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► **To cite this version:**

Emilie Caldeira. Does the system of allocation of intergovernmental transfers in Senegal eliminate politically motivated targeting?. 2011. halshs-00576508v1

**HAL Id: halshs-00576508**

**<https://shs.hal.science/halshs-00576508v1>**

Preprint submitted on 14 Mar 2011 (v1), last revised 18 Jul 2011 (v2)

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**Does the system of allocation of intergovernmental transfers  
in Senegal eliminate politically motivated targeting?**

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*Mars 2011*

# Does the system of allocation of intergovernmental transfers in Senegal eliminate politically motivated targeting?

March 2011

## Abstract

While there is a large body of literature on the determinants of allocation of intergovernmental fiscal transfers in developed countries, this kind of study is still very limited for developing countries, especially Sub-Saharan countries. Using an original micro-level public finance panel data from Senegal, we address three issues: (1) Does the Senegalese allocation system of fiscal transfers conform to the guidance of the normative theory, in particular, to the equity principle? (2) Does this allocation system eliminate the politically motivated targeting of transfers? (3) If not, what kind of political factors explain the horizontal allocation of resources? By estimating a panel data for 67 local governments (“*communes*”), from 1997 to 2009, we find that equity concerns do not affect the allocation of intergovernmental transfers in Senegal, leading to the conclusion that the resources distribution system does not comply with the dictates of normative theory. Moreover, we find evidence that political considerations influence the horizontal allocation of fiscal transfers. In particular, our analysis suggests that transfers allocation follows a pattern of tactical redistribution more than patronage, swing *communes* being targeted while partisan *communes* are not.

*JEL Classification:* H20, H77, O12.

*Keywords:* Intergovernmental transfers, political economy, decentralization, Senegal.

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# 1 Introduction

While fiscal decentralization has been adopted by a large part of the developing world, there is a wide consensus in the literature that the benefits expected from decentralization will fail to materialize if the system of intergovernmental fiscal transfers does not rely on an equitable and efficient horizontal allocation mechanism. Although a huge literature on the determinants of allocation of intergovernmental fiscal transfers in developed countries exists, this kind of study is still limited for developing countries, especially Sub-Saharan countries. This paper attempts to fill the gap in the empirical literature by raising the issue of how such transfers are allocated across local governments in a Sub-Saharan country, Senegal.

The traditional view on intergovernmental transfers is that they should be motivated by equity and efficiency considerations (Buchanan, 1950, Oates, 1972, Gramlich, 1977), a welfare maximizing government might want to transfer money from richer to poorer jurisdictions and to correct for externalities. Actually, a number of empirical studies have pointed out that political factors are as important or even more relevant in explaining the allocation of intergovernmental transfers. Beginning with Wright (1974), economic historians have examined the question of how transfers were allocated amongst American states during the New Deal in the 1930s. They find that political variables explained this allocation considerably better than economic factors. A huge literature on the determinants of allocation of fiscal transfers now exists. Empirical studies have concerned an array of countries like Albania (Case, 2001), Argentina (Porto and Sanguinetti, 2001), Australia (Bungey, Grossman, and Kenyon, 1991, Worthington and Dollery, 1998), Canada (Albouy, 2010), Ghana (Banful, 2010, Miguel and Zaidi, 2003), India (Khemani, 2007, Cole, 2009, Arulampalam et al., 2009), Israel (Alperovich, 1984), Japan (Meyer and Naka, 1999), Portugal (Pereira, 1996, Veiga and Pinho, 2007), Russian Federation (Treisman, 1996), Sweden (Dahlberg and Johansson, 2002), Tanzania (Boex, 2003) and the United States (Anderson and Tollison, 1991, Wallis, 1998). An international comparison of empirical studies reveals that, besides local expenditure needs and local fiscal capacity, other factors including electoral concerns and political influence play important and consistent roles in determining the horizontal allocation of per capita intergovernmental transfers. Policymakers are typically political parties or politicians who

may be opportunistic, using fiscal transfers in order to maximize their chances of re-election or partisan and wanting to further the interests of their own support groups (Cox, 1986, Grossman, 1994, Case, 2001, Banful, 2010).

There is a belief that allocating resources by a formula based on economic and welfare variables helps to suspend the arbitrariness that allows politically motivated targeting of transfers. Hence this strategy has been widely adopted in the developing world (see Banful, 2010). In this paper, we test the effectiveness of formulas in eliminating processes based on discretion by analyzing how transfers are allocated across local governments in Senegal where a formula allocation mechanism is employed. More precisely, we intend to tackle the three following issues: (1) Does the Senegalese allocation formula allow a distribution of fiscal transfers that conforms to the dictates of the normative theory, in particular, to the equity principle? (2) Is such an allocation system actually sufficient to eliminate politically motivated targeting of transfers? (3) If not, what kind of political factors explain the horizontal allocation of intergovernmental transfer resources? This paper adds to the existing empirical literature studying horizontal allocation of fiscal transfers and we believe its contribution to be twofold. First, to our knowledge, this is one of the first papers to exploit an original micro-level public finance panel data from a Sub-Saharan country to test political economy theories of fiscal transfers. It allows us to see to what extent results found for developed countries can be observed for a developing country.<sup>1</sup> Besides, Senegal is a particularly interesting case since there is a belief that transfers allocation is strongly influenced by the nature of the political relationship the receiving group has with higher tiers of government. In particular, some mayors deplore a discriminatory and opaque distribution of the transfers.<sup>2</sup> Second, we employ a consistent econometric method which generates credible empirical results. Indeed, to assess coefficients of time-invariant or rarely changing variables, we use the fixed effects vector decomposition (FEVD) estimator developed by Plümper and Troeger (2007). By this means, we avoid failure to control for heterogeneity of local governments and inefficiency in estimating the effect of variables that have little within variance, common issues in this

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<sup>1</sup> The findings of Miguel and Zaidi (2003) concerning Ghana already suggest that in African democracies ruling parties are able to reward their supporters and use the advantages of incumbency to win subsequent elections.

<sup>2</sup> See, for instance, *Le ministre Aliou Sow brocardé par Alioune Sarr, le Per de Notto Diobasse*, Le Peuple, October 18th 2010 (<http://lepeuple-sn.com>) or *Fonds de dotation : Aliou Sow fait la part belle à sa collectivité selon le PCR de Ndiindy*, Rewmi, November 2nd 2010 (<http://www.rewmi.com/>).

kind of study. Moreover, to test whether equity concerns are dominant in the allocation of intergovernmental transfers, we follow studies that rely on composite measures of local fiscal capacity and we compute an innovative poverty index at local level using the Demographic and Health Survey (DHS) and its geographic data.

After having briefly reviewed the literature on normative and political economy determinants of intergovernmental fiscal transfers, we rigorously investigate the empirical importance of such determinants in the allocation of central transfers across local governments in Senegal by estimating a panel data for 67 *communes* from 1997 to 2009. (1) Estimation results show that equity concerns do not affect the allocation of intergovernmental fiscal transfers in Senegal, leading to the conclusion that the resources distribution system does not follow the dictates of the normative theory. (2) We also find evidence of politically motivated targeting of transfers despite the formula-based system. (3) In particular, our results highlight three kinds of political motivation. First, our analysis suggests that transfers allocation follows more of a tactical redistribution, which aims to achieve electoral success by targeting swing *communes*, than patronage, which involves rewarding supporters. Second, local governments which are better represented in parliament seem to receive larger transfers, which confirms one of the most consistent empirical findings in this literature. Third, ethnic fractionalization seems to be positively correlated with per capita fiscal transfers which might indicate that the central government uses transfers as an instrument to pacify potentially troubled areas.

Section 2 offers a brief review of the literature on the determinants of intergovernmental fiscal transfers. Section 3 presents the institutional background of intergovernmental transfers in Senegal, the empirical model, strategy and findings. Section 4 concludes with some policy implications.

## **2 Normative and political economy determinants of intergovernmental fiscal transfers: A literature review**

Three strands of the literature consider factors that may affect the distribution of central transfers across local governments (Boex and Martinez-Vazquez, 2005). First, the public finance literature provides normative dictates on how intergovernmental transfers should be

allocated. Second, voter-choice models in the public choice literature explain how electoral mechanisms could influence the central government's fiscal choices in distributing resources to local governments. Third, political economy arguments contribute to explain the allocation of intergovernmental transfers by considering political economy considerations based on non-electoral arguments.

