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Fiscal income inequalities and efficiency: evidence from Brazilian municipalities

Bernardo Alves Furtado¹

Abstract: Distribution of fiscal income among municipalities – which are constitutionally official federal entities in Brazil - is highly unequal vis-à-vis their demands of public services. Given conurbation processes and intense urbanization in the second half of the past century, some municipalities concentrate resources and quality public services whereas neighboring municipalities harbor low-income workers who have to commute back to employment opportunities. As a result, urban landscape in Brazil is far from homogeneous displaying ruptures in level of access to transportation networks and leisure activities, education and safety, among other public goods. Given this context, this paper has a threefold objective. Firstly, it identifies the magnitude of these fiscal income inequalities by municipalities using exploratory spatial analysis and detailed fiscal information for 5212 municipalities out of 5565 ones in Brazil. Secondly, this paper describes and characterizes neighboring municipalities with high and low fiscal income vis-à-vis their GDP per capita, population and other indicators. Finally it tests the efficiency of public services offer using Data Envelopment Analysis (DEA). In order to do so, level of expenditures in health services per capita is used as input compared to quantity of health basic attention level services provided. Simultaneously, level of basic education expenditure per capita is compared to educational achievement by municipality. This is done for the sample of municipalities with high and low fiscal income per capita. Thus, this paper highlights two cumulative issues that municipalities as institutions have to face in order to provide quality service to its citizens: raw resources availability compared to need of inhabitants on the one hand, and efficiency to transform those resources into services on the other hand. Results indicate that there are 70 municipalities in which one of them concentrates income resources significantly higher than their neighbors. This so-called high-low group shows efficiency lower than other groups with worse achievement in health and education. Municipalities classified as low-high – which are in rich regions but have comparatively lower income available – fare better than the other groups with the highest efficiency rate of the sample, although with lower absolute results. Nevertheless, level of fiscal income seems to influence less the efficiency of health services provided by municipalities. Therefore, we can provide two practical public policy recommendations to be enforced based on the results: a) better equalization of fiscal income to locations where there are concentration of demand of services limited to a maximum level to avoid the fueling of municipalities at the high-low group; and b) suggestion of exchange of experiences from successful efficiency programs that have enabled a limited number of municipalities to transform income into quality public services.

Keywords: municipalities, efficiency, fiscal income, fiscal distribution, Brazil

JEL codes: R51, H21, H77

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1. Context and literature

The constitution of Brazil in its first paragraph states that the Federative Republic of Brazil is composed by the “indissoluble union of the States [26], the municipalities [5565] and the Federal District²” (Brasil. Senado Federal, 1988). The derived understanding is that there are three federative entities in Brazil: the Union, the States (and the Federal District), and the Municipalities. Each one has its own competences and obligations delineated by law. Each one has its defined shares of fiscal income. Each one has the list of taxes they are allowed to collect. The Constitution also defines which public services are to be offered by each entity. Some of them are supposed to be offered in agreement by two or more entities.

The objective of this paper is to identify the municipalities where the incompatibility of resources and demand of public demand of services is proportionally higher. Having highlighted the municipalities of higher disparity, the next step is to understand their level of efficiency and from there work out possible recommendations for public policy.

This introduction provides a general panorama of both the heterogeneity observed in Brazilian municipalities and their general numbers of fiscal data. Then a brief analysis of the literature is presented, followed by the description of the methodology used (section 2). The results (section 3), some discussion (section 4) and recommendations follow (section 5).

An important issue when discussing municipalities in Brazil is the high degree of heterogeneity observed, both in their intrinsic attributes and their demand for public services. This disparity can be observed in terms of population – ranging from 805 to 11,253,503 inhabitants in 2010; to surface (from 3.6 to 159,533 sq. km); to degree of urban population compared to total population (from 4.18 to 100%); to nearly any other indicator³. In terms of public services, such as education, for instance, we highlight the fact that the number of uneducated people varies from 0.9% of the population who are 15 years old or older to 60.7% (2007).

Despite this high level of heterogeneity in municipalities in Brazil, it is often the case that the inequality occurs within neighboring municipality with one concentrating jobs and GDP and the other one population and service demands⁴. On top of these disparities, there are varying levels of efficiency of the municipalities in offering public services⁵.

In order to further contextualize municipalities fiscal's portrait in Brazil, some numbers are put forward. The Union total budget for 2010 was established by law as one trillion and eight hundred and sixty billion reals⁶. The sum of the budget of the 5,512 municipalities for which there is information, in turn, was 309 billion, or about 16.63% of the Union budget⁷.

² The Federal District is itself indissoluble and it is considered to be a state and a municipality observing both its competences and obligations.

³ All the numbers come from the Brazilian Institute of Geographical and Statistics (IBGE/2010). Further examples can be: a. GDP: varying from 2,876 R\$ to 188,006,856 (2009); b. IHD: from 0.467 to 0.919.

⁴ Moura et. al. (2005) suggest that 6.6% of the working force commuted to work on a different municipality in 2000. Another statistic implies that 16.6% of urban areas have at least one neighbor area which is also urban.

⁵ Motta and Moreira (2007) show that the municipalities that are more dense, urban and populated are also more efficient in spending public resources. Those municipalities also have higher levels of GDP.

⁶ Considering the conversion rate for January 26 of 1.836, that is equivalent to: US \$ 1,013,305,292,253 (one trillion dollars).

⁷ All data for municipalities are based on the database made available by the Secretary of National Treasure at the Planning and Budget Ministry (STN/MPOG, 2010).

Only 61 billion of the total resource available to municipalities (of 309 billion reals) was collected by the municipalities themselves. This represents only 19.74% of the total. A bit more than a quarter, 25.95%, 16 billion reals, comes from property tax (IPTU); nearly a half (49.18%), 30 billion reals, comes from tax on services (ISSQN).

Compulsory and voluntary transfers from Union and States to municipalities amount to R\$ 213 billion, which is 68.84% of total available for municipalities⁸.

The available budget income per capita for municipalities in Brazil in 2010 ranges from R\$ 364 to 13,671 (2010), with a median of R\$ 1,604⁹. Its coefficient of variation is much smaller than the other comparisons¹⁰, at 49.25.

In sum, most of the money available for municipalities come from the Union or the states; of the income they collect themselves, half of it comes from taxes on services and a quarter from taxes on property¹¹. This indicates that some equalization in fiscal distribution can be observed in Brazil. However, this somewhat equalization or reduced heterogeneity in fiscal income does not translate into higher degrees of homogeneity in offer of public services. Thus, it is a further reason to focus on efficiency.

