Does decentralization increase access to poverty-related services? Evidence from Benin

Abstract

In this paper, we analyze the average and distributional effects of decentralization on the access to some poverty-related public services in Benin. Estimating a panel data of 77 local governments, called *communes*, for 2006 and 2007 our study suggests that decentralization has a positive overall effect on the access to basic services. However, this effect appears to be non-monotone following an inverted U-shaped curve. Moreover, it varies according to *communes*' wealth: it is positive for sufficiently wealthy *communes* and may be negative for the poorest ones. We also highlight that decentralization may increase intra-jurisdictional inequalities especially within the poorest areas. Decentralization in Benin contributes successfully to reduce poverty by improving the average access to poverty-related services. But, the devil is in the details and decentralization seems to increase inequality in terms of access within and between *communes*.

Emilie Caldeira,[‡] Martial Foucault[♯] and Grégoire Rota-Graziosi[*‡]

‡: CERDI-CNRS, Université d'Auvergne, Economics Dept
Mail address: 65 boulevard François Mitterrand, 63000 Clermont-Ferrand, France
Email: emiliecaldeira@gmail.com.

*: Fiscal Affairs Department, International Monetary Fund.
Mail address: 700 19th Street, N.W., Washington, D.C., 20431, USA
Email: grotagraziosi@imf.org

♯: Universite de Montreal, Political Science Dept.
Mail address: CP 6128, succ. centre-ville.
Montreal, Qc, H3C3J7, Canada
Email: martial.foucault@umontreal.ca

1 Introduction

Over the past two decades, decentralization has been implemented by many developing countries, becoming a key element of the public-sector reform. By bringing decision-makers closer to citizens, decentralization is expected to alleviate information asymmetries, to improve accountability, and to increase the efficiency of public goods provision. In developing countries, decentralization is one of the main institutional reforms on international organizations and donors' agenda to enhance governance and ultimately to reduce poverty. After a certain while of such a strategy, we wonder to what extent this institutional transformation has been successful to fight poverty in sub-Saharan Africa.

In this perspective, this paper analyzes the effect of decentralization in Benin on the access to some poverty-related services: water, sanitation, refuse and sewage disposal, and primary education. In regards to its democratization and decentralization processes Benin is well representative of the African French-speaking countries (20 countries and around 243 million inhabitants in 2009). Ethnically fragmented and politically stable since only 2001 this country has begun to transfer competencies to 77 local governments, called *communes*, in 1998. The decentralization process definitively took off with municipal elections in 2002. Our analysis focuses on the 2006 and 2007 years, which correspond to a crucial period for democracy in Benin: in 2006 national elections ushered in President Yayi Boni in place of Mathieu Kerekou who ruled the country for 29 years.

By estimating a panel data of 77 Beninese *communes* for 2006 and 2007, we aim at shedding light on the three following issues: (1) To what extent decentralization, measured as the share of local own-revenue in total local revenue for each *commune*, may affect the access to basic public services? Is this effect monotone with the degree of decentralization? (2) Does the decentralization effect vary between *communes* according to their wealth? (3) How does decentralization affect households' equality of access to poverty-related services within *communes*? To answer these questions, we exploit an original micro-level public finance panel data from a sub-Saharan country. Besides local public finance data, we use the 2006 and 2007 Integrated Modular Survey on Household Living Conditions (EMICoV) covering a sample of 18,000 Beninese households throughout the entire national territory and representative at the

commune level, allowing us to measure aggregated and distributional indicators. Moreover, we employ a consistent econometric method taking into account potential endogeneity of the degree of decentralization, heterogeneity of local governments, and inefficiency in estimating the effect of variables having little within variance.

Our analysis suggests that decentralization positively affects on average the access to basic public services. However, this effect is non monotone following an inverted U-shaped curve, and heterogeneous between and within *communes*. Decentralization's effect on access to poverty-related services is positive for sufficiently wealthy *communes* and becomes negative for the poorest ones. We emphasize that decentralization may also increase households' inequalities especially within the poorest jurisdictions. Thereby, if decentralization successes to reduce poverty in Benin by improving access to some basic services, the pitfall of higher inequalities between and within *communes* remains.

The paper is structured as follows: section 2 presents a review of the literature on the impact of decentralization on service delivery and human development indicators in developing countries; section 3 portrays the process of decentralization in Benin; section 4 describes our econometric framework; Section 5 presents the average and distributional impact results. Section 6 concludes.

2 The impact of decentralization on services delivery and human development indicators: A review of the literature

Decentralization in developing countries is the subject of a huge literature in economics. Our brief review presents forces and weaknesses of such a strategy to reduce poverty, or at least to increase the efficiency of public goods provision. Many benefits of decentralization are claimed in the fiscal federalism literature, most of them related to the fact that decentralization brings decisions closer to citizens, alleviating information asymmetries and improving local governments' accountability. The fiscal federalism literature has largely stressed the economic efficiency of intergovernmental competition for providing local public goods. If such a normative prescription seems to fit well with developed countries, this issue remains puzzling for developing countries where the 'voting by feet' mechanism is not so relevant.

Thus, the logic of decentralization raises some intriguing issues in developing countries that we can summarize around two perspectives: (a) Why does decentralization entail a better provision of local public goods? (b) What are the limits of decentralization in such countries given their institutional and geographical constraints? Besides these puzzles our paper emphasizes some benefits of decentralization related to the positive influence of institutions on poverty reduction in French-speaking African countries.[1]

A demand-side argument in favor of decentralization is derived from the existence of information asymmetry. Indeed, the seminal idea that decentralization may improve the provision of public services when local governments have an informational advantage goes back at least as far as Hayek (1948) and Oates (1972). As local decision-makers have a better and well-informed knowledge of local preferences, decentralization is expected to improve the level and quality of public services. This informational advantage may induce a better targeting of the poorest populations in a country (see for instance Alderman (2002) in Albania, Bardhan and Mookherjee (2005) in West Bengal or Galasso and Ravallion (2005) in Bangladesh).

On the supply-side, decentralization should enhance the accountability of policymakers. Decentralization allows a better matching between public policies and local needs. Several authors established such a link: Bird and Rodriguez (1999) in the Philippines (health, primary education, housing, and infrastructure), Faguet (2004) in Bolivia (education and social services), Galiani, Gertler, and Schargrodsky (2008) in Argentina (education), Robalino, Picazo, and Voetberg (2001) on a panel of low and high income countries from 1970 to 1995 (mortality rates), Enikolopov and Zhuravskaya (2007) on 75 developing and transition countries for 25 years (DPT immunization, infant mortality, illiteracy rate, and pupil-to-teacher ratio). Other studies are less favorable: for instance, Azfar and Livingston (2010) find little evidence of better provision of government services by local governments in Uganda; for Winkler and Rounds (1996) the transfer of education's competencies in Chile reduced the scores of cognitive tests.

Beyond improving the matching of public policies with local preferences, decentralization

[1] An important literature has been devoted to analyze the benefits of decentralization on human development indicators in the context of the Millennium objectives. The final impact of the decentralization on growth has been studied for instance by Zhang and fu Zou (1998), Wollera and Phillips (1998), Davoodi, Xie, and Zou (1999), Lin and Liu (2000), Akai and Sakata (2002), Martinez-Vazquez and McNab (2003)...

is also considered as an essential support of democratization. Seabright (1996) compares allocations of power to local and central governments as alternative means of motivating governments to act in the interests of citizens and shows that if centralization entails benefits from policy coordination, it induces also some costs in terms of diminishing accountability. Interjurisdictional competition may also enhance accountability: local citizens encourage incumbents to increase the efficiency of public spending through a 'vote with feet' (Tiebout, 1956) or a 'yardstick competition' (Salmon, 1987, Besley and Case, 1995).[2] Few studies have examined the relevance of this phenomenon in developing countries: Arze, Martinez-Vasquez, and Puwanti (2008) suggest the existence of yardstick competition between local governments in Indonesia; Caldeira, Foucault, and Rota-Graziosi (2008) establish the existence of strategic interactions between Beninese *communes*, their public spending being strategic complements. Finally, decentralization is generally viewed as a trade-off. Besley and Coate (2003) and Lockwood (2002) confirm Oates' insights by showing that the relative performance of centralized and decentralized provision of public goods depends upon spillovers and differences in tastes for public spending between jurisdictions.[3]

By expanding the decision space of local governments, decentralization may increase corruption. Bardhan and Mookherjee (2000) highlight the theoretical ambiguity of the importance of relative capture at local and national level. Huther and Shah (1998), Barenstein and de Mello (2001), and Fisman and Gatti (2002) find a negative relationship between fiscal decentralization and corruption for several panels of countries.[4] On the contrary, Reinikka and Svensson (2004) highlight capture of school's grants by local officials in Uganda. At the macroeconomic level, Treisman (2000) and Fan, Lin, and Treisman (2009) conclude that federal states are more corrupted. Using data on 154 countries, Treisman (2000) also suggests

[2] Citizens can vote with their feet, that is, move to a nearby jurisdiction to obtain the public service-tax package they prefer so that local governments compete to attract people and increase their tax bases. Even in absence of population mobility, in the context of informational asymmetries between voters and politicians, voters can use the performance cues of other governments as a benchmark to judge whether their representative wastes resources and deserves to remain in office. Thus, an action chosen by a politician in one jurisdiction affects the informational set of imperfectly informed voters in other jurisdictions forcing neighboring politicians to compete in order not to be signaled as bad incumbents and to remain in office.

