

The Comparative Political Economy of Economic Geography

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Abstract

This paper examines how different electoral rules affect the location decisions of firms through the effect on regional policy. The equilibrium location of industry in the economically smaller (larger) region is higher under majoritarian (proportional) elections. The standard prediction in the economic geography literature, that the larger region becomes the core when trade barriers are reduced, no longer holds. The establishment of manufacturing production in the smaller region is increasing in the level of regional integration. As trade is increasingly liberalized, the economy features a reversed core-periphery equilibrium. This result holds under both electoral rules. However, firms locate to the smaller region at a relatively higher rate in the case of majoritarian voting, hence, the reversed equilibrium occurs for a relatively lower level of regional integration with majoritarian elections. Empirical evidence shows that the model is consistent with qualitative features of the data, and the results are robust to an instrumental variable strategy that accounts for the potential endogeneity of the electoral rule.

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1 Introduction and Related Literature

Government grants influence where firms locate and how the presence of agglomeration externalities interacts with regional policy. At the same time, there is a large consensus in the literature that economic policy is determined by the interaction of politicians, interest groups, and voters. Political science links policy choices to fundamental constitutional features such as, for example, the electoral rule employed. Given this view, can institutional arrangements provide an explanation for the location decisions of firms through its effect on the determination of regional policy? If so, the constitutional framework is of economic importance for newly emerging democracies, but also for more consolidated democratic regimes seeking to change their election scheme. The current paper aims to answer this question by examining how regional policy affects the geographic concentration of firm activity under different electoral rules.

While the specific question of how the constitutional design influence the economic geography has been neglected, much of the work on comparative political economy studies aspects of fiscal policy. Persson and Tabellini (1999), for example, relate the size and composition of government spending to the political system. Applying the probabilistic voting model adapted by Lindbeck and Weibull (1987), they show that majoritarian, as opposed to proportional, elections increase competition between parties by focusing it into some key electoral districts containing the most responsive voters. This leads to less public goods, less rents for politicians, more redistribution and larger government.

Using the framework of Lindbeck and Weibull (1987), Robert-Nicoud and Sbergami (2004) examine the political economy of the distribution of regional subsidies and the effect on the location decisions of firms. They argue that the population in smaller regions is more politically homogenous and, for this reason, politicians will find that a given subsidy level can buy more votes when the subsidies are distributed to firms based in these areas, where there are relatively more swing voters. Taking such voter characteristics into account when determining regional policy, it follows that smaller regions can attract a more than proportional share of industry compared to what is implied by standard geography models.

The current paper combines features of the models on how political institutions affect economic outcomes with a small but growing literature on

the political economy of regional policy and industrial location.¹ In doing so, it shows that the agglomeration of economic activity depends on how the electoral system affects the political competition when regional policy is determined. Specifically, in line with the aforementioned assumption that the rural and smaller region (the South) is characterized by a relatively higher level of ideological homogeneity than the urban and larger region (the North), it is shown that the equilibrium location of industry in the South (North) is higher under majoritarian (proportional) elections.

The economic setting applied in the paper, with asymmetric-sized regions, where capital is inter-regionally mobile, gives rise to the home market effect (Krugman, 1980). That is, as trade barriers are gradually lowered, the allocation of industry shifts towards the larger region. In the absence of an endogenous regional policy, further liberalization continues to benefit the larger region until all industry agglomerates in the North. However, taking into account the institutional structure of the political competition when allocating subsidies to industrial firms, this standard prediction does not necessarily hold.

Applying the probabilistic voting model under proportional and majoritarian voting as in Persson and Tabellini (1999), whether the North or the South is subsidized on net, is shown to depend on the ideological disposition of the electorate. Given the notion that the social and economic activities are more homogenous in smaller regions, the office-motivated political candidates adjust their policy platforms to the economic interest of the electorate in the South; that is, they net subsidize manufacturing production in this region. This holds under both electoral rules.² When trade is liberalized, subsidies to manufacturing production become relatively more efficient in at-

¹See for example Persson and Tabellini (2002) for a survey of the literature on comparative political economy. Papers on the political economy of the new economic geography include for example Robert-Nicoud and Sbergami (2004); Wiberg (2010), who develops a lobbying model to explain the distribution of regional subsidies and the effect on the location of industry; and Wiberg (2011), who analyzes the location of manufacturing activities when regional policy is determined by each region's relative propensity to vote. In a study somewhat related to this issue, Henderson and Wang (2007) examine how democratization affects urbanization in an endogenous growth context. As they show, increasing democratization levels the playing field across the urban hierarchy, increasing the growth in city numbers, while reducing the population size of cities.

²This is consistent with previous research: according to Homburg (1997), population size was significantly negatively related to the allocation of regional funds within the European Union in 1992.

tracting industrial activity; hence, the equilibrium location of industry in the South is increasing in the level of economic integration. As trade is increasingly liberalized, the economy eventually features a reversed core-periphery equilibrium where all firms reside in the South.

It is further argued that the South obtains a relatively higher (lower) level of subsidies with majoritarian (proportional) voting. This in turn implies that firms locate at relatively higher (lower) rates to the South as trade costs are lowered under majoritarian (proportional) representation, and that the reversed core-periphery equilibrium occurs for a relatively lower (higher) level of regional integration. The reason for this can be explained as follows.

The population in each region consists of three groups of voters: the rich, the middle class, and the poor; the middle class is the largest voter group and on average ideologically neutral. As in the model of Persson and Tabellini (1999), under a majoritarian system the electoral competition is stiffer, because the candidates are relatively more focused on the voter group with the least average ideological bias, in this case, the middle-class. Since the election outcome is more sensitive to policy, these voters obtain a regional policy closer to their ideal point as compared to proportional representation. As a result, the larger (lower) is the South's density of ideologically neutral voters in the middle class relative to that of the rich and the poor compared to that of the North, the larger (lower) are the regional transfers to the South under majoritarian representation. Following the notion of Robert-Nicoud and Sbergami (2004), when the North becomes relatively larger, it is assumed that the relative ideological homogeneity of the South increases. Specifically, the homogeneity among a voter group of the South is proportional to the homogeneity and the relative size of the corresponding voter group of the North. For example, as the middle class of the North becomes relatively larger compared to that of the South, the relative ideological homogeneity of the middle-class voters of the South increases. This correspondence, and the fact that the middle class constitutes the largest voter group in the national electorate, thereby potentially including more swing voters, imply a larger fraction of ideologically neutral voters in the middle class of the South relative to the North. In other words, when the North becomes relatively larger, the number of swing voters in the middle-class of the South increases by more than the increase among the rich and the poor in the South. This gives rise to an ideological bias in the electorate of the smaller region, that leads the political parties to allocate a relatively higher (lower) level of subsidies to the South under the majoritarian (proportional) electoral rule. And when

the candidates distribute a relatively higher (lower) level of firm subsidies to the South under majoritarian (proportional) voting, the subsidy-included relative return to capital increases (decreases) in this region, which increases (decreases) the number of firms located in the South.

Empirical evidence from a cross-country sample of yearly averaged data over the period 1993-2007 for 88 countries supports the view that economically smaller and rural (larger and urban) regions are relatively larger (smaller) under majoritarian institutions compared to proportional elections. The empirical framework also confirms the prediction that economic activity shifts to smaller regions as trade costs are lowered. This is an interesting result since empirical research, not controlling for the electoral rule, finds a location disadvantage of rural areas as inter-regional trade is liberalized (see for example Hanson (2005)).

The rest of the paper is organized as follows. The next section presents the economic geography framework, and solves for the equilibrium location of industry when the regional policy variable is taken as exogenous. Section 3 introduces the political economy dimension, and solves for the policy instrument under proportional and majoritarian representation. In Section 4, the comparative subsidy and location equilibria are defined. Section 5 discusses the empirical strategy, the data set and tests the theoretical implications of the model. Section 6 concludes; proofs and derivations are in the Appendix.

2 The Economic Model

The economic model uses the Martin and Rogers (1995) framework, which is based on the Flam and Helpman (1987) version of the Dixit and Stiglitz (1977) model of monopolistic competition.

2.1 Assumptions

There are two regions, two sectors and two factors. Specifically, the two regions, North (N) and South (S), belong to the same country and are endowed with two factors, labor (L) and capital (K). The regions are symmetric in terms of tastes, technology, openness to trade, but differ in their factor endowments; the North is a scaled-up version of the South. Thus, the regions may be of different size, but they have identical capital-labor ratios. In particular, the North's endowment of both capital and labor is $\lambda > 1$ times the

South's endowment. For this reason, λ can be interpreted as the relative economic strength of the North.

Let the population in each region consists of three distinct groups of voters, denoted by $k = R, M, P$, representing the rich, the middle class, and the poor, respectively. It is assumed that the middle class is the largest group.

