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**Fiscal Federalism**

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# TO ASSEMBLE TO RESEMBLE? A STUDY OF TAX DISPARITIES AMONG FRENCH MUNICIPALITIES *

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ABSTRACT: The purpose of this paper is to analyze the effect of inter-municipal cooperation on local taxation. Municipalities that join/create an inter-municipal jurisdiction choose between three tax regimes, which may induce both horizontal and vertical tax externalities. Using the differences in differences method with a quasi-exhaustive panel for French municipalities over the 1994-2010 period, we show a positive causal effect of cooperation on the level of cumulative tax rates (i.e. the sum of municipal and inter-municipal tax rates). Moreover, we show that cooperation leads to a convergence of tax rates within an inter-municipal structure, which thus reduces tax disparities among municipalities.

JEL Codes: H23, H7

Keywords: Inter-municipal cooperation, tax competition, fiscal disparities

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# 1 Introduction

Inter-municipal cooperation is an old phenomenon that has particularly spread in the European countries over the last three decades. There are mainly two motives to engage in cooperation. The prior objective is to provide public services at a lower cost, i.e. to generate scale economies, or to produce public goods for which municipalities did not have the critical size to afford it. The second case for inter-municipal cooperation relates to policy coordination. On the one hand, cooperation among local authorities should aim at achieving a more equitable resource allocation. In case of an unequal distribution of tax base across the country, inter-municipal cooperation can reduce fiscal disparities by imposing a common tax on the whole tax base located in the member municipalities, and then redistributing tax revenues. On the other hand, the devolution of tax responsibilities to a higher tier should, by offsetting externalities within the cooperation structure, reduces the inefficient race to the bottom that takes place at the municipal level when municipalities compete to attract mobile tax bases.

In this perspective, France constitutes a very interesting example with a highly fragmented territory and very significant fiscal disparities. Indeed, France consists of more than 36,000 municipalities (i.e. 40% of the municipalities in the European Union), which face a very unequal distribution of tax revenues. This is mainly due to the local business tax (taxe professionnelle) which accounts for 30% of local tax revenues and whose 80% of the tax base is concentrated in only 5% of local authorities (about 1800 municipalities). Public establishments of inter-municipal cooperation (EPCI) have therefore been created to face this particular situation.

Although the creation of inter-municipal authorities is a phenomenon which started more than a century ago (Law of the 22nd of March 1890), it is only recently that the inter-municipal structures have really developed. Among the different Laws (1992, 1999 and 2004) which promoted this new territorial organization, the Law of the 12th of July 1999, known as the "loi Chevènement", has been a very important one: it was voted by 80% of the National Assembly and the Senate, which gave it a large legitimacy and showed that there was a strong will to develop this upper-municipal authority. This Law has enabled to simplify and to reinforce the inter-municipal cooperation, providing for instance fiscal incentives to municipalities. Only three years after the implementation of the law, more than 800 additional inter-municipal cooperation were created and in this perspective it was very successful. In 2010, there are 2611 EPCIs, which cover 95% of the municipalities. However some effects have not been anticipated. The cooperation among municipalities has been rather based on the resemblance, the cooperation between rich and poor municipalities being the exception. And whereas a reduction of tax pressure and of expenses was expected, some argue that the inter-municipal cooperation has led to the opposite. This is this last issue that we analyze in this paper.

The EPCIs are subject to common and homogenous rules that are comparable to those of local authorities and carry different blocks of competencies. Moreover some of those structures, on which we focus in this paper, have a tax-levying power. When the municipalities decide to form an EPCI, they choose between three different fiscal regimes: the additional taxation regime, the single business tax regime (taxe professionnelle unique, TPU) or the mixed taxation regime. A municipality is mainly financed by four direct taxes (known as the "4 vieilles"): the built and unbuilt property tax, the residence tax and the local business tax. In an additional taxation regime, the EPCI shares the tax base with the municipalities and can collect the four taxes on his own. In the case of the single business tax (TPU regime), the municipalities lose one instrument of taxation which is totally transferred to the inter-municipal level. In a mixed taxation regime, the EPCI has adopted a TPU regime which is combined with the additional tax on the other tax bases. In all cases, the municipalities decide jointly the tax rates of the upper-level.

In this framework, the effect of cooperation on tax competition must thus play an important role to explain the increase of tax pressure. Especially, three mechanisms have been defined in the literature and will be used to analyze our results. The first one refers to vertical tax competition. The co-occupation of a tax base creates vertical externalities leading to an inefficiently high tax pressure since jurisdictions ignore the depressive effect that a rise in their tax rate has on the common tax base (Keen (1998), Hoyt (2001) and Keen and Kotsogiannis (2002)). This effect occurs when a cooperation structure adopts an additional taxation regime or a mixed taxation regime. The second mechanism concerns the effect of the number of governments engaged in tax competition at a given level. It has been shown in the literature that a smaller number of jurisdictions induces a lower intensity of horizontal tax competition and thus lessen the so-called race to the bottom (Hoyt (1991)). Thereby, the number of inter-municipal structures being mechanically lower than the number of municipalities, a taxation at the cooperation level should reduce the fierceness of tax competition, in comparison to municipal taxation. The third mechanism is also related to horizontal tax competition and is observed when there is a complete devolution of a tax rate to the inter-municipal level. The mechanical effect of tax harmonization[1] among the member municipalities is to eliminate horizontal externalities and thus to weaken the effects of horizontal tax competition.

As far as we know, only three empirical papers address the issue of the impact of the creation of public establishments of inter-municipal cooperation on local taxation in the case of France. In this aim, Leprince and Guengant (2002) use the model of the median voter to estimate the fiscal choices of municipalities from a sample that accounts for only 10% of the French municipalities. However, the use of cross-sectional data of year 1997 does not enable them to control the individual fixed effect which should play

[1]See e.g. Burbidge *et al.* (1997), Itaya *et al.* (2010) and Konrad and Schjelderup (1999) for a study of tax harmonization.

an important role in this analysis. Moreover, only the additional taxation regime is considered and the effect of cooperation on local taxation is only inferred from the effect on municipal expenditures which is their dependent variable. Later, Charlot *et al.* (2008) investigated the same question using a descriptive analysis (weighted analysis of variance) for the year 2006 to show that the creation of public establishments of inter-municipal cooperation is associated with an increase in the four cumulative tax rates, defined as the sum of the municipal and inter-municipal tax rates. This result strongly depends on the socio-demographic and economic characteristics of the municipalities (rural/urban status, number of inhabitants,...) and on the characteristics of the EPCI (fiscal regime,...). They go further in their analysis in Charlot *et al.* (2010) by using a panel data set covering the 1993-2003 period to study the effect of fiscal cooperation on municipal taxation. Their panel data set enables them to use spatial and dynamic econometric techniques with a model of tax setting. In particular, they take into account spatial dependence of tax rates between municipalities by explaining local tax rates in a municipality by the weighted tax rates of neighboring municipalities.

In this paper, we extend the literature in two ways. First, we are interested in the causal effect of the creation of public establishments of inter-municipal cooperation after the Law of 1999, on local taxation. This requires a specific econometric approach, the differences in differences. This method consists in studying the effect of a "treatment", here the creation of EPCI, on an economic variable, here the local taxation. This analysis thus relies on the construction of a "treated group" and a "control group", to distinguish between the municipalities who joined an EPCI and the other ones. Since this paper is then to understand the effect of cooperation on tax pressure, the outcome variables are the four cumulative tax rates.

Second, we study not only the effect on the level of tax rates but also in terms of convergence, by looking at the evolution of tax rate dispersion among municipalities belonging to each EPCI. We use a quasi-exhaustive panel for French municipalities, that contains information about 36,530 municipalities observed over the 1994-2010 period.

The paper is organized as follows. Section 2 presents the data and how inter-municipal cooperation is organized in France. Section 3 describes the empirical strategy and section 4 presents the results. Finally, section 5 concludes.

# 2 The data

## 2.1 The organization of inter-municipal cooperation in France

France is a unitary country, which is administratively divided into three tiers of jurisdictions, i.e. 26 regions ("régions") at the top tier, 100 counties ("départements") at the middle tier, and more than 36,000 municipalities ("communes") at the bottom tier.

The size of the municipalities varies greatly from one to another: the largest city (Paris) has more than 2,000,000 inhabitants, whereas 75% of municipalities have less than 1,000 inhabitants. Several initiatives have been made to compensate for this territorial dispersion, with the aim of creating more solidarity among municipalities so that they could satisfy their citizens' need by providing public goods and services that they could not have afforded alone. A first step was made with the law of 22nd March 1890 by giving municipalities the option of creating a "syndicat de communes". First designed to manage a unique public service like the distribution of water or the collection of household garbage, these "syndicats de communes" were allowed to manage several public services of general interest from 1959. For new cities created in the late 60's, special structures called "syndicats d'agglomérations nouvelles" emerged from 1983. A further step was made in 1992 with the creation of two structures, i.e. the "communautés de communes" –which federate rural municipalities– and the "communautés de villes" –which federate cities grouping together more than 20,000 inhabitants. A last step was made in 1999 with the "Loi Chevènement", which has simplified the inter-municipal architecture around three types of inter-municipal cooperation, i.e. the "communautés de communes" (CC) established in 1992, the "communautés d'agglomération" (CA) –which gather more than 50,000 inhabitants together– and the "communautés urbaines" (CU) –which gather more than 500,000 inhabitants– and has organized the suppression of the unsuccessful "communautés de villes" (CV), of the "syndicats d'agglomérations nouvelles" (SAN) and of the "districts". This law has contributed to standardize the rules applicable to the inter-municipal structures and to simplify the inter-municipal cooperation scene.

