

Impact of own resources on municipalities' investments expenditures in Benin

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Abstract

Purpose – This paper aims to study the impact of municipalities' own resources on their investments' expenditure.

Design/methodology/approach – Panel data analysis. A sample of 34 municipalities in Benin. Econometrics tests for the panel data models – estimation of the fixed-effect and random-effect models. Hausman test to identify the best model to explain the impact of the explanatory variables on local investments' expenditures. Heteroskedasticity, normality and autocorrelation tests.

Findings – The results establish a positive and significant impact of own resources, state transfers and demographic variables on local investments' expenses.

Research limitations/implications – As an implication, the results show the importance of local resources' mobilization for the municipalities' investment capacity building. They also show that the central government transfers continue to play a major place in local investments' finance, even in a decentralization context. Limitation: Available data do not allow to well evaluate the impact of the electoral variable on municipalities' investments' expenditure. This situation does not allow to well analyze the public choice considerations in local authorities' behaviors.

Practical implications – Local mobilization of financial resources must be encouraged to raise municipalities' investments' capacities. Strategies must be developed to reinforce local capacities in local resources mobilization.

Social implications – The results show the importance of local resources in local investments. They show the importance of citizens' participation in their well-being construction, through local resource mobilization (ex: local fiscality).

Originality/value – Many authors assert in the literature that financial autonomy has a real impact on local development. However, empirically, it was not demonstrated. This paper contributes to correct this lack.

Keywords Decentralization, Municipality, Transfer, Local investment, Own resources

Paper type Research paper

1. Introduction

One of the major objectives of decentralization is to promote development at the grassroots, particularly through local investment (Lemieux, 2001). Various works converge on the idea that this type of investment takes on considerable importance with the decentralization process (Besson, 2002). These analyzes reinforce the prediction of the model of fiscal federalism according to which decentralization gives rise to the implementation by local authorities of a range of public goods, with a view to satisfying the preferences of residents (Tiebout, 1956).

JEL classification – H41, H54, H72, R53



Capital expenditure is an essential part of the budget allocated by local governments for the provision of public services. The financial architecture of local governments is based on different types of resources, including transfers from the state and their own resources. While it is accepted in accordance with Gramlich and Galper (1973) that transfers to local authorities are essentially oriented toward the provision of public services, own resources are beyond their orientation in ordinary expenditure, called upon to contribute gradually to the financing of related investments, by virtue of the principle of autonomy on which decentralization is based. In the context of the search for local autonomy, it seems essential to raise the question of the impact of own resources on the investment expenditure of local authorities.

Through different works, it has been related that the own resources of municipalities have a positive influence on local investment expenses (Peronnet, 1980; Besson, 2002; Faguet, 2005. . .). Meanwhile, The quantitative study of the link between own resources and local investment expenses is missing in their analysis, especially in the context of Africa.

The present work aims to answer this question by studying the impact of own resources on local investment expenditure, using Benin data.

The rest of the paper is organized as follows. Section 2 presents the institutional context, following by the literature review in Section 3. The methodology of the study is presented in Section 4, while results and discussion are presented in Section 5 following by the conclusion in Section 6.

2. The institutional context

Initiated in January 1993 with the General Statements of the Administration, the decentralization process became effective in Benin with the election and installation of communal elected representatives in February 2003. Benin's current decentralization is a one-level decentralization, creating communes with legal personality and financial autonomy, in place of the former sub-prefectures [1]. According to the country's current administrative architecture, the Beninese municipality has a deliberative body, the communal council, whose members are elected by direct universal suffrage. This council is headed by a mayor and deputies who make up the communal executive. The municipality also has districts headed by elected members of the communal council.

The country has a level of Province administered by an appointed prefect. The latter plays a role in controlling legality and advising the commune(s) under its responsibility. For the conduct of local development, the regulatory texts (laws and application decrees) have imposed a participatory process for the elaboration of a Communal Development Plan (PDC). This document summarizing and planning the choices of the communal population is validated at the end of the process by the communal council. However, it must be approved by the prefect (legality control). Each year, an annual investment plan is drawn up and implemented by the municipality on the basis of the PDC's feasible and updated forecasts.

Transfers of competencies are exclusive for own competencies (notably those relating to the management of communal assets) or shared competencies. In the area of shared competencies, these transfers are not exclusive, but the role of the State is increasingly moving in the direction of support and the provision of resources (human, financial) at the disposal of the municipality. In addition to its own competencies, particularly with regard to the management of its assets, Law 97-029 of 15 January 1999 (on the organization of municipalities in the Republic of Benin) assigns to the municipal institution, sharing with the state, competencies in various fields including local development, housing and urban planning, infrastructure, equipment and transport, the environment, hygiene and sanitation,

primary and nursery education, health, social and cultural action and market services and economic investment.

The Beninese municipality currently has two main types of resources at its disposal: own resources and external financing resources dominated by financial transfers from the State and its partners (decentralized, bilateral and multilateral cooperation [. . .]). Communal own resources are made up of tax revenues and own revenues. Tax revenue is made up of direct local taxes (property tax, business tax, etc.), the collection of which is the responsibility of the central State structures (General Tax Directorate). Own revenues are collected directly by local government departments (indirect local taxes, income from assets, revenues from services, administrative taxes, etc.).