The two sectors are referred to as agriculture (A) and industry, or manufacturing (I). The agricultural sector is assumed to produce a homogenous good under constant returns to scale and perfect competition using a_A units of labor per unit of output. Labor is the only input and this good is chosen as a numeraire. The manufacturing sector uses both labor and capital to produce a differentiated good under increasing returns to scale and monopolistic competition. Following Flam and Helpman (1987), the production of each differentiated good involves a one-time fixed cost consisting of one unit of K , and a per-unit-of-output cost of a_I units of L . The implied cost function of each industrial firm is therefore given by:

$$\pi + wa_Ix, \tag{2.1}$$

where π and w are the reward to capital and labor, and x is the firm level output.

Physical capital can move between the regions but capital owners are immobile. Thus, when pressures arise to concentrate production to one region, capital will move, but its entire reward will be repatriated to its region of origin. Labor, on the other hand, can move freely between the sectors but is immobile between the regions. Total supply of capital and labor in the economy is fixed, with the nation's endowments denoted by K_W and L_W . Since each industrial variety requires one unit of capital, the share of the nation's capital stock employed in a single region equals the region's share of the national manufacturing sector. Consequently, the North's share of industry can be used, i.e., $s_N \equiv \frac{n_N}{n_N + n_S}$, where n_N and n_S denote the number of industrial firms in the North and the South, respectively, to represent the share of capital employed in the North and the share of all varieties made in the North.

Output in the agricultural sector is traded at no cost, while inter-regional trade in the differentiated output is subject to an iceberg transportation cost. Hence, in order to sell one unit of the differentiated good in the other region, $\tau > 1$ units need to be shipped.

The representative consumer/voter of group k in each region has preferences according to:

$$U_k = C_I^{\mu_k} C_A^{1-\mu_k}, \quad (2.2)$$

where $\mu_k \in (0, 1)$ and C_A is consumption of the homogenous good. (2.2) implies that the expenditure shares on industrial products and the agricultural output differ across the voter groups. It is natural, but not crucial for the results, to assume that $\mu_R > \mu_M > \mu_P$, i.e., that the rich voters spend relatively more of their income on industrial goods than the middle class and the poor. Consumption of manufactures enters the utility function through the index C_I , which is defined by:

$$C_I \equiv \left(\int_0^{n_W} c_i^{\frac{\sigma-1}{\sigma}} di \right)^{\frac{\sigma}{\sigma-1}}, \quad (2.3)$$

where $n_W = n_N + n_S$ denotes the number of industrial varieties consumed, fixed by the nation's total supply of capital; c_i is the amount of variety i consumed, and $\sigma > 1$ is the constant elasticity of substitution between any two varieties.

Assuming that a government can subsidize manufacturing production in both regions at the same time, these subsidies are proportional to the reward to capital and distributed on a per-firm basis independent of output. Since the one-time fixed cost consists of one unit of K , such subsidies represent a subsidy to capital. Let π_N (π_S) denote the before-subsidy reward to capital when producing in the North (South) and let $\theta \equiv \frac{\pi_N}{\pi_S} = \frac{1+z_S}{1+z_N}$, where $\theta \in \mathbb{R}_{++}$ and $z_j \geq 0$ measures the level of per-firm subsidies proportional to the reward to capital, awarded to a typical firm located in region $j = N, S$. Subsidies defined in this way thus entitle the firm to z_j units of subsidies per unit of π_j . Clearly, when production in the South is net subsidized, the condition $\theta > 1$ must hold, and when production in the North is net subsidized, the condition $0 < \theta < 1$ must be fulfilled. $\theta = 1$ when no net subsidies are distributed.

The subsidies are paid for by lump-sum taxation, and since each unit of labor is identified with an individual, the per-capita tax can be expressed as a per-unit-of-labor tax. Moreover, the government's budget is always balanced, so that the level of taxation depends on the level of subsidies transferred. Wages are not affected by the subsidies, and since each individual is both a taxpayer and an owner of capital and labor, on net, the agents' total incomes are unaffected by the tax-cum-subsidy. Further, with free capital mobility,

those who receive subsidies earn no more than the individuals who receive no subsidies, so netting out the tax-cum-subsidy, the agents' incomes are unaffected by taxation.

By assumption, there are no savings and therefore expenditures equal disposable income. Consequently, expenditures in region j , E_j , are given by:

$$E_j = w_j L_j + \rho_j K_j - T L_j, \quad (2.4)$$

where ρ_j is the subsidy-included return to capital in region j , and T is the countrywide lump-sum tax paid by the representative consumer.

2.2 The Economic Equilibrium

The unit factor requirement of the homogenous good is one unit of labor ($a_A = 1$). This good is freely traded and since it is also chosen as a numeraire, $p_A = w = 1$ in both regions.

A consumer of group k spends a share μ_k of his income on manufactures. Maximizing (2.2), subject to (2.3) and the budget constraint, to obtain the demand function in region j for variety i of the differentiated good:

$$c_i = \frac{p_i^{-\sigma} \mu_k E_j}{\int_{l=0}^{n_W} p_{jl}^{1-\sigma} dl}, \quad (2.5)$$

where p_i is the price of variety i . Profit maximization yields:³

$$p = \frac{\sigma}{\sigma - 1} w a_I, \quad (2.6)$$

and

$$p^* = \frac{\sigma}{\sigma - 1} \tau w a_I, \quad (2.7)$$

for each differentiated commodity sold in the home and export market, respectively. Without loss of generality, let $a_I = \frac{\sigma-1}{\sigma}$,⁴ then using $w = 1$ to

³Differentiating the profit function, $\Pi_i = p_i c_i(p_i) + p_i^* c_i^*(p_i^*) - \pi - w a_I (c_i(p_i) + c_i^*(p_i^*) \tau)$, where $c_i^*(p_i^*)$ is the foreign demand for industry i products, with respect to p_i and p_i^* , using $\sigma \equiv -\frac{p_i}{c_i(p_i)} \frac{\partial c_i(p_i)}{\partial p_i} \equiv -\frac{p_i^*}{c_i^*(p_i^*)} \frac{\partial c_i^*(p_i^*)}{\partial p_i^*}$, solving for the optimal prices gives (2.6) and (2.7).

⁴This assumption is made for algebraic simplicity and does not affect the results, since a_I does not enter the location condition. $a_I = \frac{\sigma-1}{\sigma} < 1$, because $\sigma > 1$, implies that less than one unit of labor is needed to produce one unit of the differentiated good.

obtain the pricing rules for firms in the manufacturing sector: $p = 1$ and $p^* = \tau$.

Since physical capital is only used in the fixed cost component of industrial production, the reward to capital is the Ricardian surplus of a typical variety, i.e., the operating profit of a variety. With a fixed capital stock and free entry, the reward to capital will be bid up to the point where the entire operating profit goes to capital. Under Dixit-Stiglitz competition, the operating profit is the value of sales divided by σ ; that is, $\pi_j = \frac{x_j}{\sigma}$, where x_j is the scale of production of a representative industrial firm in region j .⁵

National expenditures, E_W , can be written as:

$$E_W = L_W + \rho_W K_W - T L_W, \quad (2.8)$$

where ρ_W is determined by the condition $\rho_W = \frac{x_W}{\sigma} + \frac{T L_W}{K_W}$. This means that with free entry into the industrial sector, the national subsidy-included reward to capital is the sum of the national operating profit and the level of subsidies transferred to a representative manufacturing firm in the economy (since the government's budget is always balanced, and the level of taxation therefore depends on the level of subsidies distributed). Using this and $\frac{x_W}{\sigma} = \frac{\mu E_W}{K_W \sigma}$ (see Baldwin et al. [2003]), where $\mu \equiv \frac{1}{3} \sum_{k=1}^3 \mu_k$, in (2.8) yields $E_W = L_W + \frac{\mu E_W}{\sigma}$, which implies that:

$$E_W = \frac{\sigma L_W}{\sigma - \mu}. \quad (2.9)$$

Likewise, for region j :

$$E_j = \frac{\sigma L_j}{\sigma - \mu}. \quad (2.10)$$

Combining (2.9) and (2.10) gives $s_{E_j} \equiv \frac{E_j}{E_W} = \frac{L_j}{L_W}$, where $s_{E_j} \in (0, 1)$ represents the share of national expenditures of region j , and $s_{E_N} = 1 - s_{E_S}$. Thus, the relative economic strength of the North is written as: $\lambda \equiv \frac{L_N}{L_S} = \frac{s_{E_N}}{1 - s_{E_N}}$.

