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Fischer, Justina AV and Thiessen, Ulrich
University of Mannheim, European Commission

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Incentive Effects of Fiscal Equalization: The Case of France

Justina A.V. Fischer* and Ulrich Thiessen**

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Abstract

This empirical study shows for 22 French regions between 2002 and 2008 that fiscal equalization does not appear to distort incentives for regional governments. We find a growth-enhancing impact of inter-governmental transfers on regional growth, with no major differences between donor and recipient regions. Only for the extremely poor recipient regions do we find an insignificant transfer effect. In addition, a high 'marginal tax on own tax revenues' appears to trigger income compensation efforts, yielding higher regional growth. These findings contradict previous empirical studies for federal countries that tend to find adverse incentive effects of fiscal equalization on regional governments and growth. Overall, our tentative explanation for our own contrasting results is that France's system of transfers is relatively moderate with regard to both the volume and the 'marginal tax on regional tax revenues', and also that local governments in France have – in comparison with other industrial countries – relatively well established own revenues.

Keywords: Fiscal equalization; inter-governmental transfers; French regions; decentralization

JEL classification: E62; H70; R11

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* University of Mannheim, Faculty of Economics, L7, 3-5, 68161 Mannheim, e-mail: javfischer@gmx.de.

** European Commission, e-mail: ulrich.Thiessen@eeas.europa.eu, ulrich.thiessen@t-online.de.

1 Introduction

Recently, the relevance of fiscal equalization systems in strategies for long run sustainable economic growth has been recognized – particularly as countries grow wealthier while disparities continue at the same time. An extreme example for the importance of equalization systems setting the 'right' incentives for regional governments has been the Argentinian crisis in 1999-2002, where a high degree of decentralization together with a complex tax sharing system not corresponding to economic criteria provided perverse incentives for provincial leaders to overexploit national taxation (Saiegh and Tommasi, 1999). On a supranational level, the importance of fiscal equalization schemes is shown by the current financial and Euro crises in Europe since 2008, calling for inter-governmental support to peripheral EU countries on a longer term basis despite its explicit prohibition according to article 103 of the Maastricht treaty. Many other industrial countries have recently introduced reforms of their fiscal equalization systems. Although these reforms differ substantially in their details, they show two common features: they intend to strengthen the incentive effects for local governments and to limit the scale of redistribution relative to GDP (e.g., Arachi and Zanardi, 2004, for Italy, and Blöchliger et al., 2007, for an overview of OECD countries). Empirical evidence for regional growth effects of fiscal equalization, however, is sorely lacking.

Against this background we provide an empirical analysis of the effects of inter-government fiscal arrangements on regional economic growth in France – with a specific focus on its incentive effects for regional governments. In contrast to most previous studies, we will differentiate between the effects for donor and recipient regions separately. Several characteristics make France an interesting case, including its tradition of being a rather politically centralized country with considerable disparities, but also formula-driven transfers to regions (fiscal redistribution), which exist since a long time (1982). Finally, France has fully fledged subnational governments with a relatively strong 'own tax' revenue base, i.e. taxes which the regions can largely determine themselves. As most previous empirical studies concentrate on the analysis of federal systems, there is a lack of studies on perceived centralized countries such as France.

Despite a rapidly growing literature on fiscal federalism and its popular sub-topic fiscal decentralization, the explicit empirical analysis of incentive effects exerted by fiscal equalization appears to be still in its infancy: In one of the first publications on these effects Smart and Bird (1997) showed for the Canadian system that inter-governmental transfers

tended to result in increased local tax rates in relatively poor regions because the tax revenue-lowering effect of higher tax rates was partly compensated by the transfers. Building on this work and on Bordignon et al. (2001), Barette et al. (2002) performed a pioneering theoretical and empirical analysis for Germany. Their study is the first to distinguish between donor and recipient regions - both donor and recipient regions face very high marginal 'tax rates' (well above 90 percent) on their regional revenues or, in other words, very low 'marginal retention rates', which is the notation used in this paper. Plausibly, the authors find that these high marginal tax rates had statistically significant negative effects on regional performance indicators such as economic growth and tax revenues.¹ In this paper, we will show for 22 French regions contrasting impacts of the retention rates on regional economic growth.

For 19 high income OECD countries, Feld and Dede (2005) report that the tax autonomy of subnational governments does not appear to have a robust effect on economic growth. But they also detect a negative association between the communal share in tax revenues and economic growth. By contrast, Falch and Fischer (2010), Dreher and Fischer (2010), and Bjørnskov et al. (2008) suggest that increased unconditional transfers to regions from the central government improve important welfare indicators (educational outcomes, happiness, national security). Balaguer-Coll et al. (2007) provide evidence for local public expenditures in Spain that inefficiencies were primarily of the allocative type, i.e. that a suboptimal relation of input factors is chosen. Thus, a "simple" change of the relation of inputs could increase efficiency - a finding that confirms the importance of incentives provided to subnational governments. Having recognized the importance of incentive effects for local governments to achieve sustainable and high growth, our study puts a focus on those incentive effects triggered by fiscal equalization schemes.

For transition countries, however, there already exist some empirical studies that focus on incentives effects. Several analyses concern Russia and, to the best of our knowledge, there is one each on China and Ukraine. Russia is interesting because it implemented inter-governmental fiscal reforms in the early 2000s that largely followed western scientific advice (formula driven transfers, clear separation of political and spending responsibilities etc.). The most recent paper by Freinkman et al. (2011) argues that these reforms resulted in improved

¹ Similarly, Eggert et al. (2007) report that regional transfers provided by the EU structural funds have negative effects on long term real economic growth in Germany.

incentives.² For China, Jin et al. (2004) focus on incentives for local governments to develop an own revenue base. They find that there are substantial regional differences in these incentives and that stronger revenue incentives tend to be beneficial for economic development. In his study on the Ukraine, Thiessen (2004) argues that the equalization system did not appear to have adverse growth effects because regional redistribution of revenues was only moderate. Also in this paper for the developed OECD country France we will finally come to the conclusion that it is the moderate level of redistribution across French regions that is responsible that no adverse incentive effects for regional growth are observable.