There are some references in Brazilian literature in which municipalities fiscal conditions are analyzed. A general empirical picture with data from 2002 is given by Rezende and Garson (2006). Gobetti and Klering (2007) take a look into fiscal quality of the municipalities describing their ability to make investments and pay debts, rather than giving a general description of transferences and tax collecting emphasis. A first analysis of municipalities efficiency is given by Miranda (2006)¹². The emphasis of Miranda is on the amount of resources that could have been saved, had the municipalities been as efficient as the most efficient ones¹³. Afonso and Gobetti in turn suggest that resources concentration usually does not necessarily yield positive results, on the contrary (2008). Orair and Alencar (2010) focus on establishing a high-frequency double-checked database in order to analyze tax collected by local municipalities. They point out that only larger municipalities are able to effectively collect politically inconvenient local taxes. An approach that focus on detailed information of the system and resources to describe efficiency of the health sector is proposed by Vinhadelli (2010).

2. Methodology

Indicators (spatial analysis)

Getis-Ord G_i^* (Getis; Ord, 2010) is an indicator of spatial analysis that enables the spatial analysis of clustering considering the expected statistic of a polygon and its neighbors in comparison to the average of all observations. It is mainly a local indicator that can be given a degree of significance for values that are above or below the expected mean for a given variable.

⁸ The rest of the fiscal income comes from assets, service charges, industrial and agriculture production among other items.

⁹ These are the quantiles of the distribution of fiscal income per capita of the municipalities: p1: R\$ 834; p5: R\$ 981; p10: R\$ 1,069; p25 R\$ 1,274; p50: R\$ 1,604; p75: R\$ 2,148; p90: R\$ 2,971;

¹⁰ Coefficient of variation for cited variables: number of inhabitants (2010) 594.82; surface (2010) 356.67; GDP (2009) 1,085.73; uneducated people with 15 years old or older (2000) 57.24, except for indices, such as degree of urbanization at 34.53 and HDI, at 57.23.

¹¹ Taxes on property are more intensely collected in large cities and capitals.

¹² For another paper with DEA analysis for municipalities, see Afonso and Fernandes (2003).

¹³ Miranda uses hospital admissions, educational registrations and waste collection as outputs and total expenditure as input for a DEA analysis.

For the case at hand the formula applied¹⁴ is:

$$G_i^* = \frac{\sum_{j=1}^n w_{ij}^k y_j - \bar{y} \sum_{j=1}^n w_{ij}^k}{S \sqrt{\frac{\sum_{j=1}^n (w_{ij}^k y_j)^2 - (\sum_{j=1}^n w_{ij}^k)^2}{n-1}}}$$

where S is the standard-deviation of variable y ; and w_{ij}^k is the matrix of neighborhood.

Data Envelopment Analysis

Data Envelopment Analysis (DEA) has been used frequently to evaluate empirical problems where a number of decision-making units is at play transforming inputs into outputs. In short, DEA is a “linear programming model used to evaluate the performance of decision making units (DMU)” (Sadiq, 2011, p. 1). The objective of the model is to maximize the efficiency of each unit, considering efficiency as “ratio of weighted outputs to weighted inputs”. Thus,

$$\begin{aligned} \text{maximize} \quad & z = \sum_{i=1}^n \frac{u}{y_i} \\ \text{subject to} \quad & \sum_{j=1}^m v_{i(x)} = 1 \\ & \sum_{i=1}^n \frac{u}{y_i} - \sum_{j=1}^m v_{i(x)} \leq 0 \\ & u_i \geq 0, v_i \geq 0 \end{aligned}$$

where:

z = efficiency of decision-making unit under consideration
 $u_i = n$ output coefficients of DMU under consideration
 $y_i = n$ output weighting coefficients for DMU under consideration
 $v_i = m$ input coefficients for DMU under consideration
 $x_i = m$ input weighting coefficients for DMU under consideration

Some of the advantages of using DEA is that – being a non-parametric method – no assumption are needed to be made on the data. Further, DEA compares each observation to the most efficient one. Regression analysis compares observations with an average value. Finally, DEA allows for multiple inputs and multiple outputs to be analyzed simultaneously.

3. Results

Demand of public services

In principle, the demand of public services is not necessarily equal across municipalities. These demands of services may vary according to population size as well as population cohorts. A more populous municipality (or aggregated urban area) may demand more specialized and hierarchically higher levels of educational services. Also, a municipality that concentrates younger inhabitants shall need more of basic health attention as well as education emphasis on youngsters.

¹⁴ The indicator was calculated using IpeaGeo. Downloadable from <http://www.ipea.gov.br/ipeageo/#>.

Population income is also likely to interfere in the level of service demanded by a given municipality. This effect is especially relevant if considered the definition of vulnerability that implies that the more vulnerable – to a specific threat – is proportionally more dependent on the resources of various kinds available to cope with that threat, independently of the threat itself (Sánchez; Bertolozzi, 2007)

Magnitude of fiscal inequalities

This first set of results details the context of the first section providing spatial information of the observed heterogeneity. We can observe on average some correlation¹⁵ of GDP per capita and Fiscal income per capita with richer municipalities and states having higher levels of fiscal income. It is also noticeable a concentration of states with lower fiscal income per capita in the Northeast and North (table 1 and figure 1). The richest states of Brazil (Southeast and South) are in the higher positions of mean fiscal income per capita. The data also indicates that there is spatial autocorrelation for fiscal income per capita, measured by the Moran's I index of 0.295 and p-value of 0.

Table 1 – Mean fiscal income per capita and GDP by States

States	Region	Number of municipalities	Mean Fiscal Income per capita	Mean of GDP per capita by municipality
PA	NE	107	R\$ 1,215.22	R\$ 2,582.91
MA	NE	190	R\$ 1,222.20	R\$ 2,080.99
PE	NE	179	R\$ 1,268.51	R\$ 2,677.27
AP	N	13	R\$ 1,319.87	R\$ 5,283.25
PI	NE	193	R\$ 1,345.33	R\$ 1,981.36
BA	NE	365	R\$ 1,357.46	R\$ 3,119.19
CE	NE	180	R\$ 1,366.93	R\$ 2,181.66
AC	N	21	R\$ 1,400.13	R\$ 4,378.24
AM	N	50	R\$ 1,418.09	R\$ 2,486.43
RR	N	13	R\$ 1,470.13	R\$ 4,456.38
PB	NE	208	R\$ 1,519.99	R\$ 2,354.75
AL	NE	89	R\$ 1,579.39	R\$ 2,169.44
SE	NE	73	R\$ 1,631.53	R\$ 3,961.47
RN	NE	154	R\$ 1,655.52	R\$ 2,705.03
RO	N	52	R\$ 1,725.59	R\$ 6,223.81
MG	SE	812	R\$ 1,765.68	R\$ 4,832.79
PR	S	381	R\$ 1,805.98	R\$ 6,114.63
TO	N	130	R\$ 1,889.40	R\$ 4,790.59
GO	CO	228	R\$ 2,088.09	R\$ 6,273.04
MT	CO	137	R\$ 2,097.26	R\$ 9,465.04
MS	CO	75	R\$ 2,153.34	R\$ 6,822.44
ES	SE	77	R\$ 2,162.96	R\$ 6,180.10
SC	S	291	R\$ 2,250.81	R\$ 8,220.38
SP	SE	629	R\$ 2,386.02	R\$ 8,547.15
RJ	SE	76	R\$ 2,483.88	R\$ 8,768.99
RS	S	489	R\$ 2,529.23	R\$ 8,035.24

¹⁵ Pearson correlation coefficients at 0.51, significant at 1%.