The domestic and foreign demand function for industry i products, and the optimal prices give the reward to capital or the operating profit in equi-

⁵Free entrance implies that profits are eliminated. Employing the profit function from note 3 for a typical manufacturing firm in region j , noting that $w = 1$, $a_I = \frac{\sigma-1}{\sigma}$, $p = 1$, $p^* = \tau$, and $x_j \equiv c_j + c_j^* \tau$ gives $\pi_j = \frac{x_j}{\sigma}$.

librium:⁶

$$\pi_N = \frac{x_N}{\sigma} = \frac{3}{\sigma} \left(\frac{\mu E_N}{n_N + \phi n_S} + \frac{\phi \mu E_S}{\phi n_N + n_S} \right), \quad (2.11)$$

and

$$\pi_S = \frac{x_S}{\sigma} = \frac{3}{\sigma} \left(\frac{\phi \mu E_N}{n_N + \phi n_S} + \frac{\mu E_S}{\phi n_N + n_S} \right). \quad (2.12)$$

$\tau^{1-\sigma} \equiv \phi \in [0, 1]$ is a measure of the freeness of inter-regional trade, where 0 corresponds to infinite trade barriers and 1 represents free trade. Substituting (2.10) into (2.11) and (2.12) to obtain:

$$\pi_N = aL_W \left(\frac{s_{EN}}{s_N + \phi(1 - s_N)} + \frac{\phi(1 - s_{EN})}{\phi s_N + (1 - s_N)} \right), \quad (2.13)$$

and

$$\pi_S = aL_W \left(\frac{\phi s_{EN}}{s_N + \phi(1 - s_N)} + \frac{(1 - s_{EN})}{\phi s_N + (1 - s_N)} \right), \quad (2.14)$$

where $a \equiv \frac{3\mu}{\sigma - \mu}$, s_N and $1 - s_N$ being the North and the South's share of the national manufacturing sector. With one unit of capital per variety, s_N and $1 - s_N$ are also defined as the regional shares of the national capital stock employed in the North and the South, respectively.

With perfect capital mobility and when manufacturing production takes place in both regions, the location condition requires that capital employed in the North must earn the same subsidy-included rate of return as capital in the South: $\pi_N(1 + z_N) = \pi_S(1 + z_S)$. Given (2.13) and (2.14), the distribution of industry solving this condition is:

$$s_N = \frac{s_{EN}(1 - \phi^2) - \phi(\theta - \phi)}{(1 - \phi)(\theta - \phi - s_{EN}(\theta - 1)(1 + \phi))}. \quad (2.15)$$

Let $\theta = 1$ (i.e., no net subsidies are transferred) and differentiate (2.15) with respect to s_{EN} :

$$\left. \frac{\partial s_N}{\partial s_{EN}} \right|_{\theta=1} = \frac{1 + \phi}{1 - \phi} > 1, \quad (2.16)$$

⁶Using the expressions for the demand functions in $\frac{x_j}{\sigma} \equiv \frac{c_j + c_j^* \tau}{\sigma}$, and $p = 1$, $p^* = \tau$ yields (2.11) and (2.12).

which demonstrates the home market effect, leading firms to be disproportionately represented in the economically larger region. Thus s_N increases more than proportionate to s_{E_N} for $\phi \in (0, 1)$, and this effect becomes stronger as trade barriers are reduced (so-called home market magnification, due to Krugman [1991]). This means that even if one region is just slightly larger than the other, it will obtain the entire manufacturing industry if transaction costs are sufficiently low.

To illustrate the effect of subsidies on the geographical equilibrium, differentiate (2.15) with respect to θ :

$$\frac{\partial s_N}{\partial \theta} = -\frac{s_{E_N}(1 - s_{E_N})(1 + \phi)^2}{(\phi - \theta + s_{E_N}(\theta - 1)(1 + \phi))^2} < 0. \quad (2.17)$$

(2.17) implies that the location of manufacturing activities in the North is decreasing in net subsidies distributed to the South (and vice versa). By setting $s_{E_N} = \frac{1}{2}$ and differentiating (2.17) with respect to ϕ , it can be shown that lower trade costs magnify the relocation effect of the subsidy.

The welfare of a representative individual is a function of the income and the price index prevailing in the region of residence. Given (2.2), the indirect utility functions are (see Appendix A.1 for details):

$$V_{Nk}(\theta) = \ln(1 + a) + \frac{\mu_k}{\sigma - 1} \ln(s_N + (1 - s_N)\phi), \quad (2.18)$$

and

$$V_{Sk}(\theta) = \ln(1 + a) + \frac{\mu_k}{\sigma - 1} \ln(s_N\phi + (1 - s_N)), \quad (2.19)$$

for an agent of group k residing in the North and the South, respectively. $V_{Nk} > V_{Sk}$ if and only if $s_N > \frac{1}{2}$.⁷ Moreover, it is straightforward to verify that $\frac{\partial V_{Nk}}{\partial s_N} > 0$ and $\frac{\partial V_{Sk}}{\partial s_N} < 0$. Consequently, individual welfare increases in the number of firms located in the agents' region, since this leads to a decrease in consumer prices of manufactures when less industrial varieties need to be imported, and trade costs have to be paid on a lower number of goods.

It can further be established that $\frac{\partial V_{Nk}}{\partial \theta} < 0$ and $\frac{\partial V_{Sk}}{\partial \theta} > 0$. Since θ has an impact on industry location by (2.17), subsidies have an effect on prices. When firms relocate to the South (North) as θ increases (decreases), this

⁷ $V_{Nk} - V_{Sk} = \frac{\mu_k}{\sigma - 1} (\ln(s_N + (1 - s_N)\phi) - \ln(s_N\phi + (1 - s_N))) = \frac{\mu_k}{\sigma - 1} \ln\left(\frac{s_N + (1 - s_N)\phi}{s_N\phi + (1 - s_N)}\right) > 0$ if $s_N > \frac{1}{2}$.

leads to a decrease in consumer prices of manufactures in the South (North), which increases the individual welfare of the South (North). This accords with the result of Dupont and Martin (2006) who show that more subsidies allocated to the South (North), financed at the national level, decreases real income and the agglomeration of firms in the North (South). In other words, changes in regional welfare are qualitatively symmetric: they change in the opposite direction. That is, net subsidies distributed to the South, financed with a national tax, always decrease (increase) welfare in the North (South).

With the economic model specified, it is now time to introduce the political game that aims at determining the direction and size of the net subsidy.

3 The Political Model

The political setting considered is a modification of the model by Persson and Tabellini (1999), which in turn is based on the probabilistic voting approach adapted by Lindbeck and Weibull (1987).

3.1 The Basic Setting

Assume that the national elections involve the set of candidates, or parties, $\{A, B\}$, which is fixed and finite; candidates strive to maximize their vote share or, alternatively, their probability of winning; candidates simultaneously choose the net subsidy level, θ ; having observed the candidates' platforms, voters decide which candidate to vote for, and voting is costless. In addition, the candidates' commitments to their announced policy platforms, ahead of the elections, are assumed to be binding.

Besides θ , the parties may differ in some other dimension unrelated to policy. This dimension is referred to as ideology, but it could also involve other attributes such as the personal characteristics of the party leadership. The ideological dimension is a permanent feature in that it cannot credibly be modified as part of the electoral platform. Furthermore, by assumption, voters differ in their evaluation of this feature.

The population in region j consists of citizens belonging to different electoral districts indexed, in the same way as the voter groups, by $k = R, M, P$ (a citizen of district k is interchangeably referred to as a member of voter group k).⁸ Each unit of labor is identified with a voter, hence the size

⁸It can be shown that all results generalize if groups and districts do not completely

of the electorate is $L_W = L_N + L_S$, where $L_N = l_{NR} + l_{NM} + l_{NP}$ and $L_S = l_{SR} + l_{SM} + l_{SP}$, and l_{jk} represents the size of voter group k in region j . $l_{Nk} = l_{Sk}\lambda > l_{Sk}$, since the North's endowment of labor is $\lambda > 1$ times the South's endowment. Moreover, $l_{jM} > \max\{l_{jR}, l_{jP}\}$ because the middle class is the largest voter group in region j . Recall that the total supply of labor is fixed, and that labor is immobile between the regions. Assume that there is no income mobility among the electorate in region j , and define $l_k \equiv l_{Nk} + l_{Sk}$. This implies that l_{Nk} measures the size of voter group k in the North relative to that of the South: when the electorate of group k in the North increases, that of the South decreases, and vice versa.

At the time of the elections, voters base their voting decision both on the policy announcements and on the two candidates' ideologies. Specifically, voter i of region j who belongs to group k prefers candidate A if:

$$V_{jk}(\theta^A) > V_{jk}(\theta^B) + \sigma_{ijk} + \delta, \quad (3.1)$$

where $V_{jk}(\theta)$ is given by (2.18) and (2.19). σ_{ijk} is an individual-specific parameter that can take on negative as well as positive values. It measures the individual ideological bias towards candidate B of voter i in group k residing in region j . A positive value of σ_{ijk} implies that voter i has a bias in favor of party B , whereas voters with $\sigma_{ijk} = 0$ are ideologically neutral, i.e., they care only about regional policy. Assume that this parameter has regional group-specific uniform distributions on: $\left[-\frac{1}{2\zeta_{jk}} + \bar{\sigma}_{jk}, \frac{1}{2\zeta_{jk}} + \bar{\sigma}_{jk}\right]$, where $\bar{\sigma}_{jk}$ denotes the average ideology, and ζ_{jk} is the density of the distributions, which captures the voters' responsiveness to policy.⁹ Following Persson and Tabellini (1999), label the three groups in region j according to their average ideology: $\bar{\sigma}_{jR} < \bar{\sigma}_{jM} < \bar{\sigma}_{jP}$, where $\bar{\sigma}_{jM} = 0$ without loss of generality. This means that the middle class in region j on average is ideologically neutral.

