hoyt 1989; Bond and Samuelson 1986; Haaparanta 1996; Barros and Cabral 2000).

Further, our results are related to Dewatripont and Seabright (2006) who provide a theoretical argument in favour of supranational monitoring to avoid wasteful public spending of politicians who want to signal their diligence to the voters. Jensen et al. (2015) support their findings by analysing investment incentives in the United States empirically. Biglaiser and Mezzetti (1997) state that re-election concerns may influence the amount of incentives offered to firms. Ma (2016) analyses the impact of special interest lobbying on competition for FDI. In contrast to the case where governments maximise social welfare, he shows that equilibrium subsidies are higher in the case where interest groups provide incentives to a government to attract FDI.

The remainder of the paper is organised as follows. The next section lays out the model. Section 3 concludes.

2 The model

2.1 Setup

We assume a world with two regions, indexed by $i \in \{A, B\}$, each of which consists of N_i individuals. These individuals can be either low-skilled, n_i^l, or high-skilled, n^h, with $N_i = n_i^l + n^h$. For simplicity reasons, we assume that the number of high-skilled individuals is the same in both regions. Regions, however, can differ in population size and in the skill ratio n^h/N_i. Moreover, we assume that there is no migration between regions due to high migration costs. As we will describe below, regions may also face different production technologies. Individuals' utilities depend on net income y_i^s, with $s \in \{l, h\}$

which is

$$y_i^s = (1 - t_i)w_i^s + T_i \tag{1}$$

for the high-skilled and low-skilled individuals, respectively.[7] The wage of the high-skilled individuals is denoted by w_i^h. Low-skilled individuals obtain a smaller gross income w_i^l, which is the wage in a low-paid domestic service sector. We ignore leisure and assume that individuals supply a single unit of labour. No region exhibits unemployment. For the purpose of redistribution a proportional tax t_i is levied on the gross income of both types to finance a lump-sum transfer T_i. Tax rates are exogenously given, e.g. set by federal governments, and may diverge between regions as a result of different preferences for redistribution. The region's budget constraint has to satisfy

$$N_i T_i = t_i(n^h w_i^h + n_i^l w_i^l) \tag{2}$$

The transfer function directly follows from equation (2)

$$T_i = t_i(w_i^h \frac{n^h}{N_i} + w_i^l \frac{n_i^l}{N_i}) \tag{3}$$

Thus, T_i depends on the number of high- and low-skilled individuals and it holds that $\frac{\partial T_i}{\partial n^h} > 0$ and $\frac{\partial T_i}{\partial n_i^l} < 0$. Therefore, T_i increases in the number of high-skilled and decreases in the number of low-skilled individuals.

In each of the two regions there is a large number of identical firms. For simplicity we assume that firms are foreign owned and, thus, create benefits for the region via wages only. The firms use high-skilled labour as the single input factor. The production function, $F_i(n^h)$, is a constant returns to scale production function and, hence, firms make zero profits.[8] The global market price is one. The region's aggregate profit is then given by

$$\pi_i(n^h) = F_i(n^h) - w_i^h n^h \tag{4}$$

[7] Instead of deriving utility levels we consider the individuals' net income. In this model, both approaches are equivalent since we assume a linear utility function. Implying concave utility functions does not change the results fundamentally.

[8] Allowing for positive profits and thus tax revenue does not deliver further insights.

The labour supply is assumed to be inelastic and, thus, corresponds to the amount of high-skilled individuals in the respective region. Accordingly the wage is determined by the labour demand. As constant returns to scale imply zero profits, the wage rate can be written as

$$w_i^h = \frac{F_i(n^h)}{n^h} \tag{5}$$

The right-hand side of equation (5) shows the output per capita which can be interpreted as the productivity in region i. We denote this productivity as $f_i(n^h)$. Without loss of generality, we assume for the remaining analysis that A is more productive than B, that is $f_A(n^h) > f_B(n^h)$ or since n_h is equal in both regions $F_A(n^h) > F_B(n^h)$. This technological gap can be explained by region specific organisational structures or management practices.