Table 1: Evolution of the number of EPCIs depending on their legal status, over the 1994-2010 period

| Year | CA | CC | CU | CV | DISTRICT | SAN | Total |
|---|---|---|---|---|---|---|---|
| 1994 | 0 | 562 | 9 | 4 | 291 | 9 | 875 |
| 1999 | 0 | 1346 | 12 | 5 | 306 | 9 | 1678 |
| 2005 | 162 | 2341 | 14 | 0 | 0 | 6 | 2523 |
| 2010 | 181 | 2408 | 16 | 0 | 0 | 5 | 2610 |

Our analysis exclusively focuses on inter-municipal structures allowed to raise tax revenues, i.e. "établissements de coopération intercommunale à fiscalité propre", which include the "communautés de communes" (CC), the "communautés d'agglomération" (CA), the "communautés urbaines" (CU), the "communautés de villes" (CV), the "syndicats d'agglomérations nouvelles" (SAN) and the "districts" (table 1). Table 2 shows that the development of EPCIs was particularly sustained over the period 1994-2005 and then has been strongly slower. In 2005, France is well-covered by EPCIs: 88% of the municipalities, which represents 86% of the territory and 83% of the population, cooperate through an EPCI (table 2). Only 87 EPCIs –which will constitute what we will call later our control group– were created between 2006 and 2010 (table 1).

Note that old districts and unsuccessful CVs disappeared by being transformed into CCs or CAs. The SANs have also progressively disappeared by being transformed into CAs. Most EPCIs are CCs (92% in 2010), owing to the high predominance of rural municipalities over urban municipalities (85% against 15% of French municipalities).

TABLE 2: Development of inter-municipal cooperation over the 1994-2010 period

| Year | % of municipalities in EPCI | % of area in EPCI | % of pop in EPCI |
|---|---|---|---|
| 1994 | 24,50% | 20,65% | 36,24% |
| 1999 | 52,11% | 52,32% | 54,87% |
| 2005 | 88,07% | 86,42% | 83,65% |
| 2010 | 94,78% | 93,15% | 88,97% |

## 2.2 The data set

In order to evaluate the impact of inter-municipal cooperation on the level and the dispersion of the four cumulative tax rates, we use three data sets.

- The first one is a quasi-exhaustive panel for French municipalities from the Direction Générale des Finances Publiques (Ministry of Finance). 36,530 municipalities are observed over the 1994-2010 period. However, for reasons concerning our empirical strategy that will be described below, we only keep information on municipalities over the 1994-2005 period. Besides, some French municipalities are excluded from the sample. 71 municipalities that merged in the studied period and 9 municipalities called "villages morts pour la France" –which were completely destroyed during the First World War and administratively kept in memory of the killed inhabitants– are excluded. Because of the lack of reliable information for many variables relative to overseas territories, we also exclude(d) the 112 overseas municipalities. Overall, the final sample contains 438,360 municipality-year observations from 1994 to 2005. This data set provides information on the level of the tax rates and tax bases of the four direct municipal taxes ("4 vieilles"): the built and unbuilt property tax, the residence tax and the local business tax. These tax data are also available at the inter-municipal level. Note that inter-municipal cooperation is observed over the larger period 1994-2010, in order to build coherent control groups from structures of inter-municipal cooperation that will be created over the period 2006-2010. Tables 3 presents the composition of inter-municipal and municipal tax revenues coming from these "4 vieilles"[2]. It shows that the composition of tax revenues and its

[2]Note that most tax revenues are generated by these "4 vieilles". Tax autonomy is relatively high in France since 45% of the municipal revenues comes from their own tax revenues.

evolution between 1999 and 2005 is quite similar for municipalities and EPCIs. We observe that the share of built property taxation and residence taxation in both municipal and inter-municipal tax revenues has increased over the period 1999-2005 contrary to the one of business taxation and unbuilt property taxation.

- The second data set comes from the Direction Générale des Collectivités Locales (Ministry of the Interior). It contains information on inter-municipal cooperation over the 1994-2010 period. More precisely, it gives information on i) when a structure of inter-municipal cooperation was created, ii) by which municipalities it was created, iii) which municipalities joined it afterwards, iv) the legal status of the structure –communauté de communes (CC), communauté d'agglomération (CA), communauté urbaine (CU), communauté de ville (CV), syndicat d'agglomération nouvelle (SAN) or district– v) its fiscal regime (TPU regime, additional taxation regime or mixed taxation regime). Municipalities that belong to an EPCI can indeed choose between three regimes: i) a TPU regime, where only the EPCI levies a tax rate on the business tax base[3], which constitutes its only source of tax revenues; ii) an additional taxation regime, where municipalities keep their fiscal sovereignty on each of the four tax bases. In addition, the EPCI can levy an additional tax rate on one or several tax bases; iii) a mixed taxation regime where the EPCI has adopted a TPU regime which is combined with additional taxation on the other tax bases. This data set also gives information on the "fiscal capacities" of each municipality. These fiscal capacities are a measure of municipalities' potential tax revenues, computed by applying the average national tax rates on the four tax bases of each municipality.

- Three variables used in this paper come from data collected by the French National Institute of Statistics (INSEE). First, the number of inhabitants in each municipality is proxied by the population in 1990, 1999 and 2006 obtained from the different population census. Second, we use the INSEE classification of municipalities in terms of rurality (ZAUER classification, i.e. "zoning in urban areas and labor areas of the rural space") to distinguish rural municipalities from urban ones. We also use this information to create a variable that defines if an EPCI can be considered as rural or not. We then establish two definitions: i) a rural EPCI is an EPCI in which the largest municipality of the EPCI is rural; ii) a rural EPCI is an EPCI in which more than 50% of the inhabitants live in a rural municipality. Given that the two definitions give similar results in the estimations, we only keep one variable: the one created using the second definition. Thirdly, we use the average taxable income (per inhabitants) of each municipality.

[3] This business tax, called "taxe professionnelle", was replaced in 2010 by both a tax on the rental value of properties and a tax on value added.

Table 3: Share of each tax in the total tax revenues coming from the "4 vieilles", at the inter-municipal and municipal level

| | 1999 | 2005 |
|---|---|---|
| Composition of inter-municipal tax revenues from the "4 vieilles" | | |
| % from built property taxation | 27,30% | 29,48% |
| % from unbuilt property taxation | 20,14% | 18,60% |
| % from business taxation | 26,64% | 23,59% |
| % from residence taxation | 25,92% | 28,33% |
| Composition of municipal tax revenues from the "4 vieilles" | | |
| % from built property taxation | 28,34% | 29,44% |
| % from unbuilt property taxation | 23,17% | 21,09% |
| % from business taxation | 21,29% | 20,40% |
| % from residence taxation | 27,21% | 29,07% |

To sum up, the variables at the municipal level that we have at our disposal are the following:

- dates of adhesion / withdrawal of a municipality to an EPCI
- the 4 direct tax rates levied at the municipal level (the "4 vieilles")
- the 4 corresponding tax bases
- the distinction rural / urban municipalities
- number of inhabitants in 1990, 1999 and 2006 (from the population census).
- the level of fiscal capacities
- the level of taxable income

At the EPCI level, our variables are:

- dates of creation / dissolution of an EPCI
- the 4 direct tax rates levied at the EPCI level, if applicable
- the distinction rural / urban EPCI
- the legal status of the EPCI
- the fiscal regime.

Basic statistics on the population, rurality, fiscal regime and legal status of the municipalities and EPCIs of our sample are presented in table 4. Note that the share of municipalities in a mixed taxation regime is extremely low

Table 4: Main characteristics of the municipalities and the EPCIs

| | 1994 | 1999 | 2005 | Mean |
|---|---|---|---|---|
| Characteristics of municipalities | | | | |
| % of rural municipalities | 83.7 | 83.7 | 83.7 | 83.7 |
| % of mun. with a population < 500 | 59.44 | 58.32 | 58.32 | 58.8 |
| % of mun. with 500 <= pop < 2000 | 28.82 | 29.36 | 29.36 | 29.1 |
| % of mun. with 2000 <= pop < 10000 | 9.52 | 10 | 10 | 9.8 |
| % of mun. with pop >= 10000 | 2.22 | 2.32 | 2.32 | 2.28 |
| % of mun. in a CC | 15.16 | 41.34 | 79.61 | 47.89 |
| % of mun. in a TPU | 4.66 | 6.08 | 40.6 | 23.7 |
| including % in mixed taxation regime | 0.2 | 0.4 | 5.2 | 2.5 |
| | | | | |
| Characteristics of EPCIs | | | | |
| % of rural EPCI | NA | 75.28 | 62.21 | 65.74 |
| % of EPCIs with pop < 10000 | NA | 76.4 | 64.41 | 67.75 |
| % of EPCIs with 10000 <= pop < 50000 | NA | 21.35 | 29.11 | 26.87 |
| % of EPCIs with pop >= 50000 | NA | 2.25 | 6.18 | 5.21 |
| % of CC in the EPCIs | NA | 98.88 | 94.22 | 95.69 |
| % of the EPCIs in TPU | NA | 7.87 | 44.87 | 33.47 |
| including % in mixed taxation regime | NA | 0.36 | 5.66 | 3.61 |

# 3 Empirical strategy

## 3.1 Econometric framework

In order to evaluate the causal effect of inter-municipal cooperation on the level and dispersion of the four cumulative tax rates, we use differences-in-differences (DID) estimation procedures.

The general specification of such models is the following:

$$\begin{aligned} Y_{it} &= \beta E_{it} + X_{it}'\alpha + \delta_t + \alpha_i + \varepsilon_{it} \\ i &= 1, ..., N; t = 1, ..., T \end{aligned} \tag{1}$$

where individuals are indexed by $i$ and time is indexed by $t$. Let $\delta_t$ and $\alpha_i$ be respectively time and individual fixed effects and $\varepsilon_{it}$ be an unobserved error term. $E_{it}$ is the "treatment variable", which takes a value of 0 in all periods prior to the treatment, and a value of 1 in all periods after the treatment. The subscript $i$ for the treatment variable comes from the fact that the timing of the treatment is not the same for all individuals. This model also includes additional explanatory variables denoted $X_{it}$.

$Y_{it}$ is the outcome variable. We concentrate on two outcomes : i) the level of each of the 4 cumulative tax rates (hereafter Model 1), i.e. the sum between the municipal and inter-municipal tax rate; ii) the dispersion of each of the 4 cumulative tax rates among municipalities belonging to the same EPCI (hereafter Model 2). We measure the impact of inter-municipal cooperation ($E_{it}$) on those two outcomes.

The parameter of interest is $\widehat{\beta}$, the causal effect of the treatment on the outcome variable, $Y_{it}$. It measures the difference between the average change in the outcome of the "treated" (i.e. individuals who receive the treatment) and the average change in the outcome of the control group (i.e. individuals who do not receive the treatment).

