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Abstract

This article aims to evaluate the impact of incentives to attract investments on formal employment in Brazilian municipalities, where these incentives are offered in the form of tax exemptions and through land donations/transfer of rights. It differs from the rest of the literature, which is concerned with strategic interactions among governments and generally focuses only on one instrument, namely, tax rates. The results indicate that tax exemptions have no effect, whereas land donations/transfer of rights seem to stimulate job creation only in the expansionary phase of the cycle.

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Are incentives to attract investments effective? An analysis of Brazilian municipalities

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Abstract: This paper aims to evaluate the impact of incentives to attract investments on formal employment in Brazilian municipalities, where these incentives are offered in the form of tax exemptions and through land donations/transfer of rights.
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1. Introduction

In general, national or local governments use taxation and the provision of public inputs as a way to affect the decisions of private investors with respect to where to invest. Therefore, a systematic and complete analysis of how governments compete for mobile capital should treat these two instruments as mutually determined.

However, both the theoretical literature and the related empirical literature separately address tax competition and public input competition.[1] Moreover, the empirical literature seeks almost entirely to determine whether the choice of tax rates for companies reflects strategic behavior and leaves aside the issue of public inputs.[2]

The objective of this article is to evaluate the impact of incentives to attract investments in formal employment in Brazilian municipalities, where such incentives are offered as tax exemptions and through land donations/transfer of rights.[3] Even if land donations/transfer of rights do not correspond to the provision of a traditional public input (for example, road network), they represent an important physical input that can affect the allocation of capital. Brazilian municipal governments are a good laboratory for studying the issue for two reasons. First, the significant autonomy given to local governments in setting the tax rate—as guaranteed by the Constitution of 1988—represented a strong stimulus to the fiscal war. Second, in the competition to attract investments, municipalities systematically used the instruments at their disposal to directly affect investors' choices—and made intense use of both instruments.

This article contributes to the existing literature on tax competition in two ways. First, it assesses whether granting incentives to attract investment has one of the

[1] The few exceptions include Bénassy-Quéré *et al.* (2007) and Hauptmeier *et al.* (2012).
[2] For a survey of the literature see Revelli (2006). Despite the vast amount of works on the subject, it is not possible to say that these studies can appropriately identify the reason these interactions take place because different theoretical hypotheses (fiscal competition, yardstick competition, and spillovers of public spending) lead to the same equation in reduced form. Examples of studies on interaction strategies among local governments of developing countries are Yao and Zhang (2008); Zhang and Chen (2007); and Herrmann-Pillath and Feng (2004) for China, Thomas (2009) for Vietnam; Arze del Granando *et al.* (2008) for Indonesia; and Rota-Graziozi, Caldeira and Foucault (2014) for Benin.
[3] For an analysis of policies to attract investments through the provision of public inputs, such as infrastructure, see, for example, Taylor (1992); Noiset (1995); Bayindir-Upman (1998); Matsumoto (1998, 2000); and Bucovetsky (2005).

expected effects, which is to increase formal employment.[4] Therefore, the concern is with the evaluation of the impact of incentive policies and not with the strategic choice of policy instruments, that is, how local governments react to policy changes in neighboring jurisdictions. Second, this article estimates the effect of two simultaneous incentive policies to determine the combined effects of the two policies *versus* the effect of no policy (multiple overlapping treatment effects) or a policy *versus* another policy (relative treatment effects).

In addition to this introduction, this article is organized into three sections. The second section presents the data and provides a brief description of the identification strategy. The third section discusses the results and the fourth section presents the conclusions.

2. Data and identification strategy

Data on the number of employees include formal jobs and were obtained from the RAIS (Annual Social Information Report of the Ministry of Labor and Employment). The characteristics of the municipalities—population size, total municipal and agricultural gross domestic product, vaccine coverage, and latitude and longitude—were obtained from the Brazilian Institute of Geography and Statistics (*Instituto Brasileiro de Geografia e Estatística* – IBGE), and tax collection information was obtained from the Brazilian Department of Treasury.