Low-skilled individuals work in a domestic sector, producing an output with the same constant returns to scale technology $G(n_i^l)$ in both regions. Therefore, wages are denoted by $w_i^l = {}^{G(n_i^l)}/_{n_i^l}$. Since wages are the same across regions we oppress the index i for simplicity reasons and refer to these wages as w^l.

The two regions compete for a new multinational firm, which has a labour demand $\hat{L}$ for high-skilled individuals, with $\hat{L} < n^h$, and produces an output $\hat{F}_i(\hat{L})$ with constant returns to scale.

If the firm locates in region i, its profit reads

$$\hat{\pi}(\hat{L}) = \hat{F}_i(\hat{L}) - \hat{w}_i\hat{L} \tag{6}$$

The new firm's productivity exceeds the region's productivity, i.e. ${}^{\hat{F}_i(\hat{L})}/_{\hat{L}} > {}^{F_i(\hat{L})}/_{\hat{L}}$.[9] The firm's production technology is totally accessible in the winning region i as the high-skilled workers are mobile between

[9]The MNE that acts as an entrant needs a more enhanced technology compared to the incumbents to equalise disadvantages caused by lack of experience, established clientele etc. (see e.g. Markusen et al., 1995, p. 395).

the firms within a region.[10] Fosfuri et al. (2001) provide a motivation for this assumption. In their model, part of the local high-skilled workforce is trained in the multinational firm and subsequently incumbent firms benefit via migration of these more experienced employees. Haacker (1999) adds that imitation of management practices and production methods as transmission mechanisms of spillovers may explain the productivity gain of local firms. However, empirical findings support the view that spillover effects are not only unidirectional from the new firm to the incumbent firms but also vice versa (Branstetter 2006). Therefore, we assume that $\hat{F}_i$ varies between regions as we consider the spillover effects to be a two-way process. This process implies that all firms in the winning region produce with the new enhanced technology $\hat{F}_i$. As we assume a global market, the additional production caused by the new firm and the new technology applied in the incumbent firms do not affect the selling price. The adjustment of wages restores zero profits.

According to equation (5), the attraction of the multinational firm leads to a rise in high-skilled wages, i.e. $\hat{w}_i > w_i^h$. However, due to different initial levels of productivity and different gains of productivity caused by spillovers the firm's surplus effect diverges between the two regions. We assume the wage differential in B ($\hat{w}_B - w_B$) to be larger than the wage differential in A ($\hat{w}_A - w_A$) as the less advanced region profits more from spillover effects.[11] The increase in wages generates the surplus effect which is the reason for the regions to engage in the bidding competition.

The timing is as follows. At stage 1 both regions simultaneously offer a lump-sum subsidy to the firm. Regions can credibly commit to their bid. The level of the subsidy is determined by the median voter's preference. At stage 2, the firm makes its location decision and payoffs are realised.

[10] This assumption is in line with Fumagalli (2003) assuming that all firms become as productive as the new firm. For empirical literature about spillover effects see Kokko et al. (1996), Sjöholm (1999), Javorcik (2004) and Branstetter (2006). For contradicting evidence see Haddad and Harrison (1993), Aitken and Harrison (1999) and Blomström and Sjöholm (1999). A review of this literature is provided by Görg and Greenaway (2001) and Blomström et al. (2001).

[11] Empirical findings by Barrell and Pain (1997) and Sjöholm (1999) support this assumption.

Since the lump-sum subsidy does not affect the firm's production choice, its location decision is solely driven by the subsidy. It follows that the firm locates in the region which offers the higher subsidy.

