The Impact of Local Income Inequality on Public Goods and Taxation: Evidence from French Municipalities

Brice Fabre

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PARIS-JOURDAN SCIENCES ECONOMIQUES
48, BD JOURDAN – E.N.S. – 75014 PARIS
TÉL. : 33(0) 1 80 52 16 00=
www.pse.ens.fr

The Impact of Local Income Inequality on Public Goods and Taxation:
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Abstract

This paper brings new evidence on the impact of income inequality on public decisions. Using a new panel database on French municipalities' accounts, and on households' income distribution at the local level, I estimate the impact of income distribution on municipal policy. This paper is the first to investigate this issue by simultaneously using a high number of comparable observations and identifying deciles of the income distribution which matter. After controlling for municipal fixed effects and for the dynamics of municipal incumbents' decisions, I find no impact of income inequality on operating spending, but a strong positive impact on municipal infrastructures. Evidence suggests that an increase in income inequality by 1% leads on average to an increase in the value of municipal infrastructures between 0.06% and 0.18%. Importantly, I find that this result is driven by variations in bottom and top deciles. There is clear evidence that additive public facilities associated to more inequality are due to higher tax rates. When poorest individuals get poorer, or when richest ones get richer, municipal incumbents decide to increase the amount of infrastructures by increasing local taxation. These results suggest that what matter in public decisions are the extreme parts of voters' income distribution, and that lower bottom incomes and higher top ones both lead to a higher size of government.

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1 Introduction

After a dramatic decrease during the first half of the twentieth century, income inequality has strongly increased in developed countries over the past decades (Piketty & Saez, 2014). This evolution has raised important debates on consequences of such a path, and on what public intervention should be regarding this fact. In parallel of this research on the evolution of income inequality, there have been many attempts among scholars to investigate theoretically the relationship between voters' income inequality and the size of governments in terms of public revenues and expenditure. Theoretical predictions on this relationship provide a mixed picture. The standard Political Economy literature highlights the decisive weight of the middle of the income distribution in the political process. The median-voter theorem implies that, in a framework where public goods benefit to every one in the same way and are funded through a proportional income tax, income inequality defined as the ratio between the mean and the median income increases the amount of public goods and the tax rate (Roberts, 1977; Meltzer & Richard, 1981). In contrast with this prediction, Benabou (2000) shows, by providing a model which incorporates welfare improvements due to public policy, that there can be a long-run negative relationship between inequality and governments' size. Another strand of theoretical research tackles the issue of the choice of the amount of public goods when there are substitutes in the private sector. In such a framework, Epple & Romano (1996) highlight a non-monotonic demand for public goods according to income: low-income individuals tend to favour more private consumption than middle-income ones, while high-income individuals may prefer to rely on the private sector. Then, the bottom and the top class of income form a coalition against the middle to decrease the amount of public goods. Finally, De La Croix & Doepke (2009) propose a framework in which the political power is biased towards the rich and that, given the higher preference for top incomes to rely on the private sector, higher income inequality can lead to a decrease in the level of public goods.

Regarding this mixed theoretical predictions, this paper aims at investigating empirically the relationship between income inequality and governments' size, by relying on a new panel dataset on French municipal accounts and individuals' pre-tax income distribution at the municipal level. The existing empirical literature on the link between income inequality and governments' size suffers from different caveats. This paper contributes in different ways to the improvement of identification in this field. First, data used in this paper allow to increase precision of estimates compared to existing contributions, and to go deeper on the estimation of the way income distribution may influence public decisions. Existing empirical papers can be divided in two groups. A first set of contributions uses country-level data, and relies on few observations (Schwabish et al., 2006; Shelton, 2007; Karabarbounis, 2011; Perotti, 1996).[1] Despite a low statistical power, data at the country level may have the advantage to give information on different deciles of the income distribution, in addition of income inequality measures. A second set of papers looks at the relationship between

[1]See also Scervini (2012) and Milanovic (2000) who investigate the impact of income inequality on monetary redistribution, and earlier contributions of Persson & Tabellini (1994) and Alesina & Rodrik (1994) who addressed this issue through the link between income inequality and economic growth.

income inequality at the local level on the size of local governments (Ramcharan, 2010; Corcoran & Evans, 2011; Boustan et al., 2013; Kosec, 2014). These papers benefit from higher statistical power, but have limited information on local income distribution, which is problematic in the sense that a given variation in income inequality can be driven by different variations in deciles, and can have therefore many interpretations. Results of all these contributions provide mixed empirical conclusions.[2] In contrast to this existing empirical literature, this paper uses a new panel dataset which provides detailed information on French municipalities' accounts, as well as a whole variety of income distribution indicators at the municipal level. To my knowledge, this paper is the first to investigate the relationship between income inequality and the size of governments by simultaneously relying on a high statistical power and investigating deeply the impact of income *distribution* on public decisions.

Second, this paper improves the way of dealing with endogeneity issues related to the link between income inequality and the size of government. In addition to control for unobservable municipal factors constant over time (through municipal fixed-effects), I exploit the dynamics over time of the variables of interest to deal with issues related to individuals sorting across local jurisdictions. This sorting implies a reverse causality problem, in the sense that individuals can move from a municipality to another one according to municipal policy. If preferences related to municipal policy, as well as individuals' mobility, are not independent from income, these mobilities can lead to variations in local income inequality. Most recent papers that attempt to deal with this issue instrument variations in local income inequality over time by an estimation of what would be these variations if they were driven by national trends (Corcoran & Evans, 2011; Boustan et al., 2013). In addition to apply a similar empirical strategy in a first step, I rely then on an estimation which controls more directly for sorting and is more realistic from a public decision-making point of view. First, while existing papers regress variables related to public policy at a given point in time on income inequality observe at this same date, I explain municipal decisions over a political term by income inequality policy makers observed at the beginning of their mandate. In addition to avoid simultaneity issues, this model based on one-term lagged explanatory variables may be more realistic. Then, I include a lagged dependent variable in order to identify, in a first-difference equation, the impact of lagged variations in income inequality given a level of lagged changes in municipal policy. The comparison of the instrument variable strategy and this dynamic specification suggests that endogeneity is mainly driven by measurement errors, instead of behaviours related to sorting.

Third, among contributions investigating the impact of inequality on governments' size at the local level, this paper is the first one to distinguish accurately between the effect on public revenues uncontrolled by local governments (e.g. formula-based intergovernmental transfers) and revenue components driven by active public decisions (e.g. local tax rates). Previous papers rely on aggregated measures of local revenues. The best previous contribution from this point of view is Boustan

[2]While Schwabish et al. (2006) and Ramcharan (2010) show evidence of a negative impact of inequality on governments' size, Shelton (2007), Corcoran & Evans (2011) and Boustan et al. (2013) provide empirical support for a positive effect. Karabarbounis (2011) looks ate the impact of different deciles of the income distribution, and shows that political decisions depends on a "one dollar one vote" process. Kosec (2014) provides interesting evidence that the impact of income inequality depends on the existence of substitutes for public goods in the private sector.

et al. (2013), who isolate the impact of inequality on taxation. However, they cannot distinguish between variations in tax bases, and variations in tax rates decided by jurisdictions.

To estimate the impact of income inequality on municipal governments' size, municipal operating spending and investment are considered separately, as these two components of municipal decisions can be related to different kinds of policy in reaction to income inequality.[3] For municipal investment, I use as a dependent variable the value of the stock of municipal infrastructures, instead of yearly investment spending, considering that the real target of municipalities is a given stock of infrastructures rather than a flow of this stock variation (Castells & Solé-Ollé, 2005; Solé-Ollé, 2013). While there is no robust evidence of a significant impact of income inequality on operating spending, findings suggest a robust and positive effect of income inequality on municipal infrastructures. An increase in income inequality by 1% leads on average to an increase in the stock of public infrastructures between 0.06% and 0.18% across measures of income inequality. Given the limited time span of the data (10 years), this contrast between operating and investment policy may reveal the fact that local facilities is the main municipal policy scope, and that operating spending are mainly the consequence of the stock of infrastructures, which may imply a later adjustment. The absence of a robust effect on operating spending is also in tension with previous papers who highlight the propensity of policy-makers to use public employment to reduce inequality (Alesina et al., 2000; Alesina et al., 2001; Clark & Milcent, 2011).

This evidence on a positive impact of income inequality on municipal infrastructures is important, as it is in tension with the seminal theoretical paper of Benabou (2000) which predicts a negative relationship between heterogeneity in terms of income and the size of governments. However, a given variation in income inequality can be driven by many different combinations of deciles variations. Then, it is important to investigate the impact of each decile of the income distribution on the amount of municipal public goods in order to provide a good insight of channels driving this result. Since all deciles are correlated, it is of key importance to run a variety of estimations which differ according to the set of included deciles. Then, by focusing on the municipal infrastructures side, I estimate a whole set of regressions, by making vary the number of included deciles in a same regression and the set of included deciles. I find robust evidence that the positive relationship between income inequality and municipal infrastructures is driven by the bottom and the top of the income distribution. Governments' size gets higher when low income individuals get poorer and when richest ones get richer. It suggests that what matters for the choice of the amount of public goods is not the middle, but the extreme parts of the income distribution.

This sensitivity of municipal infrastructures with respect to income distribution can be driven by automatic variations in municipal revenues due to deciles variations. It is possible that a decrease in bottom deciles leads to an increase in equalization grants received by municipalities, or that an increase in top deciles coexists with an increase in municipal tax bases. This is why I estimate

[3] Operating spending can include financial supports for low-income households. It also includes public employment, which can be used to decrease inequality or unemployment (see Alesina et al., 2000; Alesina et al., 2001; Clark & Milcent, 2011). Municipal infrastructures, created through investment, consist in creating public goods whose beneficiaries are not necessarily those with more needs (e.g. public schools).

the impact of local income distribution on the different categories of municipal revenues. For local taxation, I look separately at the impact on tax bases, and at the impact on tax rates controlled by municipal councils. I find that the impact of income inequality on municipal public goods is driven by taxation, and especially by tax rates. Intergovernmental grants, as well as debt, are not impacted by the income distribution according to my results. This evidence suggests that additive infrastructures associated to lower bottom deciles or higher top incomes are the result of active decisions of municipal councils, and not the result of an automatic variation of revenues out of the control of policy makers.

The higher propensity of French municipalities to raise more revenues and fund more infrastructures when poorest individuals get poorer or when richest ones get richer is in tension with existing theoretical predictions. It contrasts with median voters considerations, as well as with mechanisms suggesting a coalition between the bottom and the top of the distribution toward less public goods (Epple & Romano, 1996). It also do not allow to conclude to a "one dollar, one vote" channel since there is no evidence that every part of the income distribution matters.[4] Instead, findings supported in this paper raise different explanations. On the one hand, a higher government size due to lower bottom deciles or higher top ones may reveal a demand of voters or municipal incumbents for redistribution, through public goods funded by taxation. On the other hand, voters in bottom and top deciles may have higher demand for public goods and taxation with respect to the middle class, either because of different degrees of preference for public goods and taxation, or because of gains from redistribution induced by taxation. Although these different mechanisms cannot be distinguished, the conclusion is that decreases in lowest incomes, and increases in top ones induce variations in municipal policy of the same direction, which makes the middle class non-decisive in the political process. As a result, what matters is not the middle of the income distribution, but the extremes.

This paper proceeds as follows. Section 2 describes the French institutional context. Section 3 presents the data. The empirical strategy follows in Section 4. Section 5 presents the results. Section 6 provides a discussion of empirical findings. Section 7 concludes.

2 Institutional background

In this paper, I focus on French municipalities. This is the lowest tier of local government in France. The national territory is made up of 36,677 municipalities. I focus on the 2,200 municipal jurisdictions which are over 3,500 inhabitants for the whole panel period (2000-2011). Then, the French territory is made up of 2,599 inter-municipal communities (*intercommunalités*)[5], 100 counties

[4] As highlighted by Karabarbounis (2011), if the influence of a given individual over the political process depends on her weight in terms of income, then one should expect that an increase in *any* decile leads to a policy closer to the preferred platform of this part of the income distribution. The insignificant impact of middle deciles claims in favour of a rejection of this mechanism.

[5] Inter-municipal communities are groups of municipalities which decide to cooperate and merge for the provision of public goods for which there are potential economies of scale. Since 2013, being in such a community is mandatory for every municipality. During the sample period (2000-2011), this was not the case. However, 95.5% of municipalities were in a community in 2011.

(*départements*) and 26 provinces (*régions*). Apart from having a high number of observations, an additional reason to focus on municipalities is that this is the most important tier of local government in terms of expenditure. As shown in Table 1, total municipal spending represents 4.6% of French GDP in 2011, while this share goes from 1.3% to 3.4% for the other tiers of local government.

Table 2 provides a picture of the structure of municipal accounts, by showing macro data on municipal revenues from the budgets of all French municipalities in 2011. This table distinguishes between revenues over the control of municipalities (in bold) and those municipalities do not control. In France, the budget of each municipality has to be decomposed into an operating section and an investment section. Municipalities are not allowed to have an operating section in deficit, that is why there is no debt in this section. However, debt can be used to fund municipal investment. If the operating section of a municipality is in surplus, this extra-money can be used to fund investment expenditure.

The operating section is the most important part of resources, accounting for 81,1% of total municipal revenues. Operating revenues can be grouped in four categories. Local taxes represent the most important one, by funding 60.1% of the operating section in 2011. They represent the main tool for redistribution municipalities can play on in their decisions on revenues. There are four local taxes in France. For each of them, municipalities decide on tax rates. The first is the housing tax (HT)[6]. This household tax is paid by all residents on the cadastral value of their accommodation, whatever their status regarding it (owner or tenant).[7] Second, the property tax on built estate (PTBE)[8] is paid by owners of all private real estate (households as well as firms). The tax base is still the cadastral value. The third tax is the property tax on unbuilt estate (PTUE)[9]. The principle is the same as the previous property tax. The only difference is the nature of taxed property (unbuilt lands). Fourth, the local business tax (LBT)[10] is paid by firms on their real estate and their production facilities.[11]

The second main source of operating revenues are formula-based operating grants, which fund 25.3% of the operating section. These grants mainly come from the Central State, and are not over the control of municipalities. The operating section can also be funded by other resources (e.g. fees, sales, etc.) which represent 14.6% of operating revenues.

As for investment revenues, most of them are directly controlled by municipalities, through operating surplus transferred to the investment section and loans. Transferred operating surplus represent the most important source of investment revenues, with a share of 42.4%. As for loans, they fund 20.9% of the investment section. Then, municipalities benefit from other revenues they do

[6] *La taxe d'habitation.*

[7] In order to prevent from a regressive design at the bottom of the income distribution, tax exemptions and reductions exist for low-income households. Rules of these exemptions and reductions are decided by national law. The resulting loss of fiscal product for municipalities is compensated by the Central State.

[8] *La taxe foncière sur les propriétés bâties.*

[9] *La taxe foncière sur les propriétés non-bâties.*

[10] *La taxe professionnelle.*

[11] A reform in 2010 has removed production facilities from the local business tax base, through the creation of a new tax called the Contribution of Companies on Property (*La contribution foncière des entreprises*). Municipalities are compensated for this change, through a yearly transfer from the State which is fixed over time.

not control. They receive formula-based grants from the State, which represent 13.6% of investment revenues, and discretionary investment grants (i.e. grants allocated by other upper tiers of government in a discretionary way), which count for 11.8% of investment revenues. Finally, municipalities can benefit from assets transfers due to transfers of competencies.