## 3.2 Model specification, control and treated groups

Although inter-municipal cooperation is observed over the 1994-2010 period in our database (date of the creation of each EPCI, composition of each EPCI, etc.), regressions are performed over the period 1994-2005. Years 2006 to 2010 are only used to build the "control group", i.e. the group composed of municipalities which did not join an EPCI created after the end of the period selected for the regressions. Indeed, this control group must be large enough for a robust econometric analysis. Since only 10 EPCIs were created in 2010, we need to enlarge the period, going back to 2006. The control group therefore contains the 161 EPCIs created from 2006 to 2010. The date of creation of the EPCI is then used to distinguish between "treated" and "control" groups. The treatment is defined as the decision for a municipality to join or create an EPCI after 1999, i.e. after the implementation of the "Loi Chevènement". This section describes more precisely the construction of these two groups and present the models estimated.

In Model 1, we estimate the impact of inter-municipal cooperation on the level of the four cumulative tax rates previously defined.

A cumulative tax rate is the sum of the municipal and inter-municipal tax rates chosen by both the municipality and its EPCI. When a municipality does not belong to an EPCI, this cumulative tax rate is equal to the municipal tax rate. Note that the cumulative tax rate will be the sum of both municipal and inter-municipal tax rates in case of tax-base sharing but will only be the tax rate levied by one-tier in case of TPU regime or without additional taxation.

The four outcome variables are the levels of the four direct cumulative tax rates: the cumulative residence tax rate (RT), the cumulative built property tax rate (BPT), the cumulative unbuilt property tax rate (NBPT) and the cumulative local business tax rate (LBT). These cumulative tax rates are denoted $T_k$, with $k = RT$, $BPT$, $NBPT$ or $LBT$. The model is the following :

$$\log(T_{kit}) = \beta E_{it} + \delta_t + \alpha_i + \varepsilon_{it} \qquad \text{(Model 1)}$$
$$k = RT, BPT, NBPT, LBT; \quad i = 1, ..., N; \quad t = 1994, ..., 2005$$

where $k$ is the cumulative tax rate, $i$ the municipality and $t$ the year.

The treatment variable $E_{it}$ is the membership of the municipality to an EPCI.

Municipalities belonging to the treated group are municipalities that joined between

1999 and 2005 an EPCI created over the same period. All municipalities that joined after 2005 an EPCI created before 2005 are excluded from the sample, as well as all municipalities that joined an EPCI created before 1999.

Municipalities belonging to the control group are municipalities that joined an EPCI created after 2005. Note that we also used an alternative control group composed of municipalities that never joined an EPCI over the 1999-2010 period. Since the estimated treatment effects are not sensitive to the choice between those two control groups, and thus to their size, we do not keep this alternative control group, for consistency with the control group used in Model 2 (we explain this point later on). The description of the model and the definitions of the different groups are summarized in table 5. The main characteristics of municipalities belonging to the treated and control groups are given in table 6. Municipalities that decided to join or create an EPCI between 1999 and 2005 (treated group) have a lower and also less dispersed level of fiscal capacities than those who joined an EPCI after 2005. They also have a lower number of inhabitants. However, there is no significant difference between the average level of taxable income between municipalities belonging to the treated and the control group.

In Model 2, we estimate the impact of the creation of an EPCI on the dispersion of the four cumulative tax rates among municipalities that belong to the same EPCI. Since the outcome variable is defined at the EPCI level, the construction of this variable for the control group, i.e. the group of municipalities who only joined an EPCIs created between 2006 and 2010, must be carefully explained. The structure of this control group is imposed by our methodology, as we calculate coefficients of variation of cumulative tax rates within an EPCI. The control group thus cannot contain municipalities that never joined an EPCI, because otherwise, we would not have the structure on which to calculate the coefficients of variation. Therefore, for the municipalities belonging to the control group, we calculate the outcome variable using the "future" structure of EPCIs, i.e. the structure of EPCIs that is observed at the time of their creation, which, by definition of the control group, has to be after 2006. As in the previous model, the cumulative tax rate considered is either the sum of the municipal and inter-municipal tax rates or the municipal tax rate, depending on the adhesion of the municipality to the EPCI. This dispersion is measured using a weighted coefficient of variation[4]. The coefficient of variation of the cumulative tax rate $T_{kjt}$, calculated over all municipalities $i$ that belong to the EPCI $j$ in year $t$ is denoted $CV_{kjt}$. It is computed as follows:

$$CV_{kjt} = \frac{1}{\overline{T}_{k,jt}} \left\{ \sum_{i=1}^{N} \left[ \left( T_{k,jit} - \overline{T}_{k,jt} \right)^2 \frac{P_{jit}}{P_{jt}} \right] \right\}^{1/2}$$

[4]In an EPCI, the size of the different municipalities can vary greatly from one to another. The heterogeneity in terms of population of the different municipalities belonging to the same EPCI is therefore taken into account in the weighted coefficient of variation.

where $P_{jt}$ is the total number of inhabitants in the EPCI $j$ in year $t$, $P_{jit}$ is the number of inhabitants in municipality $i$ in the EPCI $j$ in year $t$. $T_{k,it}$ is the cumulative tax rate $k$ of municipality $i$ in the EPCI $j$ in year $t$ and $\overline{T}_{k,jt}$ is the average cumulative tax rate $k$ measured at the EPCI level, in year $t$. These coefficients of variation are calculated for the four cumulative tax rates.

The model is the following:

$$CV_{kjt} = \beta E_{jt} + \delta_t + \alpha_j + \varepsilon_{jt} \qquad \text{(Model 2)}$$
$$k = RT, BPT, NBPT, LBT; \quad j = 1, ..., M; \quad t = 1994, ..., 2005$$

where $k$ is the cumulative tax rate, $j$ the EPCI and $t$ the year.

The treatment variable $E_{jt}$ is still the creation of an EPCI.

EPCIs belonging to the treated group are EPCIs created between 1999 and 2005. All EPCI created before 1999 are dropped out of the sample.

The description of the model and the definitions of the different groups are summarized in table 5 and the main characteristics of EPCIs belonging to the treated and control groups are given in table 7. We find that EPCIs belonging to the treated group have a lower level of fiscal capacities than those of the control group. We do not find any significant difference in the average level of taxable income of EPCIs belonging to the treated or the control group. Note that EPCIs that were created before 2005 (treated group) are composed of more municipalities and also smaller municipalities (see table 6) as the average number of inhabitants in both kinds of EPCIs is not significantly different. All these results lead to the intuition that EPCIs created before 2005 were created by small municipalities that needed to make scale economies.

Table 5: Description of the two models estimated

| | MODEL 1 | MODEL 2 |
|---|---|---|
| **Level** | Municipality level | EPCI level |
| **Outcome variable** | 4 outcomes: the logarithm of 4 different cumulative tax rates in a municipality at a given year | 4 outcomes : the weighted coefficient of variation of the 4 different cumulative tax rates of municipalities belonging to an EPCI at a given year |
| **Treatment** | Adhesion between 1999 and 2005 of a municipality to an EPCI created between 1999 and 2005 | Creation of an EPCI between 1999 and 2005 |
| **Treated group** | All municipalities that join an EPCI between 1999 and 2005<br>→ number of municipalities: 11 936<br>→ outcome observed over years 1994-2005<br>→ number of observations: 143 232 | EPCI created 1999 and 2005<br><br>→ number of EPCI: 1 034<br>→ outcome observed over years 1994 to 2005<br>→ number of observations: 12 375 |
| **Control group** | All municipalities that join an EPCI between 2006 and 2010<br>→ number of municipalities: 1 600<br>→ outcome observed over years 1994 to 2005<br>→ number of observations : 19 200 | EPCI created between 2006 and 2010<br><br>→ number of EPCI : 161<br>→ outcome observed over years 1994 to 2005<br>→ number of observations : 1 936 |

Table 6: Comparison of the main characteristics of municipalities belonging to the treated and control groups

| | **Municipalities belonging to the treated group** | **Municipalities belonging to the control group** | **Test for significant difference** |
|---|---|---|---|
| Number of municipalities<br>(%) | 143,232<br>(88.2%) | 19 200<br>(11.8%) | - |
| **Economic characteristics** | | | |
| Average fiscal capacities (/hab)<br>[Q1-Q3] | 381.9<br>[229 - 424] | 475.6<br>[258 - 537] | *** |
| Average taxable income (/hab)<br>[Q1-Q3] | 6,556<br>[5,510 – 7,664] | 6,558<br>[5,270 – 7,935] | NS |
| Average unemployment rate | 10.6% | 10.2% | *** |
| % of executives | 3.64% | 3.53% | *** |
| % of rural municipalities | 85.6% | 85.7% | NS |
| **Socio-demographic characteristics** | | | |
| Number of inhabitants (mean)<br>Number of inhabitants (median)<br>[Q1-Q3] | 1,289<br>329<br>[156 - 803] | 1,636<br>334<br>[155 - 807] | *** |
| % of inhabitants aged 60 + | 25.6% | 26.9% | *** |

Notes:
i) ***: the means are significantly different at the 5% level; NS: the means are not significantly different.
ii) Q1 and Q3 are the first and third quartiles of the distribution of each variable.

TABLE 7: Comparison of the main characteristics of EPCIs belonging to the treated and control groups

| | EPCIs belonging to the treated group | EPCIs belonging to the control group | Test for significant difference |
|---|---|---|---|
| Number of EPCIs (%) | 11,936 (92%) | 1,034 (8%) | - |
| **Economic characteristics** | | | |
| Average fiscal capacities (/hab) [Q1-Q3] | 453.8 [313 – 526] | 573 [354 – 647] | *** |
| Average taxable income (/hab) [Q1-Q3] | 7 001 [6 026 – 7 681] | 7 010 [5 804 – 7 919] | NS |
| % of rural EPCIs | 62% | 64.6% | *** |
| **Socio-demographic characteristics** | | | |
| Number of municipalities (mean) [Q1-Q3] | 12.1 [7-16] | 10 [6-12] | *** |
| Number of inhabitants (mean) Number of inhabitants (median) [Q1-Q3] | 15 447 6 993 [4 115 – 13 014] | 16 085 5 637 [2 823 – 13 253] | NS |

Notes:
i) ***: the means are significantly different at the 5% level; NS: the means are not significantly different.
ii) Q1 and Q3 are the first and third quartiles of the distribution of each variable.