Source: STN/2010 and IBGE/2010. Elaborated by the authors.

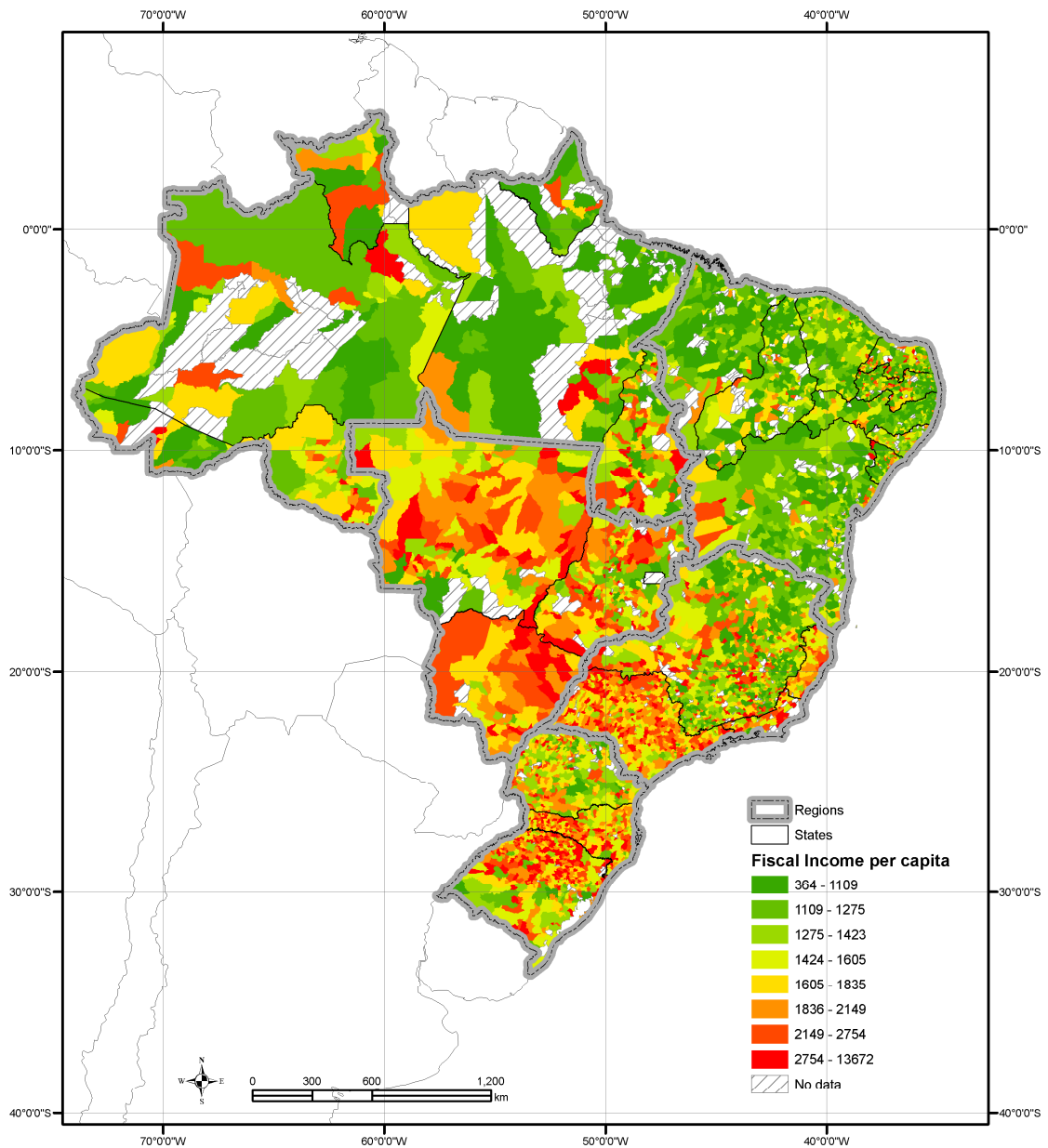


Figure 1 – Distribution of fiscal income per capita in Brazilian municipalities

Source: STN/2010 and IBGE/2010. Elaborated by the authors.

Description of municipalities with local extreme values

Following the methodology described above, figure 2 shows the results of the Getis-Ord G_i^* for all the 5,512 municipalities in the sample.