Finally, information on the incentives to attract investments was obtained from the IBGE's Municipal Basic Information Survey (*Pesquisa de Informações Básicas Municipais* - MUNIC). MUNIC indicates whether (or not) each municipality offered tax exemptions, in addition to informing on whether the municipality transferred or donated any land. Thus, the following (categorical) binary variables were created:

i) Category 0: no policy – municipalities that did not offer any incentive to attract investment in that year;
ii) Category 1: fiscal incentives only – municipalities that offered only some tax exemption in that year but did not transfer the rights of or donate land;
iii) Category 2: land donation/transfer of rights only – municipalities that donated or transferred the rights of land in that year but did not offer any tax exemption; and,
iv) Category 3: municipalities that offered both forms of incentive (categories 1 and 2).

To estimate the average treatment effect (of the adoption of investment attraction policies) on local employment, two alternative econometric models were chosen.

Initially, we used the nearest neighbor matching model, which uses pairing methods based on multiple observed characteristics to address the known endogeneity problems involved in the estimation. Doing so allows for estimating the effect of binary treatment variables; therefore, in this model, treatment corresponds to the offer of some incentive, either tax exemption or land donation/transfer of rights.

Next, we evaluated the effects of the two types of incentives using a multivalued treatment model. For this purpose, we used a parametric version of the semi-parametric estimator proposed by Cattaneo (2010), based on the average inverse probability weighting method for the case of multiple treatments.

[4] Effects on local domestic product and tax collection can also occur. We do not take into account the effects on the domestic product because the data on formal employment at the municipal level in Brazil are more accurate than those on the domestic product, since a formal employment census is conducted annually. Moreover, an effect on formal employment would have a direct and certain positive effect on citizens´ welfare.

We estimated the results for four different cross-sections: 2006, 2009, 2012, and 2015, corresponding to the years with available information. MUNIC, as pointed out by IBGE, "aims to meet the demands for disaggregated information about local public administration which could contribute to the planning and improvement of the management of Brazilian municipalities. It is an annual survey that has as a research unit the municipality and, as main informant, the city hall, through the various sectors that compose it. The questions of the basic questionnaire are raised regularly, but there are supplementary questionnaires that include specific topics". Information about which municipalities conceded mechanisms to encourage the implementation of investment and the types of incentive used is part of the block of questions named "resources for management" and was published every 3 years from 2006 to 2015. Therefore, we do not know what happened in the intermediate years.

Because the incentives granted in one year do not have immediate effects, we assumed that the incentives granted in each year should impact the following year's employment. The dependent variable then corresponds to the variation in formal employment *per capita* between year t+1 (year after granting the incentive) and year t (year in which the incentive was granted). However, if the firm has received land and intends to build a factory, it may need more than one year to start operating at full capacity. Therefore, we also ran regressions considering more than one year after the granting of incentives, using the difference between the average of formal employment *per capita* in t+1 and t+2 and the formal employment *per capita* in t as the dependent variable as well.[5]

Table 1 shows the percentage of municipalities that were submitted to each treatment category, including the case of no incentives granted.

Table 1 - Percentage of municipalities by type of incentive granted per year

	No incentive granted	Only tax exemption	Only land donations or transfer of rights	Both forms of incentive granted
2006	55.11%	10.46%	15.86%	18.57%
2009	53.37%	10.77%	14.18%	21.68%
2012	46.81%	15.15%	12.51%	25.53%
2015	41.69%	19.24%	14.52%	24.55%

3. Results [6]

We begin by presenting in Table 2, the results of the nearest neighbor matching model. In this model, treatment corresponds to the granting of some incentive by the municipality, whether tax exemption or land donation/transfer of rights.

[5] The results do not change if we consider the employment effects two years after the granting of incentives. They are not presented here, but are available from the authors upon request. We would like to thank one of the anonymous referees for the suggestion.

[6] The evidence was obtained using the simple one-nearest neighbor estimator (without caliper), but we also used the augmented inverse probability weighting (AIPW) estimator and the coefficients were similar. The results, including the balance tests, were satisfactory and can be obtained directly from the authors.