First, there is a consensus in the local public finance literature that a system of fiscal transfers should be designed to achieve equity and efficiency in the allocation of resources (Buchanan, 1950, Oates, 1972, Gramlich, 1977). It assumes that the central government is a "benevolent planner", interested in maximizing social welfare. The rationale behind the equity principle is the need for a reduction in horizontal fiscal imbalances that may exist between lower-level jurisdictions in a given country. Thereby, transfers should compensate the effect that an uneven distribution of wealth across the territory would generate on the geographical distribution of public services. The pursuit of a more equitable allocation of resources would lead us to expect a pro-poor allocation of transfers across jurisdictions, local governments with lower local revenue bases of their own receiving higher levels of transfers. However, most empirical studies (Kraemer, 1997, Alm and Boex, 2002, Wallis, 1998, Meyer and Naka, 1999) find that wealthier local governments receive greater intergovernmental transfers, indicating that political considerations outweigh those of equity. In pursuit of the economic efficiency objective, the intergovernmental transfer system should seek to correct for externalities and compensate spillover effects among jurisdictions in the provision of certain local public services. This incentive objective would result in the central government providing greater transfers in response to higher local expenditure needs.<sup>3</sup> In empirical studies, local expenditure needs and costs generally have a positive impact on the level of transfers received by a local government. Exceptions include Nigeria (Alm and Boex, 2002), where no relation was found, and Mexico (Kraemer, 1997) where lower levels of expenditure needs were associated with higher levels of transfer.<sup>4</sup>

Second, the literature on targeted redistribution distinguishes between patronage, which

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<sup>3</sup> Moreover, Albouy (2010) shows that providing higher grant levels to jurisdictions that pay higher central taxes is a mechanism for reducing inefficient migration.

<sup>4</sup> We also have to note that transfers pursue a vertical fiscal balance objective, that is, ensure that the revenues and expenditures of each level of government are approximately equal (Weingast, 2009).

consists in rewarding supporters, and tactical redistribution, which is made to achieve electoral success. Greater political support for the national government in a particular jurisdiction may be rewarded by greater transfers to it. For instance, Miguel and Zaidi (2003) find evidence from Ghana of targeting of core supporters, districts from where the ruling party won all the parliamentary seats.<sup>5</sup> This patronage can also be tactical, however. Indeed, Cox (1986) argues that voters respond more strongly to economic incentives provided by their political party, so that politicians, like risk-averse investors, will target transfers to areas in which their political support is concentrated to maximize their return in terms of votes. Similarly, Bungey, Grossman, and Kenyon (1991) and Leyden (1992) show that party closeness between central and local politicians would serve to increase the central government's support, and therefore increase the magnitude of transfers. Case (2001) interprets empirical findings of greater grants in Albania to districts where the President received more votes in the past election as evidence of the targeting of supporters which are more "pivotal". If the central government can reward its supporters or target it to maintain political support, it can also target its opponents (Treisman, 1996) or "swing" voters, defined as those with weak party preferences. A prevailing presumption is that the voting decisions of swing voters are determined by how much they receive in resource transfers from the incumbent party. Arulampalam, Dasgupta, Dhillon, and Dutta (2009) construct a model where the federal government allocates transfers to state governments that are aligned with the incumbent party but also swing. Using Indian panel data, they validate their theoretical model.<sup>6</sup> In the context of an African country, Banful (2010) also finds evidence that per capita grants are higher in Ghanaian districts where vote margins in the previous presidential election were lower, suggesting that swing districts are targeted.

Following the predictions of the well known model of opportunistic political budgetary cycles provided by Rogoff and Sibert (1988), in the case of fiscal transfers, the central government is also expected to transfer a larger amount of resources to local governments in national election years to increase its likelihood of re-election. However, according to Wor-

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<sup>5</sup> Pereira (1996) also finds that intergovernmental grants in Portugal were designed to reward central governments' political support.

<sup>6</sup> Cole (2009) also finds that state governments in India supply greater subsidized agriculture loans to electoral districts where the ruling party had a narrow margin of victory (or loss) and Johansson (2003) provides theoretical and empirical evidence that swing Swedish municipalities receive larger grants than other groups.

thington and Dollery (1998), grants to local politicians in local election years would be more productive due to a heightened awareness of policies but, in the case of central elections, the returns from purchasing political capital in this manner would be offset by direct political benefits of central direct expenditure.

Third, beyond electoral considerations, political decision-making processes can be captured by powerful interest groups. Assuming that local governments want to extract as much from central transfers as possible, those with higher bargaining power can be expected to receive larger transfers. The fact that local jurisdictions with higher political representation per capita receive greater government transfers is maybe one of the most consistent empirical findings across countries (Wright, 1974, Porto and Sanguinetti, 2001, Khemani, 2007).<sup>7</sup> Smaller jurisdictions may also receive greater per capita transfers, which may be caused either by scale economies or due to the potentially disproportionate lobbying power. Indeed, the fiscal bias in favor of smaller subnational governments may be explained by a urge to secure broad political support from the local government tier and the subnational representatives at the national level.<sup>8</sup> According to Alm and Boex (2002), this “equality” principle also reduces the likelihood of politically strong local governors and fractionalization of local governments might be important for the overall political stability of Nigeria, to reduce the threat of civil disorder. In the particular context of a developing country, central governments may also use economic means to deal with social conflicts.<sup>9</sup> It has been widely observed that local jurisdictions with a high concentration of an ethnic minority tend to receive more in fiscal transfer (Treisman, 1996). A common argument in favor of fiscal decentralization is that, by politically and fiscally empowering the local governments, the latter are enabled to allocate public spending in a way that is closer to the preferences of heterogeneous local communities. However, Tranchant (2010) shows that this hypothesis, while relevant for local majorities,

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<sup>7</sup> For instance, Atlas (1995) shows that the allocation of per capita federal net spending in the United States from 1972 to 1990 was affected by states’ per capita congressional representation and highlights that the institutional basis of political representation affects spending allocations across states.

<sup>8</sup> Empirical work on lump-sum grants in Portugal (Pereira, 1996) supports the politico-economic hypothesis and rejects the hypothesis that economies of scale are the main explanatory cause for the observed regressivity of per capita transfers. Indeed, he shows that per capita grants decrease with the population size of communities even after controlling for the effect of economies of scale which might be captured by the density variable.

<sup>9</sup> In particular, Senegal has to deal with a violent separatist movement in the southern region of the Casamance.

is likely to perform poorly for local minorities as they are not in a dominant position. In this context, fiscal decentralization could fuel communal violence, with marginalized ethnic minorities clashing against powerful local majorities. Hence, the central government may use transfers as an instrument to pacify potentially troubled areas like ethnically fractionalized local jurisdictions.<sup>10</sup>

### **3 The determinants of intergovernmental fiscal transfers in Senegal: Empirical evidence**

In this section, we intend to determine whether the Senegalese allocation system conforms to the dictates of the normative theory and if this system eliminates politically motivated targeting of transfers. For that, we first investigate the institutional background of intergovernmental transfers in Senegal, then we specify our econometric model and strategy. Lastly, we present our principal findings resulting from the estimation of a panel data for 67 *communes* from 1997 to 2009.

#### **3.1 Intergovernmental transfers in Senegal: Institutional background**

Senegal has shown a remarkable political stability since its independence in 1960, which was strengthened by peaceful presidential transitions. Abdou Diouf served five terms as President and was defeated in a free and fair election in 2000 by opposition leader Abdoulaye Wade. The regime of President Abdoulaye Wade follows four decades of Socialist Party rule, and he was re-elected in 2007. The fact that the voice of the opposition was loudly heard in the latest local elections, in 2009, including the defeat of Wade's own son, Karim, in Dakar, could be a sign that Senegal's democracy remains relatively strong.

Decentralization has been implemented since the beginning of its independence in 1960 to move government closer to citizens. However, 1990 marked a turning point in the decentralization process, with the abolition of the tutelary power of the center within the communities executive. The last step of this process is constituted by the adoption in 1996 of the new laws of decentralization: law 96-06 carrying the Local Government Code, law 96-07 defining

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<sup>10</sup> Note that Montalvo and Reynal-Querol (2005) suggested that ethnic polarization measures are more appropriate than fractionalization indices to capture social conflict.

transferred competencies, and law 96-09 fixing the territorial administration. Senegal is divided into eleven regions (*régions*) which are subdivided into 67 *communes*, 43 *communes d'arrondissements* which are further divided into 320 *communautés rurales*.<sup>11</sup> Local governments are endowed with legal personality and benefit from the administration principle according to which local jurisdictions manage themselves freely by elected councils. In particular, *communes* are ruled by a local government directly elected by the inhabitants. The *commune* has to ensure the best living conditions for the whole population.<sup>12</sup> The extent of this mission explains the permanent expansion of the *communes*' field of intervention. The competencies of Senegalese *communes* range from the maintenance of communal properties or the management of local public works to environmental protection with, for instance, the adoption of measures limiting pollution, and include the management of local employments and assistance to places of worship. One of the main features of fiscal decentralization in Senegal is the increasing level of expenditure at local level (see Table 1). At the same time, central transfers have become more important in absolute terms. The latter represent around 10% of the total local resources. However, local resources remain small relative to the center's finances: local tax revenue of all *communes* represents on average only 6 % of the central tax revenue. Moreover, important inequalities appear between *communes*: the resources of the ten poorest *communes* represent 1 % of the resources of the five richest ones.

State subsidies should mitigate the lack of resources and reduce horizontal fiscal imbalances. The design and implementation of equalization transfers is crucial for the potential equity of provision of public sector services. It deserves serious concern, in particular, in developing countries (see Bird and Smart, 2002, for a survey of central transfers systems adopted in a number of developing countries). Senegal employs a formula-based resources allocation mechanism. Finances law fixes a minimum amount of transfers as an annual percentage of central tax revenue. This then amount depends on a percentage of the VAT collected for the benefit of central government and transfers are distributed between local authorities according to criteria annually fixed by decree after consulting the National Council of Development of Local Authorities. These criteria are twofold. First, there is a compensation criterion:

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<sup>11</sup> There is also an administrative level between regions and *communes*: the departments (*départements*) but they are managed by a representative of the central government.