Other resources come from measures to strengthen own resources. These are the rebates on the State's indirect taxation (tourist tax, motor vehicle tax, value-added tax collected at the customs cordon, tax on the exploitation of quarries and mines) (Article 10d, Law 98–007) and the Local Development Tax (TDL) instituted by Law 98–007 and based on local wealth arising from the socio-economic potential and specificities of each commune. The measures to strengthen the resources of local authorities have established a Municipal Development Support Fund (FADeC) within which most of the external resources are grouped. The FADeC is a national mechanism for financing municipalities initiated through decree N°2008–276 of 19 May 2008. It is intended to transfer resources to the municipalities. It aims at mobilizing resources for the development of the offer of municipalities and inter-communal structures and the transfer of additional resources necessary to communes to exercise their competencies. The FADeC is funded by both national resources and resources from Technical and Financial Support Partners (PTF). On the basis of the operating and investment needs of the municipalities, the socio-economic objectives of the nation and the internal and external resources mobilized, the central public authority provides the FADeC with various budget lines divided into earmarked FADeC and non-earmarked FADeC.

The earmarked FADeC is a fund made available to municipalities for strictly sector-specific activities. They use it according to the predefined destination per sector (health, education, water [. . .]). The municipalities sometimes have a certain discretion, for example, the choice of location for a water point to be built. In general, they are in charge of the project on behalf of the sector ministry for the allocated funds. It includes both investment and operating allocations. The unallocated FADeC is a fund made available to municipalities for activities that fall within their priorities. It also takes into account an operating component, which constitutes the backbone of the State transfers intended for the operation of the municipalities. The investment component of the unallocated FADeC is the budget line that allows the communes to have an investment budget to be used according to their own priorities. The commune is free to use it to make investments in communal competencies included in its development plan or another planning document according to local priorities.

Beyond transfers, the first investment resource available to the local authority is the share of its operating revenue that it reserves for investment financing. This share (known as the levy) partly reflects the local authority's self-financing effort. The self-financing of local investment is both the result of improved local financial performance in terms of mobilizing its own resources and the consequence of a qualitative choice of operating expenditure which allocates a significant part of the operating budget to investment. Investment expenditure relates to all new equipment built by the municipalities in addition to the capital repayment of any loans. The capital expenditure of Beninese municipalities has increased remarkably since the implementation of the FADeC in 2008. The FADeC has had a major influence on the level and structure of capital expenditure by municipalities. For

example, FADeC revenue contributed 91% and 92% to the municipalities' investment expenditure in 2013 and 2018, respectively (CONAFIL, 2018).

3. Literature review on the factors affecting local public investment spending

The vigorous increase in local investments in some countries [2], the past decade, reveals the importance of the local public sector in public equipment's supply (Binet *et al.*, 2016). Local government investment in the production of collective goods and services falls within a general theoretical framework of fiscal federalism. According to the latter, each local authority provides the resident agents on its territory with collective goods and services in return for a share of the tax burden to which they are subject. This leads each agent to reveal his preferences for one of the communities according to the benefit/cost combination (collective goods/tax burden) (Tiebout, 1956).

The analysis of the investments that local authorities face in this area forms part of a broader set of studies on the choice of local public expenditure. This work is oriented in at least three main directions. The first set of works is at the microeconomic level and interprets local public expenditure as the result of a representative agent's demand, generally the median voter. Since Borchering and Deacon (1972) and Bergstrom and Goodman (1973), the determination of the demanded level of local public expenditure is presented as the result of maximizing the satisfaction of a "local representative agent" under the constraint of his disposable income. This expenditure is confused with that of a particular agent, the voter, whose vote is decisive in local budget consultations. The local decision-maker here is merely an executor of the wishes of the representative agent whose usefulness he maximizes. Local public good demand behavior is interpreted by reference to the behavior of a decisive agent (the median voter). The latter is in the position of the referee or decisive agent, as he gives victory to the voters on his "left" or "right" without them being able to coalesce against him. He is a positional dictator [3].

Developed toward the end of the 1970s, other models based on the microeconomic conditions of supply present spending choices on local public goods as the result of "bureaucratic" decisions or more precisely those made by local public institutions with sufficient discretionary power to be at least partially free from electoral constraints. They reflect the optimal supply of local public goods emanating from a local decision-maker exclusively concerned with his own satisfaction. It is the "local decision-maker" who imposes his choices and is no longer the representative or decisive "applicant." This is the case when local decision-makers have an objective function (e.g. the probability of their re-election is assumed to depend positively on the quantity of local public goods offered and negatively on the tax rate) (Derycke and Gilbert, 1988).

The spending choices of the municipality as a public decision-maker, those of the representative agent or those of the decisive voter are here identical in all respects. A single model, that of the "representative agent" is sufficient to describe the spending behavior of local governments, a model interpreted alternately in terms of the demand of a representative agent, the demand of a decisive agent (the median voter) or the supply of local public goods from a decision-maker concerned exclusively with his own interest, but subject to a permanent electoral constraint (Guengant, 1985; Derycke and Gilbert, 1988).