Table 2[7] - Effect of granting some incentive to attract investment, by year and sector (ATE – *average treatment effect*)

Period and sample size	Outcome = Variation in number of formal employees *per capita*		
	TOTAL	**INDUSTRY**	**SERVICES**
2006-2007 (5,541 municipalities)	-0.0015 (0.0012)	0.0009** (0.0004)	-0.0013* (0.0007)
2009-2010 (5,543 municipalities)	0.0015 (0.0009)	0.0012** (0.0005)	0.0006 (0.0006)
2012-2013 (5,545 municipalities)	-0.0010 (0.0011)	-0.0005 (0.0004)	-0.0005 (0.0008)
2015-2016 (4,766 municipalities)	0.0011 (0.0008)	0.0005 (0.0004)	-0.0001 (0.0004)

Note: *, **, and *** = 10%, 5%, and 1% significance levels, respectively.
Standard errors in parenthesis.

It is possible to observe that granting some incentive to attract investments in year t has a positive and statistically significant effect on the variation of formal employment *per capita* only during the periods 2006–2007 and 2009–2010, and only for the industry sector.[8] For the services sector, the effect is statistically significant (at 10%) only during 2006–2007 but with a negative sign.

Table 3 presents the results of the average inverse probability weighting model for multiple treatments. For each year, each row shows the effect of each policy of granting incentives to attract investments: tax exemption (category 1), land donation/transfer of rights (category 2), or both policies (category 3). In all cases, the control group is given by the municipalities that did not implement any incentive policy to attract investment (category 0).

By evaluating the first row of each year, we observed that tax exemption has no significant effect on the variation in the number of formal employees *per capita*.

In contrast, the second row shows that land donation/transfer of rights has a positive and statistically significant effect on the variation in the number of formal employees *per capita* in the industry sector during 2006–2007 and 2009–2010. However, for the remaining years, the effect disappears. These results reveal, first, that the significant effects observed in Table 2 are due to land donation/transfer of rights and not tax exemptions.[9] In addition, Table 3 corroborates the results shown in Table 2 and,

[7] Covariates include population size, lagged regional agricultural and total GDP, vaccine coverage, latitude and longitude. The number of treatment and control observations after matching were 2,696, 2,758, 3,135 and 2,989, for the first, second, third and fourth periods studied, respectively (simple one-nearest neighbor estimator).

[8] Another specification of the nearest neighbor matching model was also estimated, and the results remained the same. In this alternative specification, the pair (match) of each treated municipality is necessarily a municipality belonging to the same state.

[9] As correclty observed by one of the referees "the authors do not discuss whether the policies were in some way a result of negotiations between the municipal governments and the firms, where the government promises, e.g., donate land while the firm promises to build a factory and employ a specific number of workers. If this is the case, then the authors do not necessarily measure a causal effect of these policies on employment. It may be that the incentive was given such that the firm makes a predetermined investment in the municipality that gives incentives instead of the neighboring municipality". The fact is that donations of real estate by Brazilian public administration, regulated by Art. 17 of Law 8666/1993, can be done with or without charges. Donations with charges occurs when the property is transferred to third parties under certain conditions imposed at the time of donation and whose non-compliance impacts the nullity of the donation.

once again, draws attention to the fact that the effect of granting the incentive loses significance after 2009–2010. Given the evolution of economic activity in Brazil during the observed period, this loss of significance suggests that when the expectation regarding economic activity is not favorable, the land donation/transfer of rights incentive does not have a quick and significant effect on employment. Most likely, investors—despite receiving land—do not start construction immediately after receiving this incentive during periods of economic slowdown. We tested this hypothesis using an alternative multivalued treatment model and the results reinforce this idea[10].