Thus two parameters, $\bar{\sigma}_{jk}$ and ζ_{jk} , fully characterize the distributions. Specifically, voters differ in their average ideology, captured by the means, $\bar{\sigma}_{jk}$, and in their ideological homogeneity, a higher density, ζ_{jk} , being associated with a narrower distribution of σ_{ijk} . Hence, ζ_{jk} measures the height of the distributions, and how many votes are gained among the agents of region j who belong to group k per marginal increase in their economic welfare.

overlap.

⁹The properties of the equilibrium do not change in a qualitative substantial way for more general distributions of voters' ideological preferences, namely if the group distributions of the parameter σ_{ijk} are not uniform, but unimodal.

The parameter δ , which captures the average (relative) popularity of candidate B in the population as a whole, can be positive or negative, and is uniformly distributed on: $\left[-\frac{1}{2\psi}, \frac{1}{2\psi}\right]$. As seen below, δ generates the required uncertainty about the election outcome.

The timing of the political process is as follows. (1) The two candidates, simultaneously and noncooperatively, announce their regional policy: θ^A and θ^B . At this stage, they know the voters' policy preferences. They also know the distributions of σ_{ijk} and δ , but not yet their realized values. (2) The actual value of δ is realized and all uncertainty is resolved. (3) Elections are held. (4) The elected candidate implements the announced policy platform.

To formally study the candidates' decisions at Stage 2, the swing voter of group k in region j is identified; that is, a voter whose ideological bias, given the candidates' platforms, makes him indifferent between the two parties:

$$\sigma_{jk} = V_{jk}(\theta^A) - V_{jk}(\theta^B) - \delta, \quad (3.2)$$

where all voters i of group k in region j with $\sigma_{ijk} \leq \sigma_{jk}$ prefer party A . Hence, given the distributional assumptions, the vote share of candidate A in group k of region j is:

$$\varpi_{A,jk} = l_{jk}\zeta_{jk} \left(\sigma_{jk} - \bar{\sigma}_{jk} + \frac{1}{2\zeta_{jk}} \right). \quad (3.3)$$

Since σ_{jk} depends on the realized value of δ , the vote share is also a random variable. From both candidates' perspective, the electoral outcome is thus a random event, related to the realization of δ .

3.2 Proportional Elections

Consider the subsidy policy under an electoral rule where it is equally important to win votes in all voter groups. By assumption, there is perfect proportional representation in the sense that the parties obtain a seat share in proportion to their vote share in the entire population. Furthermore, the party which obtains more than fifty percent of the seats earns the right to set policy according to its political platform.¹⁰ Under this electoral rule the

¹⁰For countries with proportional systems, more than two parties are usually observed. However, the theory of probabilistic voting can be extended to multiparty elections, that is, elections involving three or more parties. For example, Dorussen et al. (1997) show that when the random component of voter decision making is sufficiently large, the so-

probability of candidate A winning is given by:

$$P_A = P \left(\sum_k \varpi_{A, Nk} + \sum_k \varpi_{A, Sk} \geq 3 \right). \quad (3.4)$$

Without loss of generality, assume that $\sum_k l_{jk} \zeta_{jk} \bar{\sigma}_{jk} = 0$. Given (3.2), the probability of winning then becomes:

$$P_A = \frac{1}{2} + \frac{\psi}{\zeta} \left(\sum_k l_{Nk} \zeta_{Nk} (V_{Nk}(\theta^A) - V_{Nk}(\theta^B)) + \sum_k l_{Sk} \zeta_{Sk} (V_{Sk}(\theta^A) - V_{Sk}(\theta^B)) - 3 \right) + \frac{\psi}{2\zeta} \left(\sum_k l_{Nk} + \sum_k l_{Sk} \right), \quad (3.5)$$

where $\zeta \equiv \sum_k l_{Nk} \zeta_{Nk} + \sum_k l_{Sk} \zeta_{Sk}$.

A unique equilibrium exists in which both A and B choose the same θ . Formally, they share the same first-order conditions and do not themselves have preferences over policy. It follows from (3.5) that the equilibrium policy is a weighted mean of the regional voter groups' individually optimal policy choices. The weights correspond to the group size, l_{jk} , but also to the densities of swing voters among group k in region j , ζ_{jk} , since the densities summarize how responsive the different groups are to regional policy; that is, how they reward policy with votes at the elections.

Inserting (2.15) in (2.18) and (2.19), substituting the resulting expressions in (3.5) and using $l_{Nk} = l_{Sk} \lambda$, then taking the derivative with respect to θ^A to obtain:

$$\theta^{PRO} = \frac{\phi \sum_k \mu_k l_{Sk} \zeta_{Nk} + \sum_k \mu_k l_{Sk} \zeta_{Sk}}{\phi \sum_k \mu_k l_{Sk} \zeta_{Sk} + \sum_k \mu_k l_{Sk} \zeta_{Nk}}. \quad (3.6)$$

It is straightforward to show that θ^{PRO} is increasing in ζ_{Sk} and decreasing in ζ_{Nk} . Intuitively, ideologically neutral groups with many mobile voters, those willing to swing their vote for small changes in regional policy, become an

called “minimum-sum point,” which minimizes the average distance between voters and the parties' positions, represents a convergent equilibrium. This generalizes the results for two-party competition to the multiparty setting. However, very commonly, parties sort themselves out before the elections into two party coalitions, each of which is vying for a majority of the electorate. See for example Petterson-Lidbom (2008), who characterizes the Swedish multiparty proportional system as bipartisan.

attractive target for the office-seeking politicians. When the number of swing voters increases in group k of region j , both parties allocate more subsidies to k of j , because this voter group contains more responsive voters.

Following the assumption of Robert-Nicoud and Sbergami (2004), that the population in the smaller region is relatively more ideologically homogeneous, i.e., assuming that $\zeta_{Sk} > \zeta_{Nk}$, it can be shown that the South is net subsidized, $\theta^{PRO} > 1$.

3.3 Majoritarian Elections

What if elections are instead conducted under plurality rule in one-seat electoral districts? First, assume that the candidate that obtains fifty percent or more of the vote in a district gains the seat in the legislature. Then add the following winning rule: earning the right to set policy requires winning at least four seats out of the total of six. This setting can be interpreted as a parliamentary election in which two competing parties field candidates running on the same platform in all six districts. The party winning in a majority of the districts has a majority in the assembly and can thus implement its preannounced regional policy.

Following Persson and Tabellini (1999), suppose that the ideological bias in the electorate towards party A in group R and towards party B in group P is large enough so that the group-specific means, $\bar{\sigma}_{jR}$ and $\bar{\sigma}_{jP}$, are sufficiently distant from zero. (The equilibrium restrictions on $\bar{\sigma}_{jR}$ and $\bar{\sigma}_{jP}$ are derived in Appendix A.2) Then there exists an equilibrium with policy convergence, where the entire political competition takes place in the middle-class districts. Party A wins district R in region j with a large enough probability, and loses district P with a large enough probability so that neither party finds it optimal to seek voters outside the middle-class districts, since four districts are required for winning the election. In this setting, the relevant expression for the probability of candidate A winning is the probability that A wins district M in region j . This can be written as:

$$P_A = \frac{1}{2} + \frac{\psi}{\zeta_M} (l_{NM}\zeta_{NM} (V_{NM}(\theta^A) - V_{NM}(\theta^B)) + l_{SM}\zeta_{SM} (V_{SM}(\theta^A) - V_{SM}(\theta^B)) - 1) + \frac{\psi}{2\zeta_M} (l_{NM} + l_{SM}), \quad (3.7)$$

where $\zeta_M \equiv l_{NM}\zeta_{NM} + l_{SM}\zeta_{SM}$. Compared to (3.5), this expression depends

only on what takes place in the middle-class districts.

Using (2.15) in (2.18) and (2.19), inserting the resulting expressions into (3.7) and substituting for $l_{NM} = l_{SM}\lambda$, then taking the derivative with respect to θ^A yields:

$$\theta^{MAJ} = \frac{\phi\zeta_{NM} + \zeta_{SM}}{\phi\zeta_{SM} + \zeta_{NM}}. \quad (3.8)$$

It can be shown that θ^{MAJ} is increasing in ζ_{SM} and decreasing in ζ_{NM} . The intuition is the same as under proportional elections: increasing the number of swing voters in the middle-class district of region j , increases subsidies distributed to j .