Other works are at the macroeconomic level, in the perspective of overall modeling of the financial behavior of public administrations and without seeking explicit microeconomic foundations. This is the case of the French model of Local Public Administrations (APUL) of public expenditure developed by Peronnet (1980). This model stipulates that taking into account the gross savings and equipment subsidies received from the State, local governments set the level of their investments and loans, according to the needs for

collective equipment, the financial cost of recourse to new loans and the approach of elections. According to this model, the investment of Local Public Administrations is determined in two stages. In the medium term, the desired investment of the local public sector would be based on the previous evolution of GFCF [4] – housing volume of households, with a two-year time lag. The hypothesis is that in the medium term, Local Public Administration investment would follow, with a two-year time lag, the pace of household housing construction following the sequence: Housing needs – housing construction – Needs for collective infrastructure and support facilities – Municipal investment. According to [Peronnet \(1980\)](#), this sequence would express “a dialectic equipment/needs induced by the urban phenomenon.” In the short term, the investment actually made would adjust more or less quickly to its medium-term trend and would be influenced positively by self-financing resources and the approach of local elections and negatively by the cost of new debt.

Other macroeconomic models also opt for a spill-over relationship between investment by local public administrations or the municipal sector through GFCF and household housing two years earlier such as Péronnet’s model (the case of CEREVE’s [5] model in 1984) or one year earlier through a specification “à la Kalecki” (the case of CREFAUR’s [6] model in 1984) ([CREFAUR-CEREVE, 1988](#)). In France, however, the relationship was generally only significant before 1977–1978, when, as a result of the State’s financial disengagement from the subsidized sector, the pace of construction slowed down, while the GFCF of local public administrations or municipalities continued to grow. Thus, in the analysis, household GFCF-housing is no longer often mobilized in the investment function. Instead, they involve variables such as self-financing resources, capital subsidies received and the approach of elections ([Derycke and Gilbert, 1988](#)).

With regard to the electoral cycle, most models introduce electoral variables into their relationships. The electoral cycle appears more or less clearly in the investment function of Local Public Administrations or municipalities. In Péronnet’s model, for example, the electoral variable appears in the investment function through a dummy variable (which is 1 in the years preceding the consultation and 0 in the year of the election) ([Peronnet, 1980](#); [Derycke and Gilbert, 1988](#)).

The introduction of a subsidy in the provision of local public goods leads to an increase in the supply of the good through the phenomenon of the “fly-paper effect” or the “sticky paper effect,” which originated in [Gramlich and Galper \(1973\)](#), who concluded that public money from subsidies remains stuck to the local public sector, which uses it to increase spending on public goods. It does not go to the private sector [7]. “Money sticks where it hits,” as Arthur Okun put it: the money stays in local budgets instead of being redistributed to taxpayers in the form of lower tax rates ([Inman, 2008](#)). Even if it is a lump sum, let alone a proportional one, a grant is likely to result in more spending on local public goods than would be the case if the personal income of the representative agent were increased by the same amount.

In an empirical way, transfers of resources to communities are identified among the factors favoring local government investment. According to [Estache and Sinha \(1995\)](#), transfers from central to local governments constitute one of the factors explaining in both developed and developing countries, expenditure on public infrastructure. [Faguet \(2004\)](#) also highlighted the impact of transfers beyond decentralization. Indeed, he estimated that investments in human capital and social services change significantly with decentralization and these changes are driven by the smaller and poorer municipalities that invest the transferred resources in high-priority projects ([Faguet, 2004](#)).

Beyond the transfers, the importance of municipalities' own resources in their investment expenses is analyzed by different authors through decentralization impact on the later [8]. Decentralization is seen as a favorable factor for investment growth (Besson, 2002). According to Estache and Sinha (1995), it tends to increase both aggregate and sub-national investment expenditure. Through a study of the Colombian case, Faguet (2005) found that municipalities significantly increase investment with the depth of decentralization. Some authors, however, mitigate the impact of decentralization on public service provision. This is the case of Azfar and Livingston (2010), who found little evidence of better provision of public services by local governments.

Among the factors explaining local investment expenditure, some works also question population size. Bahl and Nath (1986) indicate in this regard that the public share of sub-national government spending appears high where the level of economic development is high, in countries with large populations. Alle and Navarre (2015) emphasize that the demographic variable intervenes jointly with other ones and its impact varies in accordance with the population slice to which belongs the municipality. With regard to investment in general, all traditional patterns of analysis place the interest rate as one of its key determinants: the interest-investment nexus is central to both classical and Keynesian theory (Pierre, 1963). As far as local public investment specifically is concerned, just like African cities as a whole, few Beninese local authorities have access to loans. Similarly, bond issues are only envisaged in a limited number of African countries (de Calan and Coquart, 2012). Thus, recourse to the financial market for the financing of local government investment currently appears to be an exceptional phenomenon. For this reason, this determinant of investment cannot be taken into account in this work.

Different authors have in this review, identified own resources of municipalities, central government transfers, electoral variables and population size as important factors influencing the local investment expenses. However, the analysis of the direct link between each of these factors and local investment expenses is missing in their analysis, especially in the Africa context. In accordance with the literature, local investment expenses rely in the Benin context, on central government' subsidies and net functioning surplus of municipalities. The own resources' contribution to local investment expenses occurs through municipalities' functioning surplus whose existence is not automatic. In the first years of the current decentralization process in the country, a deduction has often been done by municipalities' on functioning resources, to contribute to their local investment budget. However, without deep analysis, it would be difficult to measure the own resources' impact on local investment' expenses. Moreover, the demographic factor' impact on local investment expenses is not proved yet, even if this factor occurs among criteria, which determine central government subsidies for municipalities. As for the electoral variable, its impact on local investment expenses cannot be measured without a deep analysis even if it is generally observed that governments increase public expenses from the year before elections.