3 Data and sample

Data on local income distribution come from the RFL (*Revenus Fiscaux Localisés*) database, provided by the French National Institute of Statistics and Economic Studies (INSEE). This database gives information on residents' *pre-tax* income distribution at the municipal level. It is constructed from French tax returns on the income tax and the local housing tax, which ensures high reliability. It provides for each municipality with more than 2,000 inhabitants over the period 2000-2011 indicators of the distribution of residents' income per unit of consumption (UC). The number of units of consumption is a measure of household size. It allows to take into account economies of scale in consumption needs according to this size.[12] This database gives for each municipality and year the amount of each decile, the mean, and the Gini coefficient of the distribution of pre-tax residents' income. For deciles, the sorting unit is the individual, whatever her age. The amount given for each decile is the cut-off of income above which one moves to the other decile of population.[13]

Inequality can be defined in many ways, with very different meanings. Then, it is important to consider different kinds of income inequality. I use five different measures of inequality. The first is the ratio between the interquartile gap and the median (*IQ/D5*). It measures inequality for the half of population which is in the middle of the distribution. Then, I take three different decile ratios: the ratio between the ninth and the first (*D9/D1*), the ratio between the median and the first decile (*D5/D1*) and the ratio between the ninth decile and the median (*D9/D5*). The last measure is the Gini coefficient. Moreover, information on each decile of income allows to identify which part of the distribution matters for municipal policy.

Information on municipal spending and revenues come from different administrative sources, all provided by the General Broad of Public Finance (*DGFiP*, French Ministry of Economy and Finance). The first provides on a yearly basis municipal profit and loss statements, which contain information on operating spending and revenues. It covers all French municipalities over the period 2000-2011. It gives aggregated accounting variables (the total of operating expenditures and revenues) for the period 2000-2001, and provide detailed information on each category of expenditures and resources from 2002. Second, I use data on municipal balance sheets, which provide information on municipal assets. They cover the period 2002-2011, and give a picture of the whole history of the investment section of municipal accounts: variables of this section are *stock* variables, contrary to profit and loss statements where variables are in annual flows. This database gives for

[12]The rule is the following: one unit for the first adult, 0.5 unit per other individual who is 14 or more and 0.3 unit per child below 14.

[13]For instance, a first decile of X euros means that 10% (respectively 90%) of the population has a pre-tax income per UC lower (respectively higher) than X euros.

each municipality and year the monetary value of the stock of municipal infrastructures. It also gives the value of the stock of investment revenues associated to these infrastructures. Stocks of investment revenues are decomposed in the categories mentioned in Section 2. As I have information on depreciation, I can compute stock values net of it. The third administrative source (the "REI" database) is on local taxes. It gives for each local tax information on the tax base, the tax product and the tax rate, and covers the period 2002-2011.

In regressions, I use control variables from different sources. The French national census (provided by INSEE) gives information on total municipal population and its age structure. I include as well political variables from the French Home Office. Section 4 provides a detailed description of included control variables. All monetary variables are per capita and deflated using the consumption price index with base 2010 provided by INSEE. In regressions, all non-dummy variables are in logarithm, so that coefficients can be interpreted as elasticities.

Although the data are in a yearly basis, the time unit I choose is the political term. A municipal council may take its policy decisions at the scale of its whole term rather than year by year. Then, it is important to take as the time unit political terms instead of years in order to prevent from autocorrelation. Thus, the final panel database is made up of one observation per municipality per political term. The last three municipal elections in France took respectively place in 2001, 2008 and 2014. Then, the sample period is related to two political terms: 2001-2007 and 2008-2013.[14] Figure 1 gives a picture which compares political terms and periods covered by the different data sources. As illustrated in this figure, data cover only partially the two political terms, and especially the second one (which ends in 2013, while data end in 2011).

I focus on municipalities which reach some critical size. The sample is comprised of jurisdictions over 3,500 inhabitants.[15] The sample is a balanced panel of 2,200 municipalities. As the panel is made up of two time periods (two political terms), there is a total of 4,400 observations. This sample size illustrates the high statistical power I rely on with respect to existing papers using country-level data. Table 3 provides descriptive statistics on this sample. The average total municipal population is 13,763 inhabitants. The sample is almost balanced between left-wing and right-wing municipalities. 50% are right-wing, 46% are left-wing and the remaining jurisdictions have an independent mayor. As for income inequality, Table 3 illustrates the high heterogeneity in each of the different measures across municipalities. This heterogeneity is especially large for ratios where the first decile is the denominator. For instance, D9/D1 goes from 2.80 to 14.00, with a mean of 4.81 and a standard deviation of 1.39. As for municipal policy variables, yearly operating spending represents on average 1,037 euros per head, while the net value of the stock of municipal facilities per head has a mean value of 6,305 euros. These amounts represent respectively 3.3% and 20.2% of the French GDP per capita of 2011. This illustrates the crucial importance of municipal policy

[14] Municipal elections take place in March. Then, a new municipal council can play on the budget during the year of its election. Thus, I assume that political terms start during the year of the ballot.

[15] Another reason to make this restriction is that political variables are not available for smaller municipalities, while these variables may be important controls for regressions. The three largest French cities (Paris, Lyon, and Marseille) are excluded from the sample as they depart from other French municipalities in many dimensions such as administrative status and municipal policy.

in France.

Figure 2 provides a macro picture of effects investigated in this paper. Figure 2a sorts municipalities in quintiles according to their value of D9/D1. The horizontal axis represents these quintiles and indicates for each of them the corresponding range in terms of D9/D1. The vertical axis gives for each quintile the average total operating spending. Figures 2b provides the same investigation for the stock of municipal infrastructures. Moving from the first to the last quintile makes both municipal policy variables increase significantly. This suggests that an increase in income inequality leads to more active municipal policy both in terms of operating policy and local investment. Figure 2c provides the same investigation for local tax products, which are the main source of municipal revenues (see Table 2). This figure shows for the same quintiles of D9/D1 the average amount of total municipal tax products. As in previous figures, the pattern is increasing, and suggests effects of important magnitude. When one moves from the first to the last quintile, the total fiscal product per head moves from 407 euros to 534 euros. These three figures are an additional motivation to look more deeply at the impact of income inequality on municipal policy. Although they provide only macro pictures, without any control and any empirical strategy to identify causal links, they bring preliminary suggestion that income inequality may play an important role in public decisions.

4 Empirical specification

I estimate the impact of income inequality on municipal public decisions by considering operating and investment policies separately. For the operating side, I consider the amount of public spending decided by the municipality. As for investment policy, I consider the stock of municipal infrastructures instead of investment spending, the underlying idea being that the real targeted outcome of municipalities is not the increase in infrastructures per se, but the value of the stock, which measures the amount of municipal facilities available in the jurisdiction (Castells & Solé-Ollé, 2005; Solé-Ollé, 2013). This leads to the following baseline equations:

$$\begin{cases} \overline{OS}_{it} &= I_{it-1}\beta + X_{it-1}\gamma + \lambda_t + \mu_i + \epsilon_{it} \quad \text{for } t = 1;2 \\ SI_{it} &= I_{it-1}\theta + X_{it-1}\varphi + \phi_t + \eta_i + \upsilon_{it} \quad \text{for } t = 1;2 \end{cases}$$

In these equations, the time unit t is the municipal term (where $t = 1; 2$, as there are two terms in the data). Considering political terms as the time unit instead of years allows to take into account that municipal policy-makers are likely to take their decisions at the scale of their political term. In this case, considering separately different years in a same term would raise an autocorrelation issue. Variables indexed by t denote the value they take at the end of the term, except $\overline{OS}_{it}$, which denotes the mean of yearly operating spending of the municipality over political term t. SI_{it} denotes the net value of the stock of municipal infrastructures of municipality i at the end of political term t. I_{it-1} is the income inequality variable, while X_{it-1} is a vector of time-varying control variables. They are both lagged by one political term. If one considers that municipal policy-makers take their decision at the scale of their municipal term, municipal incumbents may take into account local characteristics they observe when they start their mandate. These choices on periodicity and timing contrast with existing papers, which make public decisions at a point in time depend on income inequality and other characteristics observed at the same date.[16] Considering that SI_{it} depends on I_{it} implies to assume that income inequality impacts immediately decisions of policy-makers, which may be a strong hypothesis.

λ_t and ϕ_t are political term fixed-effects. They capture factors specific to period t, and affecting all municipalities in the same way (e.g. macroeconomic shocks). μ_i and η_i are municipal fixed-effects. They capture all unobservable factors constant over time, and specific to each municipality. Given that data cover two periods (two municipal terms), the dropping out of municipal fixed-effects is achieved through the following first-difference equations:[17]

$$\begin{cases} \Delta\overline{OS}_{i2} = \Delta I_{i1}\beta + \Delta X_{i1}\gamma + \Delta\epsilon_{i2} & \text{(1a)} \\ \Delta SI_{i2} = \Delta I_{i1}\theta + \Delta X_{i1}\varphi + \Delta\upsilon_{i2} & \text{(1b)} \end{cases}$$

$\Delta(.)_{it}$ denotes variations between the end of term t and the end of term $t-1$ ($\Delta(.)_{it} = (.)_{it} - (.)_{it-1}$). Municipal fixed effects disappear through first-difference. These equations do not contain political term fixed-effects anymore. After first-differencing, these effects correspond to a constant, so that they are included in the vector ΔX_{i1} for writing-convenience. In regressions, all non-dummy variables are in logarithm, so that coefficients can be interpreted as elasticities.

Even after controlling for time invariant municipal factors, estimating these equations by simple OLS would be subject to reverse-causality issues due to sorting behaviours. Households may choose their municipality of residence according to municipal policy. Then, it is likely that $\overline{OS}_{it}$ (respectively SI_{it}) has an impact on I_{it} for a given t. It follows that ΔI_{i1} may be correlated with $\Delta\epsilon_{i2}$ (respectively $\Delta\upsilon_{i2}$), due to the correlation between I_{i1} and ϵ_{i1} (respectively υ_{i1}).

Most recent contributions aiming at dealing with this issue instrument time-variations in income inequality in a given jurisdiction by what would be this variation if it followed the national evolution in income inequality (Corcoran & Evans, 2011; Boustan et al., 2013). Such an instrument aims at focusing on variations in income inequality due to national factors, and not due to municipal differences which would imply inter-jurisdictional mobility. In a first step, I apply a similar strategy, as a benchmark regarding this previous literature. In a 2SLS setting, I use as an instrument for the log-variation in municipal income inequality over the first political term the log-variation in income inequality at an upper level over the same period. Since this log-variation at the national level is the same for every municipality, I have to rely on log-variations at intermediate tiers between municipalities and the central State. I use two alternative instruments: the log-variation of income inequality at the county level, and the one at the province level.[18] Relying separately on different

[16] The only existing paper which does not use a specification with such a simultaneity is Karabarbounis (2011). The author defines time-periods by averaging variables over non-overlapping three-years periods. Regressors are lagged by one of these periods. However, given that estimations in this paper rely on country-level data, these periods do not coincide with any political term.

[17] With two periods, estimations in first-difference are equivalent to the within estimator when standard errors are clustered at the municipal level.

[18] The French territory is made of 100 counties, and 26 provinces. These are the two main intermediate tiers of local

tiers is key, as the choice of the size of the jurisdiction used for the instrument is subject to the following trade-off. One the one hand, a smaller tier of jurisdiction increases the variability of the instrument, as this instrument takes (at best) as many different values as the number of upper jurisdictions over the territory. On the other hand, the use of such an instrument implies to assume that economic agents are not mobile at the chosen intermediate level. The smaller upper jurisdictions, the stronger this assumption.

Then, I propose an alternative way to deal with endogeneity issues due to sorting behaviours, by estimating a dynamic model, taking into account the persistence of variables related to municipal policy. The use of such a model is not new for the investigation of the link between income inequality and public decisions. The novelty is that such a dynamic model, combined with time-lagged measures of income inequality, offers a new way to deal with issues related to sorting behaviours. This model is represented by the following equations:

$$\begin{cases} \Delta\overline{OS}_{i2} = \alpha\Delta\overline{OS}_{i1} + \Delta I_{i1}\beta + \Delta X_{i1}\gamma + \Delta\epsilon_{i2} & \text{(2a)} \\ \Delta SI_{i2} = \rho\Delta SI_{i1} + \Delta I_{i1}\theta + \Delta X_{i1}\varphi + \Delta\upsilon_{i2} & \text{(2b)} \end{cases}$$

As explained above, sorting behaviours imply that ΔI_{i1} may be correlated with $\Delta\epsilon_{i2}$ (respectively $\Delta\upsilon_{i2}$), due to the correlation between I_{i1} and ϵ_{i1} (respectively υ_{i1}). In terms of first-difference, variations in income inequality over the first political term may be a result of variations in municipal policy over this same term. In Equations (2a) and (2b), the impact of variations in income inequality over this first term is estimated after controlling for changes in municipal policy during this term, which is a direct way to control for sorting behaviours, with potentially lower loss in heterogeneity across municipalities in terms of variation in inequality, compared to the IV strategy.

Equations (2a) and (2b) also reveal conceptual differences between estimations related to operating and investment policy. The lagged dependent variable $\Delta\overline{OS}_{i1}$ aims at capturing persistence in operating spending, while Equation (2b) captures the fact that decisions related to investment spending are made by taking in consideration the existing stock of municipal facilities, in order to get closer from the desired stock of municipal infrastructures. This is illustrated by the following transformation of Equation (2b), resulting from the subtraction of ΔSI_{i1} on both sides:

$$\Delta\left(\Delta SI_{i2}\right) = \Delta(\rho - 1)SI_{i1} + \Delta I_{i1}\theta + \Delta X_{i1}\varphi + \Delta\upsilon_{i2}$$

In other words, this equation consists in explaining, in a first-difference setting, the variation in the stock of municipal infrastructures ΔSI_{it} by the existing stock of municipal facilities SI_{it-1}.[19] As ΔSI_{it} corresponds to municipal investment spending non-related to infrastructure replacement, this is equivalent to explain this measure of investment by the existing stock of infrastructures.

Although the inclusion of lagged dependent variables deals with the issue of sorting behaviours, it raises new concerns due to the limited time span of the data. In Equation (2a), $\Delta\overline{OS}_{i1}$ is the

government in France. See Section 2 for more details.

[19]If one gets rid of the first-difference transformation, the equation becomes:
$\Delta SI_{it} = (\rho - 1)SI_{it-1} + I_{it-1}\theta + X_{it-1}\varphi + \phi_t + \eta_i + \upsilon_{it}$ for $t = 1; 2$

difference between $\overline{OS}_{i1}$ and $\overline{OS}_{i0}$, where this last expression denotes the mean of yearly operating spending over the mandate before 2001-2007 (see Figure 1). Since data on operating spending start in 2000, I assume that the mean over this uncovered term is equal to the spending value in 2000. As for the stock equation, the lagged dependent variable ΔSI_{i1} is defined as the difference between the value of the stock of public goods in 2007 and the one in 2002, instead of the difference between 2007 and 2000 (see Figure 1). Then, ΔSI_{i1} is correlated with $\Delta \upsilon_{i2}$, as 2002 is already in the first political term, and the value of the dependent variable during this year (used as a measure of SI_{i0}) is correlated with υ_{i1}. In addition, there is a correlation between ΔSI_{i1} and $\Delta \upsilon_{i2}$ because SI_{i1} is correlated with υ_{i1} (see Nickell (1981) for a characterisation of this bias). One solution to deal with this issue is to apply a GMM estimation (Arellano & Bond, 1991; Arellano & Bover, 1995; Blundell & Bond, 1998). However, this strategy leads to misleading results in this framework. Relying on values in 2002 instead of 2000 for the lagged dependent variable ΔSI_{i1} implies the invalidity of usual instruments for the first-difference equation.[20] These issues related to the lagged dependent variables calls for a careful comparison of results with and without the inclusion of this regressor.

A first-difference estimation may seem very demanding, as it relies on within-variations in income inequality over a period of seven years (between 2000 and 2007). At first stage, one could think that there may not be enough variations over time in income distribution at the local level for identification. Figure 3 provides some evidence on this point. It shows for each measure of income inequality used in estimations an histogram of the distribution of relative variations in these measures between 2000 and 2007. These variations are not negligible, and present a high degree of heterogeneity across municipalities, whatever the inequality measure. This makes the first-difference specification reliable. These relative variations move from about -20% to 20%, except for D9/D5 and the Gini coefficient where the range is narrower. For D9/D1 and D5/D1, there are some municipalities with very high variations, which can reach a maximum of about 40% in absolute value. This higher range is due to the higher variability over time of the first decile with respect to others.

