Empirical Assessment of the Existence of Taxable Agglomeration Rents*

Souleymane Coulibaly+

DEEP-HEC, University of Lausanne and TEAM, University of Paris 1 Pantheon-Sorbonne

Abstract

The New Economic Geography literature claims that firms are ready to pay more tax in "big markets" because of agglomeration rents. Tax authorities can thus set higher tax rates in denser economic area, hence an opposite mechanism to the "race to the bottom" process described by the classical tax competition theory. The aim of this paper is to empirically assess the existence of such agglomeration rents. We use Swiss data on tax and firms location to test the tax gap between Core and Periphery regions derived by Baldwin and Krugman (2004). The estimations seem to rather confirm a "race to the bottom" process.

Keywords: agglomeration rents, tax competition, spatial autocorrelation

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+Internef HEC, 1015 Lausanne (Switzerland), Tel: +41 21 692 3474, Fax: +41 21 692 3365, E-mail: souleymane.coulibaly@unil.ch

1 Introduction

The debate on tax harmonization versus tax competition has been relaunched by the new EU enlargement wave, regardless of the view of the European commission that suggested in 2001 that "a reasonable degree of tax competition within the EU is healthy and should be allowed to operate".[1] This very commission were however proposing in October 1997 a package to tackle harmful tax competition within the Union, arguing that there was a need for action at the European level in order to prevent significant losses of tax revenue and to reverse the trend of an increasing tax burden on labour compared to more mobile tax bases.[2] These changing views reflect the emergence of competing theories against the up to then dominant theory of "race to the bottom" that asserts that in an international tax competition context, the mobile factor (capital) bears too little of the tax burden to the disadvantage of the immobile factor (labor). This point was formerly made by Gordon (1983) and Wilson (1986) and has been further developed by Bucovetsky (1991), Wildasin (1991), Kanbur and Keen (1993), and Edwards and Keen (1996) among others.

The competing theories are from two different analytical frameworks: the computable general equilibrium and the new economic geography framework. The computable general equilibrium framework describes more complex economies with inter-related economic agents playing rationally. The model is then calibrated on the social accounting matrix of the economy under consideration and different tax policies impacts are simulated (e.g. Sörensen, 2002, and Mendoza and Tesar, 2003). The new economic geography framework focuses on agglomeration rents. Ludema and Wooton (1998) show that agglomeration makes labor more responsive to tax

[1] European Commision (2001), "Future priorities for EU tax policy", Working document prepared for the fourteenth meeting of the taxation Policy Group, 16 March 2001, Doc. TPG\010316.

[2] Communication from the Commission to the council, "Towards tax co-ordination in the European Union", Brussels, 01.10.1997

differentials only when agglomeration forces are too weak or labor is insufficiently mobile. When trade costs decrease, integration appears to attenuate tax competition and an increase of labor mobility yields mixed effects. Andersson and Forslid (1999) show that mobile factors may not respond to marginal changes in tax rates if they are locked in by the existence of industrial clusters, hence location economies producing taxable rents. Kind and al. (2000) build a full fledged model where capital, goods and firms are mobile, leading to an outcome of tax competition depending on trade costs and pecuniary externalities. Trionfetti (2001) argues that if public procurement market is not liberalized, agglomeration rents are unlikely to prevail even at low trade costs. Ottaviano and Ypersele (2002) build a general equilibrium model integrating international externalities, asymmetric sizes, imperfect competition and trade costs providing a full-fledged global welfare analysis of tax competition.

This theory-based result of agglomeration rents needs now an empirical assessment and this paper proposes a first attempt. We use Swiss data on municipality tax rates and firms location to assess the key relation derived in Baldwin and Krugman (2004), which links the tax differential between the core and the periphery regions to agglomeration rents. Our estimations indicate that a higher density gap between the Core and the Periphery induces a lower tax gap, suggesting that the Swiss municipal tax authorities set low tax rates in dense locations.

The paper is organized as follows. In section 2, we describe the theoretical model linking tax differential to agglomeration rents. Section 3 explores the relevant econometric issues raised by the model and the estimation results are commented in Section 4. Section 5 concludes the paper.