Assuming that the electorate of the smaller region is relatively more ideologically homogenous, i.e., $\zeta_{SM} > \zeta_{NM}$, implies that the South is net subsidized, $\theta^{MAJ} > 1$. This assumption is kept throughout the rest of the paper.¹¹

4 The Comparative Political Economy Equilibrium

4.1 The Subsidy Equilibrium

Subtracting (3.6) from (3.8) to obtain:

$$\theta^{MAJ} - \theta^{PRO} = \frac{(1 - \phi^2) (\mu_R l_{SR} (\zeta_{NR} \zeta_{SM} - \zeta_{SR} \zeta_{NM}) + \mu_P l_{SP} (\zeta_{NP} \zeta_{SM} - \zeta_{SP} \zeta_{NM}))}{(\zeta_{NM} + \phi \zeta_{SM}) (\sum_k \mu_k l_{Sk} \zeta_{Nk} + \phi \sum_k \mu_k l_{Sk} \zeta_{Sk})}. \quad (4.1)$$

$\theta^{MAJ} > (<) \theta^{PRO}$ if $\frac{\zeta_{SM}}{\zeta_{SR}} > (<) \frac{\zeta_{NM}}{\zeta_{NR}}$ and $\frac{\zeta_{SM}}{\zeta_{SP}} > (<) \frac{\zeta_{NM}}{\zeta_{NP}}$. Hence, the South obtains a relatively higher (lower) level of subsidies with majoritarian voting compared to proportional voting, if the density of swing voters among the middle-class relative to that of the rich and the poor is higher (lower) in the South than in the North. Under a majoritarian system the electoral competition is stiffer, because the candidates are relatively more focused on the voter group with the least average ideological bias; that is, group M in region j . Since the election outcome is more sensitive to policy, the middle-class voters obtain a regional policy closer to their ideal point as compared

¹¹It is a stylized fact that smaller regions tend to be more homogenous (Duranton and Puga, 2000).

to proportional representation. Such a policy has the same political benefit to the parties as under a proportional system, namely the marginal votes gained among those who belong to group M in region j . However, the costs are smaller, as the parties do not internalize the votes lost in group R and P of region j . This implies that the larger (lower) is the density of ideologically neutral voters in group M relative to R and P in the South compared to the North, the larger (lower) are the regional transfers to the South under the majoritarian rule; that is, θ^{MAJ} increases (decreases) relative to θ^{PRO} .

Now suppose that the density of swing voters of group k in the South (North) is a fraction, α_{Sk} (α_{Nk}), of the electorate of group k in the South (North), where $\alpha_{jk} \in [0, 1]$: $\zeta_{Sk} = \alpha_{Sk}l_{Sk}$ and $\zeta_{Nk} = \alpha_{Nk}l_{Nk} = \alpha_{Nk}l_{Sk}\lambda$. Then $\theta^{MAJ} > (<)\theta^{PRO}$ if $\frac{\alpha_{SM}}{\alpha_{SR}} > (<)\frac{\alpha_{NM}}{\alpha_{NR}}$ and $\frac{\alpha_{SM}}{\alpha_{SP}} > (<)\frac{\alpha_{NM}}{\alpha_{NP}}$.

The notion that the smaller region is characterized by a relatively higher level of ideological homogeneity, with relatively more swing voters, is captured by the following correspondence: $\alpha_{Sk} \equiv \alpha_{Nk}l_{Nk} = \alpha_{Nk}l_{Sk}\lambda$. This expression holds for admissible values of $\alpha_{Sk} \in [0, 1]$. Outside the parameter space, α_{Sk} equals 1 in an obvious manner. This correspondence can be motivated as follows. First, recall the argument made in Subsection 3.1, that l_{Nk} measures the size of voter group k in the North relative to that of the South: when the voters who belong to group k in the North increase, those of the South decrease, and vice versa. Then note that the correspondence implies that the density of swing voters of group k in the South, is larger than that of the North by a factor proportional to the relative size of the North's endowment of labor: when the North becomes relatively larger, the relative ideological homogeneity of the smaller region increases, as assumed by Robert-Nicoud and Sbergami (2004). Hence, $\theta^{MAJ} > (<)\theta^{PRO}$ if $\frac{\alpha_{NM}l_{SM}\lambda}{\alpha_{NR}l_{SR}\lambda} > (<)\frac{\alpha_{NM}}{\alpha_{NR}}$ and $\frac{\alpha_{NM}l_{SM}\lambda}{\alpha_{NP}l_{SP}\lambda} > (<)\frac{\alpha_{NM}}{\alpha_{NP}}$, that is, $\theta^{MAJ} > (<)\theta^{PRO}$ if $l_{SM} > (<)l_{SR}$ and $l_{SM} > (<)l_{SP}$. Since $l_{jM} > \max\{l_{jR}, l_{jP}\}$, because the middle class is the largest voter group in region j , $\theta^{MAJ} > \theta^{PRO}$ holds.

Accordingly, both parties find it politically optimal to allocate a relatively higher (lower) level of subsidies to the smaller region under the majoritarian (proportional) electoral rule. The relatively larger endowment of labor of the North, and the fact that the middle class constitutes the largest voter group, thereby including more swing voters, translate into a larger density of ideologically neutral voters in group M relative to R and P in the South compared to the North. In other words, when the North becomes relatively larger, the number of swing voters in the middle-class of the South increases by more than the increase among the rich and the poor in the South. This gives rise

to an ideological bias of the electorate in the smaller region, which increases the political incentives to announce a relatively more favorable subsidy policy towards the South (North) under majoritarian (proportional) representation.

4.2 The Location Equilibrium

Subtracting the distribution of industry under the proportional electoral rule from that implied by the majoritarian system to obtain:

$$s_N(\theta^{MAJ}) - s_N(\theta^{PRO}) = - \frac{(\theta^{MAJ} - \theta^{PRO})s_{E_N}(1 - s_{E_N})(1 + \phi)^2}{(\theta^{MAJ} - \phi - s_{E_N}(\theta^{MAJ} - 1)(1 + \phi))(\theta^{PRO} - \phi - s_{E_N}(\theta^{PRO} - 1)(1 + \phi))}, \quad (4.2)$$

where the denominator is positive, since by (2.17) the location of manufacturing activities in the North is decreasing in net subsidies distributed to the South (and vice versa). (4.2) implies that $s_N(\theta^{MAJ}) < s_N(\theta^{PRO})$ because $\theta^{MAJ} > \theta^{PRO}$. Thus, the equilibrium location of industry in the smaller (larger) region is higher under majoritarian (proportional) elections. Intuitively, when the candidates allocate a relatively higher level of firm subsidies to the South (North) under majoritarian (proportional) voting, the subsidy-included relative return to capital increases in this region by the location condition ($\pi_N = \pi_S\theta$), which increases the number of firms located in the South (North).

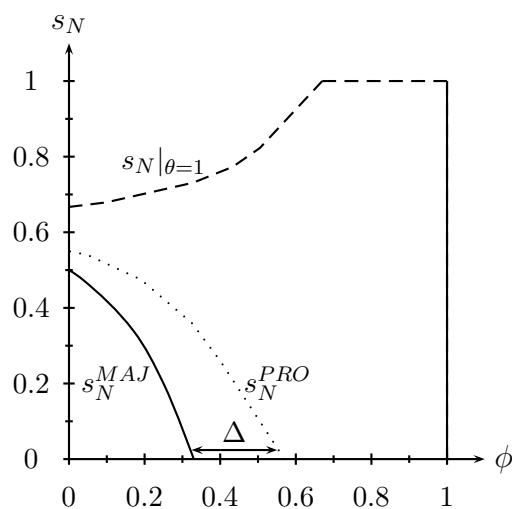
This is summarized in:

Proposition 1: *The equilibrium location of industry in the South (North) is higher under majoritarian (proportional) elections.*

It followed from (3.6) and (3.8) that if the smaller region contains relatively more swing voters, it is politically optimal to net subsidize manufacturing production in the South under both electoral rules. Moreover, it has been shown that both candidates gain by distributing more (less) subsidies to the South under the majoritarian (proportional) system. What implication does this have for the location equilibrium as inter-regional trade is liberalized? Figure 1 shows how the share of industry in the North changes as trade barriers are reduced under both electoral rules, using the following parameter

values: in accordance with the assumption that rich voters spend relatively more of their income on industrial goods than the middle class and the poor, let $\mu_R = 0.95$, $\mu_M = 0.9$ and $\mu_P = 0.85$;¹² $\alpha_{NR} = \alpha_{NM} = \alpha_{NP} = 0.2$; $l_{SM} = 2$ and $l_{SR} = l_{SP} = 1$; and $s_{EN} = 2/3$ (i.e., $\lambda = 2$). For comparison, Figure 1 also displays as a dashed curve, the location equilibrium without voting, denoted $s_N|_{\theta=1}$, where no net subsidies are transferred (that is, where $\theta = 1$), also setting $s_{EN} = 2/3$.

Figure 1: The share of industry in the North for different degrees of openness



Starting from autarky in Figure 1, the share of industry in the North under proportional and majoritarian elections is monotonically decreasing as trade is liberalized.¹³ Thus, when allowing for the endogenous determination of regional policy, economic integration results in a shift of manufacturing production to the region with relative factor scarcity. That is:

Proposition 2: *When regional policy is determined by the political competition for votes, firms locate to the relatively smaller region as trade barriers are reduced.*

¹² $\mu = 0.9$ is the average of the implied values estimated across U.S. counties 1970–1980 and 1980–1990 by Hanson (2005).

¹³Note that $s_N(\theta^{MAJ}) < s_N(\theta^{PRO}) < s_N|_{\theta=1}$ at autarky, since $\theta^{MAJ} > \theta^{PRO} > 1 \forall \phi$.