## 3.3 Estimation methodology

Contrary to most studies that perform DID on repeated cross-sections, we use a panel data set: cumulative tax rates of municipalities and EPCIs are observed over the 1994-2005 period. Therefore, model (1) can be estimated using classical estimation procedures relative to panel data models.

The most general specification of the model used for DID can be written as in model (1). In this model, the individual effect $\alpha_i$ is likely to be correlated with some of the explanatory variables of the model, and in particular, with the treatment variable $E_{it}$. Pooled OLS on equation (1) would therefore lead to inconsistent estimates and $\widehat{\beta}$ would not be the causal effect of the treatment. Panel data provide means of transforming the model so that the individual fixed effect $\alpha_i$ disappears, as well as the correlation between this term and $E_{it}$. This model can be estimated using the first-differenced estimator or the within-group estimator. The latter is usually preferred, as it gives more efficient estimates, as long as $\varepsilon_{it}$ is uncorrelated with the contemporaneous values of $E_{it}$ (i.e. $corr(E_{it}, \varepsilon_{it}) = 0, \forall i$ and $t$).

The estimated model is the following:

$$\begin{aligned} (Y_{it} - Y_{i.}) &= \beta(E_{it} - E_{i.}) + \gamma_t + (\varepsilon_{it} - \varepsilon_{i.}) \\ i &= 1, ..., N; \quad t = 1994, ..., 2005 \end{aligned} \tag{2}$$

where $Y_{i.}$and $E_{i.}$ are the individual means and $\gamma_t$ are time fixed effects.

The estimations of such models rely on the validity of several identifying assumptions.

The first "fundamental identifying assumption" is that changes (or trends) in the outcome variable would have been the same for both groups (treated and control groups) without any treatment. As it is not possible to observe this counterfactual (the evolution of the outcome for the treated group, in the absence of any treatment), the validity of this assumption can be checked by looking at the trend in the outcome variable of both groups in the pre-treatment period. Therefore, for both models, we present the trend of the outcome variables both before and after treatment. To get robust evidence that both groups have the same trend before the treatment, we estimate a fixed-effect regression over the pre-treatment period. The explained variable is the outcome and explanatory variables are time dummies as well as interactions between time dummies and the dummy that equals 1 if the observation belongs to the treated group. The tests of significance of the interaction terms allow us to conclude on whether the outcome of the control group is significantly the same as the one of the treated group, or not. We do not present results of these regressions in this paper, but we comment them.

The second assumption is the absence of any correlation between $E_{it}$ and the remaining error term $\varepsilon_{it}$. The violation of this hypothesis leads to inconsistent estimates of the treatment effect. However, it is impossible to check empirically the validity of this hypothesis.

For Bertrand, Duflo and Mullainathan (2004), DID estimates are very likely to lead to an underestimate of standard errors (and therefore a too frequent rejection of the null hypothesis that the treatment effect is not significant) if we do not control for the correlation of the error term $\varepsilon_{it}$ over time for a given individual (municipality or EPCI). This has to be taken into account in the estimates. The default standard errors assume that the regression errors are independent and identically distributed (iid). In all estimations we therefore use standard errors that are clustered at the individual level. Another way to control part of this serial correlation would be to include the lagged dependent variable as an explanatory variable. However, this lagged variable is, by construction, correlated with the error term. It should therefore be instrumented in order to get consistent estimates, but instruments can be hard to find. Note that this serial correlation is very likely to happen in our case. For example, the coefficient of correlation of the four direct cumulative tax rates between 2 years is always higher than 0.95.

In addition to the estimation of Model 1 and Model 2, we estimate three more sophisticated models.

First, we add additional explanatory variables in Model 1 and Model 2 in order to control for characteristics of the municipality or characteristics of the EPCI in the estimation of the treatment effect. Most characteristics available in the data set are time-invariant (geographical variables for instance) or only change twice over the period (population characteristics from the census for instance) so that they cannot be included as covariates in the regression. However, all fiscal and economic variables, that are time-varying, can well explain both the log of the cumulative tax rates and the coefficient of variation of the cumulative tax rates. We estimate the following models:

$$\log(T_{kit}) = \beta E_{it} + X_{it}'\alpha + \delta_t + \alpha_i + \varepsilon_{it} \qquad \text{(Model 1')}$$
$$k = RT, BPT, NBPT, LBT; \quad i = 1, ..., N; \quad t = 1994, ..., 2005$$

$$CV_{kjt} = \beta E_{jt} + X_{jt}'\alpha + \delta_t + \alpha_j + \varepsilon_{jt} \qquad \text{(Model 2')}$$
$$k = RT, BPT, NBPT, LBT; \quad j = 1, ..., M; \quad t = 1994, ..., 2005$$

In Model 1', the vector of the additional explanatory variables $X_{it}$ contains the log of the tax base $k$ of municipality $i$ in year $t$ and the log of the fiscal capacities of municipality $i$ in year $t$[5]. Fiscal capacities are defined in euro 2005[6] and per inhabitants.

In Model 2', the vector of the additional explanatory variables $X_{jt}$ contains both the log of the weighted average and the weighted coefficient of variation of two variables: the tax base $k$ of the EPCI $j$ in year $t$ and the fiscal capacities of the EPCI $j$ in year $t$. It also contains the log of the EPCI tax rate $k$.

Secondly, even if time-invariant variables cannot be included as explanatory variables in Model 1 and Model 2, they can be used to test whether there is an heterogeneity of the treatment effect between different sub-groups. We thus include interaction terms in models Model 1' and Model 2' and estimate the following models:

$$\log(T_{kit}) = \beta E_{it} + \gamma(E_{it} I_{G=A}) + X_{it}'\alpha + \delta_t + \alpha_i + \varepsilon_{it} \qquad \text{(Model 1")}$$
$$k = RT, BPT, NBPT, LBT; \quad i = 1, ..., N; \quad t = 1994, ..., 2005$$

$$CV_{kjt} = \beta E_{jt} + \gamma(E_{jt} I_{G=A}) + X_{jt}'\alpha + \delta_t + \alpha_j + \varepsilon_{jt} \qquad \text{(Model 2")}$$
$$k = RT, BPT, NBPT, LBT; \quad j = 1, ..., M; \quad t = 1994, ..., 2005$$

where $I_{G=A}$ equals 1 if the municipality (resp. EPCI) belongs to group A (for example, a rural municipality (resp. a rural EPCI)) and 0 otherwise. The coefficients of such

[5]Note that we could also have used the log of taxable income of the inhabitants of municipality $i$.in year $t$ as an additional explanatory variable. However, descriptive statistics (tables 6 and 7) have shown that this variable is not significantly different between treated and control municipalities/EPCIs. It also turned out to be unsignificant in all regressions, so we present the results without this variable.

[6]This monetary variable, as all monetary variable in this chapter, is deflated using the national consumption price index for each year. We rule out the fact that prices may differ accross municipalities and use a national index.

models must be interpreted carefully: $\beta$ gives the difference between: i) the average change in the outcome of individuals who belong to the treated group and who are not in group A, and ii) the average change in the outcome of individuals belonging to the control group, whereas $\beta + \gamma$ gives the difference between: i) the average change in the outcome of individuals belonging to both the treated group and the category A and ii) the average change in the outcome of individuals belonging to the control group. Four time-invariant characteristics have been used in the regressions : i) the legal status of the EPCI ("Communauté de Communes" or not); ii) the fiscal regime of the EPCI (TPU regime, mixed taxation regime, additional taxation regime); iii) if the municipality/EPCI is rural or not; iv) the number of inhabitants in the municipality/EPCI. In order to understand the results of Model 1" and Model 2", table 8 gives more details about the fiscal and economic characteristics of the municipalities or EPCIs belonging to the treated group, depending on these four constant characteristics. It shows for example that EPCIs who choose an additional taxation regime are composed of municipalities that are rather homogeneous in terms of fiscal potential and size of the population, whereas municipalities who opt for a TPU regime are more heterogeneous.

Thirdly, we allow the treatment effects to vary over time as in Laporte and Windmeijer (2005). The specifications of Model 1 and Model 2 rely on the assumption that the effect of the treatment is immediate : when the variable $E_{it}$ (resp. $E_{jt}$) switches from 0 to 1, it is accompanied by a change in $\log(T_{kit})$ (resp. $CV_{kjt}$) of an amount $\widehat{\beta}$. In our case, the effect of inter-municipal cooperation is likely to increase over time, which leads us to use a more flexible model in which we allow the treatment effect to vary over time. To do so, we include in the model variables relative to the number of years that passed since the treatment. More precisely, the specification is the following :

$$\log(T_{kit}) = \beta E_{it} + \sum_{\tau=1}^{2005-da_{ij}} d_\tau I_{it+\tau} + X'_{it}\alpha + \delta_t + \alpha_i + \varepsilon_{it} \qquad \text{(Model 1"')}$$

$$k = RT, BPT, NBPT, LBT; \quad i = 1, ..., N; \quad t = 1994, ..., 2005;$$

$$da_{ij} = \text{ date of adhesion of } i \text{ to EPCI } j$$

$$CV_{kjt} = \beta E_{jt} + \sum_{\tau=1}^{2005-dc_j} d_\tau I_{jt+\tau} + X'_{jt}\alpha + \delta_t + \alpha_j + \varepsilon_{jt} \qquad \text{(Model 2"')}$$

$$k = RT, BPT, NBPT, LBT; \quad j = 1, ..., M; \quad t = 1994, ..., 2005;$$

$$dc_j = \text{ date of creation of EPCI } j$$

where $I_{it+\tau}$ equals 1 if $\tau$ years passed since the individual received the treatment for the first time. Therefore, $\widehat{\beta} + \widehat{d_\tau}$ gives the impact of the treatment $\tau$ years after the first year of the treatment.