2 The model

This section is a summary of the model developed in Baldwin and Krugman (2004). Let consider a federation of two countries having identical preferences and technologies but setting independently their tax rates. One country is the Core, the other is the Periphery. There are two sectors(Agriculture (A) and Manufacture (M)) and two production factors (Entrepreneurs (K) and Workers (L)). Entrepreneurs are mobile while workers are immobile. The agricultural sector produces an homogeneous good using only workers according to constant returns to scale technology under perfect competition: the competitive wage is w and the unit input coefficient is a_A. The manufacture sector is monopolistically competitive and faces increasing returns to scale. Trade is costless in the homogeneous sector, while we assume an iceberg transport cost τ in the monopolistic sector. It is assumed that the production of a typical variety of a manufactured good involves the services of one entrepreneur, representing the fixed cost, and a_M units of labor for each unit of output produced. The total cost of producing x units of a variety is thus $\pi + wa_M x$, where π is the reward to entrepreneurs.

Let us focus on the Core country. The representative consumer has the following Cobb-Douglas preference:

$$U = C_M^{\mu} C_A^{1-\mu} \ , \ C_M = \left(\int_{i \in \{1,\ldots,n+n^*\}} c_i^{\frac{\sigma-1}{\sigma}} di \right)^{\frac{\sigma}{\sigma-1}} \tag{1}$$

where C_M is a CES composite of all varieties of the manufactured good and C_A is the consumption of the agricultural good A, n and n^* are the number of varieties produced respectively in the Core and the Periphery, μ is the expenditure share on the manufactured good M and σ (σ>1) is the constant elasticity of substitution between varieties.

The Cobb-Douglas preference implies that the optimal level of consumption of a good is proportional to the budget share addressed to this good, and the optimal demand of a differentiated good is now a standard result. We have the following demand functions:

$$c_j = \frac{p_j^{-\sigma}}{\int_{i \in \{1,\ldots,n+n^*\}} p_i^{1-\sigma} di} \mu E \ , \ C_A = (1-\mu) \frac{E}{p_A} \tag{2}$$

where p_j is the price of a typical variety j, p_A is the price of the homogenous good and E is the consumption expenditure in the Core country.

On the supply side, free trade in the A good equalizes prices across countries and thus equalizes the wage rate of workers in both countries: $p_A = w = w^* = 1$.[3] In the monopolistic sector, firms charge prices equal to $\sigma a_M / (\sigma - 1)$ in their local market and to $\tau \sigma a_M / (\sigma - 1)$ in their export market. If we make the normalization $a_M = (\sigma - 1) / \sigma$, their profits are just $1/\sigma$ times their sales. Using equation (2) the prices yields the following profit function for the core country:

$$\pi = \frac{\mu}{\sigma} \left(\frac{s_E}{n + \phi n^*} + \frac{\phi (1 - s_E)}{\phi n + n^*} \right) E^W \tag{3}$$

where E^W is the level of world expenditure, s_E is the Core country share of E^W, n (respectively n^*) is the number of active firms in the Core (respectively Periphery) country and $\phi \equiv \tau^{1-\sigma}$ measures trade "freeness": $\phi = 0$ corresponds to autarky and $\phi = 1$ corresponds to free trade. In the Periphery country, the profit function is:

$$\pi^* = \frac{\mu}{\sigma} \left(\frac{\phi s_E}{n + \phi n^*} + \frac{1 - s_E}{\phi n + n^*} \right) E^W. \tag{4}$$

The third side of this model is the tax game by tax authorities. We focus on a reduced-form of the governments of the Core and the Periphery welfare: $G = G(n, t)$

[3] It is assumed that both countries produces some A good.

and $G^* = G^*(n^*, t^*)$ where t and t^* are the tax rates set by the respective tax authorities. Baldwin and Krugman (2004) assume a three-stage game: in the first stage, the Core country sets its tax rate t, then the Periphery country sets its tax rate t^* and finally migration and production occurs in the third stage. Agglomeration rents in the Core country are defined as follows:

$$\Omega = \frac{\pi/P}{\pi^*/P^*}$$

where $P = (n + \phi n^*)^{\mu/(\sigma-1)}$ and $P^* = (\phi n + n^*)^{\mu/(\sigma-1)}$ are price indices.