[3] Competition among jurisdictions to attract mobile capital is a way to discipline governments, motivating them to invest more in infrastructure, reduce waste and corruption, and spend less on non-productive public goods. But, Cai and Treisman (2005) emphasize that the required assumptions (perfect mobility, perfect local autonomy...) are often unrealistic, and capital mobility may even weaken discipline of the poorly-endowed units.

[4] Fisman and Gatti (2002) use legal origin as an instrument for decentralization.

that more tiers of government induce higher perceived corruption, less effective provision of public health services, and lower adult literacy, especially in developing countries. Beyond corruption Prud'homme (1995) stresses several pitfalls of decentralization in developing countries: the increase in interjurisdictional disparities, the jeopardizing of macroeconomic stability, the ethnical bias of local elections, low capacities of local bureaucracies...

Another supply-side argument against decentralization concerns the risk of diseconomies of scale or at least a loss of scale economies. However, many of the public goods in question are community- and site-specific, and it is often possible to exclude nonresidents. Rural communities of poor countries, in particular, are often face-to-face, and social norms sharply distinguish "outsiders" from "insiders," especially with respect to entitlement to community services (Bardhan, 2002).

3 An overview of Benin and its decentralization process

In regards to democratization and decentralization processes in Benin, the country is well representative of African French-speaking countries (20 countries and around 243 million inhabitants in 2009). Benin belongs to the lower income group of countries with an estimated per capita income of US$740 in 2011 and a ranking of 134th out of 169 countries in the Human Development Index (2010). With 8.93 million inhabitants in 2009, the population is distributed among 42 different ethnic groups: the most prominent groups are the Fon and the Adjas in the South, the Baribas and the Sombas in the North and the Yorubas in the South-East.

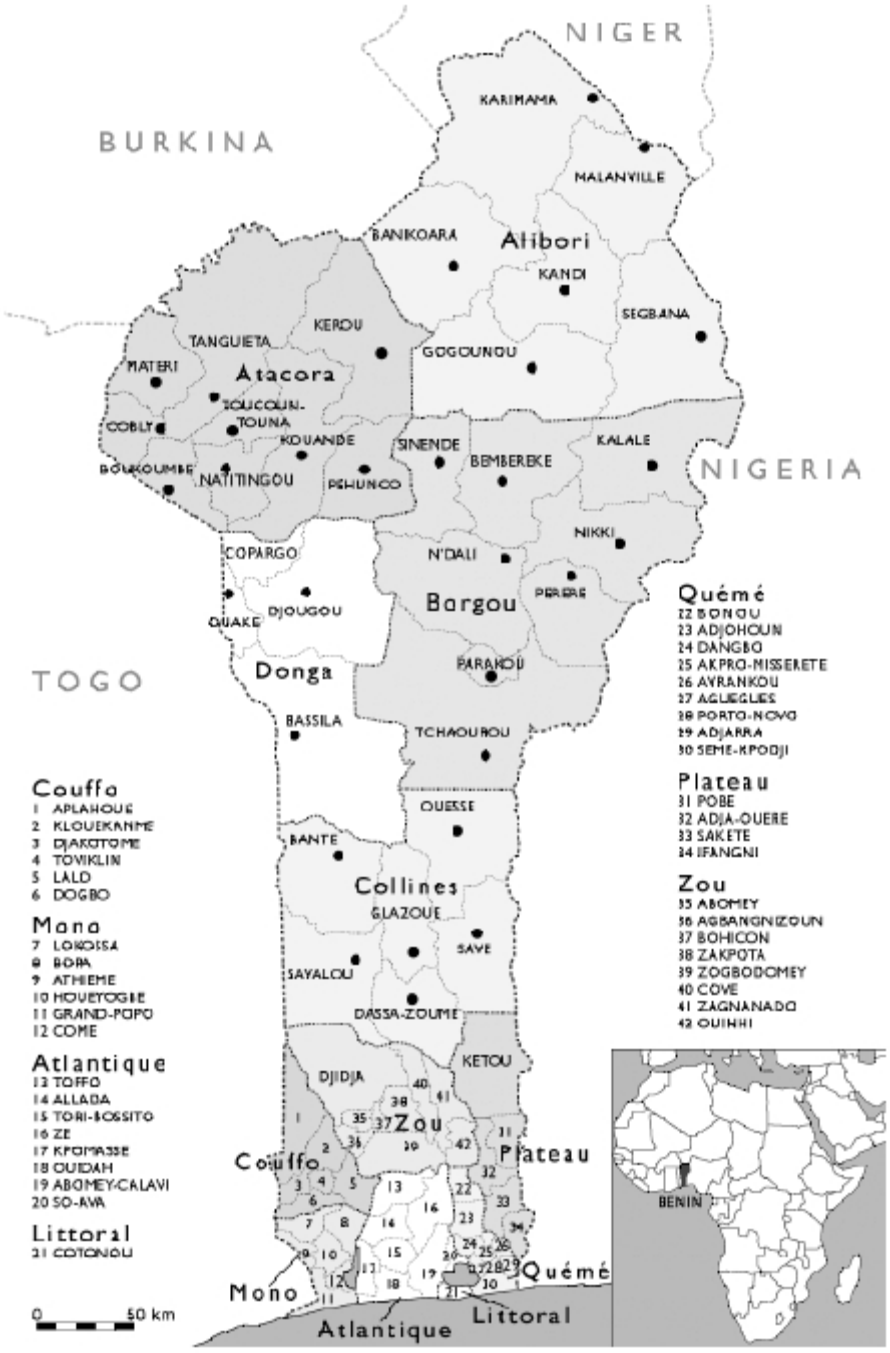
Since its independence on August 1^{rst}, 1960, the political history of Benin has been chaotic. A succession of military governments ended in 1972 with the last military coup led by Mathieu Kerekou and the establishment of a government based on Marxist-Leninist principles. A move to democracy began in 1989. Two years later, free elections ushered in the former Prime Minister, Nicephore Soglo, as president. Kerekou regained power in 1996 with some electoral frauds. With the political support of the North of the country (Alibori, Atacora, Borgou, and Donga) he won subsequent elections in 2001. Having served two terms and being over 70 years old, he was ineligible to run in the presidential elections of 2006.

He was succeeded by Thomas Boni Yayi, an independent political outsider. In March 2007, President Yayi Boni strengthened his position after the legislative elections in which his coalition, 'Force Cauris pour un Bénin Emergent' (FCBE), won the largest number of seats (35 out of 83) and negotiated a pro-government majoritarian coalition in Parliament with seven minor parties. He was reelected in 2011 with a strong support of the South of the country (Atlantic, Collines, and Mono).

The decentralization process in Benin has begun in 1998 through the transfer of several competencies to local Beninese jurisdictions, called *communes*. While an elected local government manages *communes*, a representative of the central government is in charge of the *départements*. Local elections were held in 2002 and 2007. Benin counts 77 *communes* in 12 *départements*.[5] As many African French-speaking countries[6] the shape of Beninese *communes* results from colonial history and not from any economic consideration with regards to efficiency in public good provision (see Map 1). For instance, Tanguieta stretches out across more than 5,460 square kilometers for a population of 62,321 inhabitants in 2008 (11.4 inhabitants per square kilometer), while Akro-Missérété concentrates 98,961 inhabitants on 79 square kilometers only (1,252 inhabitants per square kilometer).

[5] *Communes* are themselves divided into 546 districts.

[6] Burkina Faso counts 351 *communes* for 16.2 million inhabitants, while Mali has 703 *communes* for 15 million inhabitants.



Map 1: Administrative map of Benin

In January 1999, the Law 97-029 defined the transferred competencies from the central government to the 77 *communes*. Their scope is large from elementary school to economic development and includes transport infrastructure, environment, health, social goods, tourism,

security, and cultural activities. We may distinguish four kinds of competencies: exclusive local competencies, shared competencies, delegated competencies, and specific competencies. For delegated competencies local jurisdictions act as a representative of the central state. Specific competencies concern some *communes* that have a particular status (Cotonou, Porto-Novo, and Parakou). Table 1 summarizes these competencies.

Table 1: Beninese *communes'* competencies

Type of competencies
Exclusive local competencies
Transport infrastructure: maintenance of local roads, public lightings.
Shared competencies
Hygiene conditions: sewage and refuse disposal (latrines, septic tanks...), drinking water.
Education: construction and maintenance of public primary schools, adult literacy, cultural public infrastructures, sports, and leisure.
Delegated competencies
Public records office, security, publication and application of laws.
Specific competences
Secondary schools, security, communication.

Source: Law $N°97-029$ of Benin Republic, January 15^{th}, 1999.