Table 8: Main characteristics of the municipalities and the EPCIs belonging to the treated groups

| | Municipalities belonging to the treated group | | | EPCIS belonging to the treated group | | |
|---|---|---|---|---|---|---|
| **Rural Status** | **Rural** | **Non Rural** | **Test for signif. diff** | **Rural** | **Non Rural** | **Test for signif. diff** |
| Average fiscal potential (/inhab., €2005) | 356 | 533 | *** | 402 | 538 | *** |
| Coeff. Variation | 1.06 | 0.67 | | 0.54 | 0.38 | |
| Average taxable income (/inhab., €2005) | 6,311 | 8,027 | *** | 6,562 | 7,718 | *** |
| Coeff. Variation | 0.38 | 0.27 | | 0.21 | 0.24 | |
| Number of inhabitants | 422 | 6,360 | *** | 5,903 | 31,040 | *** |
| Coeff. Variation | 1.04 | 2.36 | | 0.75 | 1.58 | |
| % TPU | 32% | 59% | *** | 26% | 49% | *** |
| % CC | 98% | 81.6% | *** | 99.9% | 87% | *** |
| | | | | | | |
| **Fiscal status** | **TPU** | **ADD** | | **TPU** | **ADD** | |
| Average fiscal potential (/inhab., €2005) | 405 | 362 | *** | 476 | 441 | *** |
| Coeff. Variation | 1.32 | 0.72 | | 0.49 | 0.49 | |
| Average taxable income (/inhab., €2005) | 6,947 | 6,246 | *** | 7,252 | 6,866 | *** |
| Coeff. Variation | 0.32 | 0.39 | | 0.22 | 0.25 | |
| Number of inhabitants | 2,292 | 643 | *** | 26,960 | 9,278 | *** |
| Coeff. Variation | 4.20 | 2.89 | | 1.88 | 1.42 | |
| % Rural | 77% | 91% | *** | 47% | 70% | *** |
| % CC | 87% | 99% | *** | 88% | 98% | *** |
| | | | | | | |
| **Legal status** | **CC** | **Not CC** | | **CC** | **Not CC** | |
| Average fiscal potential (/inhab., €2005) | 375 | 529 | *** | 443 | 653 | *** |
| Coeff. Variation | 1.01 | 0.80 | | 0.49 | 0.36 | |
| Average taxable income (/inhab., €2005) | 6,471 | 8,379 | *** | 6,913 | 8,634 | *** |
| Coeff. Variation | 0.37 | 0.31 | | 0.23 | 0.32 | |
| Number of inhabitants | 860 | 10,071 | *** | 10,029 | 116,571 | *** |
| Coeff. Variation | 3.21 | 2.38 | | 1.22 | 0.75 | |
| % Rural | 87% | 41% | *** | 65% | 1.3% | *** |
| % TPU | 33% | 90% | *** | 32% | 81% | *** |
| | | | | | | |
| **Population** | **Pop < 2,000** | **Pop ≥ 2,000** | | **Pop < 10,000** | **Pop ≥ 10,000** | |
| Average fiscal potential (/inhab., €2005) | 360 | 567 | *** | 413 | 530 | *** |
| Coeff. Variation | 0.63 | 1.05 | | 0.54 | 0.39 | |
| Average taxable income (/inhab., €2005) | 6,396 | 7,959 | *** | 6,598 | 7,758 | *** |
| Coeff. Variation | 0.38 | 0.28 | | 0.22 | 0.24 | |
| % CC | 97% | 77% | *** | 99.9% | 85.6% | *** |
| % Rural | 94% | 11% | *** | 82% | 24% | *** |
| % TPU | 32% | 64% | *** | 25% | 53% | *** |

Notes: ***: the means are significantly different at the 5% level

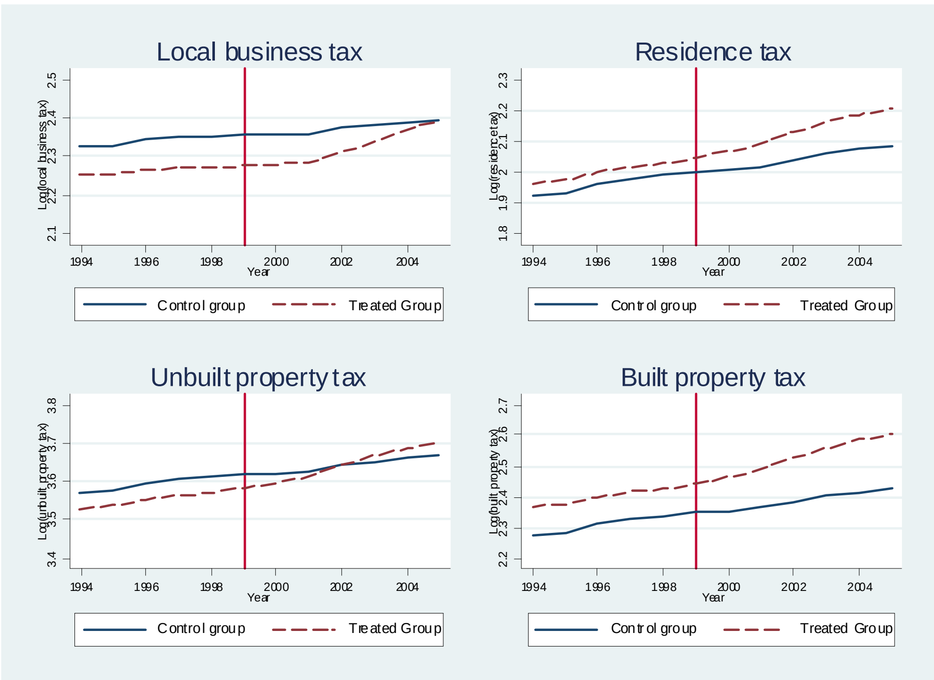
# 4 Results

## 4.1 First model : the impact of inter-municipal cooperation on the level of the four cumulative tax rates

### 4.1.1 Trends of the four cumulative tax rates: comparison between the treated and the control groups

Figure 1 displays the evolution of the four cumulative tax rates for both control and treated groups, over the 1994-2005 period. A vertical line is added for year 1999, which is the year from which a municipality can be "treated". Whatever the cumulative tax rate, the evolution between 1994 and 1999 is similar between the treated and the control group. The estimates[7] confirm that, prior to 1999, the evolutions of the outcomes for both groups are not significantly different. This result is consistent with the identifying assumption needed to perform DID estimations. Figure 1 also shows that the treatment had a strong impact on the evolution of all average cumulative tax rates. For municipalities that joined an EPCI, all four cumulative tax rates increased significantly after 1999. Consequently, as the residence tax rate and the built property tax rate were already higher for municipalities belonging to the treated group, the discrepancy between taxes of both groups increased with time. And although the local business tax rate and the unbuilt property tax rate of municipalities belonging to the control group were higher than those of the treated group before the treatment, the increase consecutive to the adhesion to an EPCI has been so strong that, at the end of the period, these tax rates become even higher for municipalities belonging to the treated group.

FIGURE 1: Evolution of the four cumulative tax rates between 1994 and 2005 for control and treated groups




### 4.1.2 Results of the estimations

The first results of the estimation of Model 1 are presented in table 9. All estimated models include time and municipality dummies that are not reported. For municipalities, joining an EPCI leads to a significant increase in all cumulative tax rates. For example, joining

[7] The model estimated is described in the previous section.

an EPCI leads to a 8.7% increase in the built property tax. The effects are relatively close for all cumulative tax rates although we notice a higher increase for the built property tax and the residence tax.

The treatment effect is slightly modified for the local business tax when control variables are added (Model 1'). Controlling for fiscal capacities and the size of the tax base increases the impact of inter-municipal cooperation on the local business tax while we observe the same positive impact on the three other cumulative tax rates. The estimation also shows the expected result that a higher tax rate is levied in municipalities with a smaller tax base. As noticed in the introduction, the tax base of the local business tax is extremely unevenly distributed across the country compared to the other tax bases. 80% of the tax base is concentrated in only 5% of local authorities, and thus most of the municipalities have a small tax base combined with a high tax rate. Moreover, all other things being equal, a relative increase of the cumulative tax rate induced by inter-municipal cooperation must decrease with the municipal tax rate observed before cooperation. Therefore, controlling for the tax base, the treatment effect increases.

Moreover, we note that in the four regressions, the log of the fiscal capacity have the negative expected impact on the cumulative tax rate since the higher the tax base and thus the higher the fiscal capacity, the lower the tax rate will be required to finance a given amount of expenditures.

Table 9: Estimation of Model 1 and Model 1'

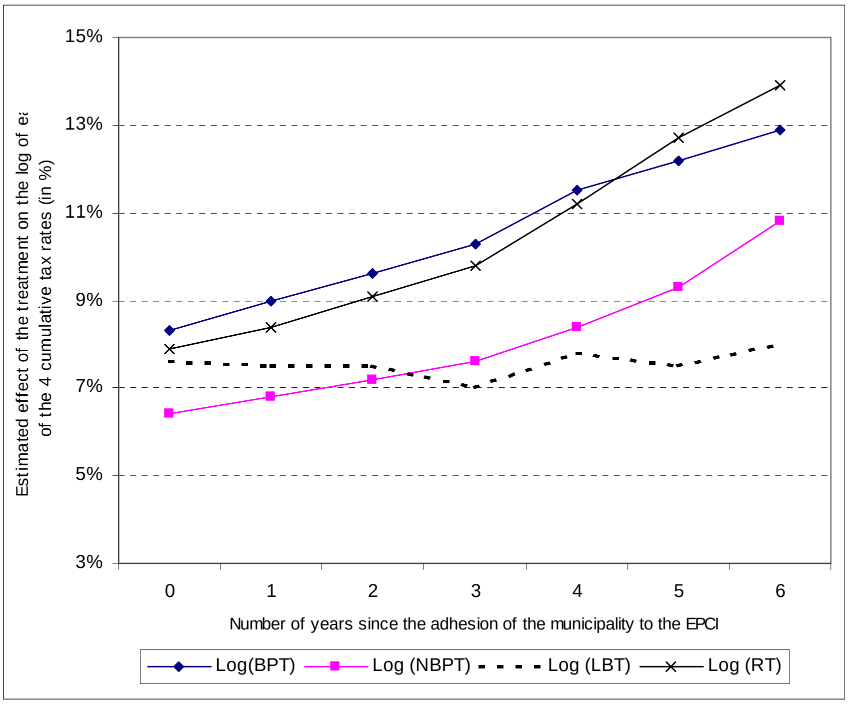
| | Without any control variables | | | | With control variables | | | |
|---|---|---|---|---|---|---|---|---|
| | Log (BPT) | Log (NBPT) | Log (LBT) | Log (RT) | Log (BPT) | Log (NBPT) | Log (LBT) | Log (RT) |
| $E_{it}$ | 0.087*** | 0.065*** | 0.062*** | 0.082*** | 0.087*** | 0.065*** | 0.076*** | 0.082*** |
| | (0.002) | (0.002) | (0.004) | (0.002) | (0.002) | (0.002) | (0.003) | (0.002) |
| Log (tax base/hab) | - | - | - | - | -0.013 | -0.012** | -0.013*** | 0.024** |
| | | | | | (0.010) | (0.006) | (0.002) | (0.009) |
| Log (fiscal capacities/hab) | - | - | - | - | -0.077*** | -0.073*** | -0.081*** | -0.096*** |
| | | | | | (0.008) | (0.006) | (0.011) | (0.007) |
| Year dummies | YES | YES | YES | YES | YES | YES | YES | YES |
| Municipality dummies | YES | YES | YES | YES | YES | YES | YES | YES |
| *N* | 161,633 | 161,520 | 156,847 | 161,704 | 152,598 | 152,318 | 145,885 | 152,745 |
| *Within* $R^2$ | 0.35 | 0.28 | 0.07 | 0.37 | 0.35 | 0.29 | 0.10 | 0.38 |