Entrepreneurs move to the country which affords them the highest post-tax real reward and governments set tax rates that permit them to keep their industrial sector. Since the Core country government is the first mover in the tax game, it will set a limit tax that hinders the Periphery country to be more attractive to firms. In such a situation, the Periphery country set its unconstrained tax rate, t_u^*, which is the tax rate maximizing its welfare G^*. The location condition of the Core-Periphery outcome is thus:

$$(1-t)\,\Omega = \left(1 - t^{*nd}\right) \tag{5}$$

where t is the limit tax set in the core, t^{*nd} is the non-delocation tax rate which makes firms located in the Core country just indifferent about moving to the Periphery country and Ω is agglomeration rents in the Core country. The equilibrium tax rate in the Core country (t) appears to be linked to the Periphery's no-deviation tax rate (t^{*nd}) rather than the unconstrained tax rate (t_u^*) set by the Periphery tax authority. Baldwin and al. (2003) propose an approximation of the tax rate gap between the Core and the Periphery ($t - t_u^*$) using a log-linear approximation of ($t - t^{*nd}$) and an approximation of the periphery welfare function around the "no-delocation" tax rate:

$$\Delta t = t - t_u^* \approx \Omega - \left(\frac{\partial G^*}{\partial n^*} / \frac{\partial G^*}{\partial t_u^*} \right) - 1. \tag{6}$$

This relation indicates that the equilibrium tax rate in the Core country is the unconstrained tax rate of the Periphery country plus the agglomeration rents minus the relative variation of the Periphery country's welfare due to changes in n^* and t_u^*. To empirically assess this relation, we need to transform equation (6) into a testable relation, construct a Core-Periphery partition of the data, and properly treat the spatial autocorrelation induced by this partition. The following section deals with these points.

3 Econometric issues

Baldwin and Krugman (2004) focus on capital and labor tax rates that are assumed identical. This is not true in real world, as can be seen in Table 1:

Table 1: Tax rates level in Swiss municipalities

Tax rates	Mean	Standard Errors	Coefficient of Variation
Capital	0.22	0.11	1.90
Single worker	4.20	1.09	3.86
Married worker	3.59	1.14	3.16
Low profitability firms	3.62	1.64	2.21
Medium profitability firms	5.15	1.93	2.67
High profitability firms	7.43	2.88	2.58

The Swiss data indicate a lower variability of capital tax rates compared to labor and corporate tax rates. Deriving a tax differential equation assuming that capital and labor tax rates are different is beyond the scope of this paper in which we aim to the evaluate empirically equation (6). Since corporate tax impacts on the whole firm and not on production factors like capital and labor tax rates, we will use assume that Δt in equation (6) rather represents the Core-Periphery differential corporate tax rates.

We then have to propose an empirical evaluation of the agglomeration rents. Ciccone and Hall (1996) and Ciccone (2002) have used different measures of density to assess the impact of agglomeration on firms' productivity. Agglomeration yields congestion costs that can reasonably be assumed as a negative externality, and these costs increase with the density of the agglomeration. If we add to this negative effect of congestion costs the ability of tax authorities to set higher tax in the Core and unconstrained tax in the Periphery as assumed in the new economic geography framework, density measures can be considered as indicators signaling the attractiveness of a location. We adopt this approach by assuming two simple proxies for agglomeration rents Ω. Let S (S^*) denotes the surface area used for industrial activities in the Core (Periphery), n_F (n_F^*) the number of industrial firms in the Core (Periphery) and n_W (n_W^*) the number of workers in the industrial sector in the Core (Periphery). The agglomeration rents proxies are defined as:

i) the difference in firms' density between the Core and the Periphery: $\bar{\Omega} = n_F/S - n_F^*/S^*$, or

ii) the difference in industrial workers' density between the Core and the Periphery: $\bar{\Omega} = n_W/S - n_W^*/S^*$.

The following step is to evaluate the welfare function governments in the Core and the Periphery. as mentioned in the previous section, the existence of agglomeration rents leads to a limit tax setting in the Core and an unconstrained tax setting in the Periphery. Under this classical tax setting behavior in the Periphery, the welfare function G^* can reasonably be assumed increasing with the number of active firms n^* and the tax rate t_u^*. However, the Laffer tax curve also suggests that