<sup>12</sup> See law 96-06 with the Local Governments Code.

around 80% of the total transfer is distributed between local authorities according to the cost of responsibilities resulting from transferred skills and from the functioning of local organs. For that, the central government considers spending made by the local government to assume the same responsibilities as those assumed during the year before. Second, the rest of the amount is divided into two parts; a first part (70 %) is inclusively distributed and a second part (30 %) is distributed towards the demographic importance of each jurisdiction. We notice that there is an important variability across jurisdictions. In 2009, *communes* such as Ranerou, Oussouye and Foundiougne received more than four times the national average, while other jurisdictions like Pikine or Bargny received a transfer per capita ten times smaller than that amount. The disparity in the allocation of transfers across *communes* has stayed relatively constant over time, as shown by the value of relative standard deviation.<sup>13</sup>

Our empirical work will help to determine if these criteria are sufficient to allow an efficient and equitable distribution of resources across local governments and whether this distribution system forbids the allocation of fiscal transfers between jurisdictions to interact with the incentives of policymakers to divert resources for personal gain.

### 3.2 The basic empirical model

To test whether the allocation of transfers across Senegalese local governments is influenced by economic considerations and to determine the presence and the nature of any politically motivated targeting of resource transfers, we use the general empirical framework followed in the literature (Boex and Martinez-Vazquez, 2005). Per capita amounts of transfers received by a local government are regressed upon sets of equity/efficiency and public choice variables that may affect center's decision-making.

To determine whether the Senegalese allocation transfers system conforms to the dictates of the normative theory we consider fiscal incapacity and expenditure needs. We first examine the impact of a local government's fiscal incapacity on the size of the transfers it receives by using a DHS poverty index (see the following section). If equity concerns are dominant in the allocation of intergovernmental transfers, then we should find a positive coefficient

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<sup>13</sup> In spite of the sharp rises of central transfers, they remain insufficient relative to needs in the operational expenses of local governments. Besides, the payments are made with delays which limits the autonomous implementation of fiscal policies by local authorities.

associated with fiscal incapacity. Second, we include local expenditure needs and costs in our econometric model (efficiency principle). The variables that are generally used to measure local expenditure needs are demographic variables such as the size of the school-aged population, the economically dependent population, or urbanization (Meyer and Naka, 1999, Wallis, 1998).<sup>14</sup> The population density is also commonly used to measure the per capita cost of providing local public goods.<sup>15</sup> We retain two variables; urbanization rate and population density. While we unambiguously expect a negative coefficient associated with population density, it may not be possible to specify beforehand which of rural or urban sets of needs dominate.<sup>16</sup>

As suggested by our review of the theoretical literature, we then consider the influence of electoral concerns in the allocation of fiscal transfers. We include a qualitative dummy variable that indicates if the central and local governments are of the same political party. This variable allows us to test the existence of patronage and the Cox (1986) model, according to which the optimal strategy of political candidates is to favor their supporters. We also include a variable that measures the difference in vote shares expressed in absolute values between the central government party and its main opponent, in the last local election in each *commune*. Following Case (2001) and Dahlberg and Johansson (2002), we use it as a proxy for the number of swing voters. With this variable, we test the prediction that jurisdictions with many swing voters are targeted by the incumbent party to win the next election. Finally, following Veiga and Pinho (2007), two dummy variables for elections, central and local, are included in order to account for time-periods when ability to purchase political capital may vary from the norm.

Lastly, as said before, the public choice models argue that political decision-making processes can be captured by powerful interest groups. We consider the number of deputies represented by departments. A local government with larger political representation per capita should be able to extract a larger net per capita transfer. We also consider the rel-

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<sup>14</sup> Generally, instead of using physical infrastructure measures such as hospital beds or the number of schools, it is preferable to measure the number of citizens with a certain need, such as infant mortality or school-aged population, which are free from incentive problems.

<sup>15</sup> Presumably, the lower the population density in a jurisdiction, the higher the unit cost of delivering social services, since the provision of public services increases with a more dispersed population. It may also be more costly to deliver government services across a larger land area.

<sup>16</sup> Indeed, rural areas may suffer from inadequate transport or electrification while urban areas have special needs associated with congestion, pollution or urban blight (Treisman, 1996).

ative population size of the jurisdiction. In the particular context of a developing country, central decisions may also concern ethnic fractionalization.<sup>17</sup> If a significant regression coefficient is found, we may conclude that the central government uses transfer as an instrument to pacify the most potentially troubled areas.

Finally, we test the following equation:

$$Transfers_{it} = \beta Normative_{it} + \varphi Electoral_{it} + \gamma Political_{it} + \varepsilon_{it}, \quad (1)$$

Indicators used for each category are summarized in Table 2.

### 3.3 Econometric framework

Before introducing our econometric strategy, we present our composite measure of local fiscal incapacity, based on a DHS poverty index.

#### 3.3.1 An indicator of local incapacity

Following studies that rely on composite measures of local incapacity, such as poverty measures, we propose to estimate a poverty index using the 1997 and 2005 DHS with their geographic data.<sup>18</sup> Theoretically, measures of household wealth can be reflected by information on income, consumption, or expenditure. Due to the abundance of household survey data on asset ownership and the considerable biases measurement error associated with reported income or consumption, a substantial body of literature has developed an asset-based measure of income. Filmer and Pritchett (2001) concluded that the DHS wealth index actually performed better than the traditional consumption expenditure index in explaining differences in economic status. Hence, in the footsteps of Filmer and Pritchett (1999) and Sahn and Stifel (2003), we compute a composite poverty indicator from the DHS surveys.<sup>19</sup>

**The DHS wealth index** The DHS wealth index is based on the assumption that an underlying continuum of economic status exists which is related to the wealth of a household.

<sup>17</sup> We also consider ethnic polarization (Montalvo and Reynal-Querol, 2005).

<sup>18</sup> It represents around 8000 representative households for each survey.

<sup>19</sup> The general methodology used to calculate the wealth index is given in Filmer and Pritchett (2001). The specific approach used in the DHS is described in Rutstein and Johnson (2004).

The first step consists in selecting indicator variables. This is relatively straightforward since almost all household assets and utility services are to be included.<sup>20</sup> For example, the proportion of households with a surface-water source (lake, pond, river or stream) is likely to decrease with increasing wealth and the proportion of households with a television or a refrigerator is likely to increase with wealth. Table 3 shows our indicator variables selection. Then, each of the items is included in a Principal Components Analysis (PCA). Filmer and Pritchett (2001) emphasize that the PCA is a pragmatic response to a data constraint problem. It is a technique for extracting from a set of variables those few orthogonal linear combinations of the variables that capture the common information most successfully.<sup>21</sup> The first principal component is taken as the underlying index of wealth, and each household's position on it is calculated using the PCA weights.<sup>22</sup> A last step is necessary: distinguishing the poor from the not poor. We are interested in relative poverty so that we divide the index into quantiles of the national household population, a useful grouping for analyses of equity.

**Approaches for rural and urban areas** The DHS wealth index has been criticized as being too urban in its construction since it relates to the national population as a whole, depending on assets and services that mainly urban populations would have.<sup>23</sup> To deal with this problem, we propose, as suggested by Rutstein (2008), to produce a single national-level composite index from wealth indexes that have been separately constructed for the urban and rural areas. This approach allows for different sets of assets and services to be used in each area to make best use of the available information. We first construct totally separate indexes for each area and then scale them so that a given score on each index means the

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<sup>20</sup> The main challenge to measure wealth is in ensuring that there is a sufficiently broad class of asset indicators collected to allow for differentiation of living standards across all households. Indeed, if an insufficient number of asset indicators are used, then households will be clumped together in a small number of groups. The reason for using a broad criterion rather than selected items is that the greater the number of indicator variables, the better the distribution of households with fewer households being concentrated on certain index scores. Generally, any item that will reflect economic status is used.

<sup>21</sup> Principal components analysis starts by specifying each variable normalized by its mean and standard deviation. Then, based on the assumption that household long-run wealth explains the maximum variance (and covariance) in the asset variables it finds the linear combination of the variables with maximum variance (for a more detailed explanation, see Filmer and Pritchett, 2001).

<sup>22</sup> Equal weights have the appeal of simplicity and apparent objectivity, but these qualities only mask the fact that the imposition of numeric equality is completely arbitrary. Hence, we use PCA weights.

<sup>23</sup> In particular, the index has an urban bias since publicly provided services (electricity, piped water or sewers) are not available in many rural areas and the original index did not include the principal rural stores of wealth, such as livestock.

same level of wealth. Based on descriptive statistics, we thought that possession of most livestock would be exclusively rural and some other items such as computer or internet access would be exclusively urban. Necessarily, the construction of the national index uses the set of indicator variables that the rural and urban areas have in common and is restricted to those that correlate with wealth in the same direction.<sup>24</sup> Table 4 summarizes the assets selected for each index and their coefficients for the DHS 2005.<sup>25</sup> “Conversion adjustments” are made between the urban and the national index and between the rural and the national index so that urban and rural indexes are mapped onto the national index. The level and distribution adjustment values are found by regressing the value of each household’s area-specific index scores onto its national index score.<sup>26</sup> Lastly we divide the national index into quantiles of the national household population and determine the percentage of the poor in each department. Table 5 gives the “profile” of a household that belongs to the first quintile in 2005 and Figures 1 gives the percentage of poor households by region.