The paper is structured as follows: Section 2 discusses briefly the theoretical literature of fiscal equalization and economic growth. Section 3 provides a small model of the incentive effects of equalization and describes major characteristics of France's equalization system. Section 4 explains our empirical model, estimation method and introduces the data, while section 5 discusses the empirical results. Section 6 provides policy advice and concludes.

2 Theoretical Background: fiscal equalization and growth

The theoretical case for fiscal equalization is well established and largely undisputed (e.g. Boadway and Keen 1996, Bordignon et al. 2001, Dahlby and Wilson 2003). The theory is continuously broadened by considering additional and important externalities between regions such as recently the case of harmful tax competition, which fiscal equalization can help to contain (Köthenbürger 2002, Grazzini and Petretto 2005, Bucovetsky and Smart 2006). However, it is also true that fiscal equalization may have unforeseen detrimental effects like on growth which should be carefully studied because society has a right to know whether the benefits of having a fiscal equalization system are larger than the costs.

2.1. Theoretical literature on intergovernmental transfers and economic growth

The existing theoretical growth literature that incorporates vertical or horizontal transfers across government tiers is scant. One of the few contributions is the model by Ogawa and Yakita (2009). They construct a model of endogenous growth with two subfederal regions in a

² For studies on the deficiencies of the old system, see Zhuravskaya (2000), Alexeev and Kurlyandskaya (2003), Desai et al. (2005), Thiessen (2006), and Freinkman and Plekhanov (2009).

fiscally decentralized country in which a central government that takes away of the richer regions' tax revenue to redistribute it to the poorer regions, with the aim to equalize the local tax revenue. While the local governments are assumed to pursue a welfare-maximizing policies, the central government has as its sole goal to maximize overall growth. The model predicts that higher interregional transfers trigger an incentive for local governments to undertax their tax base – what the authors call a 'disincentive effect' to raise their own revenue. This finding contradicts theoretical models of inter-regional fiscal redistribution explaining tax choices by regional governments (e.g. Smart 1998). Second, Ogawa and Yakita (2009) show that fiscal equalization is no determinant of regional convergence in growth – its effect on relative regional economic growth is null. Due to the conflicting interests between local and central governments, the overall-growth maximizing size of redistribution is not welfare maximizing. However, there is a specific low degree of fiscal decentralization where redistributive transfers are both growth- and welfare-increasing. This findings is complementary to the model by Akai et al. (2007) who find a humped-shaped relation between fiscal decentralization and economic growth, assuming that all tiers of governments invest in the same public good. For our research question, the theoretical model by Ogawa and Yakita (2009) implies that, even though transfers themselves create a disincentive for regions to raise their own tax revenue, there is still a range where they may still be overall growth-enhancing.

To our knowledge, most other theoretical contributions neglect the relevance of inter-governmental transfers for economic growth. Some alternative theoretical approaches model decentralization simply as a black box, as the share of local and central government spending in total government spending, assuming government size as given. An example for this type of model is Davoodi and Zou (1998) who simply calculate the level of decentralization for which overall growth is at the maximum. Another example is Madies and Ventelou (2005), who model decentralization by assuming that there are two government tiers sharing the same tax basis. Again, intergovernmental transfers are only implicitly assumed to exist; nevertheless, for reasons of completeness we discuss some of this related literature below in section 1.2. Such decentralization-growth literature makes it difficult to draw conclusions with respect to incentive effects of vertical and horizontal transfers for local governments and how they impact regional growth, which we are particularly interested in. We discuss the literature on the incentive effects of intergovernmental transfers for regional tax policies in section 1.3. - a literature which often neglects to discuss growth implications.

2.2. Related literature on intergovernmental transfers and economic growth

Related literature can be categorized into three groups: first, models of endogenous economic growth that assume redistribution by the central government across heterogeneous private agents rather than local governments.³ Second, many economists model the positive effects of simplified fiscal decentralization on economic growth – notably, the degree of fiscal decentralization can be thought to increase as transfers from the central tier to subfederal tiers grow (e.g. Akai et al., 2007). Only loosely related to our research question is the literature on government size and its effect on endogenous growth, building on Barro (1990), which usually neglects the question of cross-governmental spending structure.

2.2.1. Government redistribution and growth

One prominent example of the first type is the endogenous growth model developed by Alesina and Rodrik (1994), in which the effects of redistributive government policies affect the production by heterogeneous firms, who differ in their relative capital/labor endowments. The welfare-maximizing government taxes capital to produce a government service (here: 'law and order') and to transfer income to the factor labor. *Ceteris paribus*, government transfers to labor are predicted to hamper growth, which, however, boosts as tax rates on capital increase - as long as they remain in a sufficiently low range. Even though this model redistributes income across private agents and not across local governments, we may draw an analogy to our research question of the growth effects of interregional transfers. Assuming two heterogeneous regions, one more endowed with labor and one more with capital, we would expect government transfers financed by moderate capital taxes to exert negative effects on growth in the poor, labor-rich regions, but still positive effects in the richer, capital-rich regions.

Alternative growth models with redistributing governments focus on human capital investment as channel of government influence: for example, they assume that the poorer agent is income- or credit-constrained and thus underinvests in her capital. Consequently, moderate initial wealth redistribution may be overall-growth enhancing, while a degree of income inequality too high deters even the rich agent from investing, in expectation of massive future income redistribution (e.g., Galor and Zeira 1993, Perotti 1993, Deininger and Squire, 1998). In contrast, Perotti (1996) equally supports a human-capital investment channel

³ See Barro and Sala-y-Martin (1990) for a literature survey.

of a negative relation between income inequality and economic growth, but finds no evidence for fiscal policy effects as such.