The distinction between shared and exclusive local competencies is largely subjective linked to our interpretation of the relevant law and of observed practices in this country. First, the transfer of competencies is obviously progressive and may take some time. For instance, the effective role of *communes* in water and sanitation is limited. The SONEB (Société Nationale des Eaux du Bénin) is a public enterprise still in charge of drinking water supply and sewage disposal in urban areas. A deconcentrated service, the General Direction of Water, remains essential in rural areas. Secondly, some competencies as primary education require some technical and financial support from the central government.

Transfer of competencies needs some resources transfers. Table 2 presents Beninese *communes'* revenue distinguishing local own-revenue (tax and non-tax) and other local revenue (central conditional and unconditional grants, external transfers and, loans and advances)

over the period 2006-2007. A local representative of the central tax administration (*Directions Départementales des Impôts*) collects local taxes, mainly property and patent taxes.[7] By contrast, local governments support collection costs of non-tax own-revenue, essentially related to the public domains' occupation (market stall, parking tolls, kiosks, hoardings...) and to some administrative services. Central conditional grants represent about 25 percent of local revenue with some huge disparities: less than 3 percent for Atlantic and more than 30 percent for Oueme. Unconditional transfer is another source of Beninese *communes*' revenue. It actually corresponds to a retroceded tax, road tax, collected by customs on exports (0.85 percent of the value of exported goods).[8] Its generated revenue is shared among *communes* following a fixed rule: 80 percent are allocated to three 'special' *communes* (Cotonou, 60 percent; Porto-Novo, 24 percent; and Parakou, 16 percent); the remaining is distributed among the 74 other *communes* according to their respective demographic weight.

Table 2: Average composition of Beninese *communes* per capita revenue (FCFA)

	Average level per capita	% of total resources
Total local revenue	2175	100%
Own-revenue	**1137**	**52%**
Local non-tax own-revenue	623	29%
Local tax own-revenue	514	23%
Other local revenue	**1038**	**48%**
Unconditional central grants	225	11%
Conditional central grants	571	26%
External transfers	225	10%
Loans and advances	17	1%

Source: Beninese Ministry of Finance and Economy.

[7] Beninese local governments can also tax quarries' exploitation, advertisement, taxi drivers and they should have the opportunity to collect a tax on local development (see Chambas, 2010 for a detailed analysis of local fiscal resources in sub-Saharan Africa, in particular in Benin).

[8] The authorities suppressed this tax in 2009 on transit goods towards landlock countries as Niger and Burkina Faso.

Beninese *communes* are characterized by a low average level of per capita revenue with about 2200 FCFA (US $4.7). Moreover important inequalities exist among *communes*: the revenue per capita of the twenty poorest *communes* represent only 50 per cent of the five richest ones. Local governments' revenues differ also by their composition. For instance, Parakou and Porto-Novo with similar per capita revenue (6500 FCFA) have 50 and 35 percent of local own-revenue, respectively.

4 Econometric framework

In this section, we present our empirical model and strategy. We first test the average effect of decentralization on access to poverty-related services. We then appreciate its distributional effects between and within jurisdictions by distinguishing *communes* according to both their wealth and considering Gini coefficients of services access in the *communes*.

4.1 Data and empirical models

We use several sources of information. The Beninese Ministry of Finances and Economy provided us *communes*' budget. The 2006 and 2007 Integrated Modular Surveys on Household Living Conditions (EMICoV) give information concerning individual education level, household consumption and wealth, and access to several local public goods. They cover a sample of 18,000 Beninese households on the entire national territory. The sample includes 7,440 urban households and 10,560 rural households.[9] The main originality of these surveys lies in their representativity at the *commune* level, allowing us to measure aggregated and distributional indicators at the study-level as described below. Data concerning population, urbanization rate, and ethnic fractionalization is drawn from *General Population and Housing Census* in Benin (1992 and 2002) and 77 *communes*' monographs provided by the European Union (*Programme d'Appui au Démarrage des Communes*).

[9] This sample is a stratified sample selected in two stages: stratification was achieved by separating every *commune* into urban and rural areas.

4.1.1 Testing the average effect of decentralization on the access to basic services

Our empirical analysis focuses on universal basic needs avoiding any normative considerations in terms of welfare. It appears more relevant to study actual access to public services than ultimate effects on individual well-being, which may depend on many factors outside local governments' control. We consider several basic services: toilet facility, water, refuse and sewage disposal, and primary education. Table 3 gives the detailed list of indicators, denoted by Y_{it}, for each kind of service.

Table 3: Indicators of basic services access

Basic services, Y_{it}	Indicators
Toilet facility	
	- Share of households having access to toilet or latrine facility, $STOil_{it}$.
	- Type of toilet facility (no facility, bucket/pan, traditional latrine, pit latrine, ventilated pit latrine, own flush toilet, flush toilet), $TToil_{it}$.
Water access	
	- Share of households having access to drinking water, $SWat_{it}$.
	- Source of drinking water (rainwater, rainwater in tanker truck, river, well, spring water, borehole, public tap, piped somewhere, piped into residence), $TWat_{it}$.
Refuse disposal	
	- Share of households having access to refuse disposal facilities, $SGarb_{it}$.
	- Type of refuse disposal (nature, courtyard, burning, burying, rubbished dump, picking up truck (NGO), picking up truck (public)), $TGarb_{it}$.
Sewage disposal	
	- Share of households having access to sewage disposal facilities, $SSew_{it}$.
	- Type of sewage disposal (nature, courtyard, well, grid/downstream, open pipe, waste, covered pipe waste, draining), $TSew_{it}$.
Primary education	
	- Primary school enrollment for the 6-11 years old, SE_{it}.

Source: EMICoV surveys, 2006 and 2007.

These indicators are measured from the EMICoV surveys at the households level except for education indicators, which require individual data. For appreciating such public services access we use two indicators: the first one measures the share of households or individuals having access to the service (*quantity*); and the second one reflects the *quality* of this public good. The last variable uses all available information allowing us to better understand the

effect of decentralization.

The degree of decentralization, denoted by D_{it}, is the share of local own-revenue in *commune*'s total revenue. This measure is used as an indicator of financial autonomy in the literature and also allows us to approximate the accountability of local governments. Indeed, while central transfers are often opaque to the taxpayers who are then unable to judge the efficiency of local policies, the link between local taxes and local public services provided is more immediate and may constitute an incentive for local officials to improve their efficiency.

We consider several control variables. Time dummies, denoted by t_t, control for omitted explanatory variables that vary over time, but remain constant between *communes,* and can influence the share of local governments' own-revenue. We also control for explanatory variables that may be correlated with the degree of decentralization and that vary both across *communes* and time. Since we consider the effect of local revenues' composition and not the impact of local public spending themselves, we introduce *commune*'s per capita public spending, denoted by G_{it}. We then are able to appreciate if a higher degree of decentralization affects the efficiency of local policies, given the level of local public spending. This control variable is essential because *communes*' public spending affect the level of received transfers, the measured degree of decentralization, and the access to basic services.[10] For similar reason we introduce per capita consumption, denoted by C_{it}. Jurisdiction population size (Po_{it}) and its population density (De_{it}) allow us to capture over representativity of smaller jurisdictions and some scale economy in the provision of studied public goods, respectively. We also consider urbanization rate, denoted by U_{it}, since urban areas offer generally a better access to basic services and have higher fiscal capacities, especially in terms of property tax base. Finally, ethnic fractionalization, denoted by F_{it},[11] may be correlated with the decentralization degree and affects the provision of public goods in quantity and quality (Alesina and Ferrara, 2005).

The following regression appreciates the average impact of decentralization on access to

[10] If the pursuit of an equitable allocation of resources would lead to expect a pro-poor allocation of transfers across jurisdictions, most empirical studies (Wallis, 1998, Meyer and Naka, 1999 or Alm and Boex, 2002) find that wealthier local governments receive greater intergovernmental transfers, indicating that political considerations outweigh those of equity.

[11] Ethnic fractionalization in *commune* i on year t is defined as the probability that two individuals randomly drawn from the *commune* are from different ethnic group.

basic services:[12]

$$Y_{it} = \beta D_{it} + \theta G_{it} + \gamma C_{it} + \rho Po_{it} + \tau De_{it} + \omega U_{it} + \psi F_{it} + t_t + \varepsilon_{it}, \tag{1}$$

We also consider a non-monotone effect of the degree of decentralization by introducing its quadratic term $\left(D_{it}^2\right)$:

$$Y_{it} = \beta_1 D_{it} + \beta_2 D_{it}^2 + \theta G_{it} + \gamma C_{it} + \rho Po_{it} + \tau De_{it} + \omega U_{it} + \psi F_{it} + t_t + \varepsilon_{it}. \tag{2}$$

4.1.2 A heterogeneous effect between and within *communes*

Beyond the average impact of decentralization on access to public services we study its effect distinguishing *communes* by their wealth. This analysis allows us to appreciate the final impact of decentralization on inter-*communes* inequalities in terms of access to basic services. We obtain the following regression:

$$\begin{aligned} Y_{it} = \quad & \beta_1 (D_{it} * QP_{it}) + \beta_2 (D_{it} * (1 - QP_{it})) \\ & + \phi QP_{it} + \theta G_{it} + \gamma C_{jt} + \rho Po_{it} + \tau De_{it} + \omega U_{it} + \psi F_{it} + t_t + \varepsilon_{it}, \end{aligned} \tag{3}$$

where QP_{it} is a dummy variable taking value 1 if the *commune* i belongs to the first quintile of poor *communes*. Following Filmer and Pritchett (2001) we define an asset-based measure of wealth, denoted by W_{it}, for each *commune* using the EMICoV.[13] This measure is based on the Demographic and Health Survey (DHS) wealth index, which states each household's position on an index of asset-wealth at national level using Principal Components Analysis (PCA) weights.[14] However, the DHS index underestimates the wealth of rural areas since urban population owns main valuable assets. Following Rutstein (2008), we compute a national-level composite index from wealth indexes that have been separately constructed for urban and rural areas. We then consider the average score by *communes* and we divide

[12] Population, per capita public spending and per capita consumption are in logarithmic terms.