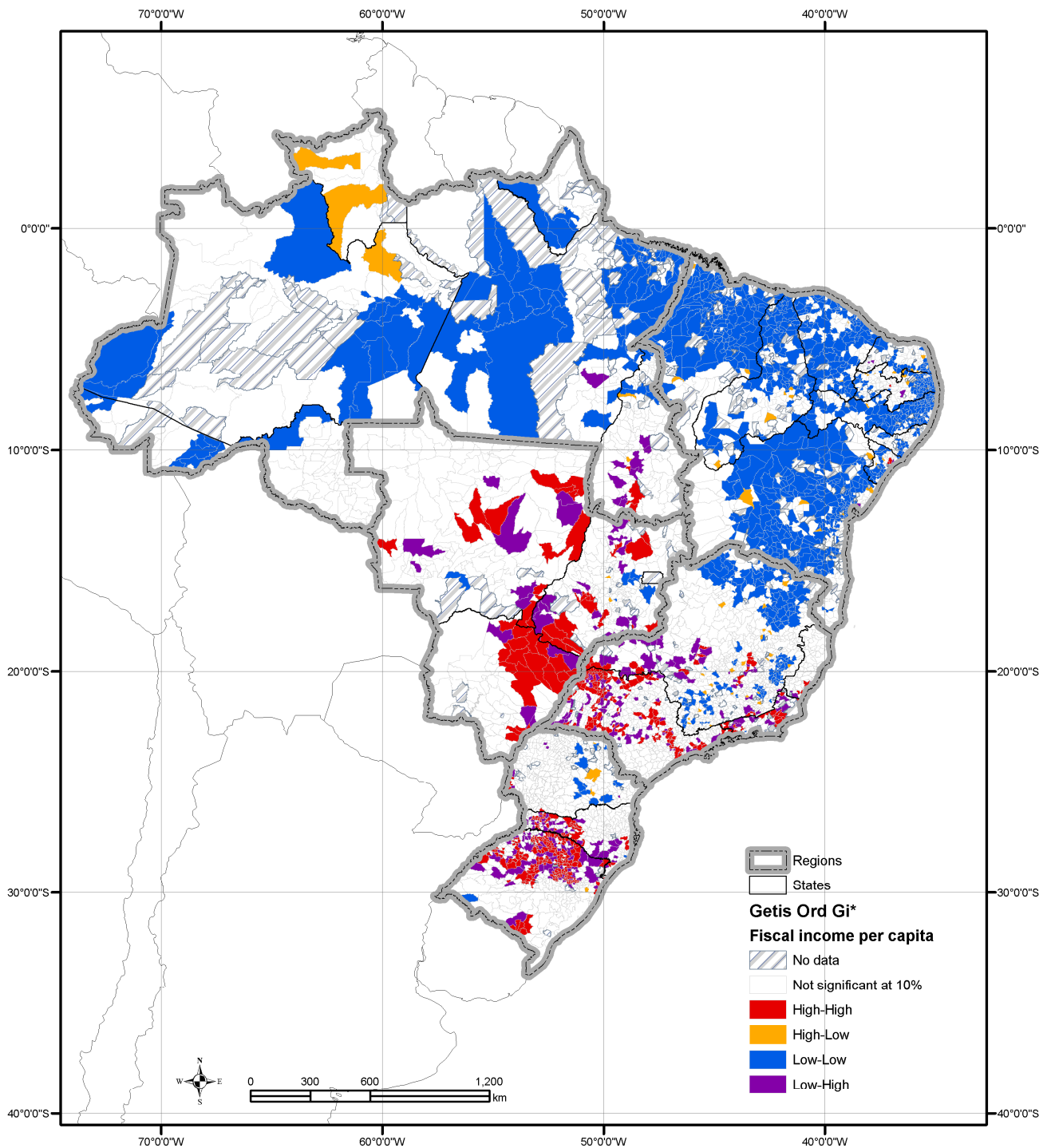


Figure 2 – Spatial distribution of municipalities by groups
Source: STN/2010 and IBGE/2010. Elaborated by the authors.

Six groups of municipalities can be examined as a result of the Getis-Ord G_i^* analysis:

1. those that did not provide fiscal data to the tax authority, even though they are obliged to by law (353);
2. those that showed no significance at 10% in the calculus (3,153);

3. those that have high levels of fiscal income per capita and are neighbored by similar municipalities;
4. those that stand out with high levels of fiscal income per capita amidst low fiscal income neighbors;
5. those municipalities located at regions of commonly low fiscal income per capita; and
6. those municipalities that are in rich regions but have low fiscal income per capita compared to their neighbors.

That is, the high-high group (group 3) depicts those regions that are clearly of higher fiscal income when compared to the total sample of municipalities. On the other end of the analysis those municipalities classified as low-low (group 5) are typically regions of generalized lower fiscal income per capita. As expected, most municipalities with low-low values are in the North and Northeast regions and most of those with high-high values in the other regions.

Those municipalities that are in areas of low economic activity but manage to receive a comparatively high level of fiscal income (group 4), usually because of a single plant, mine or special spatial configuration that favors significantly one single municipality. Those municipalities do neither harbor all labors of that specific activity nor all of the environmental externalities that are produced as a result of economic activity.

Finally, those municipalities that have lower levels of fiscal income compared to neighbors that have much higher values (group 6). They might be in areas of intense economic activity but higher levels of population and lack of within-boundaries economic activity proves to be relevant to unequal fiscal income per capita distribution.

The characterization of these municipalities is better described in tables 2 and 3.

Table 2 – Description of characteristics of municipalities by group

Groups	Sum of Inhabitants	Mean population	Number of municipalities	GDP per capita	Mean Fiscal income per capita	Percentage of population	Percentage of GDP
No data	9,664,331	27,378	353	R\$ 10,886.84		5.07%	6.73%
Not significant	98,581,054	31,266	3153	R\$ 8,300.63	R\$ 1,722.24	51.68%	52.31%
High-High	23,200,102	42,647	544	R\$ 15,065.98	R\$ 2,748.83	12.16%	22.34%
High-Low	1,026,586	14,666	70	R\$ 16,169.32	R\$ 2,476.52	0.54%	1.06%
Low-Low	44,748,131	37,415	1196	R\$ 3,666.81	R\$ 1,190.55	23.46%	10.49%
Low-High	13,535,595	54,360	249	R\$ 8,173.35	R\$ 1,478.15	7.10%	7.07%
Total	190,755,799	34,278	5,565	R\$ 8,200.77	R\$ 1,621.85	100.00%	100.00%

Source: STN/2010 and IBGE/2010. Elaborated by the authors.

The group of municipalities classified at high-high (group 3) has a high level of GDP per capita and also the highest mean fiscal income per capita with an average population above the general mean (table 2). The group high-low has only 70 municipalities and can be highlighted as a group with low population, on average, but the highest GDP per capita and very high fiscal income per capita. The low-low group concentrates nearly a quarter of the population but has a much lower GDP per capita along with the lowest mean fiscal income per capita. Finally, the last group of low-high municipalities concentrates those thought to be dormitory-municipalities, they concentrate population – with a mean of 54 thousand – but has a near average GDP and a low mean fiscal income per capita.

From this table, the extreme groups of municipalities that stand out are the high-low which may be benefiting from the fact of large economic activity and those of low-high which harbor population but does not have fiscal income to support that. These considerations assume that equalization of fiscal income should be enough to properly provide similar levels of public services in each municipality. This depends on the efficiency analysis that follows. Before that, however, we detail the composition of income that adds up as total fiscal income (table 3).

Table 3 details the composition of the mean fiscal income per capita by municipality. First of all, note that all municipalities depend on transfers from the Union and the States, be it return of taxes collected on their territory or not. Municipalities in group 3 (high-high) are the least dependable on transfers in general. In terms of municipal transfers per capita (PC) – which is the general transfer that is based solely on population and thought out to be an equalizer towards small, poor municipalities¹⁶. The group low-low is the group with proportionally the highest degree of dependency (27% of all mean fiscal income); although in absolute terms it is even smaller than the high-low group. What further differentiates the high-low from the low-low group is the amount of money that is transferred back as a part of taxes collected on their own territory which is more than 50% higher than the average transfer on the rich municipalities of the group high-high.

All in all, two facts are interesting to point out: a. first that those municipalities that have a high fiscal income per capita amidst poor neighbors receive more than double (111%) the amount of money per capita than their neighbors; b. second that the municipal transfers (FPM) fulfills its obligation of helping diminish fiscal income by municipality.