2.2.2. Fiscal decentralization and growth

That fiscal decentralization, the transferral of spending power to local government, may be conducive to economic growth because of efficiency gains in how government money is allocated in response to local needs, was already hypothesized by Oates (1972, 1993). In the case that local spending power is fueled by unconditional grants from the central government, even the traditional decentralization theory would predict a positive impact of government transfers on regional growth. Nevertheless, as they are also theories that predict that decentralization hampers growth (e.g., because of increased corruption, Prud'homme 1995, Tanzi 1996), so may transfers to subfederal regions.⁴ In general, the number of endogenous growth models that incorporate a fiscally decentralized government with public goods' provision by all tiers is negligibly small. Brueckner (2006) constructs an endogenous growth model in which public goods - financed by a head tax - are provided either centrally, averaging people's preferences, or locally, taking into account regional heterogeneity. His comparative statics suggest that in federalist states private savings and human capital investments are higher triggering more economic growth. Assuming a complementary public goods' production by two government tiers in a federalist country, Akai et al. (2007) predict a hump-shaped relationship between fiscal decentralization and overall economic growth: for low levels of decentralization, decentralization increases economic growth. Similarly, the model by Nishimura (2006) suggests that a public goods' provision not too overly decentralized may lead not only to higher economic growth, but also to growth that is less volatile as compared to when public goods are centrally provided. Leading to a contrasting prediction, Lundholm (2008) constructs a general equilibrium framework with a centralized tax revenue collection to show that decentralized public goods' production by local bureaus can lead to inefficiencies and hamper economic growth.

Our empirical model accounts for the public goods aspect of fiscal federalism by controlling for regional public investment spending and human capital accumulation, so that public goods' effects and incentive effects on regional growth are disentangled.

⁴ See Dreher and Fischer (2010) and Bjørnskov, Dreher and Fischer (2008) for more literature on the economic effects of decentralization; see Iimi (2005) for a review of empirical studies for its effects on growth effect.

2.3. Literature on the incentive effects of intergovernmental transfers

Another strand of literature models explicitly the incentive effects of cross-governmental redistribution for (local) governments. In general, much of this literature focuses on the impact of tax competition across government tiers and units, while much less has been said about the effects of fiscal equalization regimes.⁵ The few models that exist look at effects of a grant formula on local government choice of tax rates and levels of local public spending; however, most of these models lack drawing explicit conclusions for regional economic growth.

Already Smart (1998) predicted that cross-regional transfers decrease the marginal costs of the recipient government to raise public funds of her own, creating an incentive to overspend, to increase local tax rates beyond their optimal level and to focus on production of such public goods that are purely consumptive and non-productive. Dahlby (2002) extends this model allowing the recipient government to act strategically to maximize the received transfers; the recipient government will then equally underspend in productivity-enhancing public goods such as education and infrastructure. Both these contributions, however, neglect to analyze the incentive effects in the donor region. Further theoretical studies differentiate between vertical and horizontal transfers and investigate into the negative externality effects when two government tiers exploit the same tax base, leading to overtaxation and to a non-optimal public goods production (e.g., Boadway et al., 1998, Dahlby and Wilson, 2003). Even though both tax distortion effects and inefficiencies in government allocation are most likely to be overall growth-reducing, all authors make no direct prediction for regional growth, apart from not explicitly distinguishing between recipient and donor regions. In section 3 we briefly introduce the model by Barette et al. (2000 and 2002) to explain the impact of inter-governmental transfers on regional governments' incentives, for donors and recipients separately.

⁵ For a literature review, see Brülhart and Jametti (2006).

3 Incentive effects of fiscal equalization and stylized characteristics of France’s fiscal equalization scheme

3.1 Theory: the incentive effects of equalization

In the following, Figure 1 presents a graphical representation of the incentive effects for economic growth based on the model by Barette et al. (2000 and 2002), according to which the *volume* of fiscal equalization influences the optimal regional growth rate (leading to Y^*): In principle, regional governments can choose between regional income (growth)-producing 'effort' and 'leisure' (or between the generation of productive and consumptive public goods, respectively). A region’s fiscal capacity rises in received net payments transferred by other regions. Consequently, such a positive revenue shock implies lower benefits from additional regional growth (MB).

Insert Figure 1 about here

In Figure 1, the exogenous positive revenue shock of net recipients through fiscal equalization payments causes the MB-line to shift to the left (MB’). Hence, fiscal equalization payments lower the optimal growth rate for net recipients (Y^* shifts to the left), reducing their productive efforts. For net payer regions, however, an increase in fiscal equalization payments to poorer regions implies that they now have to provide more support to poor regions and thus lose own revenue, which, in turn, raises the marginal benefits of revenue-generating growth. For net payers, the exogenous revenue shock lets the MB schedule shift to the right - to MB’’. Their optimal growth rate is now higher (Y^* shifts to the right): donor regions compensate for the revenue loss through increasing their productive efforts, which generates (higher) revenue-generating growth.

The *marginal retention rate* (RET) is defined as the fraction of one additional unit of tax revenue collected by a region that it may retain for her own spending. In the theoretical model developed by Barette et al. (2000 and 2002), RET is the marginal retention rate at the end of all stages of fiscal equalization. The impact of RET on regional growth is difficult to predict, because like any implicit tax on revenue-generating 'effort' it causes both substitution and income effects. In the case of donor regions, both effects work against each other. First, in

both donor and recipient regions a lower RET diminishes the benefits from additional growth, lowering the optimal growth rate and causing a substitution of 'effort' for 'leisure' (or the production of investment goods for consumption goods). Second, there is also an income effect because a lower RET increases the total amount of funds available for redistribution: relatively wealthy regions will pay more and lose revenue, while relatively poor regions receive these additional resources, increasing their fiscal capacity. We have discussed the impact of an exogenous revenue shock and the income effect it triggers above.

Gauging the income effect versus the substitution effect, in the recipient regions both effects reinforce each other as increased local revenue diminishes further incentives to increase efforts to grow. But in donor regions, the loss of revenue implies a positive income effect, creating strong incentives to raise output to compensate for the revenue loss. Thus, for donor regions the income effect works in the opposite direction than the substitution effect.