Notes :
i) Standard errors in parentheses. They are corrected for clustering on the municipalities.
ii) * means that p<.1, ** means that p<.05, *** means that p<.01.
iii) BPT stands for the built property tax; NBPT is the unbuilt property tax; LBT is the local business tax and RT stands for the residence tax.

In order to check whether treatment effects are constant over time, we re-estimate Model 1 with a treatment variable that varies over time (Model 1"'). The results of these estimates are presented in figure 2. We find that joining an EPCI has an immediate effect on all cumulative tax rates, but that the effect increases with time, for all tax rates except the local business tax. In addition, the older the EPCI, the more competencies are likely to be transferred, which may be a reason for the increase of taxation over time. The flat pattern observed for the local business tax is entirely explained by the introduction of the tax base in the regression. Without this explanatory variable, the effect of the treatment increases over time, as this is the case for the other three tax rates.

The fiscal adjustment thus appears to be very progressive. The fact that the evolutions of the four tax rates are linked and restricted by law may explain this progressive increase of the cumulative tax rates. The difference between the pattern observed for the local business tax and the other three cumulative tax rates could be explained by the fact that the local business tax base is more mobile than the other tax bases. Therefore, when it is possible, the increase of tax pressure is applied to the other tax bases.

FIGURE 2: Representation of the time-varying effect of the treatment




We then add interaction effects in order to measure whether the treatment effect is the same for different groups of municipalities (Model 1'). The results are presented in tables 10 and 11.

The rurality clearly worsens the inflationary impact of the creation of an EPCI on the cumulative tax rates (except for the local business tax). For instance, joining an EPCI increases the built property tax by 4.5% for urban municipalities against 8.8% for rural ones. Table 8 shows that 98% of rural municipalities joined CCs[8], which explains that belonging to a CC also increases all cumulative tax rates (except for the local business tax). We expect that inter-municipal cooperation enables the provision of a wider range of public services. This effect, known as the "zoo" effect (Oates (1988)) should particularly important for rural municipalities which, alone, could not produce public goods at a large scale.

We then find that the effect of joining an EPCI decreases with the size of the municipality (for all cumulative tax rates except the local business tax). Two explanations can be provided for this result. The first one is in line with the theoretical literature. According to Wilson (1991), in a tax competition model between jurisdictions with different sizes, the smaller one is more exposed to the effect of tax competition and should set a lower tax rate. Therefore, the creation of an EPCI that lessens tax competition should induce an increase of tax rates in small jurisdictions relatively to tax rates in larger jurisdictions The second intuition for the result comes from the fact that, before becoming members of an EPCI, small municipalities often benefited from public goods or services provided by neighboring larger municipalities without contributing to their financing. Therefore larger municipalities benefit from the creation of an EPCI which enables to mutualize resources in order to provide public services that they municipalities were producing alone before. This should lead to a decrease of municipal tax rate in these municipalities on the contrary to small municipalities. Indeed, the membership of a small municipality to an EPCI could even force it to contribute more to the funding of public expenditures than it would have done otherwise, resulting in the increase of its tax rates. This mechanism, which should be even stronger when scale economies can be realized at the inter-municipal level, refers to the idea of "connected vessels" proposed by Leprince and Guengant (2002).

Finally, choosing an additional taxation regime worsens the inflationary effect on all cumulative tax rates. The effect of a mixed taxation regime is slightly lower. Table 10 also shows that choosing a single business tax regime has positive impact on cumulative tax rates. However, except for the local business tax, the effect is very small although significant. Joining an EPCI with an additional taxation regime leads to a 10.9% increase in the residence tax while this figure goes down to 1.5% for municipalities who joined EPCIs with a single business tax regime. These results are consistent with the literature on tax competition. Indeed, the adoption of an additional taxation regime or a mixed taxation regime induces vertical externalities, which is supposed to push up the tax rates. In a mixed taxation regime and in a TPU regime, an increase of the business tax rate is also expected due to the harmonization of this tax rate within the EPCI, which lessens

[8] This high proportion of rural municipalities in CCs is mechanical and is due to the definition of the other types of EPCIs. CA ("Communautés d'Agglomération") and CU ("Communautés Urbaines") must respectively group together more than 50,000 inhabitants and more than 500,000 inhabitants all in one piece.

horizontal tax competition on this tax. The very small effect on the other tax rates chosen exclusively by the municipalities could then be explained by an indirect effect of externalities due for instance to some interdependence of the tax bases.

These results contradict the one of Charlot *et al.* (2010) who find, using a similar panel data set (1993-2003), that tax rates are higher in EPCIs who choose the single business tax regime or the mixed taxation regime. However the difference between the two results may be due to the fact that their empirical analysis is based on the four municipal tax rates and not the cumulative tax rates.

It is interesting to note that, even without including any other explanatory variables than the treatment effect, the explanatory power of the model is already quite high. For example, 37% of the within variation of the logarithm of the residence tax is explained by our simplest model (table 9). The explanatory power of the model does not increase very much with the use of explanatory variables or interaction variables (tables 10 or 11).

To sum up, our results show that inter-municipal cooperation leads to an increase in the four cumulative tax rates. This finding is consistent with administrative reports (see for example Dallier (2006)) that have already mentioned this inflationary effect as one important drawback of the inter-municipal cooperation. We find that tax increase is higher for rural and/or small municipalities, municipalities that belong to a "Communauté de Communes" or municipalities who choose an additional taxation regime. Table 8 shows that these characteristics are strongly linked. For example, 98% of rural municipalities joined a CC, 91% of municipalities that chose an additional taxation regime are rural and 67% of municipalities in a CC chose an additional taxation regime. However, if this analysis gives a clear result on the effect of inter-municipal cooperation on local taxation, they do not give any information about the relative evolution of the tax rates within an EPCI. This is then the topic of the next section.

## Table 10: Estimation of Model 1' with interaction effects

| | Interactions with legal status | | | | Interactions with fiscal regime | | | |
|---|---|---|---|---|---|---|---|---|
| | Log (BPT) | Log (NBPT) | Log (LBT) | Log (RT) | Log (BPT) | Log (NBPT) | Log (LBT) | Log (RT) |
| $E_{it}$ | 0.027*** (0.006) | 0.023*** (0.005) | 0.134*** (0.015) | 0.018*** (0.005) | 0.122*** (0.003) | 0.091*** (0.002) | 0.083*** (0.003) | 0.114*** (0.003) |
| $E_{it}$ * CC | 0.063*** (0.006) | 0.045*** (0.005) | -0.062*** (0.015) | 0.068*** (0.005) | - | - | - | - |
| $E_{it}$ * TPU | - | - | - | - | -0.109*** (0.003) | -0.081*** (0.003) | -0.018** (0.008) | -0.099*** (0.003) |
| $E_{it}$ * mixed taxation | - | - | - | - | -0.021*** (0.008) | -0.010 (0.007) | -0.066*** (0.021) | -0.005 (0.008) |
| Log (tax base/hab) | -0.016* (0.010) | -0.014** (0.006) | -0.013*** (0.002) | 0.017* (0.009) | -0.025*** (0.009) | -0.017*** (0.006) | -0.013*** (0.002) | 0.006 (0.009) |
| Log (fiscal capacities/hab) | -0.073*** (0.008) | -0.071*** (0.006) | -0.084*** (0.011) | -0.091*** (0.007) | -0.057*** (0.008) | -0.061*** (0.006) | -0.077*** (0.011) | -0.077*** (0.007) |
| Year dummies | YES | YES | YES | YES | YES | YES | YES | YES |
| Municipality dummies | YES | YES | YES | YES | YES | YES | YES | YES |
| *N* | 152,598 | 152,318 | 145,885 | 152,745 | 152,598 | 152,318 | 145,885 | 152,745 |
| *Within* $R^2$ | 0.36 | 0.29 | 0.10 | 0.38 | 0.39 | 0.31 | 0.10 | 0.40 |

Notes :
i) Standard errors in parentheses. They are corrected for clustering on the municipalities.
ii) * means that p<.1, ** means that p<.05, *** means that p<.01.
iii) BPT stands for the built property tax; NBPT is the unbuilt property tax; LBT is the local business tax and RT stands for the residence tax.