2.2 Analysis

2.2.1 Optimal location

A region's welfare is measured by the aggregate net income. Hence, the socially efficient case is characterised by a location in the region which profits most, i.e. the region where the firm creates the largest effect on wages $(\hat{w}_i - w_i^h)$. Since the firm neglects this surplus effect when making its location decision a possible reason for market failure arises, i.e. the firm does not locate in the region that benefits most. Subsidies may internalise this external effect and lead to an efficient allocation (Black and Hoyt 1989).

First, we evaluate the bid inducing the optimal location as a benchmark for further considerations. Second, we derive the bids generated in a political process by comparing the net income before and after the location for both types of individuals separately. The net income of the high-skilled individuals after location reads

$$\hat{y_i}^h = (1 - t_i)\hat{w}_i + \hat{T}_i \tag{7}$$

with $\hat{T}_i$ the transfer after location. Note that the net income of low-skilled individuals is only affected by the change in the transfer function and thus reads

$$\hat{y_i}^l = (1 - t_i)w^l + \hat{T}_i \tag{8}$$

Taking the subsidy and the wage effect into account, the region's budget constraint after location reads

$$N_i\hat{T}_i + B_i = t_i(\hat{w}_i n^h + w^l n_i^l) \tag{9}$$

Rearranging equation (9) gives the new transfer function

$$\hat{T}_i = t_i(\hat{w}_i \frac{n^h}{N_i} + w^l \frac{n_i^l}{N_i}) - \frac{B_i}{N_i} \tag{10}$$

with B_i corresponding to the bid offered by region i. B_i is financed by tax revenue. Therefore, a higher bid induces a lower transfer.

The change in individual income depends on the skill level. The low-skilled individuals profit only via higher transfers $\hat{T}_i$. Their change in income reads

$$\Delta y_i^l = t_i \frac{n^h}{N_i}(\hat{w}_i - w_i^h) - \frac{B_i}{N_i} \tag{11}$$

The low-skilled individual's benefit, created by the firms location increases in the degree of redistribution as well as in the wage differential. However, a high bid per capita may exceed this income gain and so it is possible that Δy_i^l may turn negative. We assume a sufficiently high minimum wage to prevent a negative net income after location.

The high-skilled individual's benefit is directly generated by the increase in gross income.

$$\Delta y_i^h = (\frac{n^h}{N_i} + (1 - t_i)\frac{n_i^l}{N_i})(\hat{w}_i - w_i^h) - \frac{B_i}{N_i} \tag{12}$$

This gain increases in the wage differential $(\hat{w}_i - w_i^h)$ and decreases in the degree of redistribution.

To characterise the optimal location, we consider a social planner who determines the region's bid. Each region's planner evaluates the net effect of the location and is willing to bid the aggregated maximum willingness to pay. We define B_i as the bid offered to the firm, whereas the maximum willingness to pay of the decisive individual in region i is denoted by V_i. We derive the social planner's valuation (V_i^*) by aggregating the benefits resulting from firm location over the whole population.

$$V_i^* = n^h(\hat{w}_i - w_i^h) \tag{13}$$

The valuation depends on the wage differential and the number of high-

skilled individuals. Intuitively spoken, the social planner is willing to offer the sum of wages created by the new firm. Note that V_i^* induces a loss in income for the low-skilled individuals which is compensated by the high-skilled individuals' gains.

Using equation (13) we can derive the optimal location with respect to an efficient allocation.

Proposition 1 (Black and Hoyt 1989) *In a subsidy competition with monolithic regions, B attracts the firm by bidding $V_A^* + \varepsilon$. Therefore, the firm's decision is efficient from an allocative point of view.*

Proof. Since the wage differential in region B is larger than in region A, B attracts the firm by marginally overbidding A's maximum bid. ■

However, if both regions are sufficiently similar, i.e. B_B is approximately V_B^*, the surplus effect is almost entirely offset by the subsidy.[12] In the next section we show, that a political process may distort an efficient allocation.