Table 3 – Sources of fiscal income by groups of municipalities

Groups	Mean Fiscal income PC	Transfers PC	Perc. Transfers PC	Municipal transfers PC (FPM)	Perc. mun. transfers PC	Transfers of part-tax on products and services PC	Perc. transf. part-tax on products services PC
Not significant	R\$ 1,722.24	R\$ 1,195.25	69.4%	R\$ 286.86	16.7%	R\$ 361.76	21.0%
High-High	R\$ 2,748.83	R\$ 1,462.67	53.2%	R\$ 170.46	6.2%	R\$ 658.12	23.9%
High-Low	R\$ 2,476.52	R\$ 2,114.43	85.4%	R\$ 421.73	17.0%	R\$ 999.21	40.3%
Low-Low	R\$ 1,190.55	R\$ 1,002.54	84.2%	R\$ 321.94	27.0%	R\$ 156.45	13.1%
Low-High	R\$ 1,478.15	R\$ 1,047.14	70.8%	R\$ 232.70	15.7%	R\$ 327.00	22.1%
Total	R\$ 1,621.85	R\$ 1,116.45	68.8%	R\$ 263.28	16.2%	R\$ 332.28	20.5%

Source: STN/2010 and IBGE/2010. Elaborated by the authors. Obs. PC stands for per capita.

Efficiency of public services offer – DEA results

In order to apply the DEA efficiency methodology suggested, two basic dimensions are used: health and educational services provided by municipalities. For both dimensions the quantitative data analyzed are expenditure and results.

For obvious reasons, the data used should be considered a mere *proxy* for the analysis. A *proxy* that may indicate some pattern of behavior within the set of municipalities. A *proxy* that is able to contribute to the discussion at hand, but, not one that can claim to reflect ideally the efficiency of municipalities for each of these two dimensions.

¹⁶ This is from the FPM which stands for Fund of Municipal Participation and is defined as constitutional funds with fixed coefficients derived by population official counting.

Health services per capita

The data related to health services were obtained directly from the centralized database maintained by the Health Ministry itself. Based on the database called DATASUS the ministry consolidates information and indicators by municipality in great detail.

For the case at hand the input in expenditure chosen was: total expenditure on basic health attention per capita by municipality (HealthExpenditure). In order to understand the Brazilian system is interesting to highlight that within the distribution of competences among the Union (Brazil), the States and the Municipalities, it is up to the municipality to provide basic attention services whereas the State and the Union are responsible for intermediate and complex procedures, researches and regulation.

The counterpart measure used to quantify the actual offer of health services was based on the summation of a) consultancies (medical visits), considering all categories: from newborns, toddlers and infants, to elder patients; b) consultancies specific for pregnant women and high-blood pressure patients; c) sum of clinical pathology exams; d) individual attendances of health professionals, including initial care for dressings, cleaning and stitching.

Education services per capita

The educational services provision was also analyzed considering total expenditure per capita on basic schooling – also mainly of responsibility of the municipalities¹⁷ (EducationExpenditure). The indicator to evaluate the quality of the services are the results that municipal schools have achieved in the national basic education test for the year 2009.

Table 4 – Descriptive statistics of health and education data used in DEA analysis

Variable	N	Mean	Median	10th Pctl	90th Pctl	Minimum	Maximum
Health expenditure per capita (R\$)	2447	215,42	185,00	65,23	408,63	0,03	1366,75
Summation of consultancies and exams	2447	4,14	3,24	1,16	6,39	0,01	139,00
Education expenditure per capita (R\$)	2447	373,31	360,88	212,59	543,38	0,42	1255,75
Average result by municipal schools	2447	3,59	3,50	2,60	4,60	1,40	6,80

Source: STN/2010, STN/2009, IDEB/2009, IBGE/2010, DATASUS/2010. Elaborated by the authors.

Efficiency Results

The outcome of the DEA efficiency analysis indicates some patterns to be observed. Firstly, it is clear that the better quality of results in both health and education are within the high-high group. However, these good results come with higher expenditures making their efficiency below average, at 0.223. The low-high group, in turn, does well comparatively with much fewer resources. They achieve a second best result at educational level with 40% less expenditure. Nevertheless, their health results are not that good with the lowest procedures per capita in all groups.

¹⁷ Usually states are responsible to high-school education, whereas the Union burdens the responsibility of undergraduate and graduate studies.

The high-low group performs terribly with results below average and expenditures above it. Actually, they have the highest expenditure in education. Finally, the low-low group fares lowly in all indicators which also reflect in low efficiency.

Reinforcing the idea of this paper to highlight municipalities with extreme indicators, table 5 also lists those groups of municipalities at higher and lower positions. They are further discussed in the annex.

Table 5 – Efficiency and indicators by groups of municipalities

Groups (Means)	Health expenditure	Health procedures per capita	Education expenditure	Education results	Efficiency	Inhabitants	Number of municipalities
Not significant	R\$ 237.36	4.08	R\$ 377.66	3.71	0.236	52,684	1282
High-High	R\$ 341.61	4.71	R\$ 429.69	4.26	0.223	101,954	180
High-Low	R\$ 236.77	3.92	R\$ 532.78	3.55	0.182	24,932	34
Low-Low	R\$ 154.27	4.28	R\$ 362.71	3.18	0.230	42,692	846
Low-High	R\$ 217.08	2.72	R\$ 257.17	4.18	0.304	83,110	105
Total	R\$ 215.42	4.14	R\$ 373.31	3.59	0.235	53,774	2447
Above 0.70	R\$ 62.17	16.41	R\$ 232.23	4.00	0.870	96,604	28
Below 0.10	R\$ 510.43	4.10	R\$ 684.08	2.96	0.012	9,342	77

Source: STN/2010, STN/2009, IDEB/2009, IBGE/2010, DATASUS/2010. Elaborated by the authors.

Another indicator that might yield some input to public policy implementation is the analysis summarized by state (table 6). Some states have a limited number of municipalities which impairs a generalized view of the state as a whole. However, a general pattern does stand out. Most states of the Southeast (SE), South and Center-West (CO) have better than average mean efficiency. Minas Gerais – well-known for its results in education – is benefited and achieves second-best position with a high number of municipalities.

These results can also be viewed spatially (figure 3).

Table 6 – Mean efficiency by State

Region	States	Mean efficiency	Number of municipalities
N	Roraima	0.112	1
NE	Alagoas	0.166	74
CO	Mato Grosso do Sul	0.181	43
NE	Paraíba	0.184	149
NE	Rio Grande do Norte	0.196	118
NE	Bahia	0.200	279
NE	Piauí	0.205	144
NE	Sergipe	0.207	33
N	Acre	0.208	10
NE	Maranhão	0.219	144
SE	São Paulo	0.229	168
CO	Mato Grosso	0.237	69
N	Pará	0.238	74
NE	Pernambuco	0.238	147
N	Rondônia	0.244	23
NE	Ceará	0.246	174
N	Tocantins	0.252	31
S	Rio Grande do Sul	0.254	213
S	Santa Catarina	0.258	122
SE	Espírito Santo	0.259	52
SE	Rio de Janeiro	0.266	57
CO	Goiás	0.273	43
N	Amazonas	0.277	18
N	Amapá	0.278	3
SE	Minas Gerais	0.321	250
S	Paraná	0.341	8

Source: STN/2010, STN/2009, IDEB/2009, IBGE/2010, DATASUS/2010. Elaborated by the authors.