[13] 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 wealth. Filmer and Pritchett (2001) concluded that the DHS wealth index actually performed better than the traditional consumption or expenditure index in explaining differences in economic status.

[14] 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 latter into quintiles to distinguish the poor from the non-poor.

We consider the distributional effect of decentralization on access to poverty-related services within *communes* using Gini coefficients. According to the argument of greater accountability and informational advantage of local officials, decentralization should lead to a reduction of intra-jurisdictional disparities in the access to basic services. To test this hypothesis, we consider the following model:

$$GY_{it} = \beta D_{it} + \theta G_{it} + \gamma C_{it} + \varphi GC_{it} + \rho Po_{it} + \tau De_{it} + \omega U_{it} + \psi F_{it} + t_t + \varepsilon_{it}, \qquad (4)$$

where GY_{it} is the Gini coefficient of basic services access in *commune* i on year t.[15] We also add GC_{it}, Gini coefficient of per capita consumption in *commune* i on year t, to control for private inequalities. Note that we cannot compute Gini coefficients to appreciate inequalities in the access to primary school enrollment. A possible indicator of inequality on individual access to primary education could rely on the gender issue, which is beyond the scope of this analysis.

As for the average effect analysis, we consider the effect of decentralization on inequalities within *communes* according to their wealth. Formally, we test:

$$\begin{aligned} GY_{it} = \quad & = \beta_1(D_{it} * QP_{it}) + \beta_2(D_{it} * (1 - QP_{it})) \\ & + \phi QP_{it} + \theta G_{it} + \gamma C_{it} + \varphi GC_{it} + \rho Po_{it} + \tau De_{it} + \omega U_{it} + \psi F_{it} + t_t + \varepsilon_{it}. \end{aligned} \qquad (5)$$

4.2 Econometric issues and identification strategy

Given the small number of time-series with respect to cross-sectional observations and the fact that some variables have little within variance, we first estimate pooled OLS regressions with year dummies. This estimation method increases the degree of freedom and allows to inquiry into variables that have low variability. However, it assumes that control variables capture all the relevant *communes'* characteristics.

This estimation may be biased by unobserved heterogeneity between *communes.* Our panel data allows controlling for a large number of unobserved explanatory variables by using fixed-effects (FE) estimator. But, the traditional FE method results from its inefficiency in

[15] Gini coefficients are measured on the qualitative variables of public services.

estimating the effect of variables that have little within variance, a risk to consider given two successive years of observations. To assess coefficients of time-invariant variables and to control for *commune* specific effects, we use the Fixed Effects Vector Decomposition estimator (FEVD) developed by Plümper and Troeger (2007).[16] Through a three step procedure, this estimator allows a decomposition of the unit fixed effect into two parts: an explained part by time-invariant variables and an unexplained part.[17]

We finally instrument the degree of decentralization by a dummy variable, denoted by PA_{it}, taking the value 1 if the *commune* i has the same political affiliation as the president in office. This dummy variable change between 2006 and 2007 since Yayi Boni was elected in April 2006, succeeding to Mathieu Kérékou. Partisan affiliation is a good instrument of decentralization in a regression involving access to public services. In the relevant literature a jurisdiction which has a greater political support for the central government receives more transfers from the latter (see Cox, 1986 for a theoretical argument, Case, 2001 for the Albanian case, Miguel and Zaidi, 2003 for Ghana).

5 Estimation results

This section presents our empirical results using a panel data of 77 Beninese *communes* for 2006 and 2007.

5.1 The average effect of decentralization on the access to basic services

As a previous step of our statistical analysis, we present some descriptive statistics. Figures 1 to 5 tend to show that a higher degree of decentralization is positively correlated to a better access to poverty-related services.[18] However, the most decentralized *communes* are the richest, the most populated, and the most urbanized (Table 4). These variables are

[16] 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, while the FE model does not compute coefficients for the time-invariant variables, the vector decomposition model performs far better than other procedures.

[17] First, the unit fixed effect is estimated by running a fixed effect estimate of the model. Second, the latter is split into its two parts by regressing it on the time-invariant variables of the model. The unexplained part corresponds to the residuals of this equation, $\widehat{h_i}$. Third, the estimation of the full model is implemented by including the time-invariant variables and the unexplained part of the fixed effect vector estimated in the second step.

[18] The relation is relatively weak for primary school enrollment (Figure 5).

also associated with a higher access to basic public services (Table 5). This confirms the importance role of our control variables to avoid endogeneity bias.

To test the average effect of decentralization on the access to basic services (Equation 1), we first run the pooled OLS regressions with year dummies, introducing our control variables progressively (columns 1 to 7). Considering potential unobserved heterogeneity between *communes*, we then use the FEVD estimator (column 8). Finally, we instrument for the degree of decentralization by the partisan affiliation (PA_{it}) in column 9. Table 6 confirms the relevance of our instrument.[19] Moreover, the Sargan over-identifying restriction test[20] indicates that we cannot reject the hypothesis of no correlation between the instrument and the error term in the regression indicating that partisan affiliation dummy is a valid instrument. In Tables 7 to 10 we highlight that a higher degree of decentralization is consistently associated with improved water source and sanitation systems' access. However, while the effect of decentralization on the access to refuse disposal facilities is less robust (Tables 11 and 12), decentralization is not found to have a significant average effect on the access to sewage disposal facilities and *commune*'s primary school enrollment (Tables 13 to 15).

In Table 16, we consider a non-monotone effect of the degree of decentralization by introducing its quadratic term (Equation 2). We find a positive (respectively, a negative) coefficient associated to the degree of decentralization (respectively, its squared value). The impact of decentralization is not monotone: the relationship between decentralization and access to basic services may be described by an inverted U-shaped curve. On average the optimal decentralization degree corresponds to a ratio of local own-revenue over total revenue equal to around 67 percent. This optimal degree depends on the nature of the public service: higher for the access to toilet facility (66%) and refuse disposal facility (65%) (columns 1 to 3); lower for sewage disposal facility (49%) and primary school enrollment (52%) (columns 4 and 5). We remark that the effect of decentralization is monotone for drinking water access (the optimal level is above 1).

[19] As in most empirical studies, political considerations outweigh those of equity: wealthier, smaller or more ethnically fragmented jurisdictions receive more intergovernmental transfers and are less autonomous.

[20] We use the dummy variable indicating whether a *commune* has the same dominant ethnic affiliation as the president in office as another instrument to compute the Sargan test.

5.2 A non linear effect of decentralization between *communes*

We now consider heterogeneous effect of decentralization between *communes* according to their wealth (Equation 3). Table 17 shows that this effect is generally lower for poor *communes*. Moreover, while decentralization has no impact on average on primary school enrollment, it has actually a positive effect on non-poor *communes* and a negative one on the poorest *communes*.[21] As a robustness check, we interact a continuous variable, the DHS wealth index scores (W_{it}), with the degree of decentralization (see Table 18). Estimation results confirm that the positive effect of decentralization is contingent on a minimum wealth in *communes*. Only the effect of decentralization on the access to drinking water seems not to depend on wealth. The coefficient associated with the degree of decentralization measures the impact of decentralization in the absence of any wealth. Its negative sign indicates that a *commune* with zero wealth would suffer from decentralization.

5.3 The distributional effect of decentralization within *communes*

Finally, we analyze the distributional effect of decentralization on the access to poverty-related services within *communes* using Gini coefficients (Equation 4). Table 19 highlights that a higher degree of decentralization is associated with higher inequalities in the access to basic services within *communes*, with the exception of drinking water for which decentralization seems to reduce inequalities even if this effect is limited.

Once again, to improve the quality of our results we distinguish the decentralization impact on intra-jurisdictional inequalities according to *communes*' wealth (Equation 5). Table 20 emphasizes that decentralization is actually associated with higher inequalities in the access to basic services, especially within the poorest *communes*. This negative effect is weaker in non-poor *communes*. Estimation results also indicate that the reduction of inequalities in the access to drinking water is mainly explained by the decentralization effect on inequalities in non-poor *communes*.[22]

[21] We complete our analysis with Wald tests to ascertain that coefficients for poor *communes* are significantly different from those in other *communes*.

[22] Note that we also use Wald tests to ascertain that coefficients for poor *communes* are significantly different from those in other *communes*.