Hypotheses

Based on these considerations, we expect in both donor and recipient regions the receipt of fiscal transfers to reduce regional per capita growth, while a loss in own tax revenue generates higher growth. Furthermore, we predict for recipient regions a positive, growth-enhancing influence of the marginal retention rate, whereas for donor regions the sign is indeterminate.

We will differentiate and test these two propositions by examining the signs of the coefficients on the retention rate and the transferred volume in both recipient and donor regions.

3.2 Stylized facts on the fiscal equalization system of France

France's fiscal equalization system consists, in principle, only of two stages: In stage one the regions (the consolidated subnational governments, i.e. communes, departments and regions) pay a part of the tax revenue collected on their territory (by a central government tax agency) to the central government.⁶ France employs a system of shared tax bases (see Prud'homme, 2006, for a detailed description of the various transfer schemes in France).⁷ In stage two the

⁶ The official statistics show 36782 communes, 100 departements, and 22 regions plus 4 overseas regions. The latter are excluded from our analysis.

⁷ The subnational governments can determine the tax rates largely themselves within some boundaries set by the central government, but they have been relatively stable.

central government and the rules of the fiscal equalization scheme determine the amount of transfers paid to each consolidated subnational government. In our data base, we consider all transfers irrespective of their sources - they are largely driven by formulas.

We define as 'retention rate' that share of consolidated subnational government tax revenues that remains in the region, after the central government has received its share in stage one and after transfers have been paid to the regions in stage 2. Specifically, this share can be considered to be a *marginal retention rate*, defined as the fraction of one additional unit of tax revenue collected by a region that is kept by the region for its own government spending, because there is, in principle, no 'tax free' amount and no progressive tax rate schedule.⁸

For our analysis, we calculate for each of the six years the 'retention rate' each of the 22 regions faced between 2002 and 2008. Since inter-governmental transfers to our 22 regions are in each case smaller than the central government's share of tax revenues collected at the region's territory, we can calculate a net outflow of revenues from each region. Admittedly, these net outflows are "simple" in the sense that they do not make adjustments for any incidence: Hence, it is not analyzed whether tax revenues collected by a region have their economic origin in this region and were not shifted. In addition, it is assumed that transfers to a certain region have their main economic effects in the receiving region only. The study of and any adjustment for incidence would be a major effort and there are not sufficient data to do so, but this qualification must be admitted.

This net outflow of revenues is the basis for our definition of donor and recipient regions in the system of fiscal equalization (see also section 3.1). Since there is no generally accepted method of identifying these two types of regions in France; hence, we employ this net outflow to make the separation. We calculate different groups of donors and recipients to see whether they all yield consistent results: First we used the median, second we used both the lower and upper 25 percentile of the net loss distribution. The latter produced conservative measures of true donors and recipients. An alternative definition based on a large number of budgetary elements per region by Prud'homme (1997) identified only three donor regions: Alsace, Île de

⁸ Note that the inverse of this retention rate is the amount of an additional unit of tax revenue raised that flows out of the region, working like a "marginal tax rate on tax revenues" (see Barette et al. 2002). This latter expression is sometimes used in the literature instead of the retention rate, but they both mean the same.

France, and Rhône-Alpes, a measure which we employ for carrying out a robustness test (see also Davezies et al., 1998).

4 Data Description and Empirical Model

4.1. Measures of fiscal equalization

This study employs various indicators of fiscal equalization across the 22 French regions constructed on the basis of local and departmental ('subfederal') government budget statistics (DGCL, INSEE, and budgets locaux in chiffres), which have been theoretically motivated and described in detail in section 3.2. First, we employ a simple measure of the financial transfers (horizontal and vertical) received by the region, expressed as share in regional GDP. Second, we approximate (expected) transfer volume by one specific region by the averaged own tax revenue (%GDP) in all 21 remaining regions, where 'own tax revenue' is the tax revenue net of transfer payments to other regions.

We employ further the annual *net loss per capita* – for both donor and recipient regions separately - constructed as the interacted variables of the net loss with a dichotomous measure of 'recipient' or 'donor'. The net loss per capita is defined as the difference between the transfers given to other regions and the transfers received from other regions, expressed as per capita values; transfers given are calculated as total tax revenue minus the amount of tax revenue kept for region's own spending. Theoretically, positive values suggest that the region is (most likely) a net donor, while negative values indicate that the region is a net recipient. However, both variables, transfer received and transfer kept, constitute only approximations, and most regions report positive values.

For distinguishing donor from recipient regions, we split the sample according to the cross-regional distribution of net loss per capita, for each year separately. In one version we construct two groups of donors and recipients by those lying to the right and to the left of the *median*, respectively. In another version, we view the regions in the first quartile (to the left of the median) as recipients, while those in the fourth quartile are defined as donors. The regions lying in the middle constitute then a group of undecided cases that could be either donors or recipients. In our empirical analysis, we employ indicators of 'donor' and 'recipient' regions

which we interact with the continuous net loss p.c.-measure; as result, we obtain a continuous variable for the regions belonging to the specific category which takes on the value 'zero' for those regions not belonging to that category.

Finally, to account better for incentive effects exerted by transfers across regions, we employ the retention rate: The retention rate measure how much (expressed as share) of the regional tax revenue can be kept and spend by the regional governments. It is constructed as the subfederal tax revenues for own use divided by total subfederal tax revenue, based on data obtained from the DGCL. For the sources and a mathematical definition of these variables, see Table A1 of the Appendix.