4. Methodology

The objective of this paper is to analyze the impact of own resources on the investment expenditure of local authorities (local investment). This includes explaining municipal investment by own resources and other control variables.

Data and description of variables

A total of 34 Beninese municipalities are involved in the study, with three municipalities from each of the country's 12 current departments, with the exception of Littoral, which has only one municipality. The municipalities making up the sample were randomly selected

from all the municipalities in each department [9]. The annual data relating to the variables of the study cover the period 2003 to 2018 for each municipality in the sample. Their structure gives rise to series of panel data. The problem with these data lies in the choice of the best specification of the model. The structure and quality of the data may refer to a fixed-effects model or a random effect (or compound error) model. It is necessary to carry out the specification tests. Specification tests on panel data include those of Breusch and Pagan and Hausman. The Hausman test will help to identify among a fixed-effects model and a random effect model, the best one which explains the studied relationship.

Following Peronnet (1980), different models involve variables such as self-financing resources, capital subsidies received and the approach to elections in the explanation of local investment (Derycke and Gilbert, 1988). Various studies have also highlighted the positive impact of decentralization on local investment (Besson, 2002; Estache and Sinha, 1995; Faguet, 2005). Some have highlighted that transfers favor local government investment (Estache and Sinha, 1995; Faguet, 2004). Others have highlighted the impact of the population (Bahl and Nath, 1986). In view of this literature, the explanatory variables included in the model are own resources (interest variable), transfers, electoral variable and size of the population. For each of the municipalities, the values of the variables are recorded over the period from 2003 to 2018 [10]. The various variables are described as follows:

- *It*: It is the dependent (or explained) variable. It represents the local (communal) investment. It groups together investment expenditure and relates to all the new equipment built by the municipality.
- *rp*: It is the interest variable. It represents all the tax revenue and others' own revenue mobilized in the municipality [11]. This variable determines the level of financial autonomy and reveals the resources mobilization capacity of the municipality. It is assumed that the gradual increase in own resources is accompanied by an increase in local investment (Besson, 2002; Estache and Sinha, 1995; Faguet, 2005 [..]).
- *tr*: These are transfers from the state and PTFs. By hypothesis, it is assumed that the more transfers a commune receives, the better it directs resources toward investment expenditure, in accordance with the phenomenon of the "fly-paper effect" (Gramlich and Galper, 1973). Local investment is, therefore, assumed to increase with transfers.
- *el*: It represents the electoral variable, which here is a dummy variable taking the value 1 in the years preceding the electoral consultations and 0 in the other years.
- *pop*: This is the number of people in each of the municipalities. The increase in demographic weight can be a factor in increasing local investment (Bahl and Nath, 1986).

Econometric specification

The choice of panel data models is motivated by the fact that the study aims to establish a causal relationship between local investment expenditure and the municipal effort in terms of resource mobilization for several units (the municipalities) and also measuring the extent of this impact while trying to take into account the specificities of each commune. Indeed, panel data models are methods used to incorporate a combination of time series and cross-sectional observations (Hsiao, 2014; de Medeiros Silva *et al.*, 2019). Compared with other econometric models, panel data models control for heterogeneity, increase the degrees of

freedom and decrease the correlations between two or more independent and explanatory variables (de Medeiros Silva *et al.*, 2019).

Following Peronnet's (1980) model, the relationship between the explanatory variables and the dependent variable can be written in the form:

$$Ii = \alpha_i + \beta_i X + \varepsilon \tag{1}$$

where:

Ii represents the investment expenditure made by the municipality i at date t and X the value of the explanatory variable (rp, tr, el, pop) for municipality i at date t . In addition to own resources (rp), transfers from the state and technical and financial partners (tr), the electoral variable (el) and the population (pop) of the communes are used in the model as control variables. The ε is assumed to be independent and identically distributed with mean zero and variance σ_i^2 regardless of $i \in \{1, \dots, 34\}$. By hypothesis, the parameters α_i and β_i of the model (1) may differ in the individual dimension and are constant over time.

The number of observations for each of the units (municipalities) studied being the same, we then estimated a cylindrical panel. All estimates were made using Stata 13 software. The model estimated is as follows:

$$Ii = \alpha_i + \beta_1 rp + \beta_2 tr + \beta_3 el + \beta_4 pop + \varepsilon \tag{2}$$

- Ii = the investment expenditure made by the municipality i at date t ;
- rp = the own resources of the municipality i at date t ;
- tr = transfers from the State and PTFs to the municipality i at date t ;
- el = the electoral variable (a dummy variable) taking the value 1 or 0 on date t ;
- pop = the population of the municipality i at date t ;
- β_j = the parameters (estimators) with j 1; 2...4;
- α_i = the constant (the fixed effect specific to municipality i or individual effect);
- ε = the error term;
- i = the municipality studied with $i = 1,2, \dots, 34$; and
- t = the period of study with $t = 1,2, \dots, 16$.

In this model, there are five regressors, including the constant term. The individual effect which is the constant α_i is assumed to be constant over the period t , but varies from municipality to municipality. When all municipalities have the same α_i , then ordinary least squares (OLS) provide consistent and efficient estimators of the parameters. However, when assumptions are made about the constant term and the error term, this leads to models whose estimator properties are no longer the same as those for OLS. In this case, investment expenditures are not homogeneous for all Benin municipalities and the determinants of these expenditures are not the same for all municipalities. It is, therefore, not appropriate to perform OLS on these data.