### 3.3.2 Econometric issues and strategy

Our econometric model is quite similar to those considered in the literature and suffers from several defects. We propose to use the FEVD estimator developed by Plümper and Troeger (2007) which allows estimation of time-invariant variables in panel data models with specific effects, correcting for *communes* heterogeneity.

**Econometric issues** First, we correct for all time-invariant community characteristics, observed or unobserved, and all “year effects”.<sup>27</sup> Local governments differ in ways that

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<sup>24</sup> Indeed, possessing a greater number of chickens or having a bicycle would probably indicate higher wealth in rural areas but lower wealth in urban areas, so that these type of variables should be left out of this step run. It is, however, used in both urban and rural runs but with opposite coefficients in each area. Other items, such as electricity, have small coefficients in urban areas since almost everyone has electricity and larger coefficients for rural areas, distinguishing rich families with their own generators

<sup>25</sup> In 1997, assets available are not exactly the same and, for instance, electricity and television were only urban, while a bicycle represented wealth in the same direction.

<sup>26</sup> For instance, with the DHS 2005, we have:

$$Urban : WIn = 0.24 + 0.41WYu \tag{2}$$

$$Rural : WIn = -1.09 + 0.37WYr \tag{3}$$

where  $WIn$ ,  $WYu$ , and  $WYr$  are the national, urban-specific, and rural-specific wealth index scores, respectively. We also use a quadratic form of the regressions since it improves the fit a little.

<sup>27</sup> Fiscal transfers have an important characteristic to lead a relevant statistical analysis: their amount varies significantly over time, allowing the use of panel econometric methods.

are captured only imperfectly by our economic and political variables and these persistent differences between local governments may produce significant differences in transfers. So, we include a *commune*-specific effect,  $\alpha_i$ . Then, omitted variables that vary over time but are constant between *communes* can influence the amount of transfers available and received and, at the same time, the fiscal capacities of local governments. By introducing time dummies we correct this potential endogeneity bias due to omitted variables. We should limit the artificial positive correlation between the fiscal incapacity and fiscal transfers, both increasing because of their common correlation with a third variable, for instance, the national economic conjuncture.<sup>28</sup> Second, we consider endogeneity bias due to reverse causality. This turns out to be important for a number of variables, the most important being fiscal incapacity. Indeed, local spending, in part financed by central transfers, is assumed to reduce local poverty. Hence, if local governments with higher transfers tend to have higher fiscal capacity, then, estimates will tend to show that jurisdictions with higher fiscal capacity receive larger transfers, in direct contradiction to the stated goal. However, in our case, the fiscal incapacity index represents a more permanent status than does either income or consumption and transfers at time  $t$  probably cannot impact the level of wealth at time  $t$ . In case doubts remain, we propose to use the lagged value of fiscal incapacity indicator to test the robustness of our estimations. Concerning political variables, if we believe that politicians use election outcomes to determine the allocation of public resources to buy support, we must also believe that transfers have an effect on electoral results, that is, election outcomes are influenced by transfers in past periods. However, since we use values of electoral outcomes that are determined before the start of a fiscal year, transfers are unable to affect past results so that the coefficient associated with the political affiliation variables should not be biased. We could also consider the possibility of a “vote with feet”, where people are encouraged to migrate when they perceive situations, such as a higher level of fiscal transfers, to be more beneficial in another jurisdiction. However, we think that this potential bias is limited since Tiebout’s model rests on the assumptions of perfect mobility and information, which are seldom found in developing countries. Finally, since we regress central transfers on explanatory variables of which some are observed on a more aggregate level, we introduce

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<sup>28</sup> When we introduce dummy variables for election years we cannot introduce time dummies, so we will add  $T_t$ , a trend variable which accounts for the common trend in local governments’ transfers.

department cluster (Moulton, 1990).

We estimate the following equation:

$$Transfers_{it} = \beta Normative_{it} + \varphi Electoral_{it} + \gamma Political_{it} + T_t + \alpha_i + \varepsilon_{it}, \quad (4)$$

### **Econometric strategy for panel data approach with non-time varying variables**

A panel data approach allows us to control for the potentially large number of unmeasured explanatory variables by estimating a “fixed-effects” (FE) model. However, since the FE model uses only the within variance for the estimation and disregards the between variance, it does not allow the estimation of time-invariant variables (Baltagi, 2001, Wooldridge, 2002, Hsiao, 2003).<sup>29</sup> Moreover, the traditional fixed effect model results from its inefficiency in estimating the effect of variables that have very little within variance so that the inference can be wrong. In order to assess coefficients of time-constant variables or rarely changing variables, and to control for *commune* specific effects, we propose to use the FEVD estimator developed by Plümper and Troeger (2007).<sup>30</sup> This estimator, as its name indicates, decomposes the unit fixed effect into two parts; a part explained by the time-invariant variables and an unexplained part. This method uses a three-step procedure. First, by running a fixed effect model estimate of the basic model, the unit fixed effect which includes all time-invariant variables is estimated. Second, the unit effect is split into its two parts by regressing it on the time-invariant variables of the basic model. The unexplained part corresponds to the residuals of this equation,  $\hat{h}_i$ . Third, the estimation of the full model is implemented by including all explanatory time-variant variables, the time-invariant variables and the unexplained part of the fixed effect vector estimated in the second step,  $\hat{h}_i$ .<sup>31</sup> Hence, unobserved fixed effects are controlled as in the first step but not in the same way to allow the estimation of time-invariant variables.<sup>32</sup>

<sup>29</sup> In our case, for instance, ethnic variables, which are time-invariant variables, are dropped in the fixed effect model so that it is impossible to determinate whether these variables affect the allocation of fiscal transfers.

<sup>30</sup> Rarely changing variables are defined as having a low within variance. Our variables of political and ethnic factors, fiscal capacity, urbanization rate and population are rarely changing variables with a little within variance.

<sup>31</sup> This latter stage allows us to compute correct standard errors for the coefficients of the invariant variables.

<sup>32</sup> A formal explanation of this estimator is given in Plümper and Troeger (2007).

$$Transfers_{it} = \beta Normative_{it} + \varphi Electoral_{it} + \gamma Political_{it} + T_t + \hat{h}_i + \varepsilon_{it}, \quad (5)$$

Based on Monte Carlo simulations, Plümper and Troeger (2007) compare the vector decomposition model with the FE model, the random effects (RE) model, pooled OLS, and the Hausman-Taylor procedure and find that whereas the FE model does not compute coefficients for the time-invariant variables, the vector decomposition model performs far better than pooled OLS, RE, and the Hausman-Taylor procedure if both time-invariant and time-varying variables are correlated with the unit effects.

### 3.4 Data and estimation results

Data for this study come from a variety of sources. Data on fiscal transfers are drawn from the *Municipal Development Partnership*, and local characteristics like population, area, urbanization rate and ethnic composition come from the *General Population and Housing Census* and from the *National Institute of Statistics and Demography* of the *Ministry of the Economy and Finance* of Senegal. The results of legislative elections come from the *National Assembly* and the results of local elections come from the *Independent National Electoral Committee*. We constructed a panel data for 67 *communes* from 1997 to 2009.<sup>33</sup> Descriptive statistics of *communes*' principal characteristics are given in Table 6. As a previous step of our statistical analysis, we present correlations of our key variables (Table 7). It already suggests interesting results. Preliminary evidence does not show that allocation transfers conform to normative considerations and political factors seem to affect the allocation of fiscal transfers.<sup>34</sup>

An alternative answer to assess coefficients of time-constant variables and to control for *commune*-specific effects is to use a RE model. However, this model implies orthogonality between explanatory variables and the error term, a hypothesis that does not seem to be

<sup>33</sup> Note that, when we introduce the number of representatives in parliament, the panel data include data for 67 *communes* from 1998 to 2009 since we only have results of legislative elections since 1998. When we consider political affiliation variables, the panel data include data from 2002 to 2009 since we have local election results for 2002 and 2009.

<sup>34</sup> In particular, local election and central election years are respectively positively and negatively correlated with transfers, a positive relationship is found between fiscal transfers and political representation, smaller jurisdictions seem to receive greater per capita transfer and ethnic fractionalization and polarization are positively correlated with fiscal transfers.

relevant in our case. In Table 8, the Hausman test is run in order to test whether the FE or the RE specification is appropriate and it confirms that we should use fixed effects. Table 9 gives the result of our econometric estimations with the FEVD estimator. In columns (1), (2) and (3) we test the basic model and introduce progressively a trend (2) and a department cluster (3). In column (4), we test the robustness of our estimations by estimating the same econometric models with alternative indicators.<sup>35</sup> Lastly, we use the lagged value of the fiscal incapacity indicator to avoid simultaneity bias (5) and we introduce year dummies instead of the trend variable as a robustness check (6).