G^* will decrease with t_u^* since high tax rates induce fiscal fraud, hence a negative impact on G^*. These two effects of t_u^* are summarized in the following quadratic formulation of G^*:

$$G^* = \alpha n^* + \beta t_u^* + \gamma \left(t_u^*\right)^2 + k^* \tag{7}$$

where α and β are positive coefficients, γ is a negative coefficient and k^* is a constant. We can then derive the marginal welfare functions:

$$\frac{\partial G^*}{\partial n^*} = \alpha \ , \ \frac{\partial G^*}{\partial t_u^*} = \beta + 2\gamma t_u^* \tag{8}$$

and use them to compute the relative term in equation (6). Finally, the tax rate gap between the Core and the Periphery can be rewritten as:

$$\Delta t \approx \bar{\Omega} - \frac{\alpha}{\beta + 2\gamma t_u^*} - 1. \tag{9}$$

In order to have a linear formulation, we compute the second order polynomial expansion of equation (9), which yields:

$$\Delta t \approx \bar{\Omega} - \frac{\alpha}{\beta} + \frac{2\alpha\gamma}{\beta^2} t_u^* - \frac{4\alpha\gamma^2}{\beta^3} \left(t_u^*\right)^2 - 1. \tag{10}$$

The model derived in Section 2 makes a clear distinction between the Core and the Periphery. It is thus better to use a formulation that reflects this geographical distinction. Let us define Δ_{ij} as a difference operator between the core and the periphery variables, i corresponding to the Core and j corresponding to the Periphery. With these new notations, equation (10) can be re-expressed as:

$$\Delta_{ij} t = c_1 \bar{\Omega}_{ij} + c_2 t_j + c_3 t_j^2 + c_4 \Delta_{ij} \left(control\_variables\right) + c_5 + \varepsilon_{ij} \tag{11}$$

where the c_is are coefficients to be estimated, t_j is the corporate tax rate set in the

Periphery country j, $\Delta_{ij}\,(control\_variables)$ is a vector of control variables other than $\bar{\Omega}$ and t_j that can affect directly or indirectly $\Delta_{ij}t$ and ε_{ij} is the error term.

Equation (11) will be estimated using Swiss data on firms location and corporate tax rates at the municipality level. A positive and significant value of c_1 will indicate that denser locations are facing higher tax rates, hence the existence of taxable agglomeration rents. A negative and significant value of this coefficient will indicate that denser locations are facing lower tax rates, hence a tax competition between municipalities to attract more firms.

Since we are analyzing a Core-Periphery feature, we have to determine within each Swiss canton what locations stand for the Cores and the Peripheries. Such a partition will help to properly measure the key variables included in equation (11). Switzerland has a federative structure, especially for tax structure, and the 26 cantons forming the confederation have the ability to set their corporate tax rates. Furthermore within each canton, the municipalities can also adjust the corporate tax rates. Therefore, the lowest institutional level concerned by tax competition is the municipality level. To make the distinction between Core and Periphery municipalities, we consider clusters of municipalities defined as "Agglomerations" by the Swiss Federal Office of Statistics as Core municipalities, and municipalities not included in an "Agglomeration" as Periphery municipalities.

This Core-Periphery partition of Swiss municipalities involves contiguous locations, so that we have to cope with any spatial correlation of the variable $\Delta_{ij}t$. We opt for a difference in difference formulation: the first level of differentiation is included in equation (11) that considers each Core municipalities with regard to Periphery municipalities. The second level of differentiation we include is the cantonal level: if i and k are two Core municipalities belonging to the same canton m, we construct the difference $(\Delta_{ij}t - \Delta_{kj}t)$. Econometrically, this is equivalent to running a cantonal fixed effects model:

$$\triangle_{ij}^{m}t = c_1\bar{\Omega}_{ij}^{m} + c_2 t_j^m + c_3\left(t_j^m\right)^2 + c_4\Delta_{ij}^{m}\left(control\_variables\right) + c_5 + FE_m + \varepsilon_{ij}^{m} \quad (12)$$

where FE_m is cantonal fixed effects, $\triangle_{ij}^{m}$ is the difference in difference operator, $\bar{\Omega}_{ij}^{m}$ and t_j^m are agglomeration rents and Periphery corporate tax rates that takes into account the cantonal fixed effects formulation, and ε_{ij}^{m} are error terms. In the following, we will use the variable name tax_i and tax_j for t_i and t_j respectively.

4 Empirical estimation

We have now a testable relation that will be estimated using data on Swiss municipalities corporate tax rates and firms locations. We have in fact two different databases: one containing information on municipalities and the other containing information of firms. We first match these two databases before estimating equation (12).