## Table 11: Estimation of Model 1' with interaction effects

| | Interactions with rural | | | | Interactions with population | | | |
|---|---|---|---|---|---|---|---|---|
| | Log (BPT) | Log (NBPT) | Log (LBT) | Log (RT) | Log (BPT) | Log (NBPT) | Log (LBT) | Log (RT) |
| $E_{it}$ | 0.044*** (0.004) | 0.043*** (0.004) | 0.073*** (0.007) | 0.041*** (0.004) | 0.113*** (0.003) | 0.082*** (0.003) | 0.083*** (0.005) | 0.105*** (0.003) |
| $E_{it}$ * Rural | 0.050*** (0.004) | 0.027*** (0.004) | 0.003 (0.008) | 0.048*** (0.004) | | | | |
| $E_{it}$ * pop 500 to 2000 | - | - | - | - | -0.062*** (0.004) | -0.040*** (0.003) | -0.005 (0.007) | -0.052*** (0.004) |
| $E_{it}$ * pop 2000 to 10000 | - | - | - | - | -0.078*** (0.005) | -0.048*** (0.005) | -0.034*** (0.009) | -0.075*** (0.005) |
| $E_{it}$ * pop > 10000 | - | - | - | - | -0.110*** (0.007) | -0.081*** (0.006) | -0.141*** (0.016) | -0.120*** (0.006) |
| Log (tax base/hab) | -0.017* (0.010) | -0.014** (0.006) | -0.013*** (0.002) | 0.013 (0.009) | -0.022** (0.010) | -0.017*** (0.006) | -0.014*** (0.002) | -0.001 (0.009) |
| Log (fiscal capacities/hab) | -0.075*** (0.008) | -0.073*** (0.006) | -0.081*** (0.011) | -0.093*** (0.007) | -0.072*** (0.008) | -0.071*** (0.006) | -0.079*** (0.011) | -0.086*** (0.007) |
| Year dummies | YES | YES | YES | YES | YES | YES | YES | YES |
| Municipality dummies | YES | YES | YES | YES | YES | YES | YES | YES |
| *N* | 152,598 | 152,318 | 145,885 | 152,745 | 152,598 | 152,318 | 145,885 | 152,745 |
| *Within* $R^2$ | 0.36 | 0.29 | 0.10 | 0.38 | 0.37 | 0.29 | 0.10 | 0.39 |

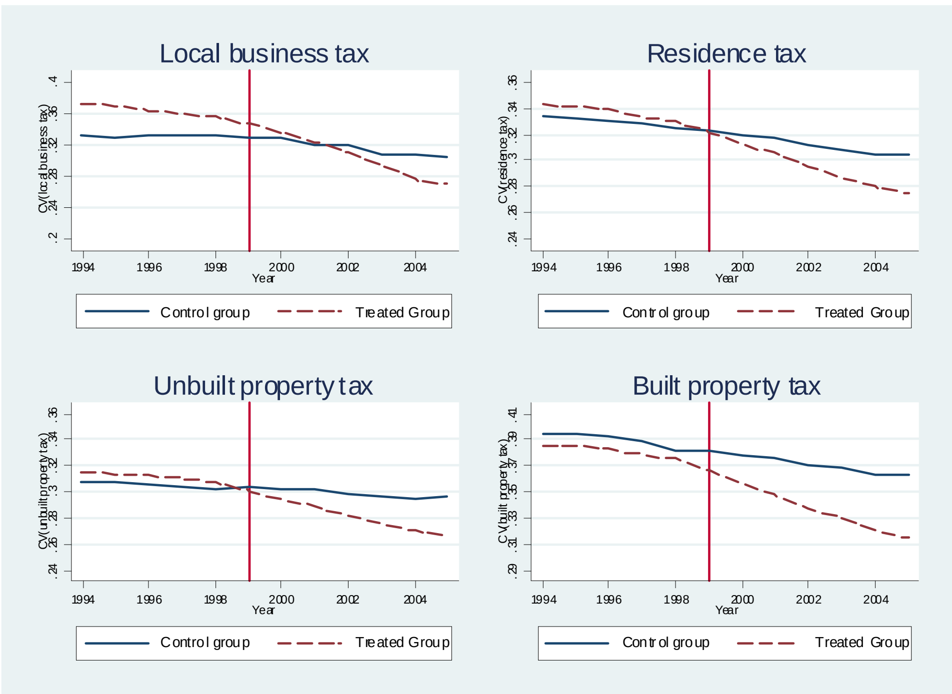
Notes :
i) Standard errors in parentheses. They are corrected for clustering on the municipalities.
ii) * means that p<.1, ** means that p<.05, *** means that p<.01.
iii) BPT stands for the built property tax; NBPT is the unbuilt property tax; LBT is the local business tax and RT stands for the residence tax.

## 4.2 Second model : the impact of inter-municipal cooperation on the dispersion of the cumulative tax rates among municipalities belonging to the same EPCI

### 4.2.1 Trends of the dispersion of the four cumulative tax rates: comparison between the treated and the control groups

In this second model, we examine tax rate dispersion among municipalities belonging to the same EPCI. Tax rate dispersion is measured using weighted coefficients of variation. Figure 3 displays the evolution of the average coefficients of variation calculated for the four cumulative tax rates over the 1994-2005 period, both for control and treated groups. Overall, we observe a continuous convergence of tax rates over the whole period. However, this trend is more definite for municipalities who decided to join an EPCI. Whereas the evolution of the coefficients of variation is similar for both groups before 1999 (for all cumulative tax rates, a regression shows that the trends of the coefficients of variation are not significantly different for the treated and the control groups), the disparities decrease at a much higher rate after 1999 in the treated group: belonging to an EPCI leads to higher convergence of tax rates. Moreover, we notice that this decrease is stronger for the local business tax while it is less important for the built and unbuilt property taxes as well as the residence tax.

FIGURE 3: Evolution of the weighted coefficients of variation of the four tax rates, between 1994 and 2005, both for control and treated groups



### 4.2.2 Results of the estimations

The results of the estimation of the simplest model (Model 2) are presented in table 12; this model does not contain any interaction effects and the effect of the treatment is supposed to be constant over the years. As for Model 1, Model 2 includes time and EPCI dummies that are not reported. We find that joining an EPCI has a positive and significant impact on the convergence of all cumulative tax rates, and especially on the local business tax rate[9]. The comparison of Model 1 and Model 1' has shown that introducing explanatory variables did not have much influence on the estimation of the treatment effect. In this model, however, adding covariates has a strong impact on the results. First, the explanatory power of the models, measured by the Within $R^2$, increases. Then, the impact of joining an EPCI on the convergence of all tax rates is strongly reduced. This reduction is mainly due to the impact of the most significant variable in these regressions: the log of the EPCI tax rate. This variable has a negative impact on the dispersion of the cumulative tax rates. This effect is mechanical, coming from the definition of a coefficient of variation. All other things being equal, adding the same inter-municipal tax rate to all municipal tax rates within an EPCI leads to a decrease of the coefficient of variation.

The regression also shows that the higher the heterogeneity of the tax base, measured by the coefficient of variation of the tax base, the higher the dispersion of tax rates. We have seen in the previous section that the level of the tax base has an impact on the choice of the level of tax rates. Therefore, different sizes of tax bases should lead to different fiscal decisions.

The estimation of Model 2", that allows the treatment effects to vary over time shows that, for all taxes, the convergence of tax rates increases over time. However, when explanatory variables are added to the regression (and especially the log of the EPCI tax rate), the effect of these "pulse variables" is not significant anymore, i.e. joining an EPCI has only an immediate impact on the convergence of tax rates, except for the local business tax (figure 4).

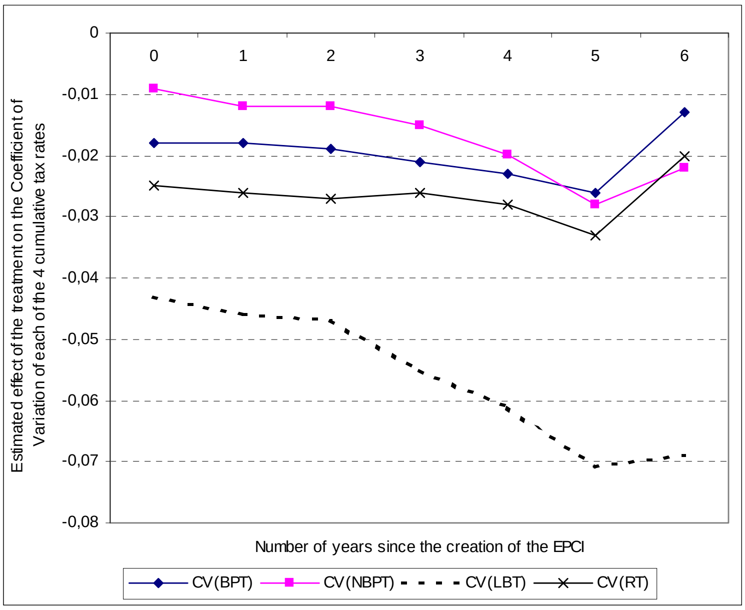
[9] For all estimates, the convergence of the local business tax rate is only measured for EPCIs that chose an additional taxation regime, since the coefficient of variation of the local business tax for EPCIs that chose the single business tax regime is zero by construction.

Table 12: Estimation of Model 2 and Model 2'

| | Without any control variables | | | | With control variables | | | |
|---|---|---|---|---|---|---|---|---|
| | CV (BPT) | CV (NBPT) | CV (LBT) | CV (RT) | CV (BPT) | CV (NBPT) | CV (LBT) | CV (RT) |
| $E_{it}$ | -0.035*** (0.004) | -0.026*** (0.003) | -0.060*** (0.005) | -0.030*** (0.003) | -0.019*** (0.003) | -0.009*** (0.003) | -0.046*** (0.004) | -0.026*** (0.003) |
| CV (tax base/hab) | - | - | - | - | 0.010 (0.012) | 0.040 (0.029) | 0.010** (0.006) | 0.096** (0.048) |
| Log (EPCI tax rate) | - | - | - | - | -0.043*** (0.005) | -0.016*** (0.002) | -0.036*** (0.005) | -0.036*** (0.005) |
| CV (fiscal capacities/hab) | - | - | - | - | -0.027 (0.020) | 0.010 (0.015) | 0.0005 (0.024) | -0.021 (0.019) |
| Year dummies | YES | YES | YES | YES | YES | YES | YES | YES |
| EPCI dummies | YES | YES | YES | YES | YES | YES | YES | YES |
| *N* | 14,074 | 14,074 | 9,724 | 14,082 | 14,057 | 14,057 | 9,707 | 14,065 |
| *Within* $R^2$ | 0.18 | 0.12 | 0.27 | 0.18 | 0.25 | 0.15 | 0.31 | 0.23 |

Notes :
i) Standard errors in parentheses. They are corrected for clustering on the EPCIs.
ii) * means that p<.1, ** means that p<.05, *** means that p<.01.
iii) BPT stands for the built property tax; NBPT is the unbuilt property tax; LBT is the local business tax and RT stands for the residence tax.