Does the central government transfers system assist jurisdictions with poor tax bases and greater socio-economic needs as it should according to normative guidance? Equity concerns are not at play in determining the allocation of intergovernmental transfers. Indeed, we find a negative and significant coefficient associated with our indicator of fiscal incapacity indicating that poorer local governments receive smaller intergovernmental transfers. This result is consistent with most empirical studies (Kraemer, 1997, Alm and Boex, 2002, Wallis, 1998, Meyer and Naka, 1999) and shows that political considerations outweigh those of equity. Estimation results support the hypothesis that expenditure needs have an effect on transfer allocation. Indeed, the urbanization rate is negatively correlated with fiscal transfers suggesting that transfers alleviate special rural problems. However, population density, used to measure the per capita cost of providing local public goods, seems to be positively correlated with fiscal transfers. But population density may also capture urban needs since a higher degree of urbanization is generally associated with higher population density.

Is the allocation of fiscal transfers also guided by political logic despite the formula-based system? Our results actually suggest that normative guidance is not the key motivation that determines the distribution of transfers across *communes* in Senegal. First, as regards electoral concerns, while political supporter *communes* do not appear to receive more transfers, greater resources seem to be provided to local governments that have a smaller difference in vote shares between the central government party and its principal opponent. Indeed, the coefficient associated with our proxy for the number of swing voters, those that can be

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<sup>35</sup> We consider  $PS_{it}$ , the score of the president in office at the previous local election instead of  $PA_{it}$  and ethnic polarization,  $EP_{it}$ , instead of  $EF_{it}$  (see Table 3).

easily swayed by transfers to support one party or the other, is always negative and significant at 1% level. Contrary to the findings of Case (2001) and Miguel and Zaidi (2003), the central government does not seem to target more resources to its supporters. Transfers are not targeted to areas in which political support is concentrated to maximize return in terms of votes, as predicted by Cox (1986). Our result is closer to Cole (2009), who finds that politicians appear to care more about winning re-election than rewarding their supporters and that they do so by targeting swing jurisdictions. It also confirms the findings of Banful (2010) suggesting that swing districts can be targeted in an African context.<sup>36</sup> As in developed countries, the Senegalese government targets resources to areas where a higher number of voters can be induced to vote for them with economic benefits. It confirms the existence of a pattern of tactical redistribution of transfers in an African context. Second, other political and ethnic considerations play important roles in the allocation of per capita transfers across *communes*. This last point is confirmed by the positive association between transfers and political economy determinants such as representatives in parliament, population and ethnic fractionalization. Indeed, we find a positively strong and significant impact of the number of representatives in parliament and the amount of per capita transfer received by each local government. Greater representation per voter actually results in greater per capita intergovernmental transfers, which confirms one of the most consistent empirical findings in this literature (Wright, 1974, Porto and Sanguinetti, 2001, Khemani, 2007). It shows that *communes* with higher bargaining power are able to extract larger transfers from central transfers despite the formula-based system. Population is generally negatively and significantly correlated with fiscal transfers indicating that smaller jurisdictions receive greater per capita grants which may denote a disproportionate lobbying power of smaller *communes*. This result is not surprising since transfers are in part inclusively distributed. Beyond the effect of political considerations, ethnic fractionalization seems to be positively correlated with per capita fiscal transfers. It indicates that the central government actually uses transfers as a pacification instrument as Treisman (1996) suggested.

Our results are robust to the introduction of a trend variable, a cluster department and

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<sup>36</sup> National election years still negatively but not always significantly correlated with grants and the coefficients associated with local election years are positive but not significant. We cannot clearly confirm the predictions of Worthington and Dollery (1998).

year dummies. Moreover, the impact of fiscal incapacity is still negative when we correct for potential simultaneity bias and results do not change when we use alternative indicators of political affiliation and ethnic fractionalization.

## 4 Conclusion

This paper exploits an original public finance panel data allowing us to test political economy theories of fiscal transfers for a developing country, Senegal. By estimating a panel data for 67 *communes* from 1997 to 2009, we show first that the allocation system in Senegal does not conform to the dictates of normative theory, in particular to the equity principle. Equity concerns do not affect the allocation of intergovernmental fiscal transfers. On the contrary, wealthier local governments receive greater intergovernmental transfers. Second, this allocation system does not eliminate politically motivated targeting of transfers. In particular, our results highlight that the allocation of transfers follows tactical redistribution by targeting swing voters. Our paper also confirms that local governments with more political power receive larger transfers. The Senegalese case also highlights the importance of ethnic considerations and the fact that the central government may use transfers as a tactical instrument to pacify fractionalized areas. Our results are consistent with those observed in other countries. Indeed, intergovernmental transfers are generally allocated in a needs-equalizing manner but are counter-equalizing when it comes to fiscal capacity, and political economy factors are consistently a driving force in determining the distribution of intergovernmental fiscal transfers.

Our work adds to empirical evidence from around the world that has shown several instances in which politicians in central government make decisions on local resources allocation based upon the optimization of their electoral objectives or other political factors beyond the normative considerations. It shows that results found for developed countries can be observed for a developing country also. This study also highlights that an allocation system based on a formula could be insufficient to eliminate the politically motivated allocation of transfers. Eliminating discretion in the allocation of transfers requires more than a formula. Delegating responsibility for the allocation of fiscal resources across local governments to an

independent agency could be a solution to mitigate distortions created by political incentives. Indeed, Khemani (2007) showed that delegation to an independent agency can make a difference by contrasting the impact of partisan politics.

**Acknowledgements** I am grateful to the Municipal Development Agency of Senegal for their valuable help in collecting data, especially to Mamadou Ndiaye. I also thank the Municipal Development Partnership, especially Hervé Agossou, for their warm welcome, helpful comments and discussions. Thanks to G. Rota-Graziosi and M. Foucault for excellent advises and encouragements. Any remaining errors are mine.

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Figure 1 : Percentage of poor households by region

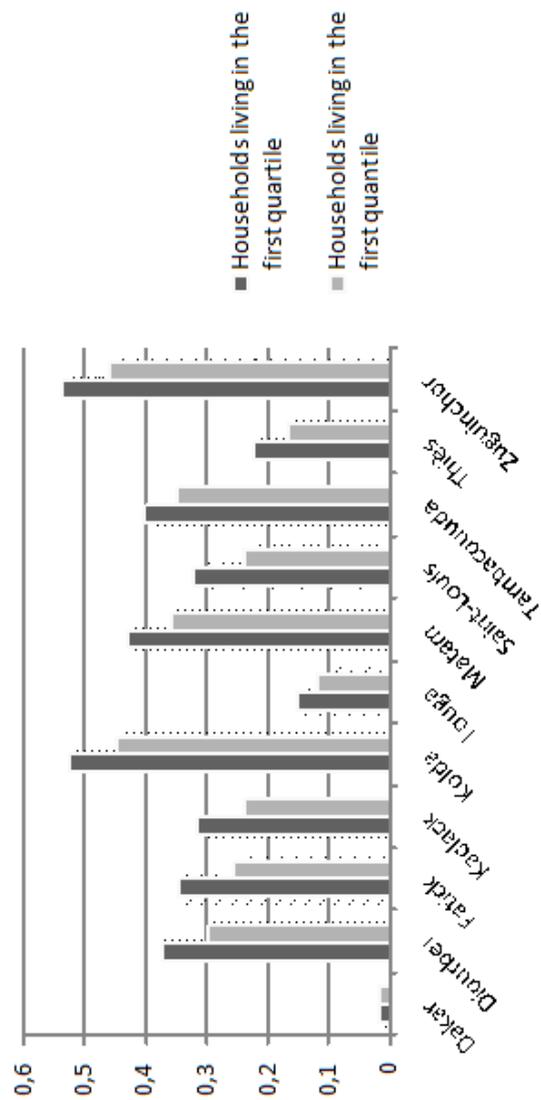


Table 1: Local resources of Senegalese communes (thousand FCFA)

| Years                  | 1997   | 1998   | 1999   | 2000   | 2001   | 2002   | 2003   | 2004   | 2005   | 2006   | 2007       | 2008       |
|------------------------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|------------|------------|
| Local expenditures     | 16 587 | 8 686  | 19 329 | 18 380 | 23 073 | 23 614 | 27 965 | 32 508 | 26 971 | 36 664 | 38 384 007 | 38 086 884 |
| Global local resources | 17 940 | 14 662 | 36 736 | 21 189 | 26 000 | 27 885 | 35 419 | 37 982 | 43 601 | 47 443 | 44 629 219 | 49 422 824 |
| Non fiscal resources   | 3 758  | 4 791  | 6 361  | 3 018  | 4223   | 4 919  | 7 690  | 5 899  | 6 429  | 6 551  | 4 532 498  | 4 632 061  |
| % of global resources  | 0.21   | 0.33   | 0.17   | 0.14   | 0.16   | 0.18   | 0.22   | 0.16   | 0.15   | 0.14   | 0.10       | 0.09       |
| Fiscal resources       | 11 975 | 7 157  | 24 249 | 13 799 | 17 066 | 17 516 | 21 100 | 23 182 | 29 131 | 30 218 | 32 404 777 | 28 507 351 |
| % of global resources  | 0.67   | 0.49   | 0.66   | 0.65   | 0.66   | 0.63   | 0.60   | 0.61   | 0.67   | 0.64   | 0.73       | 0.58       |
| Subsidies              | 2 736  | 2 119  | 4 539  | 2 799  | 3 051  | 3 120  | 3 465  | 5 466  | 4 307  | 4 939  | 5 162 657  | 5 548 490  |
| % of global resources  | 0.15   | 0.14   | 0.12   | 0.13   | 0.12   | 0.11   | 0.10   | 0.14   | 0.10   | 0.10   | 0.12       | 0.11       |
| with state subsidies   | 2 733  | 2 073  | 3 549  | 1 935  | 2 763  | 2 705  | 2 647  | 4 711  | 3 525  | 4 092  | 4 263 776  | 4 916 264  |
| % of global resources  | 0.15   | 0.14   | 0.10   | 0.09   | 0.11   | 0.10   | 0.07   | 0.12   | 0.08   | 0.09   | 0.10       | 0.10       |
| Other resources        | 263    | 594    | 1 585  | 1 571  | 1 658  | 2 329  | 3 163  | 3 433  | 3 732  | 5 733  | 2 529 285  | 10 734 921 |