For the parameter values assumed, when the government allocates a larger share of net transfers to the South and trade is liberalized, the gain from producing in the region hosting the larger number of consumers is less crucial for the location decisions of firms. The benefit for the manufacturing sector of a government policy directed towards subsidizing the establishment of industrial firms in the economically smaller region, outweighs the market-access advantage of producing in the larger region. This effect is more pronounced in the case of majoritarian voting, since $\theta^{MAJ} > \theta^{PRO} \forall \phi$. As a result, the location of production shifts to the South at a relatively higher rate under the majoritarian electoral rule. Therefore, as follows from Figure 1, the slope of s_N^{MAJ} is steeper than that of s_N^{PRO} . At some point on the integration path the South obtains the entire manufacturing industry. Consequently, the model features a reversed core-periphery equilibrium. This equilibrium occurs for a relatively lower level of regional integration with majoritarian elections. By how much lower can be determined by using (3.6) and (3.8) in (2.15), setting the resulting expressions to zero, solving for ϕ under proportional and majoritarian institutions and taking the difference:

$$\Delta = \phi^{PRO} - \phi^{MAJ} = \lambda \frac{\mu_{RLSR}(\zeta_{NR}\zeta_{SM} - \zeta_{SR}\zeta_{NM}) + \mu_{PLSP}(\zeta_{NP}\zeta_{SM} - \zeta_{SP}\zeta_{NM})}{\zeta_{SM} \sum_k \mu_k l_{Sk} \zeta_{Sk}}. \quad (4.3)$$

By inspection of (4.1) it follows that $\phi^{PRO} - \phi^{MAJ}$, which is shown in Figure 1 as Δ , increases as $\theta^{MAJ} - \theta^{PRO}$ increases: when the South obtains relatively more (less) subsidies under the majoritarian electoral rule, firms locate to the South at a relatively higher (lower) rate, producing a reversed core-periphery equilibrium under majoritarian voting for a lower (higher) level of economic integration.

This defines the political economy equilibrium. We now turn to an examination of the empirical properties of this equilibrium.

5 Empirical Framework

Using cross-country data, because national constitutional reforms are rare, this section tests Proposition 1; that is, if the economically smaller (larger) and rural (urban) region, i.e., the South (North), is relatively larger (smaller) under majoritarian institutions compared to proportional elections (formally, if $s_N(\theta^{MAJ}) < s_N(\theta^{PRO})$ holds). Proposition 2 is also tested, i.e., if economic

activity shifts to smaller, more rural, regions as inter-regional trade is liberalized.

For the remainder of this section, the North (South) is referred to as the urban (rural) region.

5.1 Data and Empirical Specification

The data set consists of a cross-section sample of yearly averaged data over the period 1993-2007 for 88 countries that can be considered as democracies. (The countries are listed in Table 4 in the Appendix.)

A regression model of the following form is estimated with the continuous variables expressed in natural logs:

$$urb_c = \alpha_1 + \alpha_2 maj_c + \alpha_3 tcost_c + \alpha_4 z_c + \varepsilon_c, \quad (5.1)$$

where urb_c is the level of the urban population to the total population of country c .¹⁴ maj_c is a dichotomous variable taking the value of one if country c has a majoritarian or plurality electoral rule, zero otherwise.¹⁵ (See Table 4 in the Appendix for a categorization of the countries in the sample according to their electoral rule.) If Proposition 1 is correct, α_2 is expected to be negative; that is, the location of economic activity is relatively more concentrated to rural areas under majoritarian institutions compared to proportional elections. $tcost_c$ measures the land area in square kilometers of

¹⁴The theoretical dependent variable of interest in (5.1), s_N^* , denotes the share of industrial firms in the urban region. For data availability reasons, the share of firms in the urban regions of country c is proxied by the share of people living in urban areas. As pointed out by Venables (2005), other things being equal, it is more profitable to produce in a place with good market access with many consumers; thus, the population size of an area shifts to the location of industry. Apart from this argument, population size is widely used as a measure of the spatial distribution of economic activity (see for example Ellison and Glaeser [1997]).

¹⁵A few countries in the sample undertook electoral reforms in the nineties. Japan (in 1994), New Zealand, the Philippines and Ukraine (all three in 1996) went from a plurality system to a mixed system. Bolivia (1996), Ecuador (1996), Italy (1994) and Venezuela (1993) all replaced full PR with mixed systems. Following the classification of electoral systems in Persson and Tabellini (2003), Japan is coded as 0.33, New Zealand as 0.67, the Philippines as 0.89 and Ukraine as 0.8, while Bolivia, Ecuador, Italy and Venezuela are coded as 0. All the results hold if Bolivia, Ecuador, Italy and Venezuela are coded as 0.5. Some other countries have parallel or segmented systems (Armenia, Georgia, Guinea, South Korea and Lithuania). They are coded as 0.5. All the results hold if these countries are excluded from the analysis.

country c , thereby capturing internal distances. As in Ades and Glaeser (1995), this variable is supposed to control for the domestic transportation cost. If Proposition 2 is correct, α_3 should be positive: as the transportation cost decreases, economic activity shifts towards rural areas. α_1 is an intercept, and ε_c is an error term capturing omitted factors, where $E(\varepsilon_c) = 0$ for all c .

z_c represents a vector of six control variables, most of them applied in the urban concentration model of Ades and Glaeser (1995). First, $polity_c$, which captures the institutional quality and the level of democratic development of country c as measured by the Polity IV scores,¹⁶ with +10 being the highest level of democratic regime and -10 being the highest level of autocratic regime.¹⁷ As Ades and Glaeser (1995) point out, there may be a negative association between political instability and urban concentration. The reason is that instability leads governments to protect themselves by moving the seat of power from urban areas, thus lessening concentration, or by controlling migration (as for example in Stalinist Russia or Communist China) to disperse population across space. The coefficient estimate of $polity_c$ should according to this view have a positive sign.

Second, the value added of the agricultural sector as a percent of GDP, $agri_c$, as a proxy for the income of rural regions in country c , i.e., the market-access advantage of rural areas. Theory predicts that a higher income of agricultural regions decreases the incentives of relocating to urban centers; a negative coefficient is thus expected.

Third, real per capita GDP in USD, gdp_c , to capture that the overall demand is important for the concentration of economic activity and that urbanization requires economic development; the parameter estimate should have a positive sign.

Fourth, the share of trade in GDP, $trade_c$, as a measure of the effect of openness on urban concentration. Following the argument of Ades and Glaeser (1995), when trade protection is low, imported goods are a large part of consumption. Imports are not cheaper in urban centers, so workers spread over space to save on congestion costs. With protection, on the other hand, domestic suppliers take over the market. Prices, net of transport costs,

¹⁶The Polity IV data is more comparable over time than the Gastil democracy index (Persson et al., 2007). The Polity IV index is also used by Henderson and Wang (2007) in their study of how democratization affects the number and population size of cities.

¹⁷All results hold if the empirical analysis, as in Persson et al. (2007), is restricted to countries with positive Polity IV scores.

are lower for domestic goods in urban centers because firms are located in those areas. Workers then migrate to these regions to pay lower prices for domestic goods. Hence, according to Ades and Glaeser (1995), a less open economy increases urbanization, which means that the coefficient on $trade_c$ should be negative.

Fifth, two dummy variables are included. An OECD dummy taking the value of one if country c has been a member of OECD during a majority of the sample period, zero otherwise. This variable controls for the fact that the urbanization trend has been particularly fast in developed countries over the past two or three decades (OECD, 2010). A South America dummy, thereby taking into account that South America seems prone to urban concentration—three of the five most concentrated countries in the world are located in South America. Both dummy variables should have a positive sign.

Data are from the World Bank, World Development Indicators, except data on real GDP per capita, the share of trade in GDP, and information on the electoral systems, which come from the Penn World Table Version 6.3 and the ACE Electoral Knowledge Network.

Table 1 contains descriptive statistics for the non-logarithmic continuous variables.

Table 1: Descriptive statistics

Variables	Mean	Standard deviation	Minimum	Maximum
Urban population (% of total): urb_c	55.69	22.92	8.23	97.39
Transportation cost: $tcost_c$	927,434	2,457,965	1,861	1.64E+07
Polity IV: $polity_c$	6.88	3.41	-3.40	10
Agricultural value added to GDP: $agri_c$	15.64	15.30	1.16	69.93
Real GDP per capita: gdp_c	13,243	11,689	430	45,334
Share of trade in GDP: $trade_c$	79.27	35.90	21.83	194.76

5.2 Results

Table 2 shows the estimation results. As predicted by Proposition 1, α_2 is significant and negative in all specifications; that is, rural (urban) regions are relatively larger (smaller) under the majoritarian electoral rule. The coefficients indicate that countries with a majoritarian system on average have a 0.18–0.44 percent lower level of urban population to the total population compared to countries with proportional representation. A back-of-the-envelope

calculation shows that this implies an increase in the rural population as a fraction of the total population of the average country in the sample by 36,000–89,000 inhabitants.

The coefficient on $tcost_c$ is as expected significantly positive. Thus, as transportation costs decrease, economic activity shifts to rural areas, which confirms Proposition 2. This is an interesting result since empirical research, not controlling for the electoral rule, finds a negative effect of distance on economic activity, i.e., a location disadvantage of rural areas as inter-regional trade is liberalized (see for example Hanson (2005)). Comparing standardized coefficients, the transportation cost variable affects the urbanization rate by far more than the other continuous explanatory variables.