The vector X_{it-1} is a set of control variables, which are suspected to be simultaneously correlated with income distribution and municipal policy. The most important control to keep in mind is the average income per unit of consumption. In other words, estimated impacts of income inequality are *given the average income*, so that the estimated impact of income inequality is only related to the shape of the income distribution, and not to factors in terms of income orders of magnitude. I control for total municipal population, as well as its age structure: I include in the regressions the share of population aged 14 or less and the share of population aged 60 or more. Total population may be an important determinant of municipal public goods, as some local facilities may need a critical size in terms of inhabitants to be funded. The share of young and elderly people are also of high interest, as an important part of municipal policy are intended to young people (e.g. primary schools) and elderly population (e.g. retirement houses). I also include political variables.[21] I

[20] Instrumenting ΔSI_{i1} by SI_{i0}, as it is done in a GMM framework, is invalid here, as SI_{i0} is measured by the value in 2002, which is already in the first term, and is thus still correlated with $\Delta \upsilon_{i2}$.

[21] Contrary to other controls related to the socio-economic characteristics of the population, political variables are not lagged by one political term, since they consist in controlling by political characteristics following last municipal

control for political affiliation of the mayor. Two dummies are considered: a left-wing dummy and a dummy for independent mayors (the reference being right-wing municipalities). I also control for the margin of victory of the mayor and for the interaction between this margin and dummies on political affiliation. This margin is defined as the difference in percentage point between the share of votes of the mayor and the one of her first challenger. These political variables are used as proxies for the municipal political landscape. Dummies on affiliation are used as proxies for the ideology of the mayor, which can play a role on the impact of inequality on municipal decisions. Interaction terms between these dummies and the margin of victory measure the extent to which voters are in majority for the winning affiliation. They can be seen as proxies for the ideology of voters in the jurisdiction, which may be an important determinant in decisions the municipal council takes on municipal policy. Finally, the margin of victory independently from the affiliation of the mayor can be seen as a proxy for experience and skills of the municipal council. I also include as a control a dummy equal to one if the mayor has changed between the first and the second political term. This variable is key, as a new incumbent is likely to have a different objective function than the previous one, leading to more changes in municipal policy.[22] I control as well for the share of households who are owners of their accommodation (distinguished from tenants). This variable measures the share of stable residents. These residents may not have the same influence on the political process. I also include in regressions the share of secondary residences, as municipalities where this share is high may have a different structure of public facilities and municipal spending. Finally, I control for inter-municipal cooperation, as defined in Section 2.[23] This is motivated by the expectation that delegation of some tasks to an inter-municipal community could lead to less public goods managed by municipalities.

Other controls could have been included from the French national census: the structure of municipal population in terms of socio-professional categories, or the unemployment rate at the municipal level. These controls would have been relevant for a cross-sectional analysis. However, the first-difference specification relies on variations in income distribution over time. Variations in

elections.

[22]This dummy is directly included in the first-difference equation, without being subject to first-differencing. Indeed, this is the dummy itself which has an impact on variations in the amount of public goods, not the variation of this dummy.

[23]In addition to decide to cooperate or not for the provision of public goods, municipalities which decide to be in an inter-municipal community have the choice between three degrees of cooperation. I include as control variables a dummy for each of these degrees, the reference being the absence of inter-municipal cooperation. These degrees differ in the number of competencies municipalities can delegate to their community. The higher the degree of cooperation of a status (i.e. the number of delegated competencies), the higher the requested degree of urbanisation of the group of municipalities to benefit from this status. During the period of analysis of this paper, there were four status of inter-municipal community. They can be listed from the lowest to the highest degree of cooperation as follows: *communauté de communes* (CC), *communauté d'agglomération* (CA), *communauté urbaine* (CU), and *syndicats d'agglomération nouvelle* (SAN). Requests on the degree of urbanisation are defined according to population. For instance, to cooperate through a CA, a group of municipalities has to count at least 50,000 inhabitants, and to be organized around one or more center-municipalities with more than 15,000 inhabitants. Given the low number of municipalities which are in a SAN, municipalities belonging in a CU or a SAN are included in the same group for the definition of the degree of cooperation, so that there are finally three kinds of cooperation. Similarly to political variables, these controls related to inter-municipal cooperation are not lagged by one political term, since they consist in controlling for the current status of the municipality which is instantaneously known.

income distribution may be highly linked to variations in the distribution of residents' economic activity. This is why it is natural not to consider variations in income distribution given variations in the socio-professional structure of population or the unemployment rate. This choice highlights an important aspect common to the different specifications. I do not focus on a specific factor of variations in income distribution, but I consider an average effect of all these factors.

If evidence supports an impact of income inequality on operating spending or municipal infrastructures, one needs to identify municipal revenues which drive these effects, in order to know whether they are due to variations in revenues over the control of municipal policy-makers. In case of an impact on operating spending, the same identification strategies can be applied for operating revenues. In case of an effect on municipal facilities, one needs to look at *stocks* of investment revenues provided in municipal balance sheets, by applying the same strategies than for the stock of infrastructures. However, operating revenues intervene in investment resources through transferred operating surplus (see Table 2). Although data give the stock of transferred operating surplus, making the link between one precise component of the operating surplus (e.g. a category of operating revenues) and the specifications estimating municipal facilities is more challenging, as operating components are in annual flow and not in stock. Then, I take for each observation the cumulated amount of these components over the political term. If STI_{it} denotes the stock of transferred operating surplus of municipality i at the end of political term t, the dynamic first-difference specification is:

$$\Delta STI_{i2} = \rho^{'} \Delta STI_{i1} + \Delta I_{i1}\theta^{'} + \Delta X_{i1}\varphi^{'} + \Delta\upsilon^{'}_{i1}$$

Where:

$$STI_{it} = SS_{it} - STO_{it} \text{ for } t = 1; 2$$

SS_{it} corresponds to the stock of cumulated operating surplus and STO_{it} denotes the part of this stock which has been kept in the operating section. Data contain both amounts (in addition of STI_{it}).[24] I denote C_{kit} the cumulated amount of the k$^{\text{th}}$ component of the operating surplus of municipality i over political term t (with $k = 1, ..., K$). If revenue components are positive and spending components are negative, then:

$$\Delta SS_{it} = \sum_{k=1}^{K} C_{kit} \text{ for } t = 1; 2 \quad (3)$$

The dynamic first-difference equation for SS_{it} gives:

$$\Delta SS_{i2} = \rho^{''} \Delta SS_{i1} + \Delta I_{i1}\theta^{''} + \Delta X_{i1}\varphi^{''} + \Delta\upsilon^{''}_{i1}$$

Which is equivalent to:

[24] This allows to know whether an effect on STI_{it} is driven by SS_{it} or STO_{it} (i.e. if it is driven by higher accumulated operating surplus or by a different allocation of surplus between the operating section and the investment one).

$$\Delta\left(\Delta SS_{i2}\right) = (\rho^{''} - 1)\Delta SS_{i1} + \Delta I_{i1}\theta^{''} + \Delta X_{i1}\varphi^{''} + \Delta\upsilon_{it}^{''}$$

Given Equation (3), I run for each component (for each $k = 1; ...; K$):

$$\Delta C_{ki2} = (\rho_k^{''} - 1)\Delta SS_{i1} + \Delta I_{i1}\theta_k^{''} + \Delta X_{i1}\varphi_k^{''} + \Delta\upsilon_{ki2}^{''} \tag{4}$$

This specification consists in explaining variations over time in each component of the operating section by variations over time in income inequality.

Finally, in case of an evidence of a significant impact of income inequality on municipal policy, one needs to identify the part of the income distribution associated to such an effect in order to provide an interpretation for it. The above empirical strategies allow to reach easily this goal, by including values of deciles instead of the inequality variable. As all deciles are correlated, one needs to run for a given specification different estimations by making vary the number of included deciles in a same regression as well as the set of included deciles. Although such a strategy does not allow to identify accurately the deciles which are decisive, it allows to provide conclusions on the impact of the bottom, the middle and the top of the income distribution.

5 Results

Tables 4 and 5 show respectively for operating spending and municipal facilities results from the different specifications presented in Section 4. In each of these tables, Column (1) shows results from Equations (1a) and (1b), which correspond to the simple first-difference specification, without instrumenting inequality and with no dynamics. Columns (2) and (3) show results from the IV specifications, taking respectively as an instrument the variation in income inequality at the province and the county level. Each of these columns show the F-statistics on the excluded instrument. In both tables, this statistics is always higher than the recommended threshold of ten (Staiger & Stock, 1997), which suggests a rejection of the null hypothesis that the instrument is weak. Finally, column (4) shows result from the main specification of this paper, which addresses the issue of sorting behaviours through the lagged dependent variable. These two tables show results from these four specifications for the five alternative measures of income inequality mentioned in Section 3.

Evidence presented Table 4 suggests a non-robust positive impact of income inequality on operating spending. Significance at conventional levels is almost never reached for specifications without instrumenting income inequality. It is then hard to support the view of any impact of income inequality on operating spending. In contrast, Table 5 reveals strong evidence of a positive and significant effect of income inequality at the municipal level on the stock of municipal infrastructures, with an estimated elasticity of interest going from 0.06 to 0.55 across specifications and income inequality definitions.[25]

[25] All regressions include average income as a control variable, so that the estimated impact of income inequality is only related to the shape of the income distribution, and not to factors in terms of income orders of magnitude. Whatever the specification, the coefficient on the average income is positive and almost always significant, which

In both tables, IV coefficients on income inequality in columns (2) and (3) are always higher than in column (1), except in Table 4 where D9/D5 is the considered inequality measure. This result is similar than in Boustan et al. (2013). One possible explanation is that sorting behaviours of households lead to an underestimation of the impact of income inequality. However, the inclusion of the lagged dependent variable, without instrumenting income inequality (column (4)) always gives similar coefficients than in column (1), while it should lead to a similar increase in the effect of income inequality if the previously mentioned underestimation were due to sorting. This suggests that underestimation of the impact of income inequality revealed by IV estimates is due to measurement errors. This suggestion that households do not sort according to municipal policy in a way of making income inequality vary with municipal policy changes may seem surprising at first stage. However, it may be explained by the short time span of data. Changing location regarding variations in municipal policy may be a decision which takes time to be made for households, so that variations in income inequality over the first political term may not correspond to sorting behaviours according to changes in municipal public decisions. Regarding these comparisons between specifications, the first-difference estimation, with a lagged dependent variable seems the most appropriate for the purpose of this paper, and will be the one used in further evidence. On the one hand, the caveat of IV estimates is that they restrict drastically the heterogeneity in income inequality variations across municipalities. This is a key issue for further more demanding estimations which include different deciles in a same regression. On the other hand, do not relying on IV strategies has the disadvantage of ignoring measurement errors. However, these measurement errors lead to underestimations of point estimates. Ignoring them would consist in keeping more conservative estimates. Considering the dynamic specification without instruments as the preferred specification leads to suggest that the elasticity of the stock of public infrastructures according to income inequality varies from 0.06 to 0.18 across the different measures of inequality, while operating spending does not seem to react to households' income distribution.

This contrast between operating spending and municipal infrastructures raises two suggestions. First, it may reveal the main competency of French municipalities, which consists in providing local facilities. In this context, one should expect municipal policy-makers to react to income distribution through investment.[26] Second, it suggests that municipalities do not face income inequality by increasing public employment, contrary to what was observed in other contexts.[27]

Evidence supporting the influence of income inequality on municipal facilities relies on first-difference over time in inequality and in the stock of municipal infrastructures. Given the short time span of data, these regressions may seem highly demanding, so that positive and significant

suggests more municipal revenues in higher-income jurisdictions, or higher preferences for public goods in richer municipalities.

[26] Still, more municipal equipment may induce more operating expenditures. Then, one could have expected a positive and significant effect of income inequality on this spending. However, operating costs of a new equipment may start to be supported with some lag in time, once the new infrastructure is achieved and effectively used by residents. The empirical strategy consists in explaining variations in infrastructures during a unique period of four years (from 2007 to 2011). This period may be too short to observe an effect on operating spending due to new equipment.

[27] See Alesina et al. (2000), Alesina et al. (2001) and Clark & Milcent (2011).

coefficients on income inequality could be driven by outliers. Figure 4 provides a scatter plot which crosses the log-variation of D9/D1 and the log-variation of the stock of municipal infrastructures. This figure also shows the fitted line from the regression of this second variable on the first one, without any control. There is clear evidence that the positive relationship between these two variables is the result of a global trend, and not of some extreme cases.

A given variation in income inequality can be of different natures, depending on the part of the income distribution which drives this variation. Then, a positive impact of income inequality on public infrastructures can have different explanations. This is why it is key to identify the parts of the income distribution which drive this result. Given the high number of observations in the data, it is possible to identify precisely the impact of one decile given others. Table 6 shows results from such identification. Point estimates come from estimations of Equation (2b) where the income inequality variable is replaced by different deciles in a same regression. Because of the correlation between different deciles, such estimations have to be considered with cautious. This is why it is key to make vary the number of deciles included in a same regression. The first part of Table 6 corresponds to regressions in which two deciles are included, while the second one corresponds to regressions where regressors contain three deciles. In each of these parts, each column corresponds to a different regression. Deciles used as regressors in a same estimation have to be far enough in order to prevent multicollinearity, and to ensure identification. Then, they are classified in categories: the three first deciles, the three next ones, and the three last deciles. No regression includes different deciles of the same category. The key idea underlying results of Table 6 is to present point estimates by taking different sets of deciles, and to induce from all these regressions a broad picture of the parts of the income distribution which matter in the amount of infrastructures. Table A1 in Appendix shows results of a similar exercise for operating spending, and provides additive evidence that it is not possible to conclude to an impact of income distribution on municipal operating expenditures.

Results of Table 6 suggest that the positive impact of income inequality on municipal infrastructures is driven by bottom and top deciles. Whatever the number or the set of included deciles, significant coefficients are always related to the first four deciles, and to the ninth one. They are negative for these four first deciles, and positive for the top one, which is coherent with a positive impact of income inequality. It is important to note that these regressions can only provide suggestions on the impact of approximate parts of the income distribution. Given the correlation between the different deciles, it is hard to identify the precise fractiles which are decisive. This is why the only aim of these regressions is to identify the effect of approximate parts of the income distribution, by testing the impact of different sets of deciles. Despite this limitation, Table 6 gives for each regression the Akaike Information Criterion (AIC) in order to have an idea of the regression which fits better the data. For regressions with two deciles, the best regression according to this criterion is the one which includes the third and the ninth decile, where both deciles have significant coefficients. For regressions with three deciles, the best one according to the AIC is the one which includes the second, the sixth and the ninth deciles, where only the two extreme ones have significant impact. While this criterion cannot be used to claim conclusions on the precise decisive deciles, it provides additive support that what matter are the bottom and the top of income distribution, but not the middle. When poorest households get poorer, or when richest ones get richer, the stock of municipal infrastructures increases.

These effects of income distribution on public infrastructures are not necessarily driven by decisions of municipal policy-makers. They can be due to automatic variations in municipal revenues correlated with income distribution. For the impact of top deciles, it is possible that an increase in highest deciles leads to an increase in local tax bases. As for the impact of the bottom of the income distribution, it can be the result of intergovernmental equalization grants. When poorest people can poorer, the municipality may benefit from a higher level of these transfers. Then, it is important to know whether this impact of income distribution on infrastructures is linked to revenues effectively controlled by municipalities.

Table 7 shows the impact of D9/D1 on uncontrolled investment revenues, and on each category of controlled investment resources, as defined in Table 2 (results with alternative measures of income inequality are presented in Table A2 in Appendix). There is clear evidence that the impact of income inequality on municipal infrastructures is not driven by investment resources uncontrolled by municipalities, but by other sources of revenues, and especially by the operating surplus municipalities transfer to the investment section.[28] Another result is a positive impact of the average income on investment revenues controlled by municipalities, but a negative impact on resources uncontrolled by local policy-makers. Although this last effect is not significant, it illustrates the role of inter-jurisdictional equalization of these revenues, especially through intergovernmental transfers.