When we analyzed the effect of multiple overlapping treatments (row 3), we observed that the effect of combined policies is positive and significant only for the initial period (2006–2007) and was not statistically significant since then. The effect of multiple policies in 2006–2007 seems to be lower than that of only the land donation/transfer of rights incentive. However, when comparing treatments 3 and 2, the results indicate no significant difference. The negative signs obtained almost unanimously for the effects of incentive policies on the number of employees in the services sector—albeit without statistical significance—are also noteworthy.

In our sample, the mean of the number of formal employees *per capita* is equal to 0.13, approximately (13% of the municipal population has a formal employment, on average), and the mean of the annual variation of formal employees *per capita* is equal to approximately 0.003. Therefore, for instance, a positive impact of 0.0017 in the annual variation of formal employees *per capita* is expressive. It means that a treated municipality would have a positive impact on this variation, and that positive impact corresponds to more than one half of the mean value of this annual variation.

[10]First, to avoid endogeneity problems, we associated the growth rate of each municipality to the mean growth rate of the state where it is located. Then we created a dummy variable that equals one when the state where the municipality is located showed an economic growth and equals zero otherwise. Finally, we created a multivalued treatment variable that equals zero if the municipality did not offer any incentive, equals 1 if the municipality had offered an incentive and the state where it is located did not show economic growth, and equals 2 if the municipality had offered an incentive and the state where it is located showed economic growth . Then we ran an AIPW model for multiple treatments joining the periods of analysis in a pool. We obtained evidence that the incentives only had significant and positive effects on employment in municipalities that offered an incentive and at the same time belong to a state where GDP had grown.

Table 3[11] - Effects of multiple treatments by year and sector
average inverse probability weighting model (ATE – *average treatment effect*)

Period (sample Size)	Treat.	Outcome = Variation in number of formal employees *per capita*		
		TOTAL	INDUSTRY	SERVICES
2006–2007 (5,541)	1 vs 0	0.0004 (0.0023)	0.0007 (0.0007)	-0.0007 (0.0006)
	2 vs 0	-0.0001 (0.0012)	0.0017** (0.0007)	-0.0010 (0.0016)
	3 vs 0	0.0001 (0.0011)	0.0014*** (0.0005)	-0.0007 (0.0008)
2009–2010 (5,543)	1 vs 0	-0.0028 (0.0019)	0.0000 (0.0006)	-0.0006 (0.0011)
	2 vs 0	0.0021** (0.0011)	0.0014** (0.0007)	0.0006 (0.0006)
	3 vs 0	-0.0005 (0.0011)	0.0003 (0.0005)	-0.0004 (0.0009)
2012–2013 (5,545)	1 vs 0	-0.0005 (0.0013)	-0.0002 (0.0005)	-0.0006 (0.0010)
	2 vs 0	-0.0003 (0.0013)	-0.0005 (0.0005)	0.0002 (0.0010)
	3 vs 0	0.0002 (0.0012)	0.0004 (0.0003)	0.0004 (0.0009)
2015–2016 (4,766)	1 vs 0	-0.0004 (0.0010)	0.0003 (0.0004)	-0.0009 (0.0005)
	2 vs 0	0.0007 (0.0009)	-0.0001 (0.0004)	-0.0001 (0.0004)
	3 vs 0	0.0014 (0.0008)	0.0003 (0.0005)	0.0007 (0.0006)

Note: Number of municipalities in parenthesis

4. Conclusion

An analysis of the results as a whole leads us to conclude that municipal incentive policies to attract investment seem to have different efficacies that are related to the phase of the cycle. The tax exemption incentive does not seem to have any effect on employment, representing only a relinquishment of resources. Land donation/transfer of rights seems to have a positive effect on employment in the industrial sector during periods of economic growth, such as the two initial periods of our sample (2006–2007 and 2009–2010). However, according to all indications, in an economic recession environment, land donation/transfer of rights does not contribute to growing the economy and generating jobs. In the last two periods, when the worst economic recession in Brazil began and was established, the government proved incapable of stimulating private capital.

[11] Covariates include population size, lagged regional agricultural and total GDP, vaccine coverage, latitude and longitude. We used the simple one-nearest neighbor estimator, which matches each treated observation with a control unit.

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