Table 2: Determinants of the horizontal allocation of per capita local government transfers

| Variables                      | Indicator used   |
|--------------------------------|--|
| Central transfers              | $T_{it}$ , per capita amount of transfers received by a <i>commune</i> $i$ on year $t$ .   |
| <b>Normative factors</b>       |  |
| Fiscal incapacity              | We evaluate the revenue incapacity, $RI_{dt}$ , using the DHS Wealth Index (see section 3.3.1) in department $d$ on year $t$ .   |
| Expenditure needs              | $U_{dt}$ , the urbanization rate in department $d$ on year $t$ , defined as the percentage of population living in urban area.   |
|                                | $D_{it}$ , the population density in <i>commune</i> $i$ on year $t$ ,  |
| <b>Electoral concerns</b>      |  |
| Patronage                      | $PA_{it}$ , a dummy variable which takes the value one if <i>commune</i> $i$ has the same political affiliation as the president in office.  |
|                                | We consider alternately $PS_{it}$ , the score of the president in office at the previous local election.   |
| Tactical distribution          | $DV_{it}$ measures the difference in vote shares expressed in absolute values between the central government party and its main opponent, in the last local election in each <i>communes</i> .   |
| Opportunistic cycles           | $EN_t$ and $EL_t$ are dummy variables, which take the value one the year of respectively national and local election.  |
| <b>Other political factors</b> |  |
| Political representation       | $N_{it}$ , the number of representatives in parliament by department $d$ on year $t$ ,   |
| Population size                | $P_{it}$ , the population size of the jurisdiction $i$ on year $t$ .   |
| Ethnical factors               | $EF_{it}$ , the ethnic fractionalization in <i>communes</i> $i$ on year $t$ defined as the probability that two individuals randomly drawn from a jurisdiction are from different ethnic group. We also consider alternative indicator by using ethnic polarization, $EP_{it}$ . |

Table 3: The DHS Wealth Index

| <b>Assets</b>        |                   | <b>Services, access to infrastructure</b> |  |
|----------------------|-------------------|---|--|
| Radio                | yes (1) or no (2) | Source of drinking water                  | 11=Piped into residence; 12=Public tap ; 21=Well in residence ; 22=Public well ; 23=Borehole ; 31=Spring water<br>32=River/Stream ; 33=Pond/Lake ; 34=Dam ; 35=Dugout ; 41=Rainwater ; 51=Tanker Truck ; 61=Bottled water                  |
| Television           | yes (1) or no (2) | Time to get to drinking water             | Time to get water in minutes   |
| Refrigerator         | yes (1) or no (2) | Type of toilet facility                   | 10 : Flush toilet ; 11 : Own flush toilet ; 12 : Shared flush toilet ; 20 : Pit toilet latrine ; 21 : Traditional pit latrine<br>22 : Ventilated pit latrine ; 23 : Bucket/pan ; 30 : No facility ; 31 : No facility/bush/field ; 96 Other |
| Bicycle              | yes (1) or no (2) | Has electricity                           | yes (1) or no (2)  |
| Motorcycle /scooter  | yes (1) or no (2) | Share toilet with other households        | yes (1) or no (2)  |
| Car /truck           | yes (1) or no (2) | Main means of sewage disposal             | 1=Pickup truck ; 2=Chart ; 3=Authorised rubbished dump ; 4=Nature ; 5=Burying ; 6=Burning ; 7=Other  |
| Telephone            | yes (1) or no (2) | Main means of disposing of water          | 1=Draining ; 2=Covered pipe waste ; 3=Open pipe waste ; 4=Grid/ downstream ; 5=In the river ; 6=Hole ; 7=Nature  |
| Antenne 5 tv         | yes (1) or no (2) | Frequency of water outages                | 1=every day, 2=most day, 3=some days, 4=occasional   |
| Canal tv             | yes (1) or no (2) | Duration of water outages                 | 1=Many hours 2=More than one day 3=More than one week 4=No water in 2 weeks  |
| Cell phone           | yes (1) or no (2) | <b>Housing characteristic</b>             |  |
| Washing machine      | yes (1) or no (2) | Main material of the floor                | 11=Earth ; 12=Dung 3= Parquet, polished wood ; 32=Vinyl ; 33=Ceramic tiles ; 34=Cement ; 35=Carpet   |
| Cooker               | yes (1) or no (2) | Type of cooking fuel                      | 1=Electricity ; 2=LPG, natural gas ; 3=Biogas ; 4=Kerosene ; 5=Coal, lignite ; 6=Charcoal ; 7=Firewood, straw ;<br>8=Dung ; 95=Do not cook.  |
| Video                | yes (1) or no (2) | Have bednet for sleeping                  | yes (1) or no (2)  |
| Air-conditioner      | yes (1) or no (2) | Place for hand washing                    | 1=In dwelling/yard/plot ; 2=Somewhere else ; 3=Nowhere   |
| Computer             | yes (1) or no (2) | Items present : water tap                 | yes (1) or no (2)  |
| Internet access      | yes (1) or no (2) | Items present : soap                      | yes (1) or no (2)  |
| Commercial van/truck | yes (1) or no (2) | Items present : basin                     | yes (1) or no (2)  |
| Hand cart            | yes (1) or no (2) | Number of rooms for sleeping              | Number of rooms  |
| Boat                 | yes (1) or no (2) |   |  |
| <b>Livestock</b>     |                   |   |  |
| Plough               | yes (1) or no (2) |   |  |
| Horse                | yes (1) or no (2) |   |  |
| Cow                  | yes (1) or no (2) |   |  |
| Donkey               | yes (1) or no (2) |   |  |
| Sheep                | yes (1) or no (2) |   |  |
| Poultry              | yes (1) or no (2) |   |  |

Table 4: The DHS Wealth Index : rural (ru), urban (urb) and national (na) indexes

|           | ru    | Only urban      | urb   | Both but different effects | ru    | urb    | Both and similar effects      | ru     | urb    | na    |
|-----------|-------|-----------------|-------|----------------------------|-------|--------|-------------------------------|--------|--------|-------|
| Plough    | +0.30 | Refrigerator    | +0.28 | Sheep                      | +0.29 | -0.09  | Radio                         | +0.20  | +0.11  | +0.12 |
| Horse     | +0.33 | Telephone       | +0.25 | Poultry                    | +0.15 | -0.003 | Television                    | +0.21  | +0.09  | +0.34 |
| Cow       | +0.25 | Antenne 5 tv    | +0.27 | Bicycle                    | +0.04 | -0.04  | Cell phone                    | +0.21  | +0.22  | +0.28 |
| Donkey    | +0.27 | Canal tv        | +0.04 |                            |       |        | Cooker                        | +0.07  | +0.14  | +0.19 |
| Hand cart | +0.40 | Washing machine | +0.26 |                            |       |        | Motorcycle /scooter           | +0.13  | +0.04  | +0.07 |
|           |       | Video           | +0.12 |                            |       |        | Car /truck                    | +0.14  | +0.18  | +0.17 |
|           |       | Air-conditioner | +0.14 |                            |       |        | Commercial van/truck          | +0.08  | +0.05  | +0.05 |
|           |       | Computer        | +0.06 |                            |       |        | Boat                          | -0.04  | -0.003 | -0.01 |
|           |       | Internet access | +0.03 |                            |       |        | Source of drinking water      | -0.03  | -0.18  | -0.26 |
|           |       |                 |       |                            |       |        | Time to get to drinking water | -0.001 | -0.06  | -0.07 |
|           |       |                 |       |                            |       |        | Type of toilet facility       | -0.08  | -0.20  | -0.29 |
|           |       |                 |       |                            |       |        | Has electricity               | +0.12  | +0.29  | +0.37 |
|           |       |                 |       |                            |       |        | Share toilet with others      | -0.05  | -0.07  | -0.04 |
|           |       |                 |       |                            |       |        | Means of sewage disposal      | -0.03  | -0.22  | -0.29 |
|           |       |                 |       |                            |       |        | Means of disposing of water   | -0.005 | -0.21  | -0.24 |
|           |       |                 |       |                            |       |        | Frequency of water outages    | +0.03  | +0.10  | +0.17 |
|           |       |                 |       |                            |       |        | Duration of water outages     | +0.02  | +0.07  | +0.12 |
|           |       |                 |       |                            |       |        | Main material of the floor    | +0.14  | +0.17  | +0.30 |
|           |       |                 |       |                            |       |        | Type of cooking fuel          | -0.07  | -0.10  | -0.07 |
|           |       |                 |       |                            |       |        | Have bednet for sleeping      | +0.02  | +0.06  | +0.03 |
|           |       |                 |       |                            |       |        | Place for hand washing        | -0.04  | -0.07  | -0.10 |
|           |       |                 |       |                            |       |        | Items present : water tap     | +0.10  | +0.15  | +0.19 |
|           |       |                 |       |                            |       |        | Items present : soap          | +0.08  | +0.14  | +0.22 |
|           |       |                 |       |                            |       |        | Items present : basin         | +0.08  | +0.01  | +0.04 |
|           |       |                 |       |                            |       |        | Number of rooms for sleeping  | +0.32  | +0.12  | +0.04 |