4.2. Growth determinants

To analyze the growth effects of fiscal equalization in French regions we use as regressand a measure of regional real economic growth. We define the regional real economic growth rate as the difference in regional real Gross Domestic Product between the current and the past year divided by the level of real GDP of the past period; real GDP is calculated as GDP deflated to the base year 2000. The GDP measures are obtained from INSEE. The variables that form the vector of controls are selected based on theoretical models of economic growth (e.g., Aghion and Howitt, 2009). To account for convergence effects, we employ (lagged) real GDP per capita, constructed as GDP deflated to the base year 2000 divided by the resident population, obtained from INSEE. It is the availability of the GDP per capita measure from 2000 on that serves a constraint to the time dimension of our data. According to modern and classical growth theory, both population growth, and investments in human and physical capital play a role. We therefore use regional population growth rate, (defined in analogy to GDP growth), the combined local and departmental government spending on investments in infrastructure as share in GDP, and the share in the regional population currently undergoing some educational training (obtained from INSEE, GGCL, and RFLM respectively). Technological progress is accounted for by the annual number of patent applications from the region to the European Patent Office (EPO). Finally, we employ a measure of regional income inequality to account for its effects on growth; the Gini coefficient on personal income takes on the value zero for equally distributed incomes and 1 for the most unequal distribution where one household received all income in the economy. In industrialized countries, we observe Gini coefficients of around 0.3. Our robustness check employs a measure of spatial growth-spillovers across French regions: we construct such spill-over as

the averaged growth rate in those regions geographically neighboring the region under analysis.

4.3. Descriptive statistics

Table 1 provides descriptive statistics of the variables employed in our empirical analysis. In our sample of 22 French regions from 2002 to 2008, based on model 2 in Table 2, French regions experienced both positive and negative growth rates, ranging between -0.03 and 0.08. The difference in GDP per capita across French regions is substantial, as the standard deviation of 3,956 Euro indicates; the maximum income level is double as much as the minimum income (17,850 Euro). Not unexpectedly is the marginal retention rate higher for recipients than for donors. Similarly, the maximum of received transfers in the recipient region is much higher than that in the donor regions, with variance larger among the recipients. Most importantly, we should note that both donors and recipients receive positive transfers from other regions and the central government.

Even though we split the regions into ‘donors’ and ‘recipients’, the descriptive statistics for the average own tax revenue in all other 21 regions is quite similar for both types of regions – this is because for either type only one region is excluded from building the average from the total sample of 22 regions. As the empirical analysis will show, the partial correlation among all four variables is sufficiently small to allow the identification of separate effects.⁹ Substantial cross-sectional variation is also observable for population growth, investment (ranging from 2% to 8%), the share of population undergoing education (18% to 27%), the number of patents (from 2.3 to 292.93) and economic growth in neighboring regions (from -2% to 4%). In France, regional income inequality ranges from 0.34 to 0.44, the latter indicating a strongly skewed income distribution. Given the sufficiently large number of regions and the relatively large variation in the data, this relatively short time period of 7 years is sufficient to allow meaningful statistical analyses.

Insert Table 1 about here

⁹ Partial correlation between both own tax revenue measures (split by median): $\rho = -0.92$ (based on model 2 of Table 2); Partial correlation between both own tax revenue measures (split by 25%/75% percentiles): $\rho = -0.05$.

4.4 Model and estimation

To estimate the effects of fiscal equalization on regional economic growth, we augment the traditional model of economic growth with measures of fiscal equalization volume and of the retention rate as discussed in section 3. This gives rise to the following empirical model:

$$\text{GROWTH}_{it} = \alpha \text{FISCEQ}_{it-1} + \beta' \mathbf{X}_{it-1} + v_i + \varepsilon_{it} \quad (1)$$

where GROWTH_{it} denotes real per capita growth in country i at time t , FISCEQ_{it-1} the (lagged) fiscal equalization measure(s) under analysis, and \mathbf{X}_{it-1} the vector of controlling variables (also lagged by one period). The choice of controlling variables (\mathbf{X}_{it-1}) is motivated by traditional and modern economic growth theories as discussed in section 2; it includes past GDP per capita, population growth, human capital, real capital investment, income inequality and innovation. v_i denotes the country fixed effects, while ε_{it} represents the error term.

In all models, we test our two components of lagged fiscal equalization (FISCEQ_{it-1}) jointly, namely the retention rate of region i at $t-1$ (RET_{it-1}) in combination with a transfer volume measure (TRANS_{it-1}) – either the tax revenue of all other regions $k \neq i$ at $t-1$ or actual transfers received by the region i at $t-1$ (see section 3 for the variable definitions). Hence, a more detailed formulation of our model yields:

$$\text{GROWTH}_{it} = \gamma \text{RET}_{it-1} + \delta \text{TRANS}_{it-1} + \beta' \mathbf{X}_{it-1} + v_i + \varepsilon_{it} \quad (2)$$

In the course of analysis, this model is then augmented with factors of spatial growth, both current and lagged, and a time trend. These models are then applied to a balanced panel of 22 French regions from 2002 to 2008.

We estimate these models with GLS and country fixed effects (v_i). We calculate standard errors that are robust to heteroscedasticity. In the baseline model, lagging all determinants of economic growth by one period corrects for serial correlation of standard errors in the panel. The combination of employing country fixed effects with lagged determinants of growth enables us to interpret the estimates as causal effects rather than simple statistical associations; it also mitigates a potential bias through endogeneity.

5 Results

5.1 The effects of fiscal equalization on economic growth

Table 2 presents the findings of the empirical analysis of how fiscal equalization affects regional economic growth for our balanced panel of 22 French regions from 2002 to 2008. Model 1 (column 1) describes the results for a baseline dynamic model of endogenous economic growth that excludes fiscal equalization measures, while models 2 to 4 add to the baseline model the marginal retention rate and diverse measures of transfer payments. The increases in R^2 (within R^2) between model 1 to models 2 - 4 suggest that fiscal equalization is an important determinant of regional economic growth. Each model is complemented with region specific fixed effects that account for time-invariant political institutions and geographical characteristics.

The baseline model estimates in column 1 show that there is convergence of per capita GDP across French regions: Regional growth rates p.c. decline in past regional GDP p.c.. Economic growth increases in the past total investment share in GDP, in innovation measured by the past number of newly registered patents, and in lagged income inequality, measured by the Gini coefficient on income. Even though the effect of income inequality on economic growth is theoretically ambiguous, the observed positive relation is consistent with empirical findings that inequality speeds up economic growth particularly in developed, richer countries (e.g., Aghion, et al. 1999, Barro, 1999, Persson and Tabellini, 1994). No statistically significant effects are exerted by current population growth (with a negative sign, as theoretically expected), and by lagged human capital investment measured by the population share currently receiving educational training. These outcomes of traditional and relatively new economic growth determinants are qualitatively not changed through the inclusion of fiscal equalization scheme measures in models 2 to 4.