The following table sums up our empirical results considering the effect of decentralization of the qualitative indicators only:

Table 21: Main empirical results

	Average effect	Non monotone average effect		Between *communes*		Within *communes*	Between/within *communes*	
		D_{it}	D_{it}^2	Poor	Non-Poor		Poor	Non-Poor
Toilet facility	0.692***	2.190***	-1.96***	0.562*	2.544***	0.317***	0.259***	0.045***
Water access	2.361***	3.234***	-1.56***	2.120***	2.355***	-0.023**	-0.023	-0.03***
Refuse disposal	1.345***	1.700***	-1.31***	0.416**	1.162***	0.564***	0.867***	0.595***
Sewage disposal	NR	4.332***	-4.44***	0.231	0.139	0.147***	0.236***	0.125**
Primary educ.	NR	6.866***	-6.60***	-0.24***	0.656**	-	-	-

***: coefficient significant at 1 % level, .**: at 5 % level, *: at 10 % level, NR: Non Robust.

6 Conclusion

In this paper, we study the average and distributional effects of decentralization on the access to some poverty-related public services in Benin. Our analysis concludes to an unambiguous positive overall effect of decentralization on the access to water source and sanitation systems in this country. Decentralization seems to be a valid strategy to improve overall access to basic services in developing countries. However, some pitfalls remain: decentralization has non monotone and differentiated effects depending on the wealth of *communes* and of households. First, the average effect of decentralization follows an inverted U-shaped curve with an average optimal degree of decentralization of 67 percent. Central grants are then essential for an efficient provision of public goods (at least 30 percent of total local revenue). Second, we establish that the decentralization effect varies according to *communes*' wealth: it is positive for sufficiently rich *communes* and becomes negative for the poorest ones. These results are in line with Galiani, Gertler, and Schargrodsky (2008). Third, our study also shows that decentralization may increase intra-jurisdictional inequalities especially within the poorest *communes*. These two latter results paradoxically reinforce the role of central transfers to guarantee a successful decentralization. If decentralization is a valid policy to

improve overall access to basic services, it is essential to maintain a minimum level of central transfers, in particular to the poorest *communes,* to avoid an increase in intra and inter-jurisdictional disparities.

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A Appendix

A.1 Figures

A.2 Tables

Table 4: Correlations of our key variables

Variables	D_{it}	G_{it}	C_{it}	P_{it}	D_{it}	U_{it}	F_{it}
Degree of decentralization, D_{it}	1						
Public spending per capita, G_{it}	0.3294*	1					
Per capita consumption, C_{it}	0.3128*	0.5646*	1				
Population size, P_{it}	0.3095*	0.5025*	0.5801*	1			
Population density, D_{it}	0.2431*	0.4656*	0.7571*	0.8080*	1		
Urbanization rate, U_{it}	0.2513*	0.4117*	0.5505*	0.5379*	0.4089*	1	
Ethnic fractionalization, F_{it}	0.0258	0.2696*	0.0817	0.2895*	0.0153	0.3330*	1

*: Correlation coefficient significant at 10 % level.

Table 5: Correlations of our key variables

Variables	G_{it}	C_{it}	P_{it}	D_{it}	U_{it}	F_{it}
Type of toilet facility, $TToil_{it}$	0.5155*	0.2760*	0.4030*	0.4274*	0.4108*	0.0018
Source of drinking water, $TWat_{it}$	0.5221*	0.3493*	0.3555*	0.3902*	0.2823*	0.1693*
Type of sewage disposal, $TSew_{it}$	0.3826*	0.1831*	0.4420*	0.4618*	0.3018*	0.0911
Type of refuse disposal, $SGarb_{it}$	0.2321*	0.2987*	0.5511*	0.6045*	0.3771*	0.0533
Primary school enrollment, SE_{it}	0.2286*	-0.0638	0.0461	0.1058	0.0962	-0.1412*

*: Correlation coefficient significant at 10 % level.

Table 6: Validity of our instrumental variable

Dependent variable: D_{it}	
Partisan affiliation, PA_{it}	**-0.026*** ** (0.000)
Public spending per capita, G_{it}	-0.027*** (0.002)
Per capita consumption, C_{it}	-0.053*** (0.004)
Population size, P_{it}	0.130*** (0.029)
Population density, D_{it}	0.002*** (0.000)
Urbanization rate, U_{it}	0.155*** (0.017)
Ethnic fractionalization, F_{it}	-0.104*** (0.029)
Constant	-0.182 (0.31)
Number of observations	145
Adjusted R^2	0.68
F-Statistic	54680
Fixed-effect	yes
Year dummies	yes
Sargan test (p-value)	

Controls for serial correlation of the error term, ar1 Coccrane-Orcutt transformation. Robust standard errors are in brackets.

***: coefficient significant at 1 % level, .**: at 5 % level, *: at 10 % level

Table 7: Estimation results - The average effect of decentralization on the access to toilet facility (quantity)

Dep. var.:$STOil_{it}$	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
Degree of decentralization, D_{it}	**0.370*** **	**0.249*** **	**0.184*** **	**0.116** **	**0.129** **	**0.140** **	**0.092***	**0.171*** **	**0.715*** **
	(0.06)	(0.06)	(0.06)	(0.05)	(0.05)	(0.05)	(0.08)	(0.025)	(0.01)
Public spending per capita, G_{it}		0.126***	0.101***	0.109***	0.090***	0.066*	0.071**	0.030***	0.009
		(0.03)	(0.03)	(0.03)	(0.03)	(0.03)	(0.03)	(0.004)	(0.01)
Per capita consumption, C_{it}			0.133**	0.094***	0.086**	0.086**	0.099***	-0.001	-0.314*
			(0.04)	(0.03)	(0.03)	(0.03)	(0.03)	(0.01)	(0.21)
Population size, P_{it}				0.102***	0.064*	0.021	0.049	0.021	-0.057***
				(0.02)	(0.03)	(0.03)	(0.03)	(0.01)	(0.01)
Population density, D_{it}					0.003**	0.003**	0.002**	0.005***	0.004***
					(0.001)	(0.01)	(0.001)	(0.00)	(0.001)
Urbanization rate, U_{it}						0.191***	0.234***	0.301***	0.242***
						(0.08)	(0.08)	(0.02)	(0.02)
Ethnic fractionalization, F_{it}							-0.188***	-0.131***	-0.052*
							(0.05)	(0.04)	(0.04)
Constant	0.049	-0.779***	-2.165***	-2.893***	-2.253***	-1.641***	-2.090***	-0.397*	-11.72***
	(0.03)	(0.22)	(0.46)	(0.52)	(0.71)	(0.58)	(0.65)	(0.20)	(1.06)
Number of observations	150	149	149	149	149	149	145	145	145
Adjusted R^2	0.17	0.35	0.41	0.46	0.49	0.96	0.54	0.92	0.96
F-Statistic	20.55	21.86	20.71	25.54	34.43	30.62	46.74	715.01	622.75
Fixed-effect	no	no	no	no	no	no	no	yes	yes
Year dummies	yes	yes	yes	yes	yes	yes	yes	yes	yes

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

Table 8: Estimation results - The average effect of decentralization on the access to toilet facility (quality)

Dep. var.:$TToil_{it}$	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
Degree of decentralization, D_{it}	**2.531*** **	**1.905*** **	**1.871*** **	**1.537*** **	**1.660*** **	**1.734*** **	**1.553*** **	**1.471*** **	**0.692*** **
	(0.54)	(0.53)	(0.56)	(0.56)	(0.54)	(0.55)	(0.56)	(0.027)	(0.02)
Public spending per capita, G_{it}		0.718***	0.705***	0.749***	0.565***	0.402*	0.464**	0.273***	0.352***
		(0.19)	(0.20)	(0.20)	(0.21)	(0.22)	(0.21)	(0.019)	(0.02)
Per capita consumption, C_{it}			0.071	-0.119	-0.197	0.199	-0.249	0.189***	0.189***
			(0.36)	(0.34)	(0.34)	(0.35)	(0.37)	(0.006)	(0.007)
Population size, P_{it}				0.498*	0.142	-0.150	-0.345	-0.411***	-0.260***
				(0.25)	(0.30)	(0.27)	(0.31)	(0.008)	(0.008)
Population density, D_{it}					0.003***	0.003***	0.004***	0.004***	0.003***
					(0.001)	(0.001)	(0.001)	(0.00)	(0.00)
Urbanization rate, U_{it}						1.284*	1.123*	1.298***	1.264***
						(0.68)	(0.73)	(0.01)	(0.01)
Ethnic fractionalization, F_{it}							-0.031	-0.229	-0.342
							(0.51)	(0.39)	(0.41)
Constant	1.542***	-3.202**	-3.940	-7.483	-1.405	-2.706	-5.178	-0.397*	0.043
	(0.25)	(1.27)	(3.94)	(4.97)	(5.54)	(5.28)	(5.92)	(0.20)	(0.11)
Number of observations	150	149	149	149	149	149	145	145	145
Adjusted R^2	0.15	0.26	0.26	0.46	0.32	0.35	0.34	0.89	0.87
F-Statistic	11.88	12.61	29.43	25.54	57.82	49.10	64.70	10608.02	992.44
Fixed-effect	no	no	no	no	no	no	no	yes	yes
Year dummies	yes	yes	yes	yes	yes	yes	yes	yes	yes