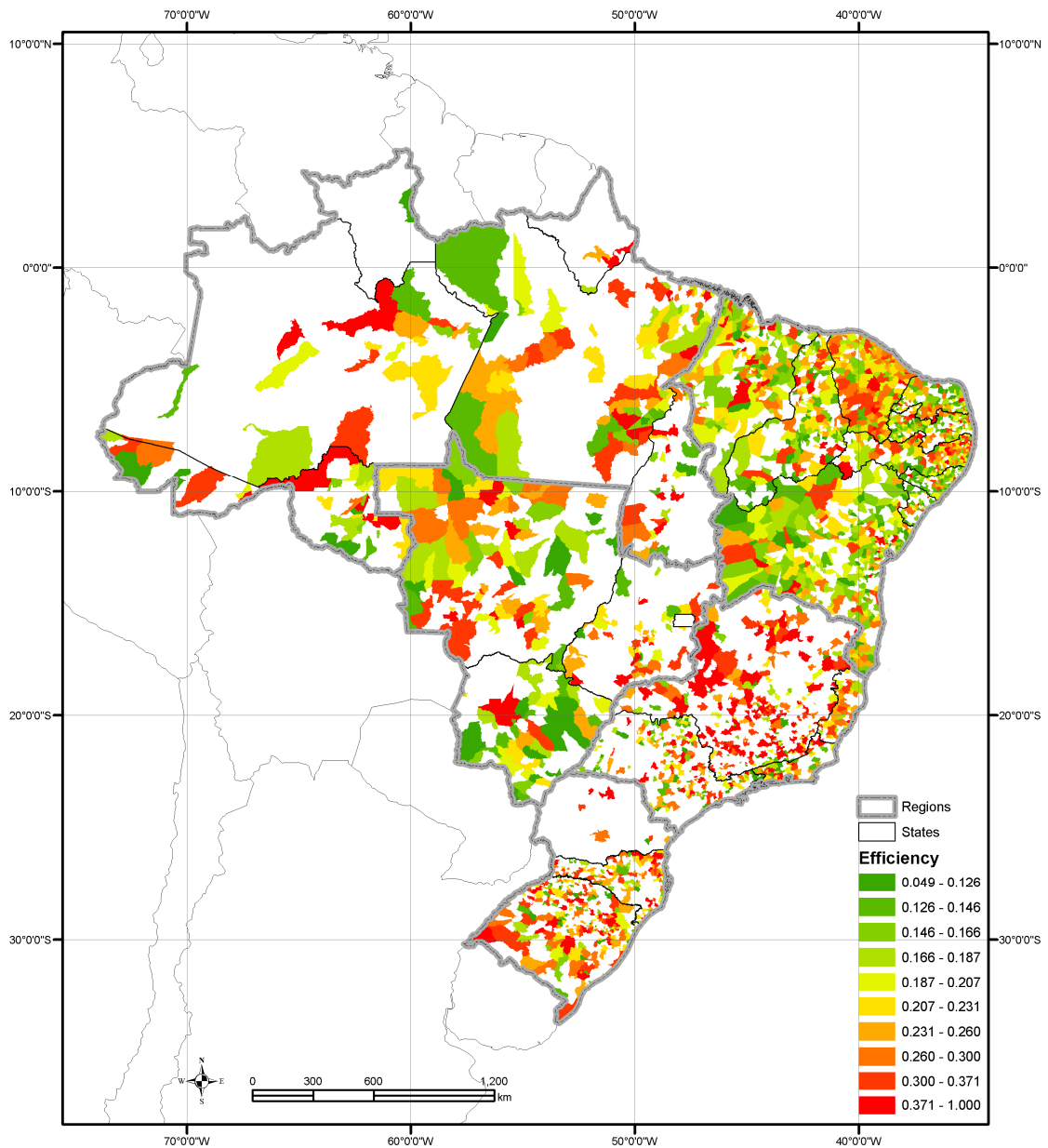


Figure 3 – Quantiles of efficiency by municipalities

Source: STN/2010, STN/2009, IDEB/2009, IBGE/2010, DATASUS/2010. Elaborated by the authors.

The distribution of ordered efficiency (figure 4) shows that the concentration of efficiency results is given between 0.16 (first quartile) and 0.28 (third quartile) at low levels. A small number of municipalities (5%) is above the 0.45 marker. However, the number of municipalities on the sample (2,447) allows for comparison with neighboring values throughout the sample.

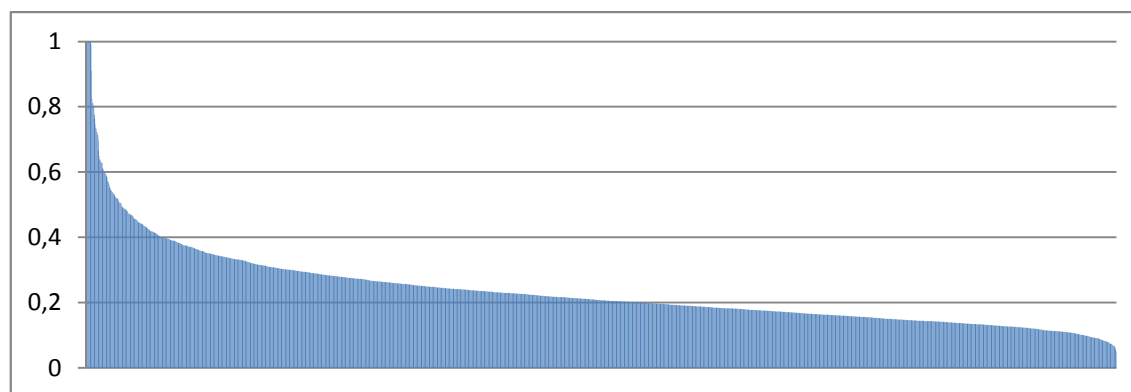


Figure 4 – Distribution of efficiency values for all municipalities

4. Considerations

The results presented above allow us to make some general considerations and highlight some indications based on the analysis. These are the so-called stylized facts

Resources

- i. Fiscal income per capita among municipalities is less heterogeneous than most other indicators. This suggests that the transfer made by the Union (FPM) does well in equalizing available resources for the municipalities.
- ii. However, rich regions still receive much more than average (70% more).
- iii. Some municipalities (high-low group) receives a proportionally much higher part of tax on products and services (ICMS) – three times the average – which contributes to make them unexpected winners.