4.1 Data and variables description

We first use the Swiss tax database built by Brülhart and Jametti (2004). This database contains different tax rates (personal income taxes, personal wealth taxes, corporate income taxes, corporate capital taxes) on 200 Swiss municipalities for five years (1985, 1991, 1995, 1998 and 2001). As mention in the previous section, we focus on corporate income tax rates that directly affect firms profitability. Indeed, each municipality sets three corporate income tax rates depending on the profitability of the firms: 2% profitability, 9% profitability and 32% profitability. A high profitability induces a high corporate income tax rate. This database also contains municipalities surface areas used for industry and for habitation.

A close inspection of this panel database indicates that some municipalities disappeared, some were created over time and the coding system of the municipalities also used to vary. Since we need a clear Core-Periphery structure, we only focus on the year 1995 when a new coding system was introduced, with the classification of some group of municipalities as “Agglomerations”, compared to “non-agglomerations” isolated municipalities. These “Agglomerations” are bigger municipalities formed by a central municipality and many contiguous municipalities forming a unique economic center.

Within a canton, we define these “Agglomerations” as the Cores and the “non-Agglomerations” as the Peripheries. The differential tax rate is thus the difference between the corporate income tax rate of each Core and each Periphery.

The second database we use is the Federal Statistics Office survey on Swiss firms conducted in various years (1991, 1995, 1998 and 2001). Since we focus on the year 1995 for the tax database, we also focus of the 1995 survey for firms location. We extract from this database non-public firms (excluding administrations, schools and hospitals), their employment and the municipalities where these firms are located. Since the municipalities codes are consistent for the year 1995, we can match these data with the tax database and obtain our final database.

We can then compute the agglomeration rents proxies defined as $\bar{\Omega} = n_F/S - n_F^*/S^*$ or $\bar{\Omega} = n_W/S - n_W^*/S^*$.[4] The unconstrained Periphery tax rate t_j is computed as the corporate income tax of municipalities that are not included in “Agglomerations” by the Swiss federal statistics office. We include four types of control variables for each municipality: economic activity variables (number of firms and number of workers), accessibility variables (distance to the nearest highway, distance to the nearest airport, distance to Zurich, distance to Basel, distance to Geneva), commodity variables (population, surface area, distance to the nearest university, surface of built area, surface of recreation area) and spacial variables (a cantonal

[4] The estimations show that both proxies yield similar results. We report only results for the first proxy. Results for the second proxy can be obtained upon request.

dummy specifying two core and periphery municipalities belonging to the same canton and a contiguity dummy variable specifying to core-periphery municipalities belonging to two contiguous cantons). All these variables are constructed as a Core-Periphery spatial differentiation.

4.2 Estimation results

Before presenting the results, let us recall how we construct the dependent variable $\triangle_{ij}^{m} tax$. If i and k are two Core municipalities belonging to the same canton m and j is a Swiss peripheral municipality (belonging to canton m or not), we first construct the two difference variables $\Delta_{ij} tax = (tax_i - tax_j)$ and $\Delta_{kj} tax = (tax_k - tax_j)$, and then construct the difference in difference variable $\triangle_{ij}^{m} tax = (\Delta_{ij} tax - \Delta_{kj} tax)$.

Table 2 reports the results. Specification 1 restrict on firms with low profitability, while specification 2 and 3 respectively focus on firms with medium and high profitability. An estimated coefficient with an upper index a is significant at the 1% level, that with an upper index b is significant at the 5% level and that with an upper index c is significant at the 10% level.

The estimated coefficients are globally significant, and the relatively R^2 statistics indicates a good econometric specification. We tried an econometric specification that considers the logarithm of all variables (dependent and independent) but the outcome yielded lower R^2 statistics and statistically less significant coefficients.

The estimated coefficient for the agglomeration proxy variable $\bar{\Omega}$ appear to be statistically significant and negative whatever is the profitability of firms included in the estimation. These values suggest that if ten more firms relocate in a Core municipality, this relocation will be associated with a 10% reduction in corporate tax rate of low profitability firms and a 20% reduction in corporate income tax rates of medium and high profitability firms within this Core municipality, relatively to any peripheral municipality in the whole country.