Then, it is important to know which components of the operating surplus drive these results related to inequality. This surplus is the difference between operating revenues and operating spending of municipalities. As data on components of this surplus provide information in annual flow instead of stock, Equation (4) is estimated. Table 8 provides results on the impact of D9/D1 on different components of the operating surplus (Table A4 in Appendix provides the same results for alternative income inequality measures). Each column corresponds to a different regression, related to a specific dependent variable. Columns (1) and (2) show respectively the impact of income inequality on total operating spending, and total operating revenues. Consistently to previous finding, there is no significant impact of income inequality on operating spending. However, the impact on operating revenues is positive and significant. Then, columns (3) to (5) of Table 8 show results on the impact of income inequality on each category of these revenues, as defined in Table 2. There is clear evidence that income inequality has an impact on local fiscal products, while other kinds of operating revenues do not play any role according to these results. Since the effects seem to be concentrated on fiscal products, columns (6) to (9) show the impact of income inequality on each of the products of the four taxes presented in Section 2. Over these tax revenues, three of

[28]Table A3 in Appendix shows the impact of the same sets of deciles as in Table 6, by replacing the dependent variable and the lagged dependent variable by the stock of this category of revenue, instead of the stock of municipal public goods. Results are qualitatively similar with respect to Table 6, which suggests that the impact of income inequality on municipal public goods and on transferred operating surplus are related to the same effect of the income distribution.

them react positively to income inequality: the PTBE, the PTUE and the LBT.[29]

However, these results could be driven by increases in local tax bases and/or by increases in local tax rates. The distinction is important, as only tax rates are parameters controlled by municipal policy-makers. The importance of this distinction is illustrated by the relatively high size of the coefficient on average income in estimated equations on total fiscal products (column (4)), and on the HT and the PTBE products (columns (6) and (7)). This coefficient is likely to be driven by a positive correlation between individuals' average income and the average tax base.

Table 9 aims at providing such evidence. It shows for each local tax base and local tax rate the impact of the ratio D9/D1, by still estimating Equation (4) (regressions using alternative measures of inequality are in Table A5 in Appendix). Results suggest a positive impact of income inequality on the four tax rates decided by municipalities. They also support the view that, except for the HT, these effects on tax rates are not a reaction to variations in tax bases in the opposite direction.[30] Overall, these results suggest that on average, municipalities react to more income inequality by increasing taxation in order to fund more public infrastructures.

If these effects on tax rates are associated to previous results on the stock of municipal public infrastructures, one should observe for taxation the same results regarding the impact of different sets of deciles. Table 10 provides results of such estimations. It focuses on tax rates of the three taxes for which a positive impact of inequality on the rate is observed without a negative impact on the tax base. In order to present compact results, this table only shows results from regressions with the inclusion of two deciles in a same regression. Results related to all sets of deciles (where two and three deciles are included) are in Appendix (Tables A6, A7 and A8). Results of this table fits previous evidence on the impact of the different deciles on municipal infrastructures. They suggest that the PTBE rate decreases with the bottom part of the income distribution, and increases with top deciles. As for the PTUE rate and the LBT rate, they seem to react negatively with the bottom of income distribution, but there is only very weak evidence that top deciles matter. Results on the PTBE may be the most important ones, since this tax has the highest weight in terms of revenues: products from the PTBE represent on average 48.9% of total tax revenues in the sample, while the similar shares for the PTUE and the LBT are respectively 2.0% and 9.9%. The weak evidence of the effect of the top of the income distribution on the PTUE rate is not of key importance regarding low amounts of this tax. As for the LBT, this same weak evidence might be the result of the highly demanding estimations on this tax due to the low number of observations they rely on.

[29] For this last tax, the sample size is reduced because of delegation of this tax to inter-municipal communities. Regressions on this tax rely only on 435 observations. Municipalities which are in an inter-municipal community (92.3% of municipalities of the sample) can decide, either to transfer competencies regarding this tax to the community, or to keep a share of it. The first case is the most frequent: 77.5% of municipalities of the sample do not have any fiscal product from the local business tax because of this transfer of taxation. The complement of this share is 22.5% while the reduced sample of 435 observations used for regressions on the local business tax rate represents 19.8% of the whole sample. Indeed, in order to run the first-difference equation, I need to keep municipalities which take decisions on the local business tax rate for both political terms.

[30] The negative relationship between income inequality and the HT tax base may be the result of tax reductions and exemptions the national law imposes for this specific tax (see Section 2). When bottom deciles decrease, these reductions and exemptions, which consist in decreasing the tax base of taxpayers, may increase.

6 Discussion

The key result of this paper is a positive and significant impact of income inequality on municipal infrastructures, driven by bottom and top deciles. When poorest households get poorer, or when richest ones get richer, the stock of municipal infrastructures increases. It is shown that such an increase is driven by higher tax rates. In other words, municipal policy-makers react to increases in gaps between the extreme parts of the income distribution by increasing taxation in order to provide more public facilities.

The main conclusion is that, in the investigated context, what matter for taxation and the amount of public goods are the extreme parts of the income distribution. This result is in tension with widely studied mechanisms in Political Economy. First, it contrasts with median-voter considerations, which would suggest a decisive role of the fifth decile, or of deciles just above (if one considers voter turnout to be increasing with income).[31] Second, it contrasts with Benabou (2000), who shows theoretically that more heterogeneous societies lead to less public policies. Third, it is also in tension with "one dollar one vote" considerations supported by Karabarbounis (2011), since there is no evidence that every decile matters for public decisions.[32] Finally, findings are not in line with Epple & Romano (1996), who suggest a coalition of the rich and the poor in favour of less public goods. If findings were in line with this mechanism, one should find that increases in top deciles and decreases in bottom ones decrease the amount of public goods in the jurisdiction.

However, even if the precise story of Epple & Romano (1996) is not validated by evidence of this paper, the idea of a coalition of the top and the bottom of the income distribution can hold. Such a coalition would imply that poorest and richest voters have a higher demand for public goods than the middle class. On the one hand, richer residents may have a relatively high preference for public goods and support high size of local governments, even if the amount they pay through taxation is higher than the amount of public goods they benefit from. On the other hand, low-income voters may have a higher demand for public goods relatively to the middle class because of their net gain through taxation.

Findings of this paper can also be the result of a demand of voters or municipal incumbents for redistribution between households, through the provision of municipal infrastructures. A decrease in income of poorest households or an increase of top incomes can be seen as events to be corrected.

Although it is not possible to disentangle between these different mechanisms, the main result is that decreases in bottom deciles and increases in top ones lead to a variation in public goods and taxation in the same direction. These variations in public policy are either the result of heterogeneous demands for public goods and taxation according to income, or the result of a demand for redistribution.

[31]See Filer et al. (1993) and Lassen (2005), who provide evidence that voter turnout increases with income and education.

[32]If the influence of voters over public decisions is a function of their economic weight, then one should expect that *for every decile*, an increase in its value will increase the weight of individuals in this decile, making public decisions closer to the preferred platform of this category of income. One then should get significant coefficients for each decile, whatever the sign of them. Since there is no evidence of an impact of all deciles on public goods (and more precisely no impact of the middle of the income distribution), this channel cannot be supported.

7 Conclusion

This paper brings new empirical evidence on the impact of income distribution on public policy. Using a new panel database on French municipalities' accounts and on households' income distribution at the municipal level, this paper is the first one to investigate this research question by simultaneously relying on a high number of comparable observations, and estimating the impact of each part of the income distribution. I propose a new way to address and document the endogeneity issue associated to sorting behaviours of voters. In addition to apply specifications of previous papers by instrumenting local income inequality, I also estimate a first-difference equation taking into account the dynamics of municipal decisions. Finally, detailed information on municipal accounts allows to identify precisely the impact of income distribution on each category and parameter of municipal revenues, so that to distinguish accurately between variations in revenues associated to an active decision of policy-makers, and those out of the control of local incumbents.

Results suggest robust evidence of a positive and significant impact of income inequality on the net value of the stock of municipal infrastructures. An increase in income inequality by 1% leads on average to an increase in this stock value between 0.06% and 0.18% across different measures of income inequality. In contrast, it is not possible to conclude to an impact of income inequality on operating spending. The comparison of the different empirical specifications suggests that sorting behaviours may not be an issue for identification, while bias would be due to measurement errors, which leads to choose more conservative estimates.

In order to interpret this evidence of an impact of income inequality on public infrastructures, I investigate the nature of income inequality which drives this result. More precisely, I estimate the part of the income distribution which matters for the amount of public facilities. There is robust evidence that municipal infrastructures significantly react to bottom and top deciles, while the middle part of the income distribution does not seem to play any role. When poorest individuals get poorer, or when richest ones get richer, the amount of public infrastructures significantly increases.

Then, I investigate deeply the impact of income distribution on each category of municipal revenues, in order to know whether this effect on public infrastructures is associated to active decisions of municipal incumbents through revenue parameters they control, or to automatic variations in revenues due to income distribution. I find evidence that the previous effect of income distribution on public infrastructures is driven by variations in local tax rates, which are directly controlled by municipalities. In other words, when lowest income get lower, or when highest ones get higher, municipal incumbents decide to increase the amount of public goods by increasing taxation.

The main message of this paper is that what matter in the amount of public goods are not middle deciles of income, but extreme parts of the income distribution. A decrease in lowest incomes or an increase in top ones makes taxation and the amount of public goods move in the same direction. Such a result is new regarding the existing literature. It can be either due to a demand of voters or municipal incumbents for redistribution, or due to a higher demand of low and top incomes for public goods and taxation with respect to the middle class. Such a higher demand for public goods would be the result of gains from redistribution for low-income individuals, while it would come from a higher preference for public goods for top income residents.

Deciding between these different interpretations remains open and requires further investigation. Identifying the categories of municipal equipment (schooling, urban policy, elderly policies, sport, etc.) which drive my results may be a way to give a more precise interpretation. Unfortunately, there is no data on such a functional decomposition with enough precision for a first-difference specification over the time span of these data.

References

Alesina, A., Baqir, R. & Easterly, W. (2000), 'Redistributive public employment', *Journal of Urban Economics* **48**(2), 219 – 241.

Alesina, A., Danninger, S. & Rostagno, M. (2001), 'Redistribution through public employment: The case of Italy', *IMF Staff Papers* **48**(3), 447–473.

Alesina, A. & Rodrik, D. (1994), 'Distributive Politics and Economic Growth', *The Quarterly Journal of Economics* **109**(2), 465–490.

Arellano, M. & Bond, S. (1991), 'Some Tests of Specification for Panel Data: Monte Carlo Evidence and an Application to Employment Equations', *The Review of Economic Studies* **58**(2), 277–297.

Arellano, M. & Bover, O. (1995), 'Another look at the instrumental variable estimation of error-components models', *Journal of Econometrics* **68**(1), 29 – 51.

Benabou, R. (2000), 'Unequal societies: Income distribution and the social contract', *American Economic Review* **90**(1), 96–129.

Blundell, R. & Bond, S. (1998), 'Initial conditions and moment restrictions in dynamic panel data models', *Journal of Econometrics* **87**(1), 115 – 143.

Boustan, L., Ferreira, F., Winkler, H. & Zolt, E. M. (2013), 'The effect of rising income inequality on taxation and public expenditures: Evidence from U.S. municipalities and school districts, 1970-2000', *The Review of Economics and Statistics* **95**(4), 1291 – 1302.

Castells, A. & Solé-Ollé, A. (2005), 'The regional allocation of infrastructure investment: The role of equity, efficiency and political factors', *European Economic Review* **49**(5), 1165–1205.

Clark, A. E. & Milcent, C. (2011), 'Public employment and political pressure: The case of French hospitals', *Journal of Health Economics* **30**(5), 1103 – 1112.

Corcoran, S. P. & Evans, W. N. (2011), 'Income inequality, the median voter, and the support for public education'. Manuscript available at http://www.nyu.edu/projects/corcoran/papers/corcoran_evans_revision_09_28_2011.pdf.

De La Croix, D. & Doepke, M. (2009), 'To segregate or to integrate: Education politics and democracy', *The Review of Economic Studies* **76**(2), 597–628.

Epple, D. & Romano, R. E. (1996), 'Ends against the middle: Determining public service provision when there are private alternatives', *Journal of Public Economics* **62**(3), 297 – 325.

Filer, J. E., Kenny, L. W. & Morton, R. B. (1993), 'Redistribution, income, and voting', *American Journal of Political Science* **37**(1), 63–87.

Karabarbounis, L. (2011), 'One dollar, one vote', *The Economic Journal* **121**(553), 621–651.

Kosec, K. (2014), 'Relying on the private sector: The income distribution and public investments in the poor', *Journal of Development Economics* **107**, 320 – 342.

Lassen, D. D. (2005), 'The effect of information on voter turnout: Evidence from a natural experiment', *American Journal of Political Science* **49**(1), 103–118.

Meltzer, A. H. & Richard, S. F. (1981), 'A Rational Theory of the Size of Government', *Journal of Political Economy* **89**(5), 914–927.

Milanovic, B. (2000), 'The median-voter hypothesis, income inequality, and income redistribution: An empirical test with the required data', *European Journal of Political Economy* **16**(3), 367 – 410.

Nickell, S. (1981), 'Biases in Dynamic Models with Fixed Effects', *Econometrica* **49**(6), 1417–1426.

Perotti, R. (1996), 'Growth, income distribution, and democracy: What the data say', *Journal of Economic Growth* **1**(2), 149–187.

Persson, T. & Tabellini, G. (1994), 'Is Inequality Harmful for Growth?', *The American Economic Review* **84**(3), 600–621.

Piketty, T. & Saez, E. (2014), 'Inequality in the long run', *Science* **344**(6186), 838–843.

Ramcharan, R. (2010), 'Inequality and redistribution: Evidence from US counties and states, 1890-1930', *The Review of Economics and Statistics* **92**(4), 729–744.

Roberts, K. W. (1977), 'Voting over income tax schedules', *Journal of Public Economics* **8**(3), 329 – 340.

Scervini, F. (2012), 'Empirics of the median voter: democracy, redistribution and the role of the middle class', *The Journal of Economic Inequality* **10**(4), 529–550.

Schwabish, J. A., Smeeding, T. M. & Osberg, L. (2006), Income distribution and social expenditures, *in* D. B. Papadimitriou, ed., 'The Distributional Effects of Government Spending and Taxation', Palgrave Macmillan UK, London, chapter 9, pp. 247–288.

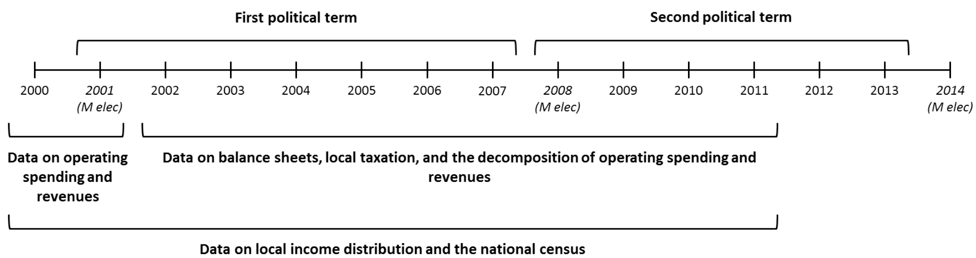
Shelton, C. A. (2007), 'The size and composition of government expenditure', *Journal of Public Economics* **91**(11-12), 2230 – 2260.

Solé-Ollé, A. (2013), 'Inter-regional redistribution through infrastructure investment: Tactical or programmatic?', *Public Choice* **156**(1), 229–252.

Staiger, D. & Stock, J. H. (1997), 'Instrumental variables regression with weak instruments', *Econometrica* **65**(3), 557–586.