Efficiency

- iv. These winners (high-low group) make the worst use of their resources being clearly the less efficient group.
- v. The low-high group – those near rich areas but which do not receive as much resource – perform better with the little they have yielding the best efficiency group.
- vi. Those municipalities at the low-low group have low levels of quality, but they do the best they can with the few resources available.

5. Recommendations

Based on the stylized facts and the data analyzed some recommendations do seem proper.

- i. The transfer of resources to small, poor municipalities do help their providing of health and education services. However, the combination of distributive tax (FPM) and the return of collected tax (ICMS) seem to benefit few municipalities which do not take full advantage of the extra resources.
- ii. It derives from that that the criteria for distributing one tax among municipalities should necessarily include other taxes already being received by each municipality¹⁸.

¹⁸ This also seems to be the case on those municipalities that receive large returns on tax based on oil exploration (Afonso; Gobetti, 2008).

- iii. Given the efficiency rank published, some highly efficient municipalities – especially those that are efficient with large population and average provision of services should be studied as benchmarking cases. Also, those municipalities with high values of expenditure should be viewed in more detail.

To sum up, three final considerations are in order. Firstly, the available data enabled the analysis to restrict itself to 2,447 municipalities out of the 5,565 in Brazil. 353 municipalities did not inform the Union about their income and expenditure data even though they are legally obliged to do so. Further, a large number of municipalities did not provide information on educational results (2,466) or expenditures (158). A small number of municipalities did not have data on health expenditure (409).

Secondly, the discussion of tax collecting and distribution among entities of Brazilian entities should be made considering the totalities of taxes, fees and contributions. If thought out individually, each tax or fee, it probably will benefit significantly one state or municipality, vis-à-vis the other entities.

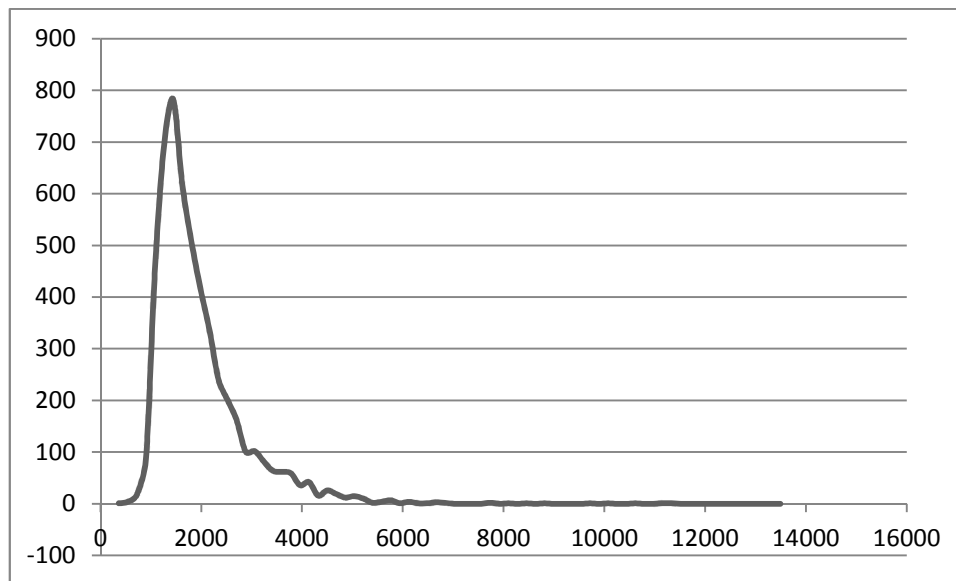
Thirdly, efficiency is the less studied aspect of the dichotomy resources x public services providing. And, as it has been shown in this paper, it might be just as relevant as the amount of resources received. Those entities with the highest level of income may just not be the one with the most efficient service.

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7. Annexes

Annex I. Histogram of fiscal income per capita of municipalities in Brazil, 2010.



Source: STN/2010, STN/2009, IDEB/2009, IBGE/2010, DATASUS/2010. Elaborated by the authors.

Annex II. Municipalities without fiscal information

Table 7 – Number of municipalities by state without fiscal data

States	Number of municipalities	% of municipalities of the state
DF	1	100.00%
PA	36	25.17%
AM	12	19.35%
AP	3	18.75%
RJ	16	17.39%
PI	31	16.76%
RR	2	13.33%
AL	13	12.75%
BA	52	12.47%
MA	27	12.44%
PR	18	8.07%
RN	13	7.78%
GO	18	7.32%
PB	15	6.73%
TO	9	6.47%
MG	41	4.81%
AC	1	4.55%
MS	3	3.80%
MT	4	2.84%
SE	2	2.67%
SP	16	2.48%
CE	4	2.17%
PE	6	1.50%
RS	7	1.41%
ES	1	1.28%
SC	2	0.68%

Source: STN/2010. Elaborated by the authors.

Table 8 – Municipalities with efficiency above .7

State	Health expenditure per capita (R\$)	Summation of consultancies and exams per capita	Education expenditure per capita (R\$)	Average result by municipal schools	Inhabitants	Group	Efficiency	Municipality name
13	R\$ 0.22	15.83	R\$ 546.25	3.5	11,891	0	1.000	Uarini
21	R\$ 0.04	2.93	R\$ 560.75	3.1	12,550	3	1.000	Igarapé do Meio
24	R\$ 65.52	1.40	R\$ 34.15	3.2	803,739	3	1.000	Natal
24	R\$ 82.30	101.63	R\$ 388.00	3.5	5,822	0	1.000	Equador
29	R\$ 235.31	4.26	R\$ 0.42	3.2	7,317	3	1.000	Muniz Ferreira
29	R\$ 103.81	2.18	R\$ 7.28	3.4	30,336	0	1.000	Gandu
31	R\$ 0.03	2.31	R\$ 413.63	3.8	15,024	3	1.000	Grão Mogol
31	R\$ 2.24	3.57	R\$ 183.53	3.7	20,245	0	1.000	Paraguaçu
31	R\$ 1.09	3.86	R\$ 271.75	5	13,872	0	1.000	Guapé
43	R\$ 360.25	139.00	R\$ 423.31	5.8	3,632	1	1.000	São Valentim
50	R\$ 8.12	2.48	R\$ 112.59	4.1	45,614	0	1.000	Aquidauana
22	R\$ 0.44	3.00	R\$ 246.88	3.1	13,646	3	0.991	Alto Longá
31	R\$ 44.16	13.89	R\$ 116.75	3.4	9,573	0	0.910	Prudente de Morais
23	R\$ 125.50	3.90	R\$ 14.70	3.2	18,894	3	0.825	Itatira
28	R\$ 117.30	72.81	R\$ 338.38	3.5	11,001	0	0.812	Moita Bonita
31	R\$ 164.59	62.52	R\$ 273.75	3.8	30,794	3	0.811	Minas Novas
31	R\$ 0.29	2.83	R\$ 655.38	5.3	1,868	2	0.805	Senador José Bento
31	R\$ 12.20	1.51	R\$ 135.19	4	263,689	0	0.800	Governador Valadares
31	R\$ 6.62	2.11	R\$ 188.25	3.9	58,740	3	0.778	Pedro Leopoldo
35	R\$ 49.92	2.41	R\$ 136.06	4.8	221,950	1	0.774	São Carlos
52	R\$ 10.52	4.60	R\$ 214.09	4.6	18,458	0	0.762	Itapaci
35	R\$ 79.36	0.23	R\$ 120.25	4.9	343,937	0	0.746	Bauru
11	R\$ 3.85	0.49	R\$ 263.13	4.1	28,729	0	0.735	Espigão D'Oeste
31	R\$ 79.70	2.24	R\$ 107.00	4.5	84,469	0	0.734	São João del Rei
33	R\$ 24.23	1.11	R\$ 119.69	3.5	458,673	0	0.723	São João de Meriti
35	R\$ 127.02	0.06	R\$ 99.91	5.3	113,068	0	0.721	Ribeirão Pires
22	R\$ 0.39	5.11	R\$ 346.38	2.4	4,475	3	0.715	Conceição do Canindé
42	R\$ 35.90	1.14	R\$ 185.16	5.3	52,912	0	0.712	Mafra