The positive coefficient on $polity_c$ is consistent with the hypothesis of Ades and Glaeser (1995), that political instability leads governments to protect themselves by lessening urban concentration. The coefficient on $agri_c$ is negative and significant, which gives support to the notion of a market-access advantage of economically larger agricultural regions. The coefficient, however, loses its significance when gdp_c is included. This might reflect a high multicollinearity between the income of rural areas and the overall level of economic development. As expected, development, as measured by real per capita GDP, is a significant positive predictor of urbanization in all specifications. $trade_c$ and the OECD dummy are not significant, which could be due to a high multicollinearity with gdp_c : more developed countries trade more than less developed countries; and more developed countries are members of the OECD. The positive and significant South America dummy indicates that countries in this region are relatively more prone to urban concentration. As a comparison with the effect of the electoral system dummy coefficient, being a South American country increases the population of urban areas as a fraction of the total population of the average country in the sample by 50,000 inhabitants.

As pointed out in note 15, these results are robust to an alternative electoral classification of the countries in the sample. The results are also robust to an alternative cross-section set of 68 countries for the period 1960–2007, excluding the former communist regimes.

Table 2: OLS estimations of equation (5.1)

	1	2	3	4	5	6	7
maj_c	-0.374** (0.147)	-0.442*** (0.139)	-0.222* (0.117)	-0.191* (0.101)	-0.230** (0.010)	-0.228** (0.101)	-0.177** (0.106)
$tcost_c$		0.086*** (0.031)	0.087*** (0.027)	0.074** (0.031)	0.077*** (0.027)	0.083** (0.033)	0.068** (0.032)
$polity_c$			0.091*** (0.014)	0.050** (0.200)	0.035** (0.015)	0.034** (0.014)	0.028** (0.014)
$agri_c$				-0.186** (0.075)	0.141 (0.174)	0.133 (0.174)	0.113 (0.184)
gdp_c					0.369** (0.160)	0.360** (0.160)	0.334** (0.158)
$trade_c$						0.053 (0.106)	0.094 (0.122)
OECD							0.079 (0.176)
South America							0.251* (0.148)
N	88	88	88	88	88	88	88
R^2	0.09	0.16	0.44	0.49	0.56	0.56	0.57
F	6.46**	9.13***	22.48***	18.20***	17.10***	14.47***	12.95***

Notes: The dependent variable (urb_c) is the level of the urban population to the total population of country c . Robust standard errors in parentheses with *, **, and *** denoting significance at the 10, 5, and 1 percent levels, respectively.

Most studies that attempt to estimate the effect of constitutional features on economic outcomes do not take into consideration that the selection of a certain constitution is not random. Agents have induced preferences over political institutions, since different institutions generate different policies, and thus lead to different economic outcomes. This is emphasized by for example Ticchi and Vindigni (2010) who show that income inequality affects the choice of the constitution: more unequal countries are expected to choose majoritarian democracy, while equal societies should prefer proportional representation. To the extent that the urban–rural divide reflects income differentials in a country, the degree of urbanization should accordingly affect the probability of adopting a majoritarian system; that is, the electoral rule is endogenous to the distribution of economic activity. To account for this simultaneity, an instrumental variable strategy is implemented to re-estimate (5.1). To this we turn next.

5.3 Instrumental Variable Estimation

In their study on the effects of electoral rules on the amount and the composition of government spending, Persson and Tabellini (2003) propose to instrument for the election system with six variables. First, they use three dating variables, indicating whether a country adopted its current form of government and electoral rule between 1921-1950, 1951-1980, and after 1981, with before 1921 as the omitted category. As they argue, the constitutional inertia suggests the use of history to explain the cross-country variation in constitutional rules. The idea is that there may have been waves in the type of constitutions, where different countries fell into different waves depending on when they adopted their constitution.

Second they apply three variables introduced by Hall and Jones (1999) that capture European influence: two language variables, indicating the fraction of the population in the country speaking one of the major European languages, and the fraction speaking English as a native language; and latitude (distance from the equator). Hall and Jones (1999) use these variables as instruments for the overall quality of institutions. The argument is that countries with a greater fraction of the population speaking European languages and those farther from the equator, which were less densely populated and geographically more similar to Europe, hence more conducive to European migration, have benefited from a European influence. Based on this theory, Persson and Tabellini (2003) reason that language and latitude could have affected the form of electoral rule adopted.

Acemoglu (2005) questions the validity of these instruments, and shows that the constitutional dating variables are weakly correlated with the electoral rule. Once the second-stage covariates applied by Persson and Tabellini (2003) are included in the first-stage regression, the constitutional dummies are no longer jointly significant for the majoritarian dummy. Hence, with only timing dummies, there is no first stage for the instrumental variable strategy—an indication of a weak instruments problem. Furthermore, Acemoglu (2005) argues that the Hall-Jones instruments are unlikely to be valid for the overall quality of institutions, since no historical evidence supports the theory that European influence was generally beneficial to institutional development. And even if these instruments were valid for the overall quality of institutions, there is no reason to think that they would be appropriate for specific features of the institutional structure such as the electoral rule. By excluding other determinants of institutions from the second-stage regres-

sion of economic outcomes, their approach creates a bias similar to omitted variables bias.

Acemoglu's (2005) critique notwithstanding, whether the constitutional timing variables are weak instruments within the framework of the current paper is ultimately an empirical question. Therefore, I tentatively propose the use of the constitutional dating variables as instruments for the electoral rule.

The exclusion restriction implied by this instrumental variable strategy is that, conditional on the controls included in the regression, the constitutional dating variables, denoted $con2150$, $con5180$ and $con81$, have no effect on the level of urban population, other than their effect through the electoral rule. (See Table 4 in the Appendix for a categorization of the countries in the sample according to the timing of the adoption of their constitutions.) To test this restriction, they are added as exogenous regressors. OLS regressions of urb_c on the timing dummies show that they indeed are insignificant. Thus the impact of these variables likely works through their effect on the electoral rule. Moreover, there are good reasons to suspect that the historical period in which the current constitution was established, is exogenous to the level of urbanization during the period 1993-2007. To determine whether the instruments have sufficient explanatory power, an F -test of the hypothesis that they do not enter the first stage regression of (5.1) is performed. Taking into account the critique of Acemoglu (2005), and contrary to the approach of Persson and Tabellini (2003), this first stage includes the second-stage covariates.

Table 3 reports the IV estimation of (5.1). The F -test rejects the null hypothesis that the instruments do not enter the first stage regression—the constitutional dating variables are jointly significant, and $con2150$ and $con81$ are individually significant at the ten and five percent level, respectively. As in the OLS model, the coefficient on maj_c , α_2 , is significantly negative, providing support for Proposition 1: countries with majoritarian elections have a 0.68 percent lower level of urban population to the total population compared to proportional democracies. This translates into an increase in the population of rural regions as a fraction of the total population of the average country in the sample by 136,000 inhabitants, indicating that the OLS estimators may be biased downwards.

The positive and significant coefficient on $tcost_c$ once again confirms Proposition 2, that the economic activity shifts to rural areas as trade barriers are reduced. Moreover, as expected, gdp_c is positive and significant,

which is consistent with the notion that the overall demand is important for the concentration of economic activity, and that urbanization requires economic development. It can also be verified that the estimated location effect of a one standard deviation change in $tcost_c$ is far more economically significant than the corresponding change in gdp_c .

The null hypothesis of the Sargan test for over-identifying restrictions, that all instruments are valid, cannot be rejected; and a Hausman test for the endogeneity of the electoral rule, the null hypothesis being that it is exogenous, is not rejected. The implication is that there is insufficient evidence to conclude that the instruments are not valid, or that the OLS estimates are biased and inconsistent.

Table 3: IV estimation of (5.1)

	maj_c	$tcost_c$	$polity_c$	$agri_c$	gdp_c	$trade_c$	OECD	South America
	-0.676*	0.100**	0.019	0.210	0.415**	0.039	0.015	0.025
	(0.403)	(0.050)	(0.015)	(0.232)	(0.193)	(0.144)	(0.179)	(0.230)
N	88	F	3.23***					
R^2	0.45	χ^2	0.44					
Sargan	5.94							

Notes: The dependent variable (urb_c) is the level of the urban population to the total population of country c . Robust standard errors in parentheses with *, **, and *** denoting significance at the 10, 5, and 1 percent levels, respectively. F is the test statistic of the hypothesis that the instruments do not enter the first stage regression. χ^2 is the Hausman test statistic for endogeneity, a test of the significance of differences between the OLS estimates and the IV estimations. Sargan is the test of over-identifying restrictions, the hypothesis being tested is that the instrumental variables are valid.

6 Conclusions

The new economic geography literature suggests that regional policy affects the location decisions of firms, while the research on comparative political economy links different electoral rules to different economic policy outcomes. Combining these approaches, this paper has analyzed how the endogenous determination of the distribution of firm subsidies under proportional and majoritarian elections affects the equilibrium location of manufacturing production.