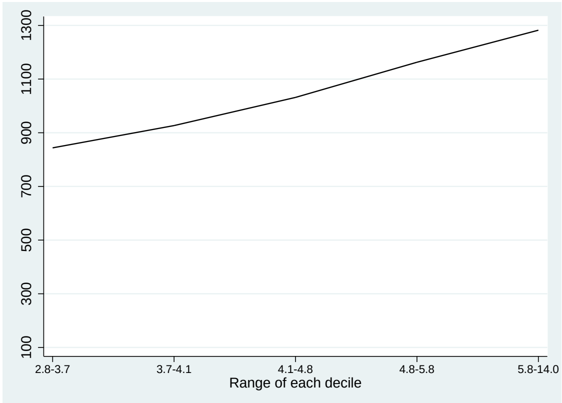
Figures

Figure 1: Periods covered by the different data sources

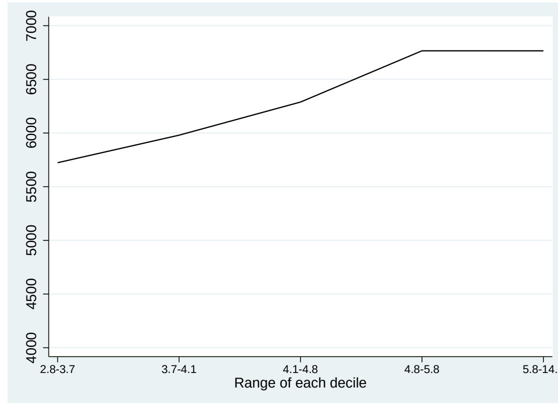


This figure confronts the two analyzed political terms with periods covered by the different data sources. *M elec* stands for "municipal elections". These covered periods impose some constraints in the years to consider in regressions for these two political terms (see Section 4 for a description of empirical specifications). For variables related to stocks, I take in my regressions values of 2007 and 2011 (instead of 2013) respectively for the two political terms. For the operating spending variable, I consider means over the period 2001-2007 and 2008-2011 respectively for the two terms. For variables on income distribution and other covariates from the national census, I take values of 2000 and 2007, as these variables are lagged by one political term. As for lagged dependent variables related to stocks, I am constrained to use values of 2002 (instead of 2000) and 2007. Finally, the lagged mean of operating spending over the term covers the period 2001-2007 for the second term, and takes only the year 2000 for the first one.

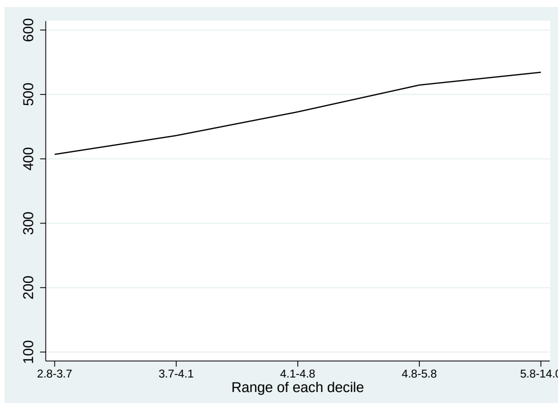
Figure 2: Municipal policy variables by quintile of D9/D1



(a) *Operating spending p.c.*



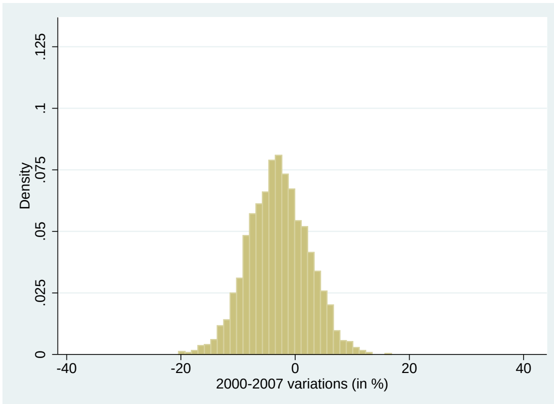
(b) *Net value of the stock of municipal infrastructures p.c.*



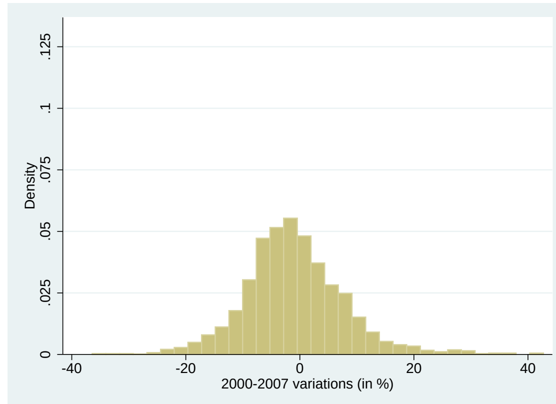
(c) *Total municipal tax revenues p.c.*

This graph shows for the whole sample (one observation per municipality per political term) a macro picture of the impact of income inequality on main variables related to municipal policy. Figure 2a (respectively Figure 2b) shows for each quintile of D9/D1 the average total operating spending per head (respectively the average net value of municipal facilities per head), while Figure 2c shows the average total fiscal product. All amounts are in 2010 euros. The horizontal axis indicates the range of D9/D1 in each quintile. For each observation (each municipality and political term), I consider values variables take during the last year of the term. *P.c.* stands for “per capita”.

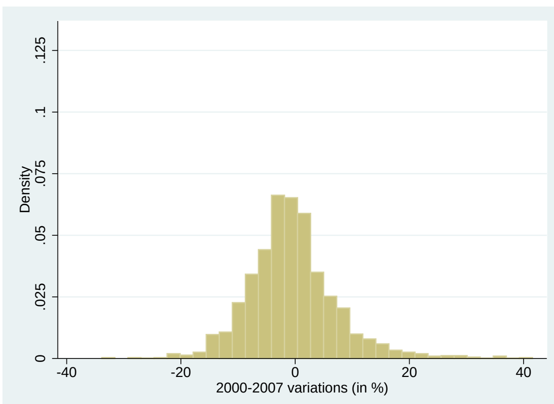
Figure 3: Distribution of relative variations in income inequality over the first political term (2000-2007) - in percentage point



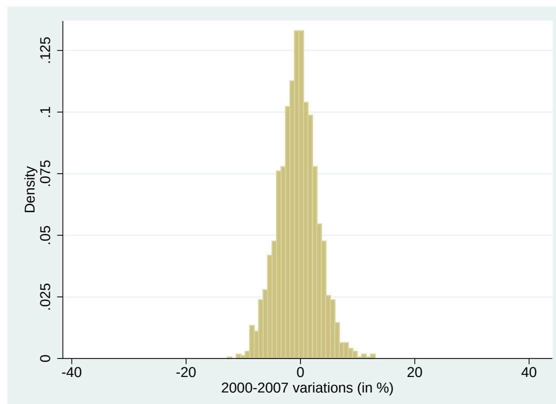
(a) *IQ/D5*



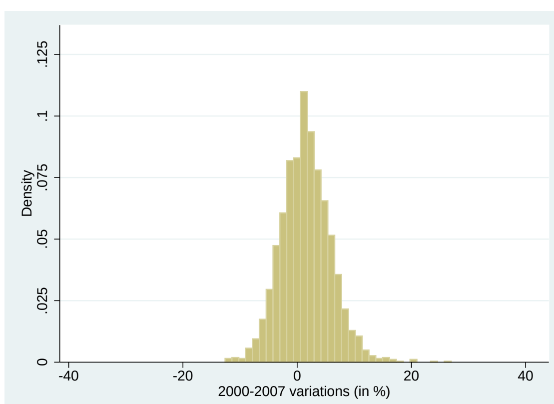
(b) *D9/D1*



(c) *D5/D1*

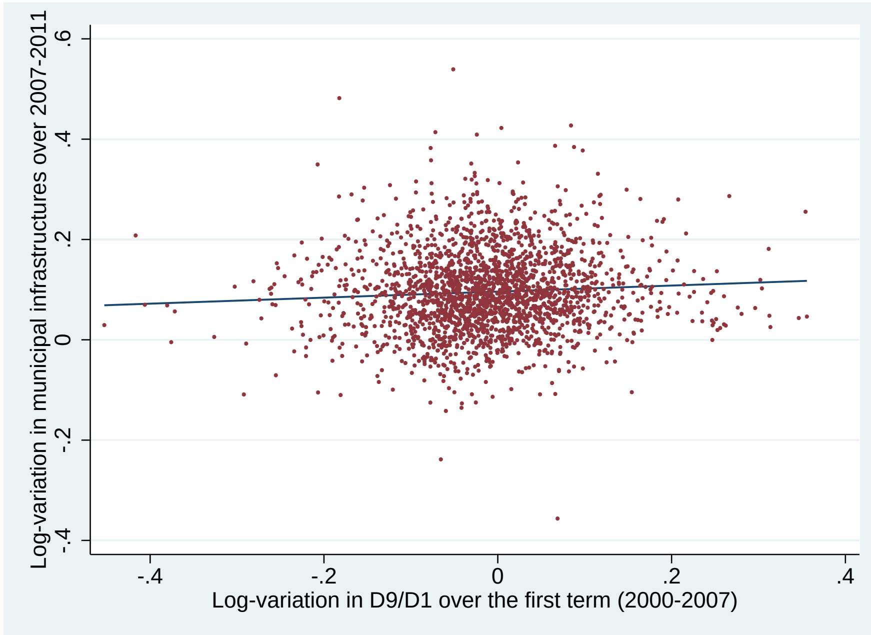


(d) *D9/D5*



(e) *Gini coefficient*

Figure 4: Variations in infrastructures according to variations in income inequality



This figure provides a scatter plot confronting the variation of the logarithm of D9/D1 over the first political term and the variation of the logarithm of the net stock of municipal infrastructures over the second political term. It also shows the fitted line from the regression of this log-variation in infrastructures on this log-variation in D9/D1. This regression corresponds to the estimation of Equation (1b) without any control.

Tables

Table 1: Total spending of the different tiers of French government in 2011 (non-consolidated[1])

	Amounts	Percentage of GDP
Central State	445.3 billion €	21.6%
Provinces (*régions*)	27.2 billion €	01.3%
Counties (*départements*)	69.6 billion €	03.4%
Inter-municipal communities (*intercommunalités*)	37.7 billion €	01.8%
Municipalities (*communes*)	94.1 billion €	04.6%

Source: DGFiP (French Ministry of Economy and Finance)
This table shows for each tier of French government, from the highest to the lowest one, statistics on the sum of total spending of all governments in this tier in 2011.
[1] These amounts are not consolidated. For instance, transfers from the State to municipalities are counted twice in these data.

Table 2: Revenues of French municipalities in 2011

Category of revenue	Amounts (in € per head)	Share in operating revenues	Share in investment revenues	Share in total revenues
	Operating section			
Local taxes[a]	**713**	**60.1%**	**.**	**48.8%**
Formula-based operating grants	300	25.3%	.	20.5%
Other operating revenues[b]	**173**	**14.6%**	**.**	**11.8%**
TOTAL operating revenues (1)	1186	100.0%	.	81.1%
	Investment section			
Surplus of the operating section[c] (2)	**203**	**.**	**42.4%**	**13.9%**
Loans	**100**	**.**	**20.9%**	**6.9%**
Formula-based investment grants	65	.	13.6%	4.4%
Discretionary investment grants	57	.	11.8%	3.9%
Assets transfers[d]	54	.	11.3%	3.7%
TOTAL investment revenues (3)	479	.	100.0%	32.8%
TOTAL municipal revenues : (1)+(3)-(2)	1462	.	.	100.0%
Used for operating spending : (1)-(2)	*983*	.	.	*67.2%*
Used for investment spending : (3)	*479*	.	.	*32.8%*

Source: DGFiP (French Ministry of Economy and Finance).
The first column of this table represents the sum of each category of investment revenue over all French municipalities in 2011, divided by the total French population of this same year.
Revenues in bold are revenues over the control of municipalities.
[a] There are four municipal taxes in France. The housing tax (HT) is paid by residents on the cadastral value of their accommodation. The property tax and built estate (PTBE) and the property tax on unbuilt estate (PTUE) are paid by owners on the cadastral value of their property. The local business tax (LBT) is paid by firms on their real estate and their production facilities. Municipalities have the control of the tax rate of each of these taxes. See Section 2 for more details.
[b] "Other operating revenues" mainly contain fees and sales.
[c] Although transferred operating surplus are classified in this table as an investment revenue over the control of municipalities, one can consider this control as partial, as some operating revenues are not controlled by municipal councils (e.g. formula-based operating grants).
[d] This item represents transfers of capital assets due to transfers of competencies.

Table 3: Descriptive statistics

	Mean	Std. dev.	Min	Max
Municipal population (in inhabitants)[a]	13763	22353	3018	346388
Share of municipal population aged 14 or less	0.19	0.03	0.09	0.29
Share of municipal population aged 60 and over	0.22	0.06	0.04	0.50
Left-wing mayor	0.46	0.50	0.00	1.00
Right-wing mayor	0.50	0.50	0.00	1.00
Independent mayor	0.04	0.20	0.00	1.00
Average pre-tax income per UC[b]	20695	4967	11276	72298
D1 - pre-tax income per UC[b]	7708	2583	2334	18430
D5 - pre-tax income per UC[b]	18245	3940	9874	44204
D9 - pre-tax income per UC[b]	34548	8400	19194	131879
IQR/D5 - pre-tax income per UC[b]	0.72	0.11	0.48	1.16
D9/D1 - pre-tax income per UC[b]	4.81	1.39	2.80	14.00
D5/D1 - pre-tax income per UC[b]	2.51	0.57	1.70	5.88
D9/D5 - pre-tax income per UC[b]	1.89	0.15	1.55	2.98
Gini - pre-tax income per UC[b]	0.33	0.04	0.23	0.54
Yearly operating spending p.c.	1037	417	341	5966
Net stock of municipal facilities p.c.	6305	2799	1796	50730
Nb. observations	4400			

These descriptive statistics come from a sample with one observation per municipality per political term (see Section 3). For each variable, I consider its value at the end of the term, except for municipal policy variables in annual flow (here operating spending), for which I consider the mean of all yearly amounts over the term. See Section 4 for more details. All monetary variables are in 2010 euros. *P.c.* stands for "per capita".

[a] The sample is made up of municipalities over 3,500 inhabitants for the whole panel period. The criteria used to do this restriction is the existence of political variables. In France, municipal electoral rules are different for municipalities over 3,500 inhabitants and those under this population threshold. Political data are reliable only for the first group of municipalities. Then, the used criterion for the restriction is the value of population used by the French administration for municipal elections. Because this value is lagged, some municipalities of the sample do not fill the condition of a population higher than 3,500 inhabitants for some years. In addition, a municipality with more than 3,500 inhabitants before an election can experience a decrease in population between two municipal elections. This is why the minimal municipal population in the sample is lower than 3,500.

[b] UC : unit of consumption. It is a measure of household size: one unit for the first adult, 0.5 unit per other individual who is 14 or more and 0.3 unit per child below 14.