2.2.2 Political process

The game is now solved by backward induction. At stage 2 the firm chooses its location by comparing the profits in both regions and locates in the region which offers the larger subsidy. At stage 1 subsidies are determined. In the following, we take into account that the political process defining the level of the subsidy is formed by majority voting. This implies that individuals representing the majority in the society determine the outcome. As the two different groups diverge in their benefits from attracting the firm, their preferential maximum bid varies accordingly. The low-skilled individuals do not directly profit by the location via higher wages, but through higher transfers T_i which are financed by the proportional tax t_i. We derive the low-skilled individual's valuation using equation (11).

$$V_i^l = n^h t_i(\hat{w}_i - w_i^h) \tag{14}$$

[12] For empirical evidence see e.g. Head et al. (1995) who show that subsidies resulting from a bidding competition between US state governments may outweigh any gain derived from attracting a foreign firm.

The valuation corresponds to the maximum bid that a low-skilled median voter would offer in the auction. For all $t_i < 1$ this maximum bid is smaller than the social planner's valuation (13).

The high-skilled individual's benefit is directly generated by the gross income increase, while the tax financing the transfer reduces the favoured maximum bid. Despite this fact, the valuation is larger than V_i^l and reads

$$V_i^h = (n^h + (1 - t_i)n_i^l)(\hat{w}_i - w_i^h) \tag{15}$$

For $t_i \in (0, 1)$, V_i^h is larger than V_i^* and V_i^l. The reason is the higher individual gain in conjunction with the opportunity to impose a contribution to the subsidy on the low-skilled that exceeds their individual benefit.[13] A tax rate of one implies an equal income distribution over the whole population and, thus, assimilates all valuations inducing V_i^*. The following Corollary describes the relationship between redistribution and the median voter's willingness to pay.

Corollary 1 *A higher degree of redistribution, i.e. a higher tax rate t_i, increases the low-skilled and decreases the high-skilled individual's valuation.*

Corollary 1 shows that redistribution may lead to higher bids by inducing a harmonisation of benefits created by a location. This result may contradict the intuition that left-wing parties, representing low-skilled individuals, demand greater redistribution but refrain from providing subsidies for MNEs. Furthermore, we can draw the policy implication that the opportunity to redistribute benefits from a firm's location increases the probability to attract investment. Especially underdeveloped economies with a low-skilled majority would profit by technological spillover effects.

Both regions engage in a first-price sealed bid auction.[14] Under full information bids B_i are determined by the median voter's preference V_i^m,

[13] To ensure a non-negative net income after location, the following inequality must hold $w^l > {}^{(B_i - t_i \hat{w_i}^h n^h)}/_{((1-t)N_i + t_i n_i^l)}$. In the extreme case where t equals zero and the high-skilled median voter offers her maximum valuation V_i^h, this simplifies to the condition that the minimum wage w^l has to be greater than the wage differential $\hat{w}_i - w_i^h$.

[14] Furusawa et al. (2015) show that under full information and foreign owned firms the choice of the auction method is irrelevant to the outcome of the competition.

with $m \in \{l, h\}$. For B_i it must hold that

$$B_i = \begin{cases} V_i^m & \text{if } V_i^m \leq V_{-i}^m \\ V_{-i}^m + \varepsilon & \text{if } V_i^m > V_{-i}^m \end{cases} \tag{16}$$

Therefore, the region with the highest valuation V_i^m wins the auction by marginally overbidding the competitor ($V_{-i}^m + \varepsilon$). Lemma 1 summarises the bids depending on the composition of the population.

Lemma 1 *Region A wins the bidding competition if*

(i) both median voters are low-skilled ($n_i^l > n^h$) and $t_A/t_B \geq (\hat{w}_B - w_B)/(\hat{w}_A - w_A)$

(ii) the median voter is high-skilled in A ($n_A^l < n^h$) and low-skilled in B ($n_B^l > n^h$) and $(\hat{w}_A - w_A)/(\hat{w}_B - w_B) \geq n^h t_B/(n^h + (1-t_A)n_A^l)$

(iii) both median voters are high-skilled ($n_i^l < n^h$) and $(\hat{w}_A - w_A)/(\hat{w}_B - w_B) \geq (n^h + (1-t_B)n_B^l)/(n^h + (1-t_A)n_A^l)$

Otherwise region B wins.