As regards the retention rate, our first component of the fiscal equalization system, models 3 and 4 (which use better proxies of actual transfer payments than model 2) indicate a negative relation with regional economic growth: a higher marginal tax on own fiscal revenue increases regional growth. This is true for both types of regions, those likely to be net recipients and those likely to be net payers in the system of fiscal equalization.

In the economic theory described above (section 3.1.), a retention rate works like an income tax that exerts both an income and substitution effect (with leisure). The negative relation between the retention rate and economic growth implies that the income effect dominates the substitution effect: the more the central government retains from the subnational tax revenue for redistribution to other regions, the 'harder the regions work' and increase their productive efforts to compensate for this income loss. In contrast, letting the regional government keep too much of their tax revenue, appears to create a disincentive that is detrimental for its economic growth. Overall, for both groups of regions, donors and recipients, within the boundaries of the given retention rates in our sample, redistribution by the central government does not appear to impede local economic growth.

Models 2, 3 and 4 test also the second component of the fiscal equalization system: the volume effect, which is proxied by three different transfer payments measures. Model 2 indicates that past average own tax revenue of all other 21 regions affects regional economic growth positively, for both donor and recipient regions (defined by the net loss in tax revenue per capita and split at the median of the regional distribution). Model 3 uses a more conservative definition of 'donor' and 'recipient', which both exclude those regions centered around the median of per capita tax revenue net loss distribution (26th to 74th percentiles). Model 3 clearly indicates that the growth-enhancing effects of equalizing transfers is for the 'richer' regions only (the likely net payers of transfers in the upper 25 percentiles of net losses), but not for the 'poorest' ones. Implicitly, a comparison of models 2 and 3 yields that regions with an average per capita net loss also experience positive growth effects of these transfers. Overall, models 2 and 3 suggest that there are positive regional growth effects of transfers for donors, but not for recipients.

Model 4 tests a different measure of the volume of fiscal equalization, the share of actual transfers received by the region defined as transfer component of their subnational budget. For both recipients and donors the transfers exert a positive growth effect. However, due to the sample split by the median of the per-capita net loss of tax revenue, possibly differential effects for the relatively poor regions (as in model 3) are disguised. We cannot exclude the possibility that for these very poor recipients the positive effect may not be present at all.

Overall, Table 2 indicates that the current scheme of fiscal equalization in France does not impede growth, but rather enhances it, albeit rather in the donor than in the recipient regions.

Insert Table 2 about here

5.2. Robustness test: Regional growth spillovers

One may argue that the effects of fiscal equalization on regional economic growth reflect growth spill-overs across regions rather than local government budget impacts and their behavioral effects: fast-growing regions may accumulate more tax revenue, making them more likely to become donors and to transfer resources to poorer, slower-growing regions. Thus, equalization transfers may just approximate economic growth in richer regions. Thus, we formulate the following counter-hypothesis:

Counter-hypothesis:

Current fiscal transfers to the region under analysis reflect past (positive) economic developments in neighboring regions; economic effects of the first are nothing but a mere approximation of impacts of the latter.

Table 3 tests this conjecture and the robustness of the equalization effects for economic growth to the inclusion of measures of both contemporary and past growth spill-overs across regions. Specifically, we employ as spatial growth factor the average growth rates in neighboring regions; each region in our sample has between 1 and 5 regional neighbors. Models 1 and 2 add a lagged spill-over measure, models 3 and 4 a contemporary one, and models 5 and 6 include both, as their correlation is below 0.4 in absolute terms. The substantial increase in R^2 between the single estimations indicates that particularly including contemporary spatial growth variable improves the fit of our model to the data. Finally, Table 3 also tests the robustness of our results to the inclusion of a time trend, which may reflect common macroeconomic and political developments at the national level.¹⁰

Overall, models 5 and 6, which are most complete, suggest that both current and past economic growth in neighboring regions exert growth-enhancing effects of their own. However, controlling for current or past economic growth in neighboring regions, our

¹⁰ The short time horizon of 7 years makes the inclusion of time fixed effects in the model infeasible.

previous effects of transfer volume and the retention rate from Table 2 are completely reserved. This is a strong indication that our counter-hypothesis does not hold, and that the government transfer effects in Table 2 do reflect a true fiscal equalization effect on regional growth.

Insert Table 3 about here

6 Conclusion

This paper provides an empirical analysis on the question whether equalization payments across regions and transfers from the central government stimulate regional growth or impede it. Using a panel of 22 French regions from 2002 to 2008, we find that regional economic growth is positively affected by the fiscal equalization system. We employ two indicators of this system, the transfer volume measure (proxied by either tax revenues in other regions or transfers to regions) and the marginal retention rate. Using either measure, the transfer volume effect is positive for growth in both donor and recipient regions: we do not find any evidence that regional governments allocate transfers inefficiently. This is, however, not true for the poorest recipients, for which we observe no significant volume effects.

The effect caused by the retention rate is negative, indicating that if wealthier regions would be asked to make greater contributions to the system (the retention rate would hence decline), their regional economic growth would, on average, not suffer but even increase. Thus, the income effect dominates the substitution effect: especially wealthier regions do want to ‘make up’ for the revenues lost due to fiscal equalization. Likewise, if recipient regions would receive less support, their regional growth would also be promoted, on average, rather than dampened.

Do our results imply that transfers across regional governments are growth-stimulating, overall? For this country and this time period, yes. However, any change of the retention rate and/or of the volume of equalization outside the range considered in this sample (‘out-of-

sample prediction') may result in the system showing different effects from the ones reported in this study. Thus, for instance, if the retention rate is lowered further and the redistributed volume is heavily increased, then the willingness to contribute and to use transfers effectively may well suffer. Indeed, Baretta et al. (2002) show for the German states strong growth-dampening incentives effects of both retention rate and transfer volume on regional growth.