Table 4: The effect of income inequality on municipal operating spending

	Dependent variable: mean of the yearly amount of operating spending per head over the political term			
	FD (1)	FD IV provinces (2)	FD IV counties (3)	FD dynamic (4)
		IQR/D5		
Lagged dependent variable				0.16***
				(0.02)
Average income	0.38***	0.44***	0.44***	0.32***
	(0.05)	(0.08)	(0.07)	(0.05)
Income inequality	0.12***	0.29*	0.29**	0.10**
	(0.04)	(0.17)	(0.13)	(0.04)
Adjusted R-squared	0.04	0.03	0.03	0.07
Nb. Obs	2200	2200	2200	2200
F-stat exclud. instruments		102.13	216.06	
		D9/D1		
Lagged dependent variable				0.16***
				(0.02)
Average income	0.36***	0.94***	0.75***	0.30***
	(0.06)	(0.18)	(0.12)	(0.06)
Income inequality	0.02	0.72***	0.50***	0.02
	(0.03)	(0.20)	(0.13)	(0.02)
Adjusted R-squared	0.03	-0.30	-0.12	0.07
Nb. Obs	2200	2200	2200	2200
F-stat exclud. instruments		43.47	81.95	
		D5/D1		
Lagged dependent variable				0.16***
				(0.02)
Average income	0.35***	1.46***	1.07***	0.29***
	(0.06)	(0.28)	(0.19)	(0.06)
Income inequality	0.01	1.40***	0.90***	0.00
	(0.03)	(0.34)	(0.23)	(0.03)
Adjusted R-squared	0.03	-0.89	-0.35	0.07
Nb. Obs	2200	2200	2200	2200
F-stat exclud. instruments		36.84	50.19	
		D9/D5		
Lagged dependent variable				0.16***
				(0.02)
Average income	0.34***	0.34***	0.34***	0.29***
	(0.05)	(0.05)	(0.05)	(0.05)
Income inequality	0.10	-0.08	0.09	0.09
	(0.06)	(0.22)	(0.17)	(0.06)
Adjusted R-squared	0.03	0.03	0.03	0.07
Nb. Obs	2200	2200	2200	2200
F-stat exclud. instruments		138.21	251.28	
		Gini		
Lagged dependent variable				0.16***
				(0.02)
Average income	0.34***	0.34***	0.33***	0.29***
	(0.05)	(0.05)	(0.05)	(0.05)
Income inequality	0.02	0.21	0.44**	0.03
	(0.05)	(0.21)	(0.17)	(0.05)
Adjusted R-squared	0.03	0.03	0.00	0.07
Nb. Obs	2200	2200	2200	2200
F-stat exclud. instruments		89.79	173.85	

* $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$. Robust standard errors in parentheses.
This table shows estimates of the impact of different measures of inequality on municipal operating spending. Column (1) shows results from Equation (1a), which is the simple first-difference equation, with no lagged dependent variable. Columns (2) and (3) estimate the same equation, by instrumenting the income inequality measure in a 2SLS setting. In Column (2) (respectively in Column (3)), the log-variation in income inequality at the municipal level is instrumented by the log-variation in income inequality at the province (respectively county) level. For each regression of these two columns, the F-statistics on the excluded instrument is shown. Column (4) presents estimates from Equation (2a), which is the first-difference equation without instrumenting, but with the inclusion of the lagged dependent variable. Coefficients represent elasticities, as variables are in logarithm.

Table 5: The effect of income inequality on municipal infrastructures

	Dependent variable: net value of the stock of municipal infrastructures per head			
	FD (1)	FD IV provinces (2)	FD IV counties (3)	FD dynamic (4)
		IQR/D5		
Lagged dependent variable				0.12***
				(0.02)
Average income	0.13***	0.20***	0.16***	0.10**
	(0.05)	(0.07)	(0.06)	(0.05)
Income inequality	0.11***	0.32**	0.22*	0.10***
	(0.03)	(0.15)	(0.12)	(0.03)
Adjusted R-squared	0.03	0.02	0.03	0.05
Nb. Obs	2200	2200	2200	2200
F-stat exclud. instruments		102.13	216.06	
		D9/D1		
Lagged dependent variable				0.12***
				(0.02)
Average income	0.15***	0.30**	0.24**	0.12**
	(0.05)	(0.13)	(0.10)	(0.05)
Income inequality	0.08***	0.25*	0.19*	0.08***
	(0.02)	(0.14)	(0.10)	(0.02)
Adjusted R-squared	0.03	0.00	0.02	0.05
Nb. Obs	2200	2200	2200	2200
F-stat exclud. instruments		43.47	81.95	
		D5/D1		
Lagged dependent variable				0.12***
				(0.02)
Average income	0.14***	0.17	0.22*	0.11**
	(0.05)	(0.16)	(0.13)	(0.05)
Income inequality	0.06**	0.10	0.17	0.06**
	(0.03)	(0.20)	(0.16)	(0.03)
Adjusted R-squared	0.03	0.03	0.02	0.05
Nb. Obs	2200	2200	2200	2200
F-stat exclud. instruments		36.84	50.19	
		D9/D5		
Lagged dependent variable				0.12***
				(0.02)
Average income	0.09**	0.10**	0.10**	0.06
	(0.05)	(0.05)	(0.05)	(0.05)
Income inequality	0.18***	0.54***	0.33**	0.18***
	(0.05)	(0.20)	(0.16)	(0.05)
Adjusted R-squared	0.03	0.01	0.03	0.05
Nb. Obs	2200	2200	2200	2200
F-stat exclud. instruments		138.21	251.28	
		Gini		
Lagged dependent variable				0.12***
				(0.02)
Average income	0.09*	0.08*	0.08*	0.06
	(0.05)	(0.05)	(0.05)	(0.05)
Income inequality	0.17***	0.55***	0.43***	0.17***
	(0.04)	(0.20)	(0.15)	(0.04)
Adjusted R-squared	0.04	-0.00	0.02	0.06
Nb. Obs	2200	2200	2200	2200
F-stat exclud. instruments		89.79	173.85	

* $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$. Robust standard errors in parentheses.

This table shows estimates of the impact of different measures of inequality on municipal infrastructures. Column (1) shows results from Equation (1b), which is the simple first-difference equation, with no lagged dependent variable. Columns (2) and (3) estimate the same equation, by instrumenting the income inequality measure in a 2SLS setting. In Column (2) (respectively in Column (3)), the log-variation in income inequality at the municipal level is instrumented by the log-variation in income inequality at the province (respectively county) level. For each regression of these two columns, the F-statistics on the excluded instrument is shown. Column (4) presents estimates from Equation (2b), which is the first-difference equation without instrumenting, but with the inclusion of the lagged dependent variable. Coefficients represent elasticities, as variables are in logarithm.

Table 6: The effect of the different deciles on municipal infrastructures

Dependent variable: net value of the stock of municipal infrastructures per head									
					Two deciles				
Lagged dependent variable	0.12***	0.12***	0.12***	0.12***	0.12***	0.11***	0.12***	0.12***	0.12***
	(0.02)	(0.02)	(0.02)	(0.02)	(0.02)	(0.02)	(0.02)	(0.02)	(0.02)
Average income	-0.04	0.24***	-0.05	0.19*	0.06	0.27***	0.29***	0.06	-0.04
	(0.09)	(0.08)	(0.10)	(0.10)	(0.10)	(0.08)	(0.07)	(0.10)	(0.10)
D1	-0.05**	-0.06**					-0.04		
	(0.02)	(0.03)					(0.03)		
D2				-0.17***		-0.17***			
				(0.04)		(0.05)			
D3					-0.16***				
					(0.06)				
D4							-0.19***	-0.19***	
							(0.07)	(0.07)	
D5		-0.10	-0.11						
		(0.08)	(0.08)						
D6						-0.02			-0.14
						(0.10)			(0.09)
D8				0.08					
				(0.11)					
D9	0.23***		0.25***		0.20**			0.21**	0.27***
	(0.08)		(0.08)		(0.08)			(0.08)	(0.08)
Adjusted R-squared	0.06	0.05	0.05	0.06	0.06	0.06	0.06	0.06	0.05
Nb. Obs	2200	2200	2200	2200	2200	2200	2200	2200	2200
AIC	-4871.19	-4864.59	-4868.72	-4873.72	-4874.58	-4873.12	-4870.14	-4874.31	-4869.28
					Three deciles				
Lagged dependent variable	0.12***	0.12***	0.12***	0.12***	0.12***	0.12***	0.12***	0.12***	0.12***
	(0.02)	(0.02)	(0.02)	(0.02)	(0.02)	(0.02)	(0.02)	(0.02)	(0.02)
Average income	0.01	0.09	0.10	0.20**	0.06	0.22**	0.19*	0.32***	0.17*
	(0.11)	(0.11)	(0.11)	(0.10)	(0.11)	(0.10)	(0.10)	(0.09)	(0.10)
D1	-0.04*	-0.03		-0.03				-0.04	
	(0.03)	(0.03)		(0.03)				(0.03)	
D2			-0.13***			-0.13*	-0.17***		
			(0.05)			(0.07)	(0.06)		
D3					-0.15**				-0.24***
					(0.07)				(0.09)
D4		-0.16**		-0.21***		-0.10		-0.17**	
		(0.07)		(0.08)		(0.10)		(0.08)	
D5	-0.07						0.01		0.06
	(0.08)						(0.11)		(0.13)
D6			-0.04		-0.01				
			(0.10)		(0.11)				
D7								-0.06	
								(0.11)	
D8				0.12		0.10	0.08		0.09
				(0.11)		(0.11)	(0.12)		(0.12)
D9	0.22***	0.19**	0.18**		0.20**				
	(0.08)	(0.08)	(0.09)		(0.08)				
Adjusted R-squared	0.06	0.06	0.06	0.06	0.06	0.06	0.06	0.05	0.05
Nb. Obs	2200	2200	2200	2200	2200	2200	2200	2200	2200
AIC	-4869.87	-4873.57	-4875.71	-4869.64	-4872.59	-4873.00	-4871.72	-4868.47	-4868.41

* $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$. Robust standard errors in parentheses.

This table shows results from Equation (2b), which is the first-difference equation with the inclusion of the lagged dependent variable. This table is divided in two parts: the first one shows regressions where two deciles are simultaneously included as regressors while the second one shows results where three deciles are included. In each of these parts, each column represents a different regression with a different set of deciles. Coefficients represent elasticities, as variables are in logarithm. The table shows for each regression the Akaike Information Criterion (AIC).

Table 7: The effect of D9/D1 on municipal investment revenues

	Dependent variable: net value of the stock of municipal investment revenues per head		
	Uncontrolled investment revenues (1)	Loans (2)	Transferred operating surplus (3)
Lagged dependent variable	0.14***	0.08**	0.32***
	(0.02)	(0.03)	(0.02)
Average income	-0.08	0.46	0.15***
	(0.06)	(0.30)	(0.05)
D9/D1	-0.01	0.18	0.11***
	(0.03)	(0.12)	(0.02)
Adjusted R-squared	0.08	0.01	0.23
Nb. Obs	2200	2200	2200

* $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$. Robust standard errors in parentheses.

This table shows estimations of the impact of D9/D1 on the different categories of investment revenues, as defined in Table 2. *Uncontrolled investment revenues* cover formula-based investment grants, discretionary investment grants, and assets transfers. Results in this table come the estimation of Equation (2b), which is the first-difference equation with the inclusion of the lagged dependent variable. Coefficients represent elasticities, as variables are in logarithm. Results using alternative measures of income inequality are presented in Appendix, in Table A2.

Table 8: The effect of D9/D1 on components of the operating surplus

	Dependent variable: cumulated amount per head of the component over the political term								
	Spending and revenues		*Categories of revenue*			*Tax products*			
	Operating spending (1)	Operating revenues (2)	Formula-based revenues (3)	Fiscal products (4)	Other operating revenues (5)	HT product (6)	PTBE product (7)	PTUE product (8)	LBT product (9)
Lagged dependent variable	0.04***	-0.03***	0.03**	-0.09***	-0.06	-0.08***	-0.06***	-0.04*	-0.52
	(0.01)	(0.01)	(0.01)	(0.01)	(0.04)	(0.01)	(0.01)	(0.02)	(0.50)
Average income	0.36***	0.35***	0.13*	0.69***	0.32	0.53***	0.49***	-0.15	1.27
	(0.06)	(0.05)	(0.07)	(0.07)	(0.21)	(0.04)	(0.04)	(0.11)	(1.16)
D9/D1	0.03	0.05**	0.01	0.13***	-0.10	0.02	0.05**	0.12**	1.02*
	(0.03)	(0.02)	(0.03)	(0.03)	(0.09)	(0.02)	(0.02)	(0.05)	(0.56)
Adjusted R-squared	0.04	0.05	0.16	0.17	0.01	0.15	0.10	0.12	-0.01
Nb. Obs	2200	2200	2200	2200	2200	2200	2200	2200	435

* $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$. Robust standard errors in parentheses.
This table shows estimations of the impact of D9/D1 on each category of the operating surplus of municipalities. Since the aim is to investigate the operating section from the specification in stocks, these results come from the estimation of Equation (4). Columns (1) and (2) take as the dependent variable operating expenditures and operating revenues respectively. Columns (3) to (5) show results on the impact of D9/D1 on each category of operating revenues, as defined in Section 2. Finally, columns (6) to (9) present estimates on the impact of D9/D1 on the product of each of the four municipal taxes described in Section 2. Coefficients represent elasticities, as variables are in logarithm. Results using alternative measures of income inequality are presented in Appendix, in Table A4.
HT, *PTBE*, *PTUE* and *LBT* respectively stand for "housing tax", "property tax on built estate", "property tax on unbuilt estate" and "local business tax".
The main part of municipalities of the sample has transferred the competency of the LBT to their inter-municipal community. This explains the lower number of observations for regressions related to this tax. See Section 5 for more details.

Table 9: The effect of D9/D1 on tax bases and tax rates

	Dependent variable: sum of the tax base per head or the tax rate over the political term							
	HT		*PTBE*		*PTUE*		*LBT*	
	Tax base	Tax rate	Tax base	Tax rate	Tax base	Tax rate	Tax base	Tax rate
Lagged dependent variable	-0.01**	-0.06***	0.01*	-0.07***	0.02	-0.05***	-0.35	-0.07***
	(0.00)	(0.01)	(0.01)	(0.01)	(0.02)	(0.01)	(0.37)	(0.02)
Average income	0.30***	0.21***	0.25***	0.22***	-0.32***	0.15***	0.97	0.20**
	(0.02)	(0.03)	(0.03)	(0.03)	(0.09)	(0.03)	(0.86)	(0.08)
D9/D1	-0.03***	0.04***	-0.00	0.04***	0.05	0.06***	0.71*	0.08**
	(0.01)	(0.01)	(0.02)	(0.02)	(0.04)	(0.01)	(0.42)	(0.03)
Adjusted R-squared	0.16	0.09	0.06	0.09	0.18	0.06	-0.01	0.08
Nb. Obs	2200	2200	2200	2200	2200	2200	435	435

* $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$. Robust standard errors in parentheses.

This table shows estimations of the impact of D9/D1 on the tax base and the tax rate of each of the four municipal taxes described in Section 2. Since the aim is to investigate operating revenues from the specification in stocks, these results come from the estimation of Equation (4). Coefficients represent elasticities, as variables are in logarithm. Results using alternative measures of income inequality are presented in Appendix, in Table A5.

HT, *PTBE*, *PTUE* and *LBT* respectively stand for "housing tax", "property tax on built estate", "property tax on unbuilt estate" and "local business tax".

The main part of municipalities of the sample has transferred the competency of the LBT to their inter-municipal community. This explains the lower number of observations for regressions related to this tax. See Section 5 for more details.