Table 5: Profile of a household who belongs to the first quintile in 2005

|                 | Mean  | Standard Dev. | Mean                          | Standard Dev. |
|-----------------|-------|---------------|-------------------------------|---------------|
| Plough          | 0.09  | 0.28          | Motorcycle /scooter           | 0.01 0.10     |
| Horse           | 0.07  | 0.26          | Car /truck                    | 0.001 0.03    |
| Cow             | 0.11  | 0.31          | Commercial van/truck          | 0.002 0.05    |
| Donkey          | 0.13  | 0.33          | Boat                          | 0.04 0.19     |
| Hand cart       | 0.04  | 0.21          | Source of drinking water      | 20.39 8.20    |
| Refrigerator    | 0.01  | 0.11          | Time to get to drinking water | 49.92 157.33  |
| Telephone       | 0.01  | 0.10          | Type of toilet facility       | 25.24 8.99    |
| Antenne 5 tv    | 0.001 | 0.02          | Has electricity               | 0.07 0.25     |
| Canal tv        | 0.001 | 0.02          | Share toilet with others      | 0.22 0.41     |
| Washing machine | 0.001 | 0.02          | Means of sewage disposal      | 4.15 0.96     |
| Video           | 0.003 | 0.05          | Means of disposing of water   | 6.92 0.41     |
| Air-conditioner | 0.002 | 0.04          | Frequency of water outages    | 0.84 1.42     |
| Computer        | 0.003 | 0.01          | Duration of water outages     | 0.41 0.68     |
| Internet access | 0     | 0             | Main material of the floor    | 18.10 10.46   |
| Sheep           | 0.41  | 0.49          | Type of cooking fuel          | 9.27 15.93    |
| Poultry         | 0.59  | 0.49          | Have bednet for sleeping      | 0.41 0.49     |
| Bicycle         | 0.15  | 0.35          | Place for hand washing        | 1.31 0.62     |
| Radio           | 0.71  | 0.45          | Items present : water tap     | 0.50 0.50     |
| Television      | 0.03  | 0.19          | Items present : soap          | 0.28 0.45     |
| Cell phone      | 0.06  | 0.24          | Items present : basin         | 0.55 0.49     |
| Cooker          | 0.11  | 0.31          | Number of rooms for sleeping  | 2.61 1.35     |

Table 6: Descriptive statistics of *communes*' characteristics.

| <i>Communes</i> | Surface | Pop.    | Dens.  | Dom. ethn. | <i>Communes</i> | Surface | Pop.   | Dens. | Dom. ethn. | <i>Communes</i> | Surface | Pop.   | Dens.  | Dom. ethn. |
|-----------------|---------|---------|--------|------------|-----------------|---------|--------|-------|------------|-----------------|---------|--------|--------|------------|
| Bakel           | 400     | 11310   | 28.27  | Sarakholé  | Kanel           | 900     | 9498   | 10.55 | Toucouleur | Passy           | 1204    | 6362   | 5.28   | Sereere    |
| Bambey          | 1352    | 24286   | 17.96  | Ouolof     | Kaolack         | 2000    | 176348 | 88.17 | Ouolof     | Pikine          | 9500    | 808486 | 85.10  | Ouolof     |
| Bargny          | 1132    | 37561   | 33.18  | Ouolof     | Kayar           | 205     | 16634  | 81.14 | Ouolof     | Podor           | 2628    | 10325  | 3.92   | Ouolof     |
| Bignona         | 686     | 25883   | 37.73  | Diola      | Kebemer         | 400     | 14296  | 35.74 | Ouolof     | Pout            | 990     | 17098  | 17.27  | Sereere    |
| Dagana          | 2952    | 19148   | 6.48   | Ouolof     | Kedougou        | 2100    | 17097  | 8.14  | Sarakholé  | Ranerou         | 1674    | 1342   | 0.80   | Toucouleur |
| Dahra           | 1440    | 27469   | 19.07  | Ouolof     | Kombole         | -       | 11922  | -     | Ouolof     | Richard-Toll    | 1200    | 44135  | 36.77  | Ouolof     |
| Dakar           | 8238    | 981050  | 119.08 | Ouolof     | Kolda           | 900     | 55621  | 61.80 | Peul       | Rosso Sen.      | 68      | 1316   | 142.67 | Ouolof     |
| Dianniado       | 3023    | 11546   | 3.81   | Ouolof     | Koungheul       | 750     | 14298  | 19.06 | Ouolof     | Rufisque        | 2644    | 151293 | 57.22  | Ouolof     |
| Diawara         | 108     | 7859    | 72.77  | Sarakholé  | Linguere        | 1466    | 13321  | 9.08  | Ouolof     | Saint-Louis     | 4579    | 158018 | 34.50  | Ouolof     |
| Diofor          | 287     | 8518    | 29.62  | Sereere    | Marsassoum      | 1500    | 6534   | 4.35  | Socé       | Sebikotane      | 1257    | 19114  | 15.20  | Ouolof     |
| Diourbel        | 3600    | 96167   | 26.71  | Ouolof     | Matam           | 375     | 15426  | 41.13 | Toucouleur | Sedhion         | 7400    | 18699  | 2.52   | Socé       |
| Fatick          | 1597    | 23460   | 14.69  | Sereere    | Mbacke          | 1830    | 57312  | 31.31 | Ouolof     | Semme           | 1200    | 4742   | 3.95   | Toucouleur |
| Foudiougne      | 1000    | 5076    | 520.08 | Sereere    | Mboro           | 310     | 11907  | 38.41 | Ouolof     | Sokone          | 991     | 11546  | 11.65  | Sereere    |
| Gandiaye        | -       | 10177   | -      | Ouolof     | Mbour           | -       | 157686 | -     | Sereere    | Tamba           | 7775    | 69893  | 8.98   | Sarakholé  |
| Gollere         | 900     | 5437    | 6.04   | Ouolof     | Mekhe           | 1050    | 15273  | 14.54 | Ouolof     | Thiadiaye       | 5220    | 10688  | 2.04   | Sereere    |
| Gossas          | 268     | 10902   | 40.53  | Sereere    | Ndiandane       | 1050    | 5005   | 4.76  | Ouolof     | Thies           | 6822    | 243165 | 35.64  | Ouolof     |
| Goudomp         | 675     | 11225   | 16.63  | Socé       | Ndioum          | -       | 14296  | -     | Toucouleur | Thilogne        | 900     | 8776   | 9.75   | Toucouleur |
| Guediawaye      | 1352    | 266125  | 196.83 | Ouolof     | Ndoffane        | 1200    | 10179  | 8.48  | Ouolof     | Thionk          | 588     | 8110   | 13.79  | Diola      |
| Guinguineo      | 350     | 13538.6 | 38.68  | Ouolof     | Nguekhock       | 3132    | 17613  | 5.62  | Sereere    | Tivaouane       | 1241    | 37848  | 30.49  | Ouolof     |
| Joal-Fadiouth   | 5035    | 34217   | 6.79   | Sereere    | Nioro Rip       | 344     | 14507  | 42.17 | Ouolof     | Velingara       | -       | 21447  | -      | Peul       |
| Kaffrine        | 440     | 26489   | 60.20  | Ouolof     | Oourrosogui     | 1525    | 13726  | 9.07  | Toucouleur | Waoumde         | 600     | 8489   | 14.14  | Toucouleur |
| Kahone          | 2500    | 5499    | 2.19   | Ouolof     | Oussouye        | 155     | 4090   | 26.39 | Diola      | Zinguinchor     | 3400    | 152889 | 44.96  | Diola      |