Proof. The combination of two regions and two types of median voters results in four possible cases. We identify the auction winner by using the bids in equation (16) which are determined by the median voter's preferences given in equations (14) and (15). In cases (i)-(iii) the auction winner depends on the composition of the population and on the tax rate. In the case where $n_A^l > n^h$ and $n_B^l < n^h$ region B wins the auction as

$$\frac{n^h t_A}{(n^h + (1-t_B)n_B^l)} < \frac{\hat{w}_B - w_B}{\hat{w}_A - w_A} \tag{17}$$

always holds. The right hand side of equation (17) is strictly greater than one as the wage differential in region B is greater than in region A. Recall that $t_i \in (0, 1)$. It follows that the maximum value of the left hand side is one. ■

Using Lemma 1 we can state the following proposition.

Proposition 2 *A political process that determines the subsidies offered in a bidding competition induces an inefficient location if the firm locates in region A, i.e. if conditions (i)-(iii) hold as stated in Lemma 1.*

Proof. This proposition follows directly from Lemma 1. ■

The case in Lemma 1 part (i) occurs if the level of redistribution in A is sufficiently higher than in B. Given the disparities in wage differentials between both regions $\left({}^{(\hat{w}_B - w_B)}/_{(\hat{w}_A - w_A)}\right)$, region A's bid is determined by low-skilled individuals and is larger than B's bid since the higher tax rate t_A redistributes the benefit created by a firm's location to a higher extent. However, in case (ii) the inefficient location arises as the high-skilled median voter in region A is able to impose a contribution on the low-skilled individuals which exceeds their individual benefit. Therefore, a low skill ratio in A, i.e. a high amount of individuals potentially being exploited, as well as low redistribution in both regions make inefficiencies more likely. The latter applies because a low tax rate in the region with a high-skilled majority increases the median voter's valuation. However, a low tax rate decreases the valuation of the decisive individual in the other region. In contrast to case (i), case (ii) may also occur if A is the low-tax region. Analogously in case (iii), a larger population in A gives the high-skilled median voter the opportunity to impose his individual willingness to pay on more contributors. Furthermore, a high tax rate in B and a low one in A imply an inefficient outcome. However, if it holds that $t_B > t_A$, an inefficient allocation is more likely under two conditions. Either the differences between regions in terms of the gain in wages of the high-skilled has to be sufficiently small or the population in region A has to exceed the population in region B. In general, the smaller the disparity in wage differentials between the regions the more likely is an inefficient outcome.

Lemma 1 shows that for the case with a low-skilled median voter in region A and a high-skilled median voter in region B the location decision is efficient, i.e. the firm locates in B. In Proposition 2 we state that even if a location in region B would be efficient from an allocative point of view the political process can induce an inefficient location.

While we consider the allocation between regions in Proposition 2, in Proposition 3 we focus on the effects on income generated by a firm's attraction within a region. All results derived in the following hold for both regions.

Lemma 2 shows how the bid affects individual and aggregate income. Analysing these effects, we distinguish three cases.

Lemma 2 *(i) If the bid is smaller than the valuation of the low-skilled ($B_i < V_i^l$), individuals of both types benefit by the firm's location.*

(ii) If the bid exceeds the valuation of the low-skilled and is smaller than the location's effect on aggregate income ($V_i^l < B_i < V_i^*$), the low-skilled suffer a loss in income whereas the high-skilled individuals' net income increases. The gains of the high-skilled exceed the losses of the low-skilled.

(iii) If the bid exceeds the firm's surplus effect ($B_i > V_i^*$), the impact of the location on individuals' income is the same as in case (ii). However, the aggregate income decreases in the region.