Table 2: Difference in difference estimations on the whole sample

	Dependent variable: $\triangle_{ij}^{m} tax$		
	1	2	3
$\bar{\Omega}_{ij}^{m}$	-0.001[a]	-0.002[a]	-0.002[a]
tax_j^m	-0.19[a]	-0.33[a]	-0.03
$\left(tax_j^m\right)^2$	0.02[a]	0.02[a]	-0.02[a]
Δ_{ij}^{m}Firms	-0.0001[c]	0.0003[a]	0.001[a]
Δ_{ij}^{m}Workers	0.00	-0.00002[a]	-0.00005[a]
Δ_{ij}^{m}Highways	-0.02[a]	-0.03[a]	-0.01[a]
Δ_{ij}^{m}DistAirport	0.01[a]	0.01[a]	0.02[a]
Δ_{ij}^{m}DistZurich	-0.002[a]	-0.01[a]	-0.05[a]
Δ_{ij}^{m}DistBasel	0.006[a]	0.01[a]	0.04[a]
Δ_{ij}^{m}DistGeneva	0.01[a]	0.009[a]	-0.01[a]
Δ_{ij}^{m}Population	0.00002[a]	0.00	-0.00006[c]
Δ_{ij}^{m}Area	-0.00001[b]	0.00	0.00004[a]
Δ_{ij}^{m}DistUniversity	-0.007[a]	-0.002[a]	-0.005[a]
Δ_{ij}^{m}AreaBuilt	0.0008[a]	0.001[a]	0.002[a]
Δ_{ij}^{m}AreaRecration	-0.009[a]	-0.0008[a]	0.005[b]
Cant_{ij}	-0.13[b]	-0.09	-0.21[b]
Contig_{ij}	-0.18[a]	-0.24[a]	-0.41[a]
Const	0.32	1.19[a]	1.59[b]
R^2	0.39	0.37	0.32
Proba	0.00	0.00	0.00
N	7,802	7,802	7,802

However, this result does not necessarily imply a causality relationship between higher density (agglomeration rents proxy) and tax rates differential between Core and Periphery municipalities. We need to perform a Granger test of causality to assess such a relation, but the database we use do not contains time series of tax rates differentials that are necessary to perform this test. These results are thus limited to a negative correlation between agglomeration rents proxy variables and tax differentials between Core and Periphery municipalities, suggesting that a denser Core is rather associated with a lower tax gap between the Core and the Periphery. This result contradicts the existence of taxable agglomeration rents.

To check the robustness of this result, we include two additional specifications: the first restrict on Core-Periphery municipalities belonging to the same canton and the second restrict on Core-Periphery municipalities belonging to contiguous canton. These two specifications are presented in Tables 3 and 4 in the Appendix, and the estimated coefficients for the agglomeration rent proxy variable remains statistically significant and negative, confirming the contradiction of the existence of agglomeration rents.

The non-linear impact of the tax rate of peripheral municipalities assumed in equation (12) is confirmed by the estimation results. Indeed, the estimated coefficients for the variable tax_j and $(tax_j)^2$ are all statistically significant (except for tax_j in specification 3). The control variables included yield statistically significant coefficients in most of the cases. Let us comment some of them.

The distance to Zurich, Basel and Geneva seem to induce opposite impacts on tax differentials for low and medium profitability firms. Indeed, the estimated coefficients are statistically significant and positive for the distance to Zurich, and statistically significant and negative for the distance to Basel and Geneva, suggesting that tax competition is tougher when we are far from Zurich, and close to Basel and Geneva. When we focus on high profitability firms (specification 3 in

Table 2), the estimated coefficients suggest that competition is tougher when we are far from Geneva and Zurich, and close to Basel. These results suggest that taxable agglomeration rents are more likely to be observed in the economic area of Zurich. Unfortunately, we do not enough observations for the canton of Zurich to perform a robust estimation of equation (12). The canton dummy (1 if the Core and the Periphery municipalities belong to the same canton) and the contiguity variable yield statistically significant and negative coefficients (except for the canton dummy in specification 2), suggesting that tax competition is tougher between closer municipalities.

All these results tend to confirm that the basic tax competition result of "race to the bottom" is more characteristic of the Swiss municipalities under consideration, rather than the existence of taxable agglomeration rents.