Figure 4: Representation of the time-varying effect of the treatment




The intuition behind this general result of convergence of the tax rates within an EPCI comes from the previous results and confirm the idea of "connected vessels" suggested by Leprince and Guengant (2002). When joining an EPCI, the contribution to the cooperation level should lead small municipalities to increase more their tax rates than the larger municipalities would do. As a consequence, a convergence of tax rates is expected, which should be even stronger when the heterogeneity before cooperation is high.

The estimation of Model 2"' that uses interaction effects shows that the convergence of tax rates differs according to the characteristics of the EPCI. We then allow the treatment effect to depend on whether the EPCI is rural or not[10], on the legal status of the EPCI, on its fiscal regime and on the size of the coefficient inhabitants in the EPCI. The results are presented in tables 13 and 14.

From table 13, we see that there is a strong convergence of tax rates for EPCIs that chose an additional taxation regime, for every local taxes, and this effect is not significantly different for the EPCIs with a mixed taxation regime. However the convergence is lower for EPCIs that choose a single business tax regime, but still significant. The heterogeneity of municipalities should be reflected in their level of public expenditures and/or in their local tax rates. Therefore, the result can be explained by the fact that choosing a single business tax regime implies the loss of a tax instrument for the municipalities and thus, the heterogeneity of fiscal decisions can only be distributed among the three taxes left at the municipal level which increases the coefficient of variation. However, this result goes against the main reason of the implementation of TPU regime. Indeed, this fiscal regime has been mainly created to address the issue of fiscal disparities due to the uneven distribution of the business tax base. Therefore, a stronger financial solidarity between municipalities within an EPCI should have induced a higher convergence of tax rates.

In table 14, interactions with the coefficient of variation of the municipal population shows an increasing effect of convergence with the heterogeneity of the EPCIs in terms of population. It thus confirms the intuition we already outlined before. We expect that cooperation lessens tax competition especially for the smaller municipalities, resulting in a relatively higher increase of tax rates in the municipalities with a relatively lower population (see table 11). Therefore, the creation of an EPCI composed of municipalities of similar sizes, i.e. with a low coefficient of variation, has a much smaller effect or not significant effect (in the case property taxes) on the convergence of tax rates since homogeneous municipalities in terms of sizes see an increase of their cumulative tax rates in the same proportion. On the opposite, table 14 suggests that the effect of cooperation on convergence is important when the EPCI is characterized by a very heterogeneous population.

Finally, no significant differences of the cooperation effect are found according to the legal or rural status. This may be explained by the composition of these sub-groups. For instance, rural EPCIs are on average more homogeneous in terms of population while non-rural EPCIs adopt more often a TPU regime (see table 8). As noticed before, these characteristics both reduce the effect on convergence which should thus explain that the total treatment effect is the same.

[10]We have defined as rural, an EPCI in which more than 50% of the inhabitants live in a rural municipality.

Table 13: Estimation of Model 2" with interaction effects

| | Interactions with legal status | | | | Interactions with fiscal regime | | |
|---|---|---|---|---|---|---|---|
| | CV (BPT) | CV (NBPT) | CV (LBT) | CV (RT) | CV (BPT) | CV (NBPT) | CV (RT) |
| $E_{it}$ | -0.019* (0.011) | -0.009 (0.007) | -0.065*** (0.005) | -0.026* (0.014) | -0.025*** (0.003) | -0.010*** (0.004) | -0.033*** (0.003) |
| $E_{it}$ * CC | 0.000 (0.011) | -0.001 (0.007) | 0.019*** (0.006) | 0.000 (0.014) | - | - | - |
| $E_{it}$ * TPU | - | - | - | - | 0.016*** (0.005) | 0.002 (0.005) | 0.023*** (0.005) |
| $E_{it}$ * mixed taxation | - | - | - | - | 0.013 (0.009) | 0.003 (0.007) | 0.001 (0.015) |
| CV (tax base/hab) | 0.010 (0.012) | 0.040 (0.029) | 0.010* (0.006) | 0.096** (0.048) | 0.010 (0.012) | 0.040 (0.030) | 0.095** (0.048) |
| Log (EPCI tax rate) | -0.043*** (0.005) | -0.016*** (0.002) | -0.036*** (0.005) | -0.036*** (0.005) | -0.039*** (0.004) | -0.016*** (0.003) | -0.034*** (0.004) |
| CV (fiscal capacities/hab) | -0.027 (0.020) | 0.010 (0.015) | 0.000 (0.024) | -0.021 (0.019) | -0.022 (0.020) | 0.013 (0.015) | -0.013 (0.019) |
| Year dummies | YES | YES | YES | YES | YES | YES | YES |
| EPCI dummies | YES | YES | YES | YES | YES | YES | YES |
| *N* | 14,057 | 14,057 | 9,707 | 14,065 | 13,934 | 13,934 | 13,939 |
| *Within* $R^2$ | 0.25 | 0.15 | 0.31 | 0.23 | 0.26 | 0.15 | 0.23 |

Notes :
i) Standard errors in parentheses. They are corrected for clustering on the EPCIs.
ii) * means that p<.1, ** means that p<.05, *** means that p<.01.
iii) BPT stands for the built property tax; NBPT is the unbuilt property tax; LBT is the local business tax and RT stands for the residence tax.

Table 14: Estimation of Model 2" with interaction effects

| | Interactions with rural | | | | Interactions with population | | | |
|---|---|---|---|---|---|---|---|---|
| | CV (BPT) | CV (NBPT) | CV (LBT) | CV (RT) | CV (BPT) | CV (NBPT) | CV (LBT) | CV (RT) |
| $E_{it}$ | -0.019*** (0.005) | -0.012*** (0.004) | -0.038*** (0.009) | -0.028*** (0.006) | -0.017*** (0.004) | -0.009** (0.004) | -0.047*** (0.005) | -0.026*** (0.004) |
| $E_{it}$ * Rural | 0.001 (0.006) | 0.004 (0.006) | -0.011 (0.011) | 0.004 (0.007) | - | - | - | - |
| $E_{it}$ * low_CV(pop) | - | - | - | - | 0.018*** (0.005) | 0.011*** (0.004) | 0.013 (0.010) | 0.020*** (0.005) |
| $E_{it}$ * high_CV(pop) | - | - | - | - | -0.023** (0.009) | -0.010 (0.008) | -0.009 (0.012) | -0.017* (0.009) |
| CV (tax base/hab) | 0.010 (0.012) | 0.040 (0.029) | 0.010* (0.006) | 0.095** (0.048) | 0.006 (0.011) | 0.039 (0.029) | 0.010* (0.006) | 0.076 (0.048) |
| Log (EPCI tax rate) | -0.043*** (0.005) | -0.017*** (0.003) | -0.035*** (0.005) | -0.037*** (0.005) | -0.043*** (0.004) | -0.017*** (0.003) | -0.037*** (0.005) | -0.037*** (0.005) |
| CV (fiscal capacities/hab) | -0.027 (0.020) | 0.010 (0.015) | -0.001 (0.025) | -0.021 (0.019) | -0.025 (0.020) | 0.010 (0.015) | 0.002 (0.025) | -0.020 (0.019) |
| Year dummies | YES | YES | YES | YES | YES | YES | YES | YES |
| EPCI dummies | YES | YES | YES | YES | YES | YES | YES | YES |
| *N* | 14,074 | 14,074 | 9,724 | 14,082 | 14,057 | 14,057 | 9,707 | 14,065 |
| *Within* $R^2$ | 0.18 | 0.12 | 0.27 | 0.18 | 0.26 | 0.15 | 0.31 | 0.24 |

Notes :
i) Standard errors in parentheses. They are corrected for clustering on the EPCIs.
ii) * means that p<.1, ** means that p<.05, *** means that p<.01.
iii) BPT stands for the built property tax; NBPT is the unbuilt property tax; LBT is the local business tax and RT stands for the residence tax.
iv) Low CV(pop) (resp. High CV(pop)) means that the coefficient of variation of the number of inhabitants in the EPCI is lower (resp. higher) than the 1st quartile (resp. the 3rd quartile) of the distribution of the coefficient of variation of the number of inhabitants.

# 5 Conclusion

Cooperation among the French municipalities clearly leads to an increase in each of the four cumulative tax rates over the period 1999-2005. As a consequence of fiscal integration, this effect becomes stronger with time. The highest tax rises are observable in small and rural municipalities, where cooperation has often been an opportunity to launch important investment projects. The comparison between the three fiscal regimes offered to municipalities in EPCIs (i.e. the additional taxation regime, the single business tax regime and the mixed taxation regime) shows that the additional taxation regime worsens the inflationary effect on all cumulative tax rates. This is thus consistent with the prediction of the theoretical literature on tax competition. However, we cannot rule out a problem of accountability that could occur with cooperation. Indeed, in the French case, inter-municipal assemblies are composed of members who are not directly elected since they are representatives of each member municipality. Each one is designed by the elected incumbents of its municipality. Therefore, there is a scope for a leviathan behaviour at the inter-municipal level, that could also explain the overtaxation.

The study of tax rate convergence among municipalities that belong to the same EPCI –measured by weighted coefficients of variation– brings new insights as it shows that cooperation leads to a higher convergence of each cumulative tax rate, and especially the local business tax rate. Contrary to the results obtained on the level of the cumulative tax rates, we find that the convergence of tax rates is not significantly different between rural EPCI and non rural EPCI. We also find that, for all cumulative tax rates, the convergence of tax rates is higher for EPCIs that chose an additional or mixed taxation regime than for those who chose a single business tax regime. This suggests that with due to the loss of one of their tax instruments, municipalities in a TPU regime face their heterogeneity by differencing even more their remaining tax rates. Finally, the results found for the analysis on the level of tax rates provide an explanation of the increasing convergence with the heterogeneity in terms of population. The creation of an EPCI leads to a higher increase of tax rates for its smaller municipalities than for its larger ones, which thus results in a higher convergence of tax rates.

Overall, if this empirical analysis confirms the main drawback of inter-municipal cooperation, i.e. a higher tax pressure, the significance of positive effects expected from a higher inter-municipal solidarity, i.e. a convergence of fiscal decisions, is also questioned. The results and evidence provided in this paper, could then be used as a starting point for a new reflexion on the impact and design of inter-municipal cooperation.

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