Source: STN/2010, STN/2009, IDEB/2009, IBGE/2010, DATASUS/2010. Elaborated by the authors.

Table 9 - Municipalities with efficiency below .09

State	Health expenditure per capita (R\$)	Summation of consultancies and exams per capita	Education expenditure per capita (R\$)	Average result by municipal schools	Inhabitants	Group	Efficiency	Municipality name
29	R\$ 252.06	6.04	R\$ 556.13	1.8	7,459	0	0.090	Apuarema
33	R\$ 392.94	4.33	R\$ 751.75	3.1	8,561	0	0.090	Rio das Flores
25	R\$ 288.94	3.68	R\$ 525.50	2.1	6,010	3	0.089	São José de Caiana
25	R\$ 401.44	4.53	R\$ 687.25	2.8	3,075	0	0.088	Bernardino Batista
29	R\$ 481.94	2.87	R\$ 670.63	3.2	3,733	0	0.088	Lajedão
35	R\$ 955.13	7.99	R\$ 906.13	4.6	1,544	0	0.087	Trabiju
35	R\$ 550.50	0.31	R\$ 690.88	3.5	5,349	0	0.086	Jambeiro
25	R\$ 512.63	3.26	R\$ 717.88	3.3	2,233	1	0.086	Passagem
29	R\$ 285.63	2.57	R\$ 549.13	2.2	12,491	0	0.086	Caldeirão Grande
22	R\$ 195.91	2.27	R\$ 621.00	2.2	4,241	3	0.085	Riacho Frio
22	R\$ 426.88	5.20	R\$ 739.00	2.8	3,560	2	0.084	Sebastião Barros
22	R\$ 293.81	2.74	R\$ 755.75	2.8	2,986	2	0.084	Vera Mendes
12	R\$ 702.13	2.60	R\$ 712.25	3.8	4,691	0	0.084	Santa Rosa do Purus
27	R\$ 327.19	5.36	R\$ 492.38	1.7	7,574	0	0.083	Barra de São Miguel
28	R\$ 559.63	3.73	R\$ 508.63	2.6	2,275	0	0.083	Amparo de São Francisco
35	R\$ 870.25	1.66	R\$ 659.88	4.1	11,286	0	0.083	Luís Antônio
51	R\$ 887.50	5.15	R\$ 810.50	4.2	2,005	0	0.083	Novo Santo Antônio
25	R\$ 506.44	6.42	R\$ 653.13	2.5	2,841	2	0.082	Lastro
25	R\$ 363.94	3.90	R\$ 746.50	2.7	3,751	0	0.081	Poço Dantas
51	R\$ 964.75	2.70	R\$ 470.50	3.6	4,786	0	0.080	Canabrava do Norte
50	R\$ 622.13	4.47	R\$ 524.50	2.6	5,900	0	0.080	Juti
42	R\$ 512.63	6.14	R\$ 1,002.25	3.5	3,290	0	0.080	Bocaina do Sul
25	R\$ 416.88	5.65	R\$ 629.00	2.2	2,813	0	0.080	Tenório
43	R\$ 852.13	5.02	R\$ 744.13	3.7	2,267	0	0.079	Inhacorá
33	R\$ 949.63	1.31	R\$ 519.13	3.7	37,533	1	0.078	Parati
29	R\$ 548.00	7.25	R\$ 885.00	3	2,612	0	0.078	Catolândia
22	R\$ 363.56	4.39	R\$ 656.88	2.2	2,620	0	0.077	Tanque do Piauí
25	R\$ 358.06	4.60	R\$ 407.00	1.4	6,070	0	0.075	Nova Olinda
12	R\$ 357.31	2.46	R\$ 845.75	2.9	6,577	0	0.075	Jordão
24	R\$ 625.00	4.05	R\$ 517.75	2.4	5,217	0	0.074	Porto do Mangue
29	R\$ 396.88	3.59	R\$ 593.25	2.1	7,903	0	0.074	Itamari
24	R\$ 91.84	3.21	R\$ 589.50	1.4	2,872	0	0.074	Vila Flor
33	R\$ 853.13	1.84	R\$ 566.38	3.3	169,511	1	0.073	Angra dos Reis
31	R\$ 825.13	4.52	R\$ 766.75	3.4	2,785	0	0.072	Chiador
50	R\$ 796.38	3.77	R\$ 842.75	3.5	3,518	1	0.070	Taquarussu
35	R\$ 533.88	6.77	R\$ 821.88	2.4	4,077	1	0.069	São José do Barreiro
24	R\$ 341.56	3.82	R\$ 692.63	2	3,521	0	0.068	Pedra Grande
24	R\$ 590.63	3.42	R\$ 866.13	3	2,425	0	0.067	Bodó
25	R\$ 557.63	3.94	R\$ 794.50	2.6	1,927	0	0.065	Areia de Baraúnas
35	R\$ 828.38	1.62	R\$ 726.00	3.3	4,053	0	0.065	Buritizal
29	R\$ 151.03	3.06	R\$ 1,255.75	2.8	33,183	0	0.062	São Francisco do Conde
24	R\$ 711.88	4.43	R\$ 689.75	2.3	2,590	0	0.059	Pedra Preta
29	R\$ 1,233.25	3.13	R\$ 736.88	3.3	17,376	1	0.055	Madre de Deus
33	R\$ 1,366.75	4.10	R\$ 913.50	3.3	16,592	0	0.049	Porto Real

Source: STN/2010, STN/2009, IDEB/2009, IBGE/2010, DATASUS/2010. Elaborated by the authors.