The particular modeling only concerns the specification of the error term ε .

The basic form of the error term is written as follows:

$$\varepsilon = \alpha_i + \vartheta_t + \mu \tag{3}$$

where α_i denotes a term constant over time, dependent only on the municipality i , ϑ_t a term depends only on the period t and μ a random cross term. Modeling depends on the assumptions made about composites α_i , ϑ_t , μ and the relationship between them. For the verification of the study assumptions, both fixed and random effects models are estimated.

The Hausman test allows one to choose between these two types of models, the more efficient one. In the case of random effects models, one of the best estimators of the parameters of the model is that of the generalized least squares (GLS) while the Within estimator provides the best estimates of the parameters in the case of the fixed effects models, where specific effects can be correlated with regressors (Trognon, 2003).

Econometrics tests for the panel data models

To determine which model is most suitable in the context of this study, the Heteroskedasticity, Hausman, Normality and autocorrelation tests were applied. These tests help to identify the probable biases in the estimation and to evaluate the joint behavior of certain data (de Medeiros Silva *et al.*, 2019).

Heteroskedasticity test. The heteroskedasticity test carried out is the Breusch and Pagan test or the Lagrange Multiplier (LM) test. It tests the significance of random effects through the null hypothesis that the variance of individual residues is equal to zero. The statistic has a χ^2 distribution in the presence of the null hypothesis (Greene, 2012). When the p -value associated with this statistic is less than 5%, the hypothesis of the significant presence of random effects is accepted.

Hausman test. Hausman's test (Hausman, 1978), as indicated by its hypotheses, leads to the conclusion that there are either fixed or random effects. The test helps in the decision to use either a fixed or random-effects model.

The hypotheses are as follows:

H0. Presence of random effects.

H1. Presence of fixed effects.

The test is also based on the χ^2 statistic and the alternate hypothesis of the presence of fixed effects is accepted if the value associated with the χ^2 statistic is less than 5%.

Error normality test. The test used here is the Geary LM test based on χ^2 statistics. The decision rule is that when the p -value associated with this statistic is less than 5%, the assumption of error normality is rejected.

Error autocorrelation test. The Durbin-Watson (DW) test is used here to check whether the errors are correlated. The hypotheses of the test are as follows:

H0. Absence of first-order autocorrelation.

H1. Presence of order 1 autocorrelation.

This test is based on DW statistics. When the probability associated with this statistic is less than 5%, the hypothesis of absence of autocorrelation is rejected.

5. Results and discussion

This section presents the descriptive statistics of the variables and the estimation of the fixed-effect and random-effect models, to identify the best way to explain the impact of the explanatory variables on local investment expenditure.

Descriptive statistics and correlation analysis

The descriptive statistics of the local investment expenditure variable and those of the explanatory variables are presented in Table 1 for all the municipalities in the sample.

From Table 1, it emerges that the average annual investment expenditure of Beninese municipalities amounts to a value of 329,262,000 F CFA with a maximum of 4,425,978,000 F

CFA for the city of Cotonou in 2016. With regard to own resources, Benin's municipalities mobilize an average of 425,501,600 F CFA each year, with a maximum of 12,142,321,502 F CFA for the city of Cotonou in 2018 and a minimum of 7,430,000 F CFA for the municipality of Bonou in 2004. As for transfers from the state and partners, they amount to a communal average of 364,904,800 CFA francs, with a maximum of 2,662,243,000 F CFA for the city of Cotonou in 2015 and a minimum of 53,000 F CFA for the municipality of Bonou (period 2003–2006). As for the communal population, the average for the entire sample and for the study period was approximately 149,172 inhabitants, with a maximum of 1,135,675 inhabitants for the city of Cotonou in 2018 and a minimum of 30,589 inhabitants for the city of Bonou in 2003. The electoral variable takes the value 1 or 0 for any commune depending on whether or not it is the day before an election year.

Analysis of the simple correlation between the variables reveals significant links, particularly between the endogenous variable (local investment expenditure) and variables own resources, transfer and population (Table 2).

The demographic variable seems logical to maintain a positive and significant link with both own resources and transfers. This type of relationship is also observed between own resources and transfers, which confirms certain analyzes that consider that the effect of the crowding out of transfers on local resources is not always verified (Caldeira and Rota-Graziosi, 2014). At the level of the electoral variable, the link with local investment expenditure and own resources is weak and insignificant. This link appears weakly positive and significant with the transfer variable, which suggests a slight tendency toward an increase in transfer spending toward the municipalities on the eve of the elections.

Beyond this correlation analysis, it appears necessary to study to what extent each of the exogenous variables explains local investment expenditure. On this subject, the fixed-effect model and the random-effect model are used. The best one which explains the studied relationship is identified through a specific test (Hausman test).

Variable	Mean	SD	Minimum	Maximum
Il(in thousands of francs)	329,262	529,015	0	4,425,978
rp (in thousands of francs)	452,501.6	1,416,105	7,430	12,142,321.5
tr(in thousands of francs)	364,904.8	407,298.6	53	2,662,243
El	0.4411765	0.4969847	0	1
Pop	149,171.5	151,491.1	30,589	1,135,675

Table 1.
Descriptive
statistics^a

Note: ^aSee Appendix 2
Source: Study data

Variable	Il	Rp	Tr	el	Pop
Il	1.0000				
Rp	0.9074*	1.0000			
Tr	0.5321*	0.3538*	1.0000		
El	0.0012	0.0037	0.1110*	1.0000	
Pop	0.8925*	0.9369*	0.4277*	-0.0004	1.0000

Table 2.
Variable correlation
test

Note: *Significance level of 5%
Source: Study data

Estimation results and discussion

According to the correlation test of [Table 2](#), most of the explanatory variables are significantly correlated with local investment expenditure. To better analyze the relationship between this capital expenditure and explanatory variables, a multi-regression analysis is conducted. Taking into account the panel structure of data, the fixed-effects model, the random-effects model and the validation tests of the model that proves to be the most efficient are carried out here.