Our results may also bear implications for the discussion of introducing a transfer scheme between richer and poorer countries in the European Union, with the aim to stabilize the Euro currency. Based on this study, transfers across EU members should rather exert overall growth enhancing effects - at least they should not dampen growth in the richer member states. However, this is true only if the redistributed volume does not become too large.

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Appendix

Table A1: Definition of Variables

Variable Name	Description	Source
GDP pc, real	Real GDP per capita: GDP deflated to the base year 2000, divided by the resident population	INSEE ¹¹
GDP pc growth, real	Growth of real GDP per capita ((GDPpc _t - GDPpc _{t-1}) / GDPpc _t).	INSEE
Population Growth	Growth rate in residential population: ((pop _t - pop _{t-1}) / pop _t)	INSEE
Investment, %GDP	Aggregated subfederal government investments as share of the GDP: INV / nominal GDP	DGCL ¹² , Budgets locaux en chiffres
In educ. training, %pop Gini	Share of population in any education Gini coefficient of personal income	EUROSTAT ¹³ Statistiques locales ¹⁴ , "revenus fiscaux localisés des ménages" (RFLM)
Patents	Number of patent applications at the EPO, divided by resident population	EUROSTAT
Marginal retention rate (Recipients and Donors)	Subfederal tax revenues for own use/ total subfederal tax revenue	DGCL, Budgets locaux en chiffres
Received transfers, %GDP	Subfederal received transfers / GDP	DGCL, Budgets locaux en chiffres, INSEE
Net Loss (of tax revenue) p.c.	(Total subfederal tax revenue – subfederal tax revenues kept - subfederal transfers received from other regions) / POP _i	DGCL, Budgets locaux en chiffres, INSEE
Donor Dummy	Equals 1 if Net Loss pc is greater than the median of annual Net Loss pc distribution	
Recipient Dummy	Equals 1 if Net Loss pc is less than the median of annual Net Loss pc distribution	
"Poor" 25% Quartile Dummy	Equals 1 if Net Loss pc is less than or equal to the first quartile of annual Net Loss pc distribution	
"Rich" 25% Quartile Dummy (= 75% Quartile Dummy)	Equals 1 if Net Loss pc is greater than the fourth quartile of annual Net Loss pc distribution	
av. own tax revenue, other regions, %GDP	For the i-th region: $\left(\sum_{j \neq i} Own_Taxes_j / GDP_j \right) / (J)$	DGCL, Budgets locaux en chiffres, INSEE
av. real growth in neighboring regions	For the i-th region with k neighbors: $\left(\sum_{k \neq i} GDPgrowth_k \right) / (K)$	INSEE

Notes: 'regions' refer to territories of French regions; 'subfederal' spending refers to combined spending by local and departmental governments

¹¹ INSEE: Institut national de la statistique et des études économiques, www.insee.fr

¹² DGCL: [Direction générale des collectivités locales](http://www.dgcl.interieur.gouv.fr/), <http://www.dgcl.interieur.gouv.fr/>

¹³ EUROSTAT: www.epp.eurostat.ec.europa.eu/

¹⁴ Statistiques locales: www.statistiques-locales.insee.fr

Figure 1: Incentive effects of fiscal federalism

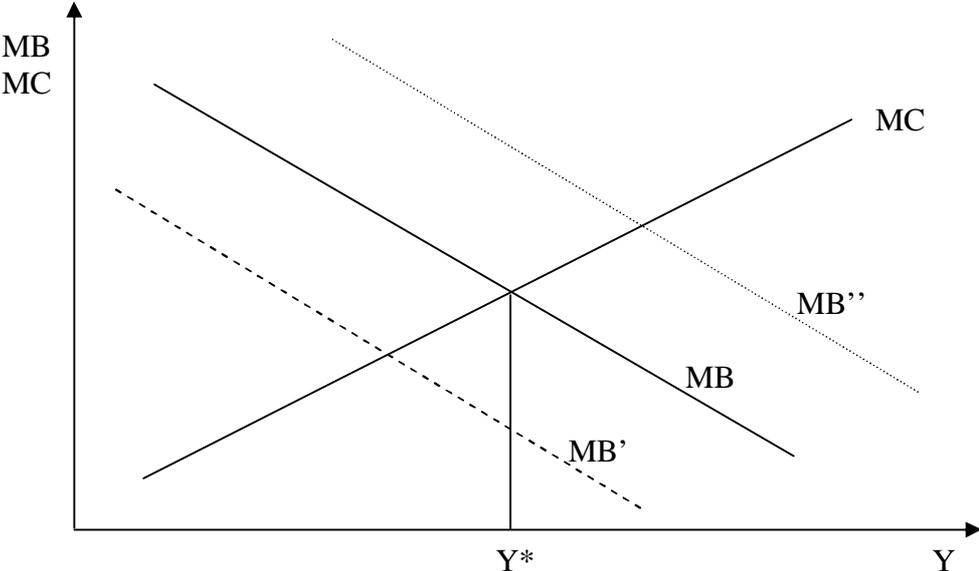


Table 1: Descriptive statistics

Variable	Mean	Std. Dev.	Min	Max
GDP growth, real	.01	.014	-.03	.08
GDP, real, pc (t-1)	22275.09	3956.87	17857.04	40519.74
Population growth	.01	.004539	-.001	.02
Marginal retention rate, recipient, (t-1)	.40	.43	0	1.57
Marginal retention rate, donor, (t-1)	.29	.32	0	.747
av. own tax revenue, other regions, %GDP, recipients (t-1)	.022	.022	0	.0474
av. own tax revenue, other regions, %GDP, donors, (t-1)	.022	.023	0	.0477
av. own tax revenue, poorest 25% regions, by net loss p.c. (t-1)	.012	.02	0	.0473
av. own tax revenue, richest 25% regions, by net loss p.c. (t-1)	.012	.02	0	.0477
Received transfers, %GDP, recipients, (t-1)	.02	.03	0	.12
Received transfers, %GDP, donors, (t-1)	.02	.02	0	.04
Investment, %GDP (t-1)	.03	.01	.02	.08
In educ. training, %pop, (t-1)	.23	.02	.18	.27
Patents, (t-1)	90.18	59.05	2.34	292.93
Gini, (t-1)	.37	.02	.34	.44
av. real growth in neighboring dep. (t-1)	.01	.01	-.02	.041

Notes: Based on 132 region-year observations in model 2 of Table 2.