Table 7: Correlations of our key variables

| Variables                               | $T_{it}$ | $U_{dt}$ | $D_{it}$ | $RI_{dt}$ | $PA_{it}$ | $PS_{it}$ | $DV_{it}$ | $EN_t$ | $EL_t$ | $N_{it}$ | $P_{it}$ | $EF_{it}$ | $EP_{it}$ |
|---|----------|----------|----------|-----------|-----------|-----------|-----------|--------|--------|----------|----------|-----------|-----------|
| Per capita transfers, $T_{it}$          | 1        |          |          |           |           |           |           |        |        |          |          |           |           |
| Urbanization rate, $U_{dt}$             | 0.23*    | 1        |          |           |           |           |           |        |        |          |          |           |           |
| Population density, $D_{it}$            | 0.01     | 0.42*    | 1        |           |           |           |           |        |        |          |          |           |           |
| Revenue incapacity, $RI_{dt}$           | -0.13*   | -0.47*   | -0.26*   | 1         |           |           |           |        |        |          |          |           |           |
| Political affiliation, $PA_{it}$        | -0.03    | 0.21*    | 0.24*    | -0.28*    | 1         |           |           |        |        |          |          |           |           |
| President's score, $PS_{it}$            | -0.04    | 0.16*    | 0.21*    | -0.16*    | 0.70*     | 1         |           |        |        |          |          |           |           |
| Difference in vote shares, $DV_{it}$    | -0.05    | 0.10*    | 0.06     | -0.17*    | 0.11*     | 0.36*     | 1         |        |        |          |          |           |           |
| National elections, $EN_t$              | -0.14*   | 0.01     | -0.01    | -0.01     | 0.02      | 0.02      | 0.01      | 1      |        |          |          |           |           |
| Local elections, $EL_t$                 | 0.37*    | -0.04    | 0.01     | 0.003     | 0.006     | 0.02      | 0.01      | -0.18* | 1      |          |          |           |           |
| Representatives in parliament, $N_{it}$ | 0.38*    | -0.39*   | -0.16*   | 0.23*     | -0.15*    | -0.05     | 0.02      | -0.02  | -0.04  | 1        |          |           |           |
| Population size, $P_{it}$               | -0.06*   | 0.56*    | 0.58*    | -0.30*    | 0.24*     | 0.17*     | 0.12*     | -0.004 | 0.01   | -0.39*   | 1        |           |           |
| Ethnic fractionalization, $EF_{it}$     | 0.04*    | 0.40*    | 0.26*    | 0.04      | -0.01     | -0.11*    | -0.01     | 0.00   | 0.00   | -0.32*   | 0.38*    | 1         |           |
| Ethnic polarization, $EP_{it}$          | 0.10*    | 0.03     | 0.03     | 0.10*     | 0.07*     | -0.07     | -0.01     | -0.00  | 0.00   | -0.22*   | 0.08*    | 0.53*     | 1         |

\*: Correlation coefficient significant at 10 % level.

Table 8: Estimation results - Fixed effects or Random Effects

| Dependent variable: Per capita transfers | (1)                 | (2)                 |
|--|---------------------|---------------------|
| Normative factors                        |                     |                     |
| Urbanization rate, $U_{dt}$              | 0.013<br>(0.01)     | -0.009**<br>(0.00)  |
| Population density, $D_{it}$             | 2.547<br>(2.74)     | 0.153<br>(0.12)     |
| Revenue incapacity, $RJ_{dt}$            | -1.884<br>(2.64)    | -0.748<br>(0.66)    |
| Electoral concerns                       |                     |                     |
| Political affiliation, $PA_{it}$         | (dropped)           | -0.071<br>(0.24)    |
| Difference in vote shares, $DV_{it}$     | (dropped)           | -1.481**<br>(0.66)  |
| National elections, $EN_t$               | -3.166***<br>(0.22) | -3.359***<br>(0.21) |
| Local elections, $EL_t$                  | 0.268<br>(0.31)     | 0.335<br>(0.30)     |
| Other political factors                  |                     |                     |
| Representatives in parliament, $N_{it}$  | 1.457***<br>(0.26)  | 0.987***<br>(0.15)  |
| Population size, $P_{it}$                | (dropped)           | -0.151<br>(0.12)    |
| Ethnic fractionalization, $EF_{it}$      | (dropped)           | 2.495**<br>(1.17)   |
| Trend variable $T_t$                     | 1.339***<br>(0.10)  | 1.426***<br>(0.07)  |
| Number of observations                   | 351                 | 351                 |
| Adjusted R <sup>2</sup>                  | 0.81                | 0.81                |
| Haussman test: p-value                   |                     | 0.0001              |

Controls for serial correlation of the error term, ar1 Cochrane-Orcutt transformation. Robust standard errors are in brackets.\*\*\*: coefficient significant at 1 % level, \*\*: at 5 % level, \*: at 10 % level.

Table 9: Estimation results - Fixed effects vector decomposition

| Dep. var.: Per cap. transfers         | (1)                  | (2)                  | (3)                  | (4)                 | (5)                  | (6)                  |
|---------------------------------------|----------------------|----------------------|----------------------|---------------------|----------------------|----------------------|
| Normative factors                     |                      |                      |                      |                     |                      |                      |
| Urbanization rate, $U_{dt}$           | -0.025***<br>(0.006) | -0.017***<br>(0.001) | -0.017***<br>(0.003) | -0.010**<br>(0.004) | -0.015***<br>(0.004) | -0.016***<br>(0.001) |
| Population density, $D_{it}$          | 0.539**<br>(0.19)    | 0.177*<br>(0.11)     | 0.177**<br>(0.06)    | 0.180**<br>(0.07)   | 0.162**<br>(0.07)    | 0.045<br>(0.04)      |
| Revenue incapacity, $RI_{dt}$         | -3.185***<br>(0.81)  | -1.287***<br>(0.46)  | -1.287***<br>(0.32)  | -0.853*<br>(0.46)   | -0.732*<br>(0.24)    | -0.314*<br>(0.21)    |
| Electoral concerns                    |                      |                      |                      |                     |                      |                      |
| Political affiliation, $PA_{it}$      | 0.139<br>(0.15)      | 0.065<br>(0.11)      | 0.065<br>(0.06)      | 0.001<br>(0.01)     | 0.015<br>(0.08)      | 0.116<br>(0.08)      |
| Difference in vote shares, $DV_{it}$  | -1.526***<br>(0.27)  | -1.390***<br>(0.21)  | -1.390***<br>(0.11)  | -1.531***<br>(0.10) | -1.522***<br>(0.16)  | -1.134***<br>(0.26)  |
| National elections, $EN_t$            | -2.161<br>(3.46)     | -3.166<br>(2.23)     | -3.166***<br>(0.45)  | -3.166***<br>(0.45) | -3.174***<br>(0.50)  | -<br>(0.37)          |
| Local elections, $EL_t$               | 1.540<br>(3.75)      | 0.268<br>(0.64)      | 0.268<br>(0.37)      | 0.268<br>(0.37)     | 0.377<br>(0.38)      | -<br>(0.38)          |
| Other political factors               |                      |                      |                      |                     |                      |                      |
| Representatives, $N_{it}$             | 2.234***<br>(0.58)   | 1.057**<br>(0.38)    | 1.057***<br>(0.39)   | 1.079***<br>(0.40)  | 0.971**<br>(0.38)    | 0.372***<br>(0.06)   |
| Population size, $P_{it}$             | -0.283***<br>(0.07)  | -0.172**<br>(0.05)   | -0.172***<br>(0.04)  | -0.177***<br>(0.03) | -0.160***<br>(0.04)  | -0.046<br>(0.04)     |
| Ethnic fract., $EF_{it}$              | 2.429***<br>(0.37)   | 1.913***<br>(0.44)   | 1.915***<br>(0.34)   | 2.420***<br>(0.72)  | 1.927***<br>(0.32)   | 1.818***<br>(0.31)   |
| Trend variable $T_t$                  | -<br>(2.56)          | 1.339***<br>(2.11)   | 1.339***<br>(0.96)   | 1.339***<br>(1.41)  | 1.385***<br>(1.06)   | -<br>(1.13)          |
| Residual of the 2 <sup>nd</sup> stage | 1.397**<br>(0.39)    | 1.000***<br>(0.19)   | 1.000***<br>(0.20)   | 1.000***<br>(0.19)  | 1.000***<br>(0.20)   | 1.000***<br>(0.05)   |
| Constant                              | -2.910<br>(2.56)     | -11.14***<br>(2.11)  | -11.14***<br>(0.96)  | -12.61***<br>(1.41) | -11.72***<br>(1.06)  | -<br>(1.13)          |
| Number of observations                | 351                  | 351                  | 351                  | 351                 | 331                  | 351                  |
| Adjusted R <sup>2</sup>               | 0.70                 | 0.80                 | 0.80                 | 0.80                | 0.80                 | 0.96                 |
| F-Statistic                           | 34.82                | 50.73                | 140.07               | 281.39              | 6473.35              | 968.43               |
| Cluster                               | no                   | no                   | yes                  | yes                 | yes                  | yes                  |
| Years dummies                         | no                   | no                   | no                   | no                  | no                   | yes                  |

Controls for serial correlation of the error term, ar1 Coccane-Orcutt transformation. Robust standard errors are in brackets.\*\*\*: coefficient significant at

1 % level, \*\*: at 5 % level, \*: at 10 % level