Estimation of the fixed-effects model. The estimation of the fixed-effect model is based on the following assumptions:

H0. Absence of fixed effects.

H1. Presence of fixed effects.

This estimate is based on Fisher's statistics. The hypothesis of the presence of fixed effects is validated when the probability (*p*-value) associated with the Fisher statistic (displayed below the regression table) is less than 5%. [Table 3](#) presents the estimation results with this model.

In view of the results in [Table 3](#), the value associated with the Fisher statistic concerned is equal to 0.0002, a value strictly inferior to 5%. It can be partially concluded that the least ordinary squares (LOS) are less efficient than within.

Estimation of the random-effects model. The estimate here is based on assumptions:

H0. Absence of random effects.

H1. Presence of random effects.

The estimation of the random effects model is based on the Chi² statistic. The hypothesis of the presence of random effects is accepted if the value associated with the Chi² statistic is less than 5% ([Table 4](#)).

Fixed-effect (within) regression		Number of obs = 443				
Group variable: N commune		Number of groups = 35				
R-sq: within = 0.5345		obs per group: min= 1				
Between = 0.9417		avg = 15.5				
overall = 0.8321		max = 16				
corr (u _i ,xb) = 0.6608		F(4, 504) = 144.66				
		Prob > F = 0.0000				
ll	Coef.	Std.err	T	<i>p</i> > <i>t</i>	[95% conf. interval]	
Rp	0.0493075	0.0361811	1.36	0.174	-0.0217768	0.1203918
Tr	0.3325996	0.0295739	11.25	0.000	0.2744963	0.390703
El	-28,789.77	15,706.49	-1.83	0.067	-5,964,802	2,068.479
Pop	1.471648	0.4481658	3.28	0.001	0.5911444	2.352151
_Cons	- 21,646.27	51,099	-0.42	0.672	-122,039.6	78,747.03
Sigma_u	175,763.57					
Sigma_e	178,723					
Rho	0.49165207 (fraction of variance due to u _i)					
<i>F</i> test that all u _i = 0: F(34, 504) = 2.18 Prob > F = 0.0002						

Note: See [Appendix 3](#)

Source: Study data

Table 3.
Estimation of the fixed-effect model

Random-effects GLS regression		Number of obs = 543				
Group variable: N commune		Number of groups = 35				
R-sq: within = 0.5042		obs per group: min = 1				
between = 0.9908		avg = 15.5				
overall = 0.8783		max = 16				
		Wald chi ² (4) = 3,881.11				
		Prob > chi ² = 0.0000				
corr(u_i, X) = 0 (assumed)						
ll	Coef.	Std.err	Z	p > z	[95% conf. interval]	
Rp	0.2501648	0.0162487	15.40	0.000	0.2183179	0.2820117
Tr	0.2936063	0.0220197	13.33	0.000	0.2504486	0.3367641
El	-27,274.62	16,137.2	-1.69	0.091	-58,902.95	4,353.703
Pop	0.5857456	0.1572703	3.72	0.000	0.2775015	0.8939897
_cons	3,3177.12	19,165.59	1.73	0.083	-4,386.738	70,740.99
Sigma_u	0					
Sigma_e	178,723					
Rho	0 (fraction of variance due to u_i)					

Table 4.
Estimation of the
random-effects model

Note: See [Appendix 4](#)
Source: Study data

The results in [Table 4](#) reveal that the value associated with the Chi² statistic is 0.0000; a value strictly less than 5%, indicating the presence of random effects.

[Table 5](#) shows the statistics and *p*-value of the tests at a significance level of 5%. In terms of estimates through the Heteroskedasticity test, the associated *p*-value is 1.00; a value greater than 5% ([Appendix 6](#)). Thus, the Lagrange multiplier test does not reject the OLS estimates in the total dimension. The *p*-value associated with the Hausman test is 0.2421; a value greater than 5% ([Appendix 5](#)). Therefore, we concluded that the random-effects model is more efficient than the fixed effects model. Also, it appears that the errors of the random effects model are normally distributed as the *p*-value associated with the Chi² statistic is 0.1374, a value greater than 5% ([Appendix 7](#)). In the autocorrelation test, the *p*-value is 0.2208, a value above 5% ([Appendix 8](#)). Thus, the null hypothesis was not rejected; the errors of the random effects model are not correlated.

Overall, the results of the tests show that the random-effects model is most appropriate than the fixed effects model. The relationship between the variables can then be written:

$$ll = 33177.12 + 0.2501648rp + 0.2936063tr - 27274.62el + 0.5857456pop + \varepsilon$$

It, therefore, appears that the incidence of the variable *rp* is positive and significant at the 1% threshold. Thus, in accordance with the theoretical model of [Peronnet \(1980\)](#) and various

Table 5.
Econometric tests for
the choice of the
panel data model

Type of test	Statistics	<i>p</i> -value
Heteroskedasticity test	0.00	1.00
Hausman test	2.04	0.24
Error normality test	-1.97	0.13
Error autocorrelation test	1.55	0.22

Source: Study data

empirical works including Besson (2002), Estache and Sinha (1995) and Faguet (2005), self-financing resources have a favorable effect on the investment expenditure of local authorities.