Proof.

(i) For each $B_i < V_i^l$ it holds that Δy_i^l and Δy_i^h are strictly greater than zero (see equations (11) and (12)).

(ii) For each $V_i^l < B_i < V_i^*$ it holds that Δy_i^l is smaller and Δy_i^h is greater than zero. Since B_i is smaller than the surplus effect created by the firm's location (V_i^*) the net effect is positive.

(iii) As B_i exceeds the firm's surplus effect the net effect is negative.

■

Considering case (iii) in Lemma 2 we can show that high subsidies induced by a strong bidding competition may decrease aggregate income. This inefficiency is summarised in the following Proposition.

Proposition 3 *The winning region suffers a loss in income if its median voter is high-skilled and if the heterogeneity between both regions is sufficiently small.*

Proof. A bid inducing a loss in income for the low-skilled (see case (iii) in Lemma 2) occurs only if the median voter is high-skilled because a low-skilled individual would not offer a bid that exceeds her personal valuation. The bidding function (equation (16)) shows that a close similarity between regions' valuations leads to high bids offered in the competition. ■

The problem identified in Proposition 3 occurs if the magnitude of the potential surplus effect created by the firm and, thus, the corresponding valuation is similar in both regions. Indeed, Greenstone and Moretti (2003) and Greenstone et al. (2010) show that competing regions have similar trends in wage bill, employment and per capita income. Obviously, this result is more likely if the median voter in the other region is high-skilled. Interestingly, a loss in aggregate income can occur even though the firm's location is efficient from an allocative point of view.

In the case of a low-skilled median voter (see case (i) in Lemma 2) the high-skilled individuals benefit from the attraction of a firm due to a bid that is smaller than their individual willingness to pay. The low-skilled individuals are at least indifferent between location or no location. Therefore, the attraction is a pareto-improvement.

If we extend our modelling by assuming that both the tax rates and the bids are subject to majority voting, the results do not change fundamentally. In this scenario, a low-skilled voter would choose a tax rate inducing a uniform income distribution, whereas a high-skilled voter would refrain from taxing income. As a result, region B would win the bidding competition for sure if the median voter in A is considered to be low-skilled. In the remaining cases the location of the firm depends on the wage differential as well as on the population composition and, thus, may be inefficient and detrimental for the winning region in terms of aggregate income.

To summarise our results, we find two dimensions of potential inefficiencies caused by the political process. First, the firm locates in the region,

that benefits less. Second, the winning region suffers a loss of aggregate income.

3 Conclusion

This paper analyses the competition for a firm between two asymmetric regions when bids are subject to a political process. We show that the firm's location may be inefficient as the external effects cannot be internalised perfectly. Furthermore, the winning region may suffer a loss of aggregate income if a high-skilled median voter offers a bid that exceeds the surplus effect created by the firm's location. As a consequence, regulating the opportunity of granting subsidies enhances welfare by preventing an exploitation of the low-skilled by the high-skilled individuals. Additionally, redistributing the benefits created by the new firm mitigates inefficiencies.

Our paper explains the excessive practice of granting subsidies which is the reason for a restrictive state aid policy pursued, for instance, by the EU. Due to European regulation, state aid is controlled by the European Commission and restricted to few exceptional regions characterised by an 'abnormally low standard of living' (art. 107(3a) TFEU). The EU Treaty is designed to prevent competitive distortions which would contradict the idea of an internal market. Besides this argument, we offer a novel rationale based on political mechanisms contradicting a large part of the existing literature.

Additionally, our model may shed some light on agglomeration processes, i.e. that firms' do not locate in low-productive regions but concentrate in clusters. As the benefit from location cannot be fully redistributed on the local level, high-productive regions have an advantage in bidding competitions. The reason for this is that many inhabitants in such regions profit directly by a new firm's location via higher wages, whereas regions with an unaffected low-skilled majority lack political support for high subsidies.

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