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

Table 9: Estimation results - The average effect of decentralization on water access (quantity)

Dep. var.:$SWat_{it}$	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
Degree of decentralization, D_{it}	**0.365*** **	**0.260*** **	**0.220*** **	**0.192*** **	**0.212*** **	**0.207** **	**0.173** **	**0.230*** **	**0.654*** **
	(0.07)	(0.07)	(0.08)	(0.07)	(0.07)	(0.08)	(0.08)	(0.028)	(0.01)
Public spending per capita, G_{it}		0.116***	0.101***	0.105***	0.076***	0.085***	0.087***	0.047***	0.047***
		(0.02)	(0.02)	(0.02)	(0.03)	(0.03)	(0.03)	(0.003)	(0.003)
Per capita consumption, C_{it}			0.081**	0.065	0.053	0.053	0.072	0.021	0.021
			(0.04)	(0.04)	(0.04)	(0.04)	(0.04)	(0.014)	(0.15)
Population size, P_{it}				0.041	-0.148	0.002	0.022	-0.032	-0.064**
				(0.04)	(0.04)	(0.04)	(0.05)	(0.019)	(0.018)
Population density, D_{it}					0.005***	0.005***	0.004***	0.006***	0.006***
					(0.001)	(0.001)	(0.001)	(0.00)	(0.00)
Urbanization rate, U_{it}						-0.076	0.058	0.002	1.264***
						(0.10)	(0.11)	(0.003)	(0.01)
Ethnic fractionalization, F_{it}							-0.145*	-0.115***	-0.053***
							(0.08)	(0.01)	(0.012)
Constant	0.110***	-0.660**	-1.505***	-1.801***	-0.836	-1.080*	-1.480 **	-0.378*	0.110
	(0.04)	(0.19)	(0.47)	(0.51)	(0.62)	(0.65)	(0.71)	(0.21)	(0.20)
Number of observations	150	149	149	149	149	149	145	145	145
Adjusted R^2	0.12	0.24	0.25	0.26	0.29	0.30	0.34	0.88	0.87
F-Statistic	13.51	15.49	13.44	12.62	30.13	25.31	64.70	1537.87	992.44
Fixed-effect	no	no	no	no	no	no	no	yes	yes
Year dummies	yes	yes	yes	yes	yes	yes	yes	yes	yes

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

Table 10: Estimation results - The average effect of decentralization on water access (quality)

Dep. var.:$TWat_{it}$	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
Degree of decentralization, D_{it}	**1.935*** **	**1.685*** **	**1.490*** **	**1.360*** **	**1.441*** **	**1.454*** **	**1.591*** **	**1.714*** **	**2.361*** **
	(0.32)	(0.34)	(0.35)	(0.37)	(035)	(0.36)	(0.37)	(0.22)	(0.27)
Public spending per capita, G_{it}		0.327***	0.250**	0.268**	0.147	0.117	0.133	-0.028	-0.028
		(0.12)	(0.12)	(0.12)	(0.12)	(0.14)	(0.13)	(0.034)	(0.037)
Per capita consumption, C_{it}			0.402*	0.327	0.276	0.275	0.143	0.185*	0.185*
			(0.21)	(0.22)	(0.22)	(0.23)	(0.24)	(0.11)	(0.10)
Population size, P_{it}				0.194	-0.040	-0.092	-0.340	-0.434***	-0.528***
				(0.20)	(0.21)	(0.21)	(0.24)	(0.10)	(0.10)
Population density, D_{it}					0.002***	0.002***	0.003***	0.003***	0.003***
					(0.001)	(0.001)	(0.001)	(0.00)	(0.00)
Urbanization rate, U_{it}						0.228	0.001	0.216*	0.147
						(0.44)	(0.44)	(0.13)	(0.14)
Ethnic fractionalization, F_{it}							-0.934***	-0.933***	1.028***
							(0.34)	(0.02)	(0.03)
Constant	6.364***	4.186***	0.021	-1.363	2.649	3.382	7.297*	8.872***	9.616***
	(0.18)	(0.83)	(0.60)	(3.09)	(3.29)	(3.40)	(3.84)	(1.29)	(1.33)
Number of observations	150	149	149	149	149	149	145	145	145
Adjusted R^2	0.18	0.24	0.26	0.27	0.30	0.30	0.32	0.86	0.84
F-Statistic	17.44	14.71	11.33	10.42	51.08	45.16	82.58	142.652	188.52
Fixed-effect	no	no	no	no	no	no	no	yes	yes
Year dummies	yes	yes	yes	yes	yes	yes	yes	yes	yes

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

Table 11: Estimation results - The average effect of decentralization on the access to refuse disposal facility (quantity)

Dep. var.:$SGarb_{it}$	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
Degree of decentralization, D_{it}	**0.137*** **	**0.092*** **	**0.081** **	**0.018**	**0.035**	**0.040**	**0.048**	**0.038*** **	**0.077*** **
	(0.04)	(0.03)	(0.03)	(0.04)	(0.03)	(0.03)	(0.03)	(0.007)	(0.01)
Public spending per capita, G_{it}		0.049**	0.044**	0.053***	0.027**	0.017*	0.019*	0.013***	-0.024***
		(0.02)	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)	(0.001)	(0.001)
Per capita consumption, C_{it}			0.022	-0.012	-0.023	-0.023	-0.036	-0.006*	-0.006
			(0.02)	(0.02)	(0.02)	(0.02)	(0.02)	(0.003)	(0.004)
Population size, P_{it}				0.019***	0.044**	0.025**	0.002	0.001	-0.012**
				(0.02)	(0.01)	(0.01)	(0.01)	(0.003)	(0.005)
Population density, D_{it}					0.005***	0.005***	0.005***	0.005***	0.005***
					(0.001)	(0.001)	(0.001)	(0.000)	(0.000)
Urbanization rate, U_{it}						0.084**	0.065*	0.069***	0.089***
						(0.03)	(0.03)	(0.06)	(0.009)
Ethnic fractionalization, F_{it}							0.074***	0.060***	0.065***
							(0.02)	(0.006)	(0.001)
Constant	-0.033**	-0.357**	-0.595*	-1.258***	-0.424	-0.424	0.205	-0.081**	0.161***
	(0.01)	(0.14)	(0.37)	(0.007)	(0.36)	(0.36)	(0.29)	(0.03)	(0.05)
Number of observations	150	149	149	149	149	149	145	145	145
Adjusted R^2	0.10	0.21	0.22	0.40	0.55	0.57	0.58	0.96	0.95
F-Statistic	4.26	4.26	3.30	4.50	67.65	56.65	79.65	89.10	79.30
Fixed-effect	no	no	no	no	no	no	no	yes	yes
Year dummies	yes	yes	yes	yes	yes	yes	yes	yes	yes

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

Table 12: Estimation results - The average effect of decentralization on the access to refuse disposal facility (quality)

Dep. var.:$TGarb_{it}$	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
Degree of decentralization, D_{it}	**0.510*** **	**0.313** **	**0.260**	**0.098**	**0.176**	**0.189**	**0.176**	**0.225*** **	**1.345*** **
	(0.18)	(0.15)	(0.17)	(0.19)	(0.17)	(0.17)	(0.17)	(0.05)	(0.12)
Public spending per capita, G_{it}		0.218***	0.198***	0.219***	0.104*	0.074*	0.089*	0.044**	-0.078***
		(0.08)	(0.01)	(0.07)	(0.06)	(0.05)	(0.05)	(0.02)	(0.008)
Per capita consumption, C_{it}			0.108*	0.016	-0.032	-0.033	-0.067	-0.122***	-0.122**
			(0.09)	(0.11)	(0.11)	(0.11)	(0.11)	(0.03)	(0.05)
Population size, P_{it}				0.241*	0.018	-0.034	-0.122	-0.144*	-0.365***
				(0.12)	(0.10)	(0.08)	(0.08)	(0.08)	(0.11)
Population density, D_{it}					0.002***	0.002***	0.002***	0.002***	0.003***
					(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Urbanization rate, U_{it}						0.023**	0.154	0.213***	0.276***
						(0.21)	(0.21)	(0.03)	(0.02)
Ethnic fractionalization, F_{it}							0.163	0.196***	0.359***
							(0.11)	(0.01)	(0.01)
Constant	0.973***	-0.466	-1.590	-3.308*	0.509	1.249	2.499*	3.568***	6.354***
	(0.07)	(0.56)	(1.58)	(2.05)	(1.72)	(1..30)	(1.37)	(0.92)	(1.30)
Number of observations	150	149	149	149	149	149	145	145	145
Adjusted R^2	0.07	0.18	0.19	0.25	0.41	0.41	0.42	0.83	0.81
F-Statistic	4.83	4.41	3.40	3.90	68.32	56.66	58.22	119.60	1317.32
Fixed-effect	no	no	no	no	no	no	no	yes	yes
Year dummies	yes	yes	yes	yes	yes	yes	yes	yes	yes

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

Table 13: Estimation results - The average effect of decentralization on the access to sewage disposal (quantity)