Table 10: The effect of the different deciles on tax rates

	Dependent variable: sum of the tax rate over the political term								
					PTBE rate				
D1	-0.03	-0.04*					-0.02		
	(0.02)	(0.02)					(0.02)		
D2				-0.10***		-0.12***			
				(0.03)		(0.03)			
D3					-0.12***				
					(0.04)				
D4							-0.14**	-0.13***	
							(0.06)	(0.05)	
D5		-0.05	-0.05						
		(0.06)	(0.06)						
D6						0.11			0.02
						(0.07)			(0.07)
D8				0.17**					
				(0.08)					
D9	0.14**		0.16***		0.11*			0.12**	0.17***
	(0.06)		(0.06)		(0.06)			(0.06)	(0.06)
AIC	-6400.89	-6395.46	-6398.87	-6408.56	-6407.45	-6404.89	-6401.73	-6405.00	-6398.08
					PTUE rate				
D1	-0.06***	-0.06***					-0.05**		
	(0.02)	(0.02)					(0.02)		
D2				-0.12***		-0.13***			
				(0.03)		(0.03)			
D3					-0.13***				
					(0.04)				
D4							-0.12**	-0.15***	
							(0.05)	(0.05)	
D5		-0.08	-0.12**						
		(0.06)	(0.06)						
D6						0.02			-0.08
						(0.07)			(0.06)
D8				0.07					
				(0.07)					
D9	0.09		0.11**		0.07			0.08	0.13**
	(0.06)		(0.06)		(0.06)			(0.06)	(0.05)
AIC	-6624.88	-6624.59	-6617.67	-6628.75	-6624.30	-6627.75	-6628.44	-6624.02	-6614.53
					LBT rate				
D1	-0.07	-0.06*					-0.05		
	(0.04)	(0.04)					(0.04)		
D2				-0.20***		-0.22***			
				(0.07)		(0.07)			
D3					-0.20*				
					(0.11)				
D4							-0.20	-0.23*	
							(0.13)	(0.13)	
D5		-0.19	-0.22						
		(0.15)	(0.15)						
D6						0.13			-0.06
						(0.15)			(0.15)
D8				0.25					
				(0.15)					
D9	0.16		0.18		0.11			0.15	0.23**
	(0.11)		(0.11)		(0.12)			(0.12)	(0.11)
AIC	-1256.33	-1256.99	-1255.95	-1264.49	-1259.09	-1262.67	-1258.17	-1257.84	-1252.71

* $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$. Robust standard errors in parentheses.
This table shows results on the impact of different sets of deciles on the different tax rates, where two deciles are included in the same regression. It focuses on tax rates of the three taxes for which a positive impact of inequality on the rate is observed without a negative impact on the tax base (see Table 8). For each tax rate, each column is related to a different regression. Since the aim is to investigate operating revenues from the specification in stocks, these results come from the estimation of Equation (4). Coefficients represent elasticities, as variables are in logarithm. The table shows for each regression the Akaike Information Criterion (AIC). Tables A6, A7 and A8 in Appendix provide results for each of these tax rates where two and three deciles are simultaneously included, taking the same sets of deciles as in Table 6.
PTBE, *PTUE* and *LBT* respectively stand for "property tax on built estate", "property tax on unbuilt estate" and "local business tax".
Regressions related to the PTBE rate and the PTUE rate rely on 2,200 observations, while the sample for regressions explaining the LBT rate is made up of 435 observations. The main part of municipalities of the sample has transferred the competency of the LBT to their inter-municipal community. This explains the lower number of observations for regressions related to this tax. See Section 5 for more details.

Appendix

Table A1: The effect of the different deciles on municipal operating spending

	Dependent variable: mean of the yearly amount of operating spending per head over the political term								
					Two deciles				
D1	-0.00	-0.00					-0.00		
	(0.03)	(0.03)					(0.03)		
D2				-0.07		-0.10**			
				(0.05)		(0.05)			
D3					-0.10				
					(0.07)				
D4							-0.05	-0.02	
							(0.09)	(0.09)	
D5		-0.08	-0.06						
		(0.11)	(0.10)						
D6						0.12			0.05
						(0.12)			(0.11)
D8				0.23*					
				(0.13)					
D9	0.14		0.12		0.08			0.13	0.14
	(0.11)		(0.10)		(0.11)			(0.11)	(0.10)
Adjusted R-squared	0.07	0.07	0.07	0.07	0.07	0.07	0.07	0.07	0.07
Nb. Obs	2200	2200	2200	2200	2200	2200	2200	2200	2200
AIC	-4067.18	-4065.91	-4067.54	-4071.46	-4069.53	-4068.87	-4065.59	-4067.26	-4067.36
					Three deciles				
D1	0.01	0.00		0.01				0.00	
	(0.03)	(0.03)		(0.03)				(0.03)	
D2			-0.08			-0.09	-0.05		
			(0.05)			(0.07)	(0.06)		
D3					-0.17**				-0.13
					(0.08)				(0.09)
D4		-0.03		-0.08		0.03		-0.08	
		(0.10)		(0.09)		(0.12)		(0.10)	
D5	-0.06						-0.08		0.00
	(0.11)						(0.13)		(0.14)
D6			0.11		0.19				
			(0.12)		(0.12)				
D7								0.09	
								(0.13)	
D8				0.26**		0.22*	0.26*		0.24*
				(0.13)		(0.13)	(0.13)		(0.13)
D9	0.13	0.13	0.09		0.07				
	(0.11)	(0.11)	(0.11)		(0.11)				
Adjusted R-squared	0.07	0.07	0.07	0.07	0.07	0.07	0.07	0.06	0.07
Nb. Obs	2200	2200	2200	2200	2200	2200	2200	2200	2200
AIC	-4065.57	-4065.27	-4067.61	-4067.96	-4069.67	-4069.53	-4069.87	-4064.08	-4070.87

* $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$. Robust standard errors in parentheses.

This table shows results from Equation (2a), which is the first-difference equation with the inclusion of the lagged dependent variable. This table is divided in two parts: the first one shows regressions where two deciles are simultaneously included as regressors while the second one shows results where three deciles are included. In each of these parts, each column represents a different regression with a different set of deciles. Coefficients represent elasticities, as variables are in logarithm. The table shows for each regression the Akaike Information Criterion (AIC).

Table A2: The effect of income inequality on municipal investment revenues

	Dependent variable: net value of the stock of municipal investment revenues per head		
	Uncontrolled investment revenues (1)	Loans (2)	Transferred operating surplus (3)
		IQR/D5	
Lagged dependent variable	0.14***	0.08**	0.32***
	(0.02)	(0.03)	(0.02)
Average income	-0.06	0.34	0.10**
	(0.06)	(0.29)	(0.05)
IQR/D5	0.04	0.09	0.12***
	(0.04)	(0.20)	(0.04)
Adjusted R-squared	0.08	0.01	0.23
Nb. Obs	2200	2200	2200
		D5/D1	
Lagged dependent variable	0.14***	0.08**	0.32***
	(0.02)	(0.03)	(0.02)
Average income	-0.09	0.52	0.15***
	(0.07)	(0.32)	(0.06)
D5/D1	-0.03	0.26*	0.11***
	(0.03)	(0.14)	(0.03)
Adjusted R-squared	0.08	0.01	0.23
Nb. Obs	2200	2200	2200
		D9/D5	
Lagged dependent variable	0.14***	0.08**	0.32***
	(0.02)	(0.03)	(0.02)
Average income	-0.07	0.31	0.06
	(0.06)	(0.28)	(0.05)
D9/D5	0.07	-0.02	0.21***
	(0.07)	(0.30)	(0.06)
Adjusted R-squared	0.08	0.01	0.23
Nb. Obs	2200	2200	2200
		Gini	
Lagged dependent variable	0.14***	0.08**	0.32***
	(0.02)	(0.03)	(0.02)
Average income	-0.07	0.31	0.06
	(0.06)	(0.28)	(0.05)
Gini	0.07	0.23	0.21***
	(0.05)	(0.24)	(0.05)
Adjusted R-squared	0.08	0.01	0.23
Nb. Obs	2200	2200	2200

* $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$. Robust standard errors in parentheses.

This table presents the same estimations as Table 7 with alternative measures of income inequality. It shows estimations of the impact of income inequality on the different categories of investment revenues, as defined in Table 2. *Uncontrolled investment revenues* cover formula-based investment grants, discretionary investment grants, and assets transfers. Results in this table come the estimation of Equation (2b), which is the first-difference equation with the inclusion of the lagged dependent variable. Coefficients represent elasticities, as variables are in logarithm.

Table A3: The effect of the different deciles on transferred operating surplus

	Dependent variable: net value of the stock of municipal transferred operating surplus per head								
	Two deciles								
Lagged dependent variable	0.32***	0.32***	0.32***	0.32***	0.32***	0.32***	0.32***	0.32***	0.32***
	(0.02)	(0.02)	(0.02)	(0.02)	(0.02)	(0.02)	(0.02)	(0.02)	(0.02)
Average income	0.08	0.32***	0.01	0.26**	0.05	0.30***	0.36***	0.11	-0.03
	(0.10)	(0.09)	(0.12)	(0.11)	(0.11)	(0.09)	(0.08)	(0.12)	(0.12)
D1	-0.10***	-0.11***					-0.09***		
	(0.03)	(0.03)					(0.03)		
D2				-0.21***		-0.21***			
				(0.04)		(0.05)			
D3					-0.16**				
					(0.06)				
D4							-0.18**	-0.24***	
							(0.08)	(0.08)	
D5		-0.11	-0.17*						
		(0.10)	(0.09)						
D6						-0.01			-0.16
						(0.12)			(0.11)
D8				0.04					
				(0.12)					
D9	0.19**		0.24***		0.20**			0.19**	0.27***
	(0.09)		(0.09)		(0.09)			(0.09)	(0.09)
Adjusted R-squared	0.23	0.23	0.23	0.23	0.23	0.23	0.23	0.23	0.23
Nb. Obs	2200	2200	2200	2200	2200	2200	2200	2200	2200
AIC	-4365.90	-4363.06	-4355.33	-4363.77	-4357.83	-4363.62	-4366.41	-4361.23	-4354.14
	Three deciles								
Lagged dependent variable	0.32***	0.32***	0.32***	0.32***	0.32***	0.32***	0.32***	0.32***	0.32***
	(0.02)	(0.02)	(0.02)	(0.02)	(0.02)	(0.02)	(0.02)	(0.02)	(0.02)
Average income	0.14	0.20	0.15	0.31***	0.07	0.29**	0.26**	0.38***	0.20*
	(0.13)	(0.12)	(0.13)	(0.11)	(0.13)	(0.11)	(0.11)	(0.10)	(0.11)
D1	-0.10***	-0.08***		-0.09***				-0.09***	
	(0.03)	(0.03)		(0.03)				(0.03)	
D2			-0.18***			-0.17**	-0.21***		
			(0.05)			(0.07)	(0.06)		
D3					-0.15**				-0.18**
					(0.07)				(0.09)
D4		-0.15*		-0.18**		-0.10		-0.16*	
		(0.09)		(0.09)		(0.11)		(0.10)	
D5	-0.08						-0.01		-0.06
	(0.10)						(0.12)		(0.14)
D6			-0.02		-0.03				
			(0.12)		(0.13)				
D7								-0.05	
								(0.13)	
D8				0.06		0.07	0.05		0.10
				(0.12)		(0.12)	(0.13)		(0.13)
D9	0.17*	0.15	0.15		0.20**				
	(0.09)	(0.09)	(0.09)		(0.09)				
Adjusted R-squared	0.23	0.23	0.23	0.23	0.23	0.23	0.23	0.23	0.23
Nb. Obs	2200	2200	2200	2200	2200	2200	2200	2200	2200
AIC	-4364.65	-4367.01	-4364.21	-4364.72	-4355.92	-4362.77	-4361.77	-4364.57	-4351.89

* $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$. Robust standard errors in parentheses.
This table shows results from Equation (2b), which is the first-difference equation with the inclusion of the lagged dependent variable. This table is divided in two parts: the first one shows regressions where two deciles are simultaneously included as regressors while the second one shows results where three deciles are included. In each of these parts, each column represents a different regression with a different set of deciles. Coefficients represent elasticities, as variables are in logarithm. The table shows for each regression the Akaike Information Criterion (AIC).

Table A4: The effect of income inequality on components of the operating surplus

	Dependent variable: cumulated amount per head of the component over the political term								
	Spending and revenues		*Categories of revenue*			*Tax products*			
	Operating spending (1)	Operating revenues (2)	Formula-based revenues (3)	Fiscal products (4)	Other operating revenues (5)	HT product (6)	PTBE product (7)	PTUE product (8)	LBT product (9)
			IQR/D5						
Lagged dependent variable	0.04***	-0.03***	0.03**	-0.09***	-0.06	-0.08***	-0.06***	-0.04*	-0.62
	(0.01)	(0.01)	(0.01)	(0.01)	(0.04)	(0.01)	(0.01)	(0.02)	(0.49)
Average income	0.38***	0.35***	0.14**	0.63***	0.44**	0.51***	0.46***	-0.19*	1.72
	(0.05)	(0.04)	(0.06)	(0.06)	(0.20)	(0.04)	(0.04)	(0.11)	(1.25)
IQR/D5	0.12***	0.14***	0.07	0.16***	0.12	-0.02	0.03	0.17**	4.06**
	(0.04)	(0.03)	(0.05)	(0.06)	(0.15)	(0.03)	(0.03)	(0.07)	(1.57)
Adjusted R-squared	0.04	0.05	0.16	0.16	0.01	0.15	0.10	0.12	0.01
Nb. Obs	2200	2200	2200	2200	2200	2200	2200	2200	435
			D5/D1						
Lagged dependent variable	0.04***	-0.03***	0.03**	-0.09***	-0.06	-0.08***	-0.06***	-0.04*	-0.52
	(0.01)	(0.01)	(0.01)	(0.01)	(0.04)	(0.01)	(0.01)	(0.02)	(0.50)
Average income	0.35***	0.33***	0.14**	0.68***	0.25	0.56***	0.50***	-0.18	1.11
	(0.06)	(0.05)	(0.07)	(0.07)	(0.21)	(0.04)	(0.04)	(0.12)	(1.16)
D5/D1	0.01	0.04	0.03	0.13***	-0.18*	0.06***	0.06***	0.08	0.76
	(0.03)	(0.03)	(0.04)	(0.04)	(0.11)	(0.02)	(0.02)	(0.06)	(0.62)
Adjusted R-squared	0.04	0.05	0.16	0.16	0.01	0.15	0.10	0.12	-0.01
Nb. Obs	2200	2200	2200	2200	2200	2200	2200	2200	435
			D9/D5						
Lagged dependent variable	0.04***	-0.03***	0.03**	-0.09***	-0.06	-0.08***	-0.06***	-0.04*	-0.56
	(0.01)	(0.01)	(0.01)	(0.01)	(0.04)	(0.01)	(0.01)	(0.02)	(0.49)
Average income	0.34***	0.31***	0.12*	0.58***	0.40**	0.51***	0.45***	-0.24**	0.38
	(0.05)	(0.04)	(0.06)	(0.06)	(0.19)	(0.03)	(0.04)	(0.10)	(1.17)
D9/D5	0.09	0.16***	-0.05	0.24***	0.18	-0.13***	0.01	0.35***	2.91
	(0.06)	(0.05)	(0.07)	(0.08)	(0.22)	(0.04)	(0.05)	(0.11)	(1.81)
Adjusted R-squared	0.04	0.05	0.16	0.16	0.01	0.15	0.10	0.13	-0.01
Nb. Obs	2200	2200	2200	2200	2200	2200	2200	2200	435
			Gini						
Lagged dependent variable	0.04***	-0.03***	0.03**	-0.09***	-0.06	-0.08***	-0.06***	-0.04*	-0.57
	(0.01)	(0.01)	(0.01)	(0.01)	(0.04)	(0.01)	(0.01)	(0.02)	(0.49)
Average income	0.34***	0.30***	0.12*	0.58***	0.40**	0.52***	0.45***	-0.25**	0.20
	(0.05)	(0.04)	(0.06)	(0.06)	(0.19)	(0.03)	(0.04)	(0.10)	(1.19)
Gini	0.02	0.10**	0.04	0.16***	-0.10	-0.09***	-0.02	0.26***	2.68**
	(0.05)	(0.04)	(0.06)	(0.06)	(0.17)	(0.03)	(0.04)	(0.09)	(1.35)
Adjusted R-squared	0.04	0.05	0.16	0.16	0.01	0.15	0.10	0.12	-0.01
Nb. Obs	2200	2200	2200	2200	2200	2200	2200	2200	435

* $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$. Robust standard errors in parentheses.
This table presents the same estimations as Table 8 with alternative measures of income inequality. It shows results of the impact of income inequality on each category of the operating surplus of municipalities. Since the aim is to investigate the operating section from the specification in stocks, these results come from the estimation of Equation (4). Columns (1) and (2) take as the dependent variable operating expenditures and operating revenues respectively. Columns (3) to (5) show results on the impact of income inequality on each category of operating revenues, as defined in Section 2. Finally, columns (6) to (9) present estimates on the impact of inequality on the product of each of the four municipal taxes described in Section 2. Coefficients represent elasticities, as variables are in logarithm.
HT, *PTBE*, *PTUE* and *LBT* respectively stand for "housing tax", "property tax on built estate", "property tax on unbuilt estate" and "local business tax".
The main part of municipalities of the sample has transferred the competency of the LBT to their inter-municipal community. This explains the lower number of observations for regressions related to this tax. See Section 5 for more details.