It has been shown that the smaller region obtains a relatively higher (lower) level of subsidies with majoritarian (proportional) voting. The North

has a relatively larger endowment of labor, which gives rise to relatively more swing voters in the South. Given that the middle class constitutes the largest voting group, this creates an ideological bias in the electorate of the smaller region, with a larger fraction of ideologically neutral voters in the middle class in the South compared to the North. As a result, both parties find it politically optimal to distribute a higher (lower) level of subsidies to the South under the majoritarian (proportional) electoral rule, which increases (decreases) the number of firms in this region.

When trade is liberalized, subsidies to manufacturing production become relatively more efficient in attracting industrial activity. Since the smaller region is net subsidized under both electoral rules, this implies that the equilibrium location of industry in the South is increasing in the level of economic integration. Consequently, as trade is liberalized, the economy eventually features a reversed core-periphery equilibrium where all firms reside in the South. However, since the South obtains a relatively higher (lower) level of subsidies with majoritarian (proportional) voting, firms locate at relatively higher (lower) rates to the smaller region as trade costs are lowered under this electoral rule. Hence, the reversed core-periphery equilibrium occurs for a relatively lower (higher) level of regional integration with majoritarian (proportional) representation.

Empirical evidence from a cross-section sample of 88 countries supports the theory that smaller and rural (larger and urban) regions are relatively larger (smaller) under majoritarian institutions compared to proportional elections. The empirical framework has also confirmed the prediction that economic activity shifts to economically smaller, more rural, regions as trade is liberalized. These results are robust to an instrumental-variable strategy where, following the literature on constitutions and fiscal policy outcomes, the electoral rule is instrumented by the timing of the adoption of the national constitution.

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A Appendix

A.1 Derivation of (2.18) and (2.19)

The indirect utility function of a representative agent in group k residing in region j with preferences given by (2.2) is: $\frac{E_j}{(\int_{l=0}^{n_W} p_{jl}^{1-\sigma} dl)^{\frac{-\mu_k}{\sigma-1}}}$. Using $w = 1$,

$\rho_W K_W = \frac{x_W K_W}{\sigma} + T L_W$ and normalizing L_W to unity without loss of generality to obtain the representative individual's net earnings: $E_j = 1 + \rho_W K_W - T = 1 + \frac{x_W K_W}{\sigma}$. $\frac{x_W K_W}{\sigma} = \frac{x_N n_N + x_S n_S}{\sigma} = \pi_N n_N + \pi_S n_S$. Substituting (2.10) into (2.11) and (2.12) gives: $\pi_N n_N + \pi_S n_S = \frac{a s_{E_N} (n_N + n_S \phi)}{(n_N + n_S \phi)} + \frac{a (1 - s_{E_N}) (n_N \phi + n_S)}{(n_N \phi + n_S)} = a$, which yields:

$$E_j = 1 + a. \quad (\text{A.1})$$

Solving for the price index prevailing in the North and the South, respectively:

$$\left(\int_{l=0}^{n_W} p_{Nl}^{1-\sigma} dl \right)^{\frac{-\mu_k}{\sigma-1}} = (n_N + n_S \phi)^{\frac{-\mu_k}{\sigma-1}} = (s_N + (1 - s_N) \phi)^{\frac{-\mu_k}{\sigma-1}}, \quad (\text{A.2})$$

and

$$\left(\int_{l=0}^{n_W} p_{Sl}^{1-\sigma} dl \right)^{\frac{-\mu_k}{\sigma-1}} = (n_N \phi + n_S)^{\frac{-\mu_k}{\sigma-1}} = (s_N \phi + (1 - s_N))^{\frac{-\mu_k}{\sigma-1}}. \quad (\text{A.3})$$

Substituting (A.1), (A.2) and (A.3) into the indirect utility function and taking the logarithm of the resulting expression to obtain (2.18) and (2.19).

A.2 Existence of a Majoritarian Equilibrium: Restrictions on $\bar{\sigma}_{jk \neq M}$

Existence of a majoritarian equilibrium requires that candidate A does not want to seek victory in district P of region j . Party A is already winning district R with a higher probability than district M , which candidate A wins with 50 percents probability in the proposed equilibrium.

Let a tilde denote a deviation by party A to district P of region j . A deviation does not pay for A if:

$$\tilde{P}_P^A \vartheta_P^A \leq \frac{1}{2} \vartheta_M^A, \quad (\text{A.4})$$

where ϑ_P^A (ϑ_M^A) is the exogenous utility of candidate A from holding district P (M) in the North and the South.

In equilibrium, both candidates announce the same policy. By the definition of \tilde{P}_k^A this implies that:

$$\tilde{P}_P^A = \frac{1}{2} - \psi \bar{\sigma}_{jP}. \quad (\text{A.5})$$

Substituting (A.5) into (A.4) to obtain the restriction on $\bar{\sigma}_{jP}$ for an equilibrium:

$$\bar{\sigma}_{jP} \geq \frac{1}{2\psi\vartheta_P^A} (\vartheta_P^A - \vartheta_M^A). \quad (\text{A.6})$$

Existence of a majoritarian equilibrium also requires that candidate B does not want to seek victory in district R . Party B is winning district P with a higher probability than district M , which candidate B wins with 50 percents probability.

Let a tilde denote a deviation by party B to district R . A deviation does not pay for B if:

$$(1 - \tilde{P}_R^A) \vartheta_R^B \leq \frac{1}{2} \vartheta_M^B. \quad (\text{A.7})$$

Similar calculations, as above, show that the following condition insures that party B does not want to deviate from the proposed equilibrium, either:

$$\bar{\sigma}_{jR} \leq -\frac{1}{2\psi\vartheta_R^B} (\vartheta_R^B - \vartheta_M^B). \quad (\text{A.8})$$

Table 4: Electoral rules and timing of the adoption of the constitution

Country	maj_c	$con2150$	$con5180$	$con81$	Country	maj_c	$con2150$	$con5180$	$con81$
Argentina	0	0	0	1	Liberia	0	0	0	1
Armenia	0.5	0	0	1	Lithuania	0.5	0	0	1
Australia	1	0	0	0	Macedonia	0	0	0	1
Austria	0	1	0	0	Madagascar	0	0	0	1
Belgium	0	0	0	0	Malawi	1	0	0	1
Benin	0	0	0	1	Malaysia	1	0	1	0
Bolivia	0	0	0	1	Mali	1	0	0	1
Bosnia and Herzegovina	0	0	0	1	Mauritius	1	0	1	0
Brazil	0	0	0	1	Mexico	0	0	0	1
Bulgaria	0	0	0	1	Montenegro	0	0	0	1
Burundi	0	0	0	1	Namibia	0	0	0	1
Canada	1	0	0	0	Nepal	1	0	0	1
Chad	1	0	0	1	Netherlands	0	0	0	0
Chile	1	0	0	1	New Zealand	0.67	0	0	0
Colombia	0	0	1	0	Nicaragua	0	0	0	1
Comoros	1	0	0	1	Nigeria	1	0	1	0
Costa Rica	0	1	1	0	Norway	0	0	0	0
Croatia	0	0	0	1	Panama	0	0	1	0
Cyprus	0	0	1	1	Papua New Guinea	1	0	1	0
Czech Republic	0	0	0	1	Paraguay	0	0	0	1
Denmark	0	0	0	0	Peru	0	0	1	0
Ecuador	0	0	1	0	Philippines	0.89	0	0	1
El Salvador	0	0	0	1	Poland	0	0	0	1
Estonia	0	0	0	1	Portugal	0	0	1	0
Finland	0	0	0	0	Russia	0	0	0	1
France	1	0	1	1	Sierra Leone	0	0	0	1
Georgia	0.5	0	0	1	Slovak Republic	0	0	0	1
Germany	0	1	0	0	Slovenia	0	0	0	1
Ghana	1	0	0	1	Solomon Islands	1	0	1	0
Greece	0	0	1	0	Spain	0	0	1	0
Guatemala	0	0	0	1	Sri Lanka	0	1	1	0
Guinea	0.5	0	0	1	Sweden	0	0	0	0
Guinea-Bissau	0	0	0	1	Switzerland	0	0	0	0
Guyana	0	0	1	0	Tanzania	1	0	1	0
Honduras	0	0	0	0	Thailand	0	0	1	0
Hungary	0	0	0	1	Trinidad and Tobago	0	0	1	0
India	1	1	0	0	Turkey	0	0	0	1
Ireland	0	1	0	0	Uganda	1	0	0	1
Italy	0	1	0	0	Ukraine	0.8	0	0	1
Jamaica	1	0	1	0	United Kingdom	1	0	0	0
Japan	0.33	0	1	0	United States	1	0	0	0
Kenya	1	0	0	1	Uruguay	0	0	0	1
Korea, Republic of	0.5	1	0	0	Venezuela	0	0	1	0
Latvia	0	0	0	1	Zambia	1	0	0	1

Notes: Some countries adopted their constitution before 1921. As for the constitutional dating variables, these countries are the omitted category and coded as 0.