Dep. var.:$SSew_{it}$	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
Degree of decentralization, D_{it}	**0.258*** **	**0.143** **	**0.105**	**-0.061**	**-0.018**	**-0.005**	**0.037**	**0.013**	**0.024*** **
	(0.09)	(0.06)	(0.07)	(0.10)	(0.09)	(0.09)	(0.08)	(0.009)	(0.002)
Public spending per capita, G_{it}		0.125**	0.110**	0.132***	0.068*	0.038*	0.034	0.020***	0.009***
		(0.05)	(0.04)	(0.04)	(0.04)	(0.002)	(0.02)	(0.002)	(0.001)
Per capita consumption, C_{it}			0.078	-0.016	-0.043	-0.044	-0.061	0.006	-0.001
			(0.06)	(0.05)	(0.05)	(0.05)	(0.05)	(0.008)	(0.001)
Population size, P_{it}				0.248***	0.125**	0.072*	0.054	0.051***	0.004***
				(0.07)	(0.05)	(0.03)	(0.04)	(0.01)	(0.000)
Population density, D_{it}					0.001***	0.001***	0.001***	0.001***	0.001***
					(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Urbanization rate, U_{it}						0.235*	0.218*	0.226***	0.034***
						(0.13)	(0.13)	(0.05)	(0.01)
Ethnic fractionalization, F_{it}							0.157**	0.124**	0.012
							(0.07)	(0.05)	(0.008)
Constant	-0.038	-0.852**	-1.675*	-3.444***	-1.34	-0.587	-0.221	-0.897***	-0.069***
	(0.03)	(0.38)	(0.001)	(1.29)	(1.21)	(0.85)	(0.98)	(0.17)	(0.003)
Number of observations	150	149	149	149	149	149	145	145	145
Adjusted R^2	0.05	0.17	0.18	0.37	0.52	0.55	0.57	0.91	0.91
F-Statistic	4.00	3.17	3.38	3.25	21.06	18.75	19.07	235.90	350.65
Fixed-effect	no	no	no	no	no	no	no	yes	yes
Year dummies	yes	yes	yes	yes	yes	yes	yes	yes	yes

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

Table 14: Estimation results - The average effect of decentralization on the access to sewage disposal (quality)

Dep. var.:$TSew_{it}$	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
Degree of decentralization, D_{it}	**1.412****	**1.101****	**1.008***	**0.390**	**0.578**	**0.613**	**0.680**	**0.142**	**-2.81*****
	(0.57)	(0.51)	(0.61)	(0.69)	(0.66)	(0.65)	(0.67)	(0.35)	(0.306)
Public spending per capita, G_{it}		0.388	0.352	0.433*	0.152	0.074	0.079	0.049**	0.049***
		(0.26)	(0.25)	(0.24)	(0.25)	(0.22)	(0.22)	(0.02)	(0.01)
Per capita consumption, C_{it}			0.190	-0.163	-0.282	-0.283	-0.357	0.595**	0.595***
			(0.41)	(0.38)	(0.38)	(0.39)	(0.40)	(0.06)	(0.06)
Population size, P_{it}				0.924**	0.378	0.238	0.254	0.348	0.778**
				(0.36)	(0.34)	(0.30)	(0.34)	(0.36)	(0.38)
Population density, D_{it}					0.005***	0.005***	0.005***	0.004***	0.004***
					(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Urbanization rate, U_{it}						0.312*	0.656	0.503*	0.819***
						(0.79)	(0.79)	(0.29)	(0.30)
Ethnic fractionalization, F_{it}							0.274	-0.204	-0.637*
							(0.55)	(0.33)	(0.37)
Constant	-1.48***	7.909***	5.93	-0.634	8.682	10.643**	11.138*	-1.089	-4.494
	(0.23)	(1.83)	(5.07)	(6.16)	(6.19)	(4.92	(5.66)	(4.13)	(0.003)
Number of observations	150	149	149	149	149	149	145	145	145
Adjusted R^2	0.06	0.10	0.10	0.18	0.26	0.26	0.28	0.64	0.84
F-Statistic	6.22	4.61	3.47	3.68	47.77	40.32	49.20	35.87	140.55
Fixed-effect	no	no	no	no	no	no	no	yes	yes
Year dummies	yes	yes	yes	yes	yes	yes	yes	yes	yes

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

Table 15: Estimation results - The average effect of decentralization on the access to primary education

Dep. var.:SE_{it}	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
Degree of decentralization, D_{it}	**0.019**	**-0.010**	**-0.016**	**-0.015**	**-0.011**	**-0.009**	**-0.039**	**0.003**	**0.242****
	(0.04)	(0.04)	(0.04)	(0.04)	(0.04)	(0.04)	(0.04)	(0.03)	(0.11)
Public spending per capita, G_{it}		0.031**	0.028*	0.028*	0.022	0.017	0.020	0.063**	0.031*
		(0.01)	(0.09)	(0.01)	(0.01)	(0.01)	(0.01)	(0.02)	(0.01)
Per capita consumption, C_{it}			0.122	0.013	0.010	0.010	0.023	0.134***	0.072**
			(0.02)	(0.02)	(0.02)	(0.02)	(0.02)	(0.04)	(0.02)
Population size, P_{it}				-0.002	-0.013	-0.022	0.001	0.013	-0.036***
				(0.01)	(0.02)	(0.02)	(0.03)	(0.01)	(0.007)
Population density, D_{it}					0.001***	0.001***	0.002***	0.001***	0.001***
					(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Urbanization rate, U_{it}						0.038*	0.063	0.030***	0.040***
						(0.04)	(0.05)	(0.009)	(0.01)
Ethnic fractionalization, F_{it}							-0.131**	-0.056	-0.049
							(0.06)	(0.08)	(0.08)
Constant	0.777***	0.573***	0.446*	0.464**	0.652**	0.776*	0.3898*	1.809***	1.765***
	(0.02)	(0.11)	(0.22)	(0.25)	(0.35)	(0.40)	(0.45)	(0.26)	(0.32)
Number of observations	150	149	149	149	149	149	145	145	145
Adjusted R^2	0.35	0.37	0.10	0.37	0.38	0.38	0.41	0.58	0.52
F-Statistic	43.21	30.10	3.47	20.60	16.95	14.45	12.77	17.26	14.19
Fixed-effect	no	no	no	no	no	no	no	yes	yes
Year dummies	yes	yes	yes	yes	yes	yes	yes	yes	yes

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

Table 16: Estimation results - A non monotone effect of decentralization on the access to basic services

Dep. var.:	(1) $TToil_{it}$	(2) $TWat_{it}$	(3) $TGarb_{it}$	(4) $TSew_{it}$	(5) SE_{it}
Degree of decentralization, D_{it}	**2.190*** **	**3.234*** **	**1.700*** **	**4.332*** **	**6.866*** **
	(0.05)	(0.34)	(0.26)	(0.24)	(2.21)
D_{it}^2	**-1.96*** **	**-1.56*** **	**-1.31*** **	**-4.44*** **	**-6.60*** **
	(0.07)	(0.47)	(0.23)	(0.24)	(2.11)
Public spending per capita, G_{it}	0.030***	-0.026	-0.079***	0.003*	-0.009
	(0.004)	(0.03)	(0.01)	(0.001)	(0.01)
Per capita consumption, C_{it}	-0.008	0.182*	-0.121**	0.062***	0.138***
	(0.01)	(0.12)	(0.05)	(0.006)	(0.04)
Population size, P_{it}	-0.002	-0.440***	-0.237**	0.088**	-0.112***
	(0.01)	(0.11)	(0.09)	(0.03)	(0.02)
Population density, D_{it}	0.005***	0.003***	0.003***	0.003***	0.004***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Urbanization rate, U_{it}	0.359***	0.270*	0.422***	-0.077**	0.329***
	(0.02)	(0.16)	(0.01)	(0.03)	(0.10)
Ethnic fractionalization, F_{it}	-0.132**	0.921***	0.2131***	-0.021	-0.047
	(0.05)	(0.03)	(0.007)	(0.03)	(0.09)
Constant	-0.552**	8.667***	5.106***	0.212	2.302***
	(0.22)	(1.32)	(1.15)	(0.43)	(0.13)
Number of observations	145	145	145	145	145
Adjusted R^2	0.91	0.84	0.80	0.59	0.53
F-Statistic	577.64	96.49	87.06	149.11	19.60
Fixed-effect	yes	yes	yes	yes	yes
Year dummies	yes	yes	yes	yes	yes
Instrumental variable	yes	yes	yes	yes	yes

Controls for serial correlation of the error term, ar1 Coccrane-Orcutt transformation. Robust standard errors are in brackets.