The model adopted also shows a positive and significant impact of transfers on the dependent variable. From a theoretical point of view, this result is consistent with the fly-paper effect phenomenon (Gramlich and Galper, 1973). At the empirical level, it confirms the predictions of various studies including those of Estache and Sinha (1995) and Faguet (2004) on the promising role of transfers in local authority investment.

In view of these results, the impact of the electoral variable is not significant, contrary to the development of Péronnet's model on the issue. In the context of our study, elections do not appear to be an opportunity for politicians and their bureaucrats to mobilize resources in favor of local government investment. The positive and significant relationship highlighted between the electoral variable and transfers in Table 2 suggests an increase in transfers on the eve of the elections, but this phenomenon does not have a significant impact on the investment expenditure of communes. At this level, it can be suggested the hypothesis according to which, capital expenditure engaged in electoral period meet difficulties to result in investment in the year because of administrative slowness. The impact of demographics on municipal investment expenditure also appears to be positive and significant. This result is consistent with certain analyzes, including Bahl and Nath (1986). This suggests that in general in the study sample, the more populated the municipalities are, the better they direct resources toward investments in public services.

In sum, the impact of own resources on the annual investment expenditure of the municipalities studied is significant and positive. The control variables, state transfers and the demographic variable have a significant positive impact on this expenditure. So, well a municipality mobilizes its own resources, well it receives a capital transfer from central government and well its demography is important, more it expenses in public investments.

Considering our findings, it would be important for public policies to improve their own resources capacity mobilization of municipalities to raise their public investment level. It is also necessary for the central government to reinforce investment transfer level, to raise municipalities capacity for collective goods supply.

6. Conclusion

This study analyzed the impact of local authorities' own resources on their investment expenditure in Benin, using panel data from a sample of selected municipalities. The results of the analysis showed a positive impact of own resources on local investment expenditure. Thus, the more the municipality mobilizes its own resources, the more investment expenditure it makes. We also found a positive impact of the State transfers and the demographic variable on this expenditure. However, the impact of the electoral variable is not significant. Therefore, it is necessary to target investment periods beyond the election period, even two years before the elections, to better study the impact of this variable on the level of local investment. Beyond the desire of local actors to see an increase in the level of transfer to their municipalities, it appears necessary to strengthen strategies for mobilizing their own resources, to increase their investment capacity.

Notes

1. Benin currently has 77 municipalities, including 3 with special status (Cotonou and Porto-Novo in the South and Parakou in the North).
2. Case of France, for example.

3. Applied to the analysis of collective budgetary choices, the median voter hypothesis requires that voters, ranked according to their preferences on a single scale, can only coalesce with neighbors and in the order of neighborhood on either side of their position. The Median Voter Theorem states that if all voters are odd in number and reveal unimodal preferences, then the choice is guaranteed to be unique.
4. Gross fixed capital formation.
5. Centre d'Etudes et de Recherches Economiques sur la Ville et l'Espace (University of Paris-X, Nanterre).
6. Centre de Recherche en Economie et Finances Appliquées (University of Rennes).
7. This phenomenon is observed if the observed increase in expenditure on local public goods as a result of a lump-sum grant franc is greater than the "rational" increase in expenditure calculated on the basis of income elasticity and the tax-personalized price.
8. Decentralization is understood in quantitative terms with reference to the degree of autonomy of decision-making power in the provision of public services at local level. The relative importance of local resources is a plausible indicator of the decision-making autonomy of local authorities (Oates, 1972; Prud'homme, 1990).
9. See the list of municipalities in the sample in [Appendix 1](#).
10. 2003 is the year in which Benin's current decentralization process began. The data are extracted from the database of the National Commission for Local Finances (CONAFIL) and from the administrative accounts of the communes.
11. Tax revenue consists of direct local taxes (property tax, business tax, etc.), the collection of which is the responsibility of the central government structures (General Tax Department). The latter collect those taxes and return recipes to municipalities others own revenues are collected directly by local government departments (indirect local taxes, income from assets, revenues from services, administrative taxes, etc.).

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Appendix 1. Municipalities in the study sampleImpact of own
resources

Departments provinces	Municipalities
Atacora	Cobly, Kouandé and Natitingou
Donga	Bassila, Djougou and Ouake
Borgou	Bembereke, Tchaourou and Parakou
Alibori	Banikoara, Kandi and Malanville
Collines	Bante, Glazoue and Savalou
Zou	Bohicon, Zagnanado and Abomey
Ouémé	Adjarra, Bonou and Porto-Novo
Plateau	Ifangni, Pobe and Sakete
Atlantique	Abomey-Calavi, Kpomasse and Toffo
Littoral	Cotonou
Mono	Athieme, Come and Lokossa
Couffo	Aplahoue, Dogbo and Toviklin