5 Conclusion

The aim of this paper was to empirically evaluate the existence of taxable agglomeration rents by deriving a testable econometric relation from the Baldwin and Krugman (2004) model. We focused on Swiss data on firms location and tax rates set at the municipality level to estimate the econometric model. Swiss municipalities appeared to contradict the existence of taxable agglomeration rents, since the estimated coefficient for the agglomeration rents proxy variable was statistically significant and negative, inducing that denser location is associated with lower tax rates. This result suggests that Swiss Core municipalities rather propose lower tax rates to attract more firms.

The new economic geography framework is plausible, and many theoretical papers confirm the existence of taxable agglomeration rents. However, our attempt to assess this theory-based result on Swiss data does not yield an empirical confirmation despite our rigorous econometric estimation approach. Maybe, we need to propose another proxy variable to better evaluate agglomeration rents. Maybe Swiss municipalities are not well-suited for a Core-Periphery structure as assumed in the new economic geography framework. Maybe the "race to the bottom" empirically dominates the new economic geography outcome of taxable agglomeration rents. Anyway, there is room for further empirical explorations.

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Appendix

Table 3: Difference in difference estimations on municipalities belonging to the same cantons

	Dependent variable: $\triangle_{ij}^{m} tax$		
	1	2	3
$\bar{\Omega}_{ij}^{m}$	-0.0007^a	-0.001^a	-0.002^a
tax_j^m	0.02	0.08	0.12^b
$\left(tax_j^m\right)^2$	-0.003	-0.01^b	-0.01^a
Δ_{ij}^{m}Firms	0.00005	0.0008	0.0002^c
Δ_{ij}^{m}Workers	-0.00001^a	-0.00001^a	-0.00003^a
Δ_{ij}^{m}Highways	0.004^c	0.007^b	0.01^c
Δ_{ij}^{m}DistAirport	0.0002	0.003	0.006^c
Δ_{ij}^{m}DistZurich	0.0006	-0.009	-0.002
Δ_{ij}^{m}DistBasel	-0.003^b	-0.004^c	-0.008^b
Δ_{ij}^{m}DistGeneva	0.001	0.00009	0.001
Δ_{ij}^{m}Population	0.00	0.00	-0.00
Δ_{ij}^{m}Area	0.00001^b	0.00001	0.00001
Δ_{ij}^{m}DistUniversity	0.004^a	0.005^a	0.008
Δ_{ij}^{m}AreaBuilt	0.0003^b	0.0003	0.007^b
Δ_{ij}^{m}AreaRecration	0.0007^c	0.001	0.001
Const	0.02	0.009	-0.09
R^2	0.37	0.38	0.43
Proba	0.00	0.00	0.00
N	438	438	438

Table 4: Difference in difference estimations on municipalities belonging to contiguous cantons

	Dependent variable: $\triangle_{ij}^{m} tax$		
	1	2	3
$\bar{\Omega}_{ij}^{m}$	-0.001^a	-0.002^a	-0.003^a
tax_j^m	-0.04	0.04	0.04
$\left(tax_j^m\right)^2$	-0.006	-0.02^a	-0.02^a
Δ_{ij}^{m}Firms	-0.0001	0.00002	0.0007^a
Δ_{ij}^{m}Workers	0.00	-0.000002	-0.00003^b
Δ_{ij}^{m}Highways	-0.009^b	-0.02^a	-0.002
Δ_{ij}^{m}DistAirport	0.01^a	0.01^a	0.02^a
Δ_{ij}^{m}DistZurich	-0.004^a	-0.01^a	-0.05^a
Δ_{ij}^{m}DistBasel	0.004^a	0.01^a	0.04^a
Δ_{ij}^{m}DistGeneva	0.02^a	0.009^a	-0.01^a
Δ_{ij}^{m}Population	0.00001^c	0.000009	-0.00004^a
Δ_{ij}^{m}Area	-0.00	0.000008	0.00002
Δ_{ij}^{m}DistUniversity	-0.005^a	0.001	-0.0008
Δ_{ij}^{m}AreaBuilt	0.0003	0.0006	0.0008
Δ_{ij}^{m}AreaRecration	-0.005^a	-0.006^a	0.006^a
Const	1.15	0.12	0.79
R^2	0.18	0.10	0.14
Proba	0.00	0.00	0.00
N	1,890	1,890	1,890