Table 2: Fiscal equalization and economic growth in France, 2003-2008

	1	2	3	4
	baseline	tax rev others	tax rev others, 25%	transfers
GDP, real, pc (t-1)	-0.00002*** [3.38]	-0.00003*** [3.64]	-0.00002*** [3.79]	-0.00003*** [3.45]
Population growth	-1.217 [1.46]	-1.034 [1.07]	-0.753 [0.95]	-2.523*** [2.91]
Investment, %GDP, (t-1)	2.169*** [6.88]	2.459*** [5.97]	2.284*** [6.90]	1.528*** [3.48]
In educ. training, %pop, (t-1)	-0.734 [0.81]	1.030 [1.29]	-0.529 [0.55]	0.172 [0.21]
Gini, (t-1)	3.174*** [4.69]	2.265** [2.50]	3.375*** [4.60]	3.071*** [3.95]
Patents, (t-1)	0.0002*** [3.93]	0.0001** [2.61]	0.0001** [2.62]	0.00006 [0.93]
Marg. retention rate, recipients (t-1)		0.017 [0.45]	-0.057* [1.88]	-0.065* [1.94]
Marg. retention rate, donor (t-1)		0.015 [0.36]	-0.052* [1.75]	-0.059* [1.91]
av. own tax revenue, other regions, %GDP, recipients (t-1)		6.473** [2.16]		
av. own tax revenue, other regions %GDP, payers (t-1)		6.596** [2.21]		
av. own tax revenue, poorest 25% regions by net loss of tax rev. p.c. (t-1)			-0.149 [1.10]	
av. own tax revenue, richest 25% regions by net loss of tax rev. p.c. (t-1)			0.147*** [3.19]	
Received transfers, %GDP, recipients (t-1)				2.281** [2.49]
Received transfers, %GDP, donors (t-1)				2.304** [2.49]
Observations	132	132	132	132
Number of regions	22	22	22	22
R2	0.35	0.42	0.39	0.41

Notes: Dependent variable is the per capita regional growth rate. All models include region fixed effects. Tables report GLS estimates with standard errors robust to heteroscedasticity. T-statistics are reported in squared brackets. '*', '**', '***' denotes significant at 10%, 5% and 1%, respectively.

Table 3: Accounting for growth-spillovers

	1	2	3	4	5	6	7
	Current spill-overs		Past spill-overs		Current and past spill-overs		Trend
GDP, real, pc (t-1)	-0.00002***	-0.00002***	-0.00002***	-0.00002***	-0.00002***	-0.00002***	-0.00003***
	[3.29]	[2.93]	[3.28]	[3.25]	[3.24]	[3.22]	[3.20]
Population growth	-0.342	-2.018**	-0.303	-1.721**	-1.166	-1.930**	-1.553**
	[0.35]	[2.36]	[0.37]	[2.27]	[1.48]	[2.50]	[2.14]
Investment, %GDP, (t-1)	2.296***	1.316**	1.685***	1.052**	1.561***	1.123**	1.399***
	[7.31]	[2.64]	[5.48]	[2.41]	[4.69]	[2.50]	[2.91]
In educ. training, %pop, (t-1)	-0.528	0.405	-0.821	-0.295	-0.869	-0.489	0.141
	[0.54]	[0.46]	[1.00]	[0.41]	[1.07]	[0.66]	[0.22]
Gini, (t-1)	3.319***	2.862***	2.418***	2.104**	2.393***	2.116**	1.722
	[4.48]	[3.42]	[3.15]	[2.36]	[3.05]	[2.40]	[1.65]
Patents, (t-1)	0.0001**	0.00005	-0.00002	-0.0001	-0.0001	-0.0001	-0.0001
	[2.79]	[0.86]	[0.51]	[1.33]	[0.98]	[1.35]	[1.01]
Marg. retention rate, recipients (t-1)	-0.050	-0.053	-0.052*	-0.055*	-0.065**	-0.061*	-0.038
	[1.40]	[1.35]	[2.01]	[1.89]	[2.35]	[2.06]	[1.24]
Marg. retention rate, donor (t-1)	-0.046	-0.045	-0.046*	-0.066**	-0.059**	-0.076**	-0.051
	[1.30]	[1.21]	[1.79]	[2.49]	[2.21]	[2.70]	[1.67]
av. own tax revenue, poorest 25% regions by net loss of tax rev. p.c. (t-1)	-0.129		-0.019		-0.045		
	[1.08]		[0.21]		[0.44]		
av. own tax revenue, richest 25% regions by net loss of tax rev. p.c. (t-1)	0.159***		0.188***		0.165**		
	[2.90]		[3.75]		[2.58]		
Received transfers, %GDP, recipients (t-1)		3.145***		1.931**		1.371*	0.868
		[3.76]		[2.81]		[1.92]	[1.50]
Received transfers, %GDP, donors (t-1)		3.119***		2.310***		1.822**	1.279*
		[3.68]		[3.26]		[2.38]	[2.04]
av. real growth in neighboring dep.			0.678***	0.667***	0.786***	0.746***	0.686***
			[5.53]	[5.90]	[5.73]	[5.71]	[6.24]
av. real growth in neighboring dep. (t-1)	-0.116	-0.290**			0.265**	0.174	0.135
	[0.97]	[2.66]			[2.27]	[1.58]	[1.30]
time trend							0.003
							[1.51]
R-squared	0.39	0.44	0.59	0.61	0.61	0.62	0.63

Notes: See Table 2.