Appendix 2. Descriptive statistics

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Variable	Mean	SD.	Min	Max	Observations
<i>xtsum Il rp tr el pop</i>					
<i>Il</i>					
Overall	329,262	529,015	0	4,425,978	N = 543
Between		466,704.3	21,843	2,907,658	n = 35
Within		252,593.9	-1,247,935	1,847,582	T-bar = 15.5143
<i>rp</i>					
Overall	452,501.6	1,416,105	7,430	1.21e + 07	N = 544
Between		1,364,638	30,756.44	8,098,773	n = 35
Within		379,809.5	-2,320,639	4,496,050	T-bar = 15.5429
<i>tr</i>					
Overall	364,904.8	407,298.6	53	2,662,243	N = 544
Between		144,742.6	21,843	857,870.4	n = 35
Within		384,804.2	-490,478.6	2,169,278	T-bar = 15.5429
<i>el</i>					
Overall	0.4411765	0.4969847	0	1	N = 544
Between		0.0762688	0	0.5	n = 35
Within		0.4963881	-0.0588235	1.003676	T-bar = 15.5429
<i>pop</i>					
Overall	149,171.5	151,491.1	30,589	1,135,675	N = 544
Between		146,892.6	39,714.08	890,583.8	n = 35
Within		37,479.59	-131,709.1	394,263.1	T-bar = 15.5429

.xtreg ll rp tr el pop, fe

Fixed-effects (within) regression
 Group variable: id
 R-sq: within = 0.5345
 between = 0.9417
 overall = 0.8321

Number of obs = 543
 Number of groups = 35
 Obs per group: min = 1
 avg = 15.5
 max = 16
 F(4,504) = 144.66
 Prob > F = 0.0000

corr(u_i, Xb) = 0.6608

ll	Coef.	Std. err.	t	p > t	[95% conf. interval]	
rp	0.0493075	0.0361811	1.36	0.174	-0.0217768	0.1203918
tr	0.3325996	0.0295739	11.25	0.000	0.2744963	0.390703
el	-28,789.77	15,706.49	-1.83	0.067	-59,648.02	2,068.479
pop	1.471648	0.4481658	3.28	0.001	0.5911444	2.352151
_cons	-21,646.27	51,099	-0.42	0.672	-122,039.6	78,747.03
sigma_u	175,763.57					
sigma_e	178,723					
rho	0.49165207 fraction of variance due to u_i)					
F test that all u_i = 0:		F(34, 504) = 2.18		Prob > F = 0.0002		

Appendix 4. Random effect models

.xtreg ll rp tr el pop, re

Random-effects GLS regression
 Group variable: id
 R-sq: within = 0.5042
 between = 0.9908
 overall = 0.8783

Number of obs = 543
 Number of groups = 35
 Obs per group: min = 1
 avg = 15.5
 max = 16
 Wald chi² (4) = 3,881.11
 Prob > chi² = 0.0000

corr(u_i, x) = 0 (assumed)

	Coef.	Std. err.	z	p > z	(95% conf. interval)	
ll						
rp	0.2501648	0.0162487	15.40	0.000	0.2183179	0.2820117
tr	0.2936063	0.0220197	13.33	0.000	0.2504486	0.3367641
el	-27,274.62	16,137.2	-1.69	0.091	-58,902.95	4,353.703
pop	0.5857456	0.1572703	3.72	0.000	0.2775015	0.8939897
_cons	33,177.12	19,165.59	1.73	0.083	-4,386.738	70,740.99
sigma_u	0					
sigma_e	178,723					
rho	0 (fraction of variance due to u_i)					

Appendix 5. Hausman test

Variable	Coefficients (b) eq1	(B)	(b-B) Difference	sqrt (diag (V_b-V_B)) S.E.
rp	0.0493075	0.2501648	-0.2008573	0.0323272
tr	0.3325996	0.2936063	0.0389933	0.0197421
el	-28,789.77	-27,274.62	-1,515.148	-
pop	1.471648	0.5857456	0.885902	0.4196649

b = consistent under Ho and Ha; obtained from xtreg
 B = inconsistent under Ha, efficient under Ho; obtained from xtreg
 Test: Ho: difference in coefficients not systematic
 $\chi^2(2) = (b-B)' [(V_b-V_B)^{-1}] (b-B)$
 = 2.84
 Prob > chi2 = 0.2421
 (V_b-V_B is not positive definite)

Appendix 6. Heteroskedasticity test: Breusch and Pagan test (LM test)

.xttest0

Breusch and Pagan Lagrangian multiplier test for random effects

$$\Pi[id, t] = Xb + u[id] + e[id, t]$$

Estimated results

	Var	sd = sqrt (Var)
ll	2.80e + 11	529015
e	3.19e + 10	178723
u	0	0

Test: $\text{Var}(u) = 0$

$\text{chibar}^2(01) = 0.00$

Prob > $\text{chibar}^2 = 1.0000$

***** Panel data non normality geary runs test**

Ho: Normality – Ha: Non-normality

Geary LM test = -3.9704 p -value > $\text{Chi}^2(2)$ 0.1374

Skewness coefficient = 4.5761 – standard deviation = 0.1048

Kurtosis coefficient = 33.2463 – standard deviation = 0.2093

Runs test: (199) runs – (177) positives – (366) negatives

Standard deviation runs sig(k) = 10.2276, mean runs E(k) = 239.6077

95% conf. interval [E(k) +/- 1.96* Sig(k)] = (219.5617, 259.6538)

.xtserial Il rp tr el pop
Wooldridge test for autocorrelation in panel data
H0: no first-order autocorrelation
F(1, 33) = 1.558
Prob > F = 0.2208

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