***: coefficient significant at 1 % level, .**: at 5 % level, *: at 10 % level

Table 17: Estimation results - A differentiated effect of decentralization between *communes* (quintiles)

Dep. var.:	(1) $TToil_{it}$	(2) $TWat_{it}$	(3) $TGarb_{it}$	(4) $TSew_{it}$	(5) SE_{it}
$D_{it} * QP_{it}$	**0.562***	**2.120*****	**0.416****	**0.231**	**-0.24*****
	(0.28)	(0.29)	(0.19)	(1.24)	(0.03)
$D_{it} * (1 - QP_{it})$	**2.544*****	**2.355*****	**1.162*****	**0.139**	**0.656****
	(0.03)	(0.27)	(0.08)	(0.41)	(0.21)
Public spending per capita, G_{it}	-0.006	-0.063	0.088***	0.013	-0.010
	(0.005)	(0.03)	(0.01)	(0.14)	(0.01)
Per capita consumption, C_{it}	0.190***	0.189*	-0.121**	0.598**	-0.13***
	(0.02)	(0.10)	(0.05)	(0.24)	(0.04)
Belong to the first quintile, QP_{it}	-0.233**	-0.278***	-0.126***	-0.124	0.133***
	(0.10)	(0.08)	(0.01)	(0.53)	(0.10)
Population size, P_{it}	-0.755***	-0.587***	-0.369***	0.313	-0.106***
	(0.01)	(0.10)	(0.12)	(0.25)	(0.03)
Population density, D_{it}	0.004***	0.003***	0.003***	0.004***	0.002***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Urbanization rate, U_{it}	1.400***	0.147	0.231***	0.551*	0.009**
	(0.01)	(0.13)	(0.03)	(0.46)	(0.004)
Ethnic fractionalization, F_{it}	-0.602	0.843***	0.115**	-0.247	-0.088
	(0.48)	(0.04)	(0.04)	(0.44)	(0.11)
Constant	7.575***	10.64***	6.719***	-0.434	3.465***
	(0.35)	(1.23)	(1.39)	(4.03)	(0.31)
Number of observations	145	145	145	145	145
Adjusted R^2	0.88	0.84	0.80	0.63	0.50
Fixed-effect	yes	yes	yes	yes	yes
Year dummies	yes	yes	yes	yes	yes
Instrumental variable	yes	yes	yes	yes	yes
Wald test: p-value	0.000	0.494	0.011	-	0.000

Controls for serial correlation of the error term, ar1 Coccrane-Orcutt transformation. Robust standard errors are in brackets.

***: coefficient significant at 1 % level, .**: at 5 % level, *: at 10 % level

Table 18: Estimation results - A differentiated effect of decentralization between *communes* (wealth)

Dep. var.:	(1) $TToil_{it}$	(2) $TWat_{it}$	(3) $TGarb_{it}$	(4) $TSew_{it}$	(5) SE_{it}
D_{it}	**-1.70*** **	**1.365*** **	**-0.94*** **	**-3.99*** **	**-0.64*** **
	(0.07)	(0.24)	(0.16)	(0.73)	(0.18)
$D_{it} * W_{it}$	**1.597*** **	**-0.01**	**0.762*** **	**2.312*** **	**0.399*** **
	(0.04)	(0.06)	(0.05)	(0.25)	(0.11)
Public spending per capita, G_{it}	0.017**	-0.065*	-0.084***	0.096***	-0.010*
	(0.008)	(0.03)	(0.01)	(0.02)	(0.005)
Per capita consumption, C_{it}	0.407***	0.052	-0.187***	0.652***	-0.148***
	(0.02)	(0.12)	(0.05)	(0.06)	(0.04)
DHS wealth index scores, W_{it}	0.274***	0.247***	0.114**	0.722***	0.064***
	(0.03)	(0.06)	(0.02)	(0.16)	(0.02)
Population size, P_{it}	-0.482***	-0.451***	-0.177**	0.621	-0.001
	(0.04)	(0.13)	(0.08)	(0.39)	(0.006)
Population density, D_{it}	0.001***	0.003***	0.001***	0.004	0.006**
	(0.000)	(0.000)	(0.000)	(0.000)	(0.002)
Urbanization rate, U_{it}	-0.048	-0.069	0.034	-0.158	-0.066
	(0.03)	(0.15)	(0.04)	(0.12)	(0.04)
Ethnic fractionalization, F_{it}	-1.265***	0.780***	-0.013	-0.784***	-0.176
	(0.29)	(0.06)	(0.05)	(0.28)	(0.14)
Constant	2.889***	10.93***	6.024***	-3.350	2.898***
	(0.64)	(1.58)	(1.05)	(4.38)	(0.07)
Number of observations	145	145	145	145	145
Adjusted R^2	0.88	0.85	0.81	0.57	0.50
Fixed-effect	yes	yes	yes	yes	yes
Year dummies	yes	yes	yes	yes	yes
Instrumental variable	yes	yes	yes	yes	yes
Wald test: p-value	0.000	-	0.000	0.000	0.000

Controls for serial correlation of the error term, ar1 Coccrane-Orcutt transformation. Robust standard errors are in brackets.

***: coefficient significant at 1 % level, .**: at 5 % level, *: at 10 % level

Table 19: Estimation results-The differentiated effect of decentralization on the access to basic services within *communes*

Dep. var.:	(1) $GToil_{it}$	(2) $GWat_{it}$	(3) $GGarb_{it}$	(4) $GSew_{it}$
Degree of decentralization, D_{it}	**0.317*** **	**-0.023** **	**0.564*** **	**0.147*** **
	(0.02)	(0.01)	(0.05)	(0.05)
Public spending per capita, G_{it}	-0.026***	-0.003***	-0.043***	-0.032***
	(0.001)	(0.000)	(0.002)	(0.000)
Per capita consumption, C_{it}	0.005	-0.016***	-0.093***	0.026***
	(0.008)	(0.002)	(0.01)	(0.003)
Gini coefficient of C_{it}, GC_{it}.	0.159***	0.118***	0.090***	0.072***
	(0.01)	(0.01)	(0.02)	(0.02)
Population size, P_{it}	-0.029	-0.003	-0.114***	-0.020
	(0.02)	(0.002)	(0.01)	(0.01)
Population density, D_{it}	-0.002***	-0.001***	0.001*	-0.004***
	(0.001)	(0.001)	(0.001)	(0.001)
Urbanization rate, U_{it}	-0.055***	0.028*	-0.005	-0.044
	(0.01)	(0.01)	(0.03)	(0.03)
Ethnic fractionalization, F_{it}	0.056***	0.105***	0.015	0.024***
	(0.05)	(0.01)	(0.04)	(0.005)
Constant	0.646**	0.397***	2.520***	0.161
	(0.25)	(0.02)	(0.08)	(0.16)
Number of observations	145	145	145	145
Adjusted R^2	0.71	0.82	0.57	0.61
Fixed-effect	yes	yes	yes	yes
Year dummies	yes	yes	yes	yes
Instrumental variable	yes	yes	yes	yes

Controls for serial correlation of the error term, ar1 Coccrane-Orcutt transformation. Robust standard errors are in brackets.

***: coefficient significant at 1 % level, .**: at 5 % level, *: at 10 % level

Table 20: Estimation results-The differentiated effect of decentralization on the access to basic services between and within *communes*

Dep. var.:	(1) $GToil_{it}$	(2) $GWat_{it}$	(3) $GGarb_{it}$	(4) $GSew_{it}$
$D_{it} * QP_{it}$	**0.259*** **	**-0.023**	**0.867*** **	**0.236*** **
	(0.02)	(0.01)	(0.08)	(0.05)
$D_{it} * (1 - QP_{it})$	**0.045*** **	**-0.03*** **	**0.595*** **	**0.125** **
	(0.01)	(0.01)	(0.05)	(0.05)
Public spending per capita, G_{it}	-0.024***	-0.004**	-0.044***	-0.034***
	(0.001)	(0.001)	(0.002)	(0.001)
Per capita consumption, C_{it}	0.006	-0.015***	-0.093***	0.026***
	(0.008)	(0.002)	(0.01)	(0.004)
Gini coefficient of C_{it}, GC_{it}.	0.154***	0.108***	0.089***	-0.071***
	(0.01)	(0.01)	(0.02)	(0.01)
Belong to the first quintile, QP_{it}	0.005	0.007	-0.052***	-0.064***
	(0.002)	(0.03)	(0.005)	(0.004)
Population size, P_{it}	-0.022	-0.006	-0.124***	-0.026*
	(0.02)	(0.002)	(0.01)	(0.01)
Population density, D_{it}	-0.002***	-0.001***	0.001*	0.003**
	(0.001)	(0.000)	(0.000)	(0.001)
Urbanization rate, U_{it}	-0.070***	0.026*	0.021	0.002
	(0.02)	(0.07)	(0.51)	(0.03)
Ethnic fractionalization, F_{it}	0.003	0.103***	0.052	0.035***
	(0.01)	(0.01)	(0.19)	(0.004)
Constant	0.614**	0.328***	2.591***	0.257
	(0.26)	(0.02)	(0.18)	(0.17)
Number of observations	145	145	145	145
Adjusted R^2	0.69	0.81	0.57	0.61
Fixed-effect	yes	yes	yes	yes
Year dummies	yes	yes	yes	yes
Instrumental variable	yes	yes	yes	yes
Wald test: p-value	0.000	-	0.000	0.000

Controls for serial correlation of the error term, ar1 Coccrane-Orcutt transformation. Robust standard errors are in brackets.

***: coefficient significant at 1 % level, .**: at 5 % level, *: at 10 % level