Table A5: The effect of income inequality on tax bases and tax rates

	Dependent variable: sum of the tax base per head or the tax rate over the political term							
	HT Tax base	Tax rate	*PTBE* Tax base	Tax rate	*PTUE* Tax base	Tax rate	*LBT* Tax base	Tax rate
				IQR/D5				
Lagged dependent variable	-0.01**	-0.06***	0.01*	-0.07***	0.02	-0.05***	-0.43	-0.07***
	(0.00)	(0.01)	(0.01)	(0.01)	(0.02)	(0.01)	(0.37)	(0.02)
Average income	0.30***	0.20***	0.23***	0.22***	-0.32***	0.13***	1.29	0.20**
	(0.02)	(0.03)	(0.03)	(0.03)	(0.08)	(0.03)	(0.93)	(0.08)
IQR/D5	-0.09***	0.06**	-0.07***	0.09***	0.13**	0.07***	2.87**	0.18***
	(0.02)	(0.02)	(0.02)	(0.02)	(0.06)	(0.02)	(1.15)	(0.06)
Adjusted R-squared	0.17	0.09	0.07	0.10	0.18	0.06	0.01	0.10
Nb. Obs	2200	2200	2200	2200	2200	2200	435	435
				D5/D1				
Lagged dependent variable	-0.01**	-0.06***	0.01*	-0.07***	0.02	-0.05***	-0.35	-0.07***
	(0.00)	(0.01)	(0.01)	(0.01)	(0.02)	(0.01)	(0.37)	(0.02)
Average income	0.34***	0.21***	0.27***	0.21***	-0.36***	0.15***	0.84	0.20**
	(0.02)	(0.03)	(0.03)	(0.03)	(0.09)	(0.03)	(0.86)	(0.09)
D5/D1	0.01	0.04**	0.02	0.04*	0.01	0.06***	0.53	0.07*
	(0.01)	(0.02)	(0.02)	(0.02)	(0.04)	(0.02)	(0.47)	(0.04)
Adjusted R-squared	0.15	0.09	0.06	0.09	0.18	0.06	-0.01	0.08
Nb. Obs	2200	2200	2200	2200	2200	2200	435	435
				D9/D5				
Lagged dependent variable	-0.01**	-0.06***	0.01*	-0.07***	0.02	-0.05***	-0.38	-0.07***
	(0.00)	(0.01)	(0.01)	(0.01)	(0.02)	(0.01)	(0.37)	(0.02)
Average income	0.32***	0.18***	0.25***	0.19***	-0.36***	0.11***	0.34	0.14*
	(0.02)	(0.03)	(0.03)	(0.03)	(0.08)	(0.03)	(0.86)	(0.07)
D9/D5	-0.21***	0.08**	-0.11***	0.10***	0.28***	0.12***	2.08	0.20**
	(0.02)	(0.04)	(0.03)	(0.04)	(0.09)	(0.04)	(1.32)	(0.08)
Adjusted R-squared	0.19	0.09	0.07	0.09	0.19	0.06	-0.01	0.08
Nb. Obs	2200	2200	2200	2200	2200	2200	435	435
				Gini				
Lagged dependent variable	-0.01**	-0.06***	0.01*	-0.07***	0.02	-0.05***	-0.39	-0.07***
	(0.00)	(0.01)	(0.01)	(0.01)	(0.02)	(0.01)	(0.37)	(0.02)
Average income	0.33***	0.18***	0.25***	0.18***	-0.37***	0.10***	0.21	0.13*
	(0.02)	(0.03)	(0.03)	(0.03)	(0.08)	(0.03)	(0.88)	(0.08)
Gini	-0.15***	0.05*	-0.09***	0.06**	0.18***	0.09***	1.91*	0.14**
	(0.02)	(0.03)	(0.03)	(0.03)	(0.07)	(0.03)	(0.99)	(0.07)
Adjusted R-squared	0.18	0.09	0.07	0.09	0.18	0.06	-0.01	0.08
Nb. Obs	2200	2200	2200	2200	2200	2200	435	435

* $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$. Robust standard errors in parentheses.
This table presents the same estimations as Table 9 with alternative measures of income inequality. It shows estimations of the impact of income inequality on the tax base and the tax rate of each of the four municipal taxes described in Section 2. Since the aim is to investigate operating revenues from the specification in stocks, these results come from the estimation of Equation (4). Coefficients represent elasticities, as variables are in logarithm.
HT, *PTBE*, *PTUE* and *LBT* respectively stand for "housing tax", "property tax on built estate", "property tax on unbuilt estate" and "local business tax".
The main part of municipalities of the sample has transferred the competency of the LBT to their inter-municipal community. This explains the lower number of observations for regressions related to this tax. See Section 5 for more details.

Table A6: The effect of the different deciles on the PTBE rate

	Dependent variable: sum of the PTBE rate over the political term								
					Two deciles				
Lagged dependent variable	-0.07***	-0.07***	-0.07***	-0.07***	-0.07***	-0.07***	-0.07***	-0.07***	-0.07***
	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)
Average income	0.12*	0.28***	0.11	0.17**	0.22***	0.24***	0.33***	0.20***	0.04
	(0.07)	(0.06)	(0.08)	(0.07)	(0.07)	(0.06)	(0.05)	(0.08)	(0.08)
D1	-0.03	-0.04*					-0.02		
	(0.02)	(0.02)					(0.02)		
D2				-0.10***		-0.12***			
				(0.03)		(0.03)			
D3					-0.12***				
					(0.04)				
D4							-0.14**	-0.13***	
							(0.06)	(0.05)	
D5		-0.05	-0.05						
		(0.06)	(0.06)						
D6						0.11			0.02
						(0.07)			(0.07)
D8				0.17**					
				(0.08)					
D9	0.14**		0.16***		0.11*			0.12**	0.17***
	(0.06)		(0.06)		(0.06)			(0.06)	(0.06)
Adjusted R-squared	0.10	0.09	0.09	0.10	0.10	0.10	0.10	0.10	0.09
Nb. Obs	2200	2200	2200	2200	2200	2200	2200	2200	2200
AIC	-6400.89	-6395.46	-6398.87	-6408.56	-6407.45	-6404.89	-6401.73	-6405.00	-6398.08
					Three deciles				
Lagged dependent variable	-0.07***	-0.07***	-0.07***	-0.07***	-0.07***	-0.07***	-0.07***	-0.07***	-0.07***
	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)
Average income	0.14*	0.21***	0.14*	0.19***	0.16**	0.20***	0.17**	0.26***	0.18**
	(0.08)	(0.08)	(0.08)	(0.07)	(0.08)	(0.07)	(0.07)	(0.07)	(0.07)
D1	-0.03	-0.01		-0.01				-0.01	
	(0.02)	(0.02)		(0.02)				(0.02)	
D2			-0.10***			-0.05	-0.10***		
			(0.03)			(0.04)	(0.04)		
D3					-0.18***				-0.19***
					(0.05)				(0.06)
D4		-0.11**		-0.16***		-0.11		-0.19***	
		(0.06)		(0.06)		(0.07)		(0.06)	
D5	-0.03						-0.02		0.08
	(0.06)						(0.08)		(0.09)
D6			0.10		0.17**				
			(0.07)		(0.08)				
D7								0.15*	
								(0.08)	
D8				0.21***		0.20**	0.18**		0.17**
				(0.08)		(0.08)	(0.08)		(0.08)
D9	0.14**	0.11*	0.10*		0.09				
	(0.06)	(0.06)	(0.06)		(0.06)				
Adjusted R-squared	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10
Nb. Obs	2200	2200	2200	2200	2200	2200	2200	2200	2200
AIC	-6399.11	-6403.53	-6405.97	-6408.21	-6410.62	-6409.57	-6406.63	-6403.53	-6410.37

* $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$. Robust standard errors in parentheses.
PTBE stands for "property tax on built estate".
This table shows results on the impact of different sets of deciles on the PTBE rate. Since the aim is to investigate this operating component from the specification in stocks, these results come from the estimation of Equation (4). This table is divided in two parts: the first one shows regressions where two deciles are simultaneously included as regressors while the second one shows results where three deciles are included. In each of these parts, each column represents a different regression with a different set of deciles. Coefficients represent elasticities, as variables are in logarithm. The table shows for each regression the Akaike Information Criterion (AIC).

Table A7: The effect of the different deciles on the PTUE rate

	Dependent variable: sum of the PTUE rate over the political term								
					Two deciles				
Lagged dependent variable	-0.05***	-0.05***	-0.05***	-0.05***	-0.05***	-0.05***	-0.05***	-0.05***	-0.05***
	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)
Average income	0.13**	0.26***	0.11	0.19***	0.17**	0.24***	0.28***	0.17**	0.06
	(0.06)	(0.05)	(0.07)	(0.06)	(0.07)	(0.06)	(0.05)	(0.07)	(0.07)
D1	-0.06***	-0.06***					-0.05**		
	(0.02)	(0.02)					(0.02)		
D2				-0.12***		-0.13***			
				(0.03)		(0.03)			
D3					-0.13***				
					(0.04)				
D4							-0.12**	-0.15***	
							(0.05)	(0.05)	
D5		-0.08	-0.12**						
		(0.06)	(0.06)						
D6						0.02			-0.08
						(0.07)			(0.06)
D8				0.07					
				(0.07)					
D9	0.09		0.11**		0.07			0.08	0.13**
	(0.06)		(0.06)		(0.06)			(0.06)	(0.05)
Adjusted R-squared	0.06	0.06	0.06	0.07	0.06	0.07	0.07	0.06	0.06
Nb. Obs	2200	2200	2200	2200	2200	2200	2200	2200	2200
AIC	-6624.88	-6624.59	-6617.67	-6628.75	-6624.30	-6627.75	-6628.44	-6624.02	-6614.53
					Three deciles				
Lagged dependent variable	-0.05***	-0.05***	-0.05***	-0.05***	-0.05***	-0.05***	-0.05***	-0.05***	-0.05***
	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)
Average income	0.18**	0.22***	0.18**	0.22***	0.16**	0.21***	0.20***	0.29***	0.18***
	(0.07)	(0.07)	(0.08)	(0.06)	(0.08)	(0.06)	(0.07)	(0.06)	(0.07)
D1	-0.05***	-0.04**		-0.04**				-0.05**	
	(0.02)	(0.02)		(0.02)				(0.02)	
D2			-0.12***			-0.09**	-0.11***		
			(0.03)			(0.04)	(0.04)		
D3					-0.14***				-0.14**
					(0.04)				(0.05)
D4		-0.11**		-0.13**		-0.08		-0.11*	
		(0.05)		(0.05)		(0.07)		(0.06)	
D5	-0.07						-0.04		-0.02
	(0.06)						(0.08)		(0.09)
D6			0.01		0.04				
			(0.07)		(0.07)				
D7								-0.02	
								(0.08)	
D8				0.09		0.09	0.08		0.09
				(0.07)		(0.07)	(0.07)		(0.07)
D9	0.08	0.06	0.06		0.07				
	(0.06)	(0.06)	(0.06)		(0.06)				
Adjusted R-squared	0.06	0.07	0.07	0.07	0.06	0.07	0.07	0.07	0.06
Nb. Obs	2200	2200	2200	2200	2200	2200	2200	2200	2200
AIC	-6624.51	-6627.61	-6626.77	-6628.15	-6622.61	-6628.37	-6627.04	-6626.49	-6622.40

* $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$. Robust standard errors in parentheses.
PTUE stands for "property tax on unbuilt estate".
This table shows results on the impact of different sets of deciles on the PTUE rate. Since the aim is to investigate this operating component from the specification in stocks, these results come from the estimation of Equation (4). This table is divided in two parts: the first one shows regressions where two deciles are simultaneously included as regressors while the second one shows results where three deciles are included. In each of these parts, each column represents a different regression with a different set of deciles. Coefficients represent elasticities, as variables are in logarithm. The table shows for each regression the Akaike Information Criterion (AIC).

Table A8: The effect of the different deciles on the LBT rate

	Dependent variable: sum of the LBT rate over the political term								
	Two deciles								
Lagged dependent variable	-0.07***	-0.07***	-0.07***	-0.07***	-0.07***	-0.07***	-0.07***	-0.07***	-0.07***
	(0.02)	(0.02)	(0.02)	(0.02)	(0.02)	(0.02)	(0.02)	(0.02)	(0.02)
Average income	0.13	0.38**	0.16	0.20	0.24	0.29*	0.38***	0.21	0.01
	(0.16)	(0.16)	(0.19)	(0.16)	(0.19)	(0.15)	(0.14)	(0.19)	(0.17)
D1	-0.07	-0.06*					-0.05		
	(0.04)	(0.04)					(0.04)		
D2				-0.20***		-0.22***			
				(0.07)		(0.07)			
D3					-0.20*				
					(0.11)				
D4							-0.20	-0.23*	
							(0.13)	(0.13)	
D5		-0.19	-0.22						
		(0.15)	(0.15)						
D6						0.13			-0.06
						(0.15)			(0.15)
D8				0.25					
				(0.15)					
D9	0.16		0.18		0.11			0.15	0.23**
	(0.11)		(0.11)		(0.12)			(0.12)	(0.11)
Adjusted R-squared	0.08	0.09	0.08	0.10	0.09	0.10	0.09	0.09	0.08
Nb. Obs	435	435	435	435	435	435	435	435	435
AIC	-1256.33	-1256.99	-1255.95	-1264.49	-1259.09	-1262.67	-1258.17	-1257.84	-1252.71
	Three deciles								
Lagged dependent variable	-0.07***	-0.07***	-0.07***	-0.07***	-0.07***	-0.07***	-0.07***	-0.07***	-0.07***
	(0.02)	(0.02)	(0.02)	(0.02)	(0.02)	(0.02)	(0.02)	(0.02)	(0.02)
Average income	0.25	0.26	0.24	0.19	0.20	0.21	0.22	0.37**	0.18
	(0.21)	(0.20)	(0.20)	(0.17)	(0.20)	(0.17)	(0.17)	(0.16)	(0.17)
D1	-0.06	-0.04		-0.03				-0.05	
	(0.04)	(0.04)		(0.04)				(0.04)	
D2			-0.21***			-0.15	-0.16**		
			(0.08)			(0.09)	(0.08)		
D3					-0.28**				-0.18
					(0.12)				(0.11)
D4		-0.18		-0.26**		-0.13		-0.20	
		(0.13)		(0.13)		(0.16)		(0.15)	
D5	-0.17						-0.16		-0.14
	(0.15)						(0.17)		(0.19)
D6			0.12		0.20				
			(0.15)		(0.16)				
D7								0.00	
								(0.16)	
D8				0.33**		0.29*	0.31*		0.34**
				(0.16)		(0.16)	(0.17)		(0.16)
D9	0.14	0.12	0.06		0.08				
	(0.12)	(0.12)	(0.12)		(0.12)				
Adjusted R-squared	0.09	0.09	0.10	0.09	0.09	0.10	0.10	0.09	0.09
Nb. Obs	435	435	435	435	435	435	435	435	435
AIC	-1256.24	-1257.15	-1260.86	-1260.54	-1258.72	-1263.37	-1263.63	-1256.17	-1260.73

* $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$. Robust standard errors in parentheses.
LBT stands for "local business tax".
This table shows results on the impact of different sets of deciles on the LBT rate. Since the aim is to investigate this operating component from the specification in stocks, these results come from the estimation of Equation (4). This table is divided in two parts: the first one shows regressions where two deciles are simultaneously included as regressors while the second one shows results where three deciles are included. In each of these parts, each column represents a different regression with a different set of deciles. Coefficients represent elasticities, as variables are in logarithm. The table shows for each regression the Akaike Information Criterion (AIC).
The main part of municipalities of the sample has transferred the competency of the LBT to their inter-municipal community. This explains the lower number of observations for regressions related to this tax. See Section 5 for more details.