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Municipal Merger and Debt Issuance in South African Municipality*

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【Abstract】Employing South African data and Difference-In-Difference (DID) method, this paper investigates whether the free-ride behaviour was taken by municipalities which faced their mergers before the municipal demarcation changes are executed. With several developed countries' data, many research show that there are opportunistic free-ride behaviours of municipalities such as over-issuance of debt before their mergers since the burden of them will be shared by newly constructed municipalities. In spite of these fruits of research, few solution is suggested in the literature.

Considering this, we focus on the South African municipal mergers, where the upper government of municipalities implemented the policy for pre-merged municipalities to suspend new contracts involving the borrowing contract before the mergers. As a result of DID analysis, we show that South African municipalities did decrease the amount of borrowings before their mergers. This result is an opposite result considering the previous empirical researches and means that the proper policy for municipal mergers can prevent the fiscal common pool problem caused by free-ride behavior. In addition, this paper shed the light to utilize the data of developing countries and is the first paper to show there were reductions of borrowings before municipal mergers.

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Municipal Merger and Debt Issuance in South African Municipality

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1 Introduction

As local governments, which are commonly referred to as municipalities, have faced many problems such as urbanization, a financial viability and a divergence of needs for public services, various reforms have been implemented for municipalities all over the world. In particular, many countries[*1] have implemented municipal mergers to deal with the problems. Since there are a lot of data and research topics related to municipal mergers and demarcation changes of municipalities, many researches about mergers in developed countries have done.

Among the papers, a topic which various studies are concerned is about a fiscal common pool problem. The fiscal common pool problem is a closely tied concept to free-ride problem and is formalized by Weingast et al. (1981). The basic idea of the fiscal common pool problem is that, if n municipalities with debt get merged, a debt burden of each municipality will be shared among the merged municipalities and will be $1/n$ of original repayment cost. Employing this idea and the data of different countries, various papers are written (Allers and Geertsema, 2016; Blom-Hansen, 2010; Frid and Fritz, 2015; Hansen, 2014; Hinnerich, 2009; Hirota and Yunoue, 2017; Jordahl and Liang, 2010; Nakazawa, 2016). In this strand, most papers show that there is the fiscal common pool problem and some papers show that the extent of free-ride behaviour of municipalities depends on the scale of each municipality. Therefore, the empirical results successfully verify the existence and mechanism of the fiscal common pool problem as Weingast et al. (1981) show[*2].

However, there may be several shortfalls for the literature. One point is about policy implications and suggestions considering the awareness of each municipality or government. Why do not the upper government realize the municipalities issue a lot of debts? Why do not they stop it if they notice it? If the financial information of municipalities to be merged is transparent and there is a preventive regu-

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[*1] For example, Australia, Belgium, Canada, Denmark, Finland, Germany, Japan, and Sweden implemented amalgamations of local governments.

[*2] Related to this study, Akai and Goto (2018) theoretically show that the mechanism of the dynamic fiscal common pool problem considering municipal mergers.

lation, the fiscal common pool problem may not occur. Milesi-Ferretti (2003) theoretically shows that the transparency reduce the amount of unnecessarily over-issued debt and the optimal regulation will be strict if the government run a excessive deficit. This fact implies that a rational central government will implement the strict regulation for municipalities when they are suspected to issue excessive debt and if the central government can tell which municipalities will increase debt excessively. Therefore, it is natural that the central government sets the regulation for municipalities to borrow money before their merger since they are suspended to run a deficit before their merger. However, the effect of such a regulation is not researched a lot, while Nakazawa (2016), which shows that Japanese municipalities with the regulation for the debt issuance did not issue more debt than ones without it, is the exception. Considering this, the extent of debt issuance is affected by the regulation and the transparency.

Another point is that the previous papers focus only on developed countries. If we deal with other types of countries, the result of analysis may be varied. The problem such as urbanization and a financial sustainability is a serious problem in developing countries now. Potentially, more and more developing countries will implement demarcation changes of municipalities and they will refer to precedents of municipal mergers though the case of developed countries is not able to apply simply.

Employing South African data, this paper tries to fill these shortfalls. We utilize the panel data of South African local governments, called municipalities. South Africa is one of the advanced African countries, where the local public finance and governance system is maintained and a lot of data is also available. Indeed, South African local municipalities have a good budget transparency and is listed as the best country in Open Budget Index Rankings (International Budget Partnership, 2017). Thus, before the mergers, pre-merged municipalities could be monitored and were regulated to stop making new contracts. These monitoring and regulation policy are expected to reduce the fiscal common pool problem. In addition, South Africa is one of the developing countries as well, though it is sometimes classified as a semi-developed country and experienced some problems along with their development. Many developing countries will face the problems that South Africa already experienced, including the problems entailed by municipal mergers. As a result of Difference-In-Difference (DID) analysis, although many research shows there are opportunistic behaviours of municipalities such as excessive debt issuance, interestingly and surprisingly, we find that pre-merger municipalities did not increase and even decrease the amount of borrowing per capita in South Africa. This result shows that the proper policy for municipal mergers can prevent the fiscal common pool problem caused by free-ride behavior.

In this research, we deal with the South African municipal demarcation change implemented in August 2016. There are also several advantageous points to investigate this South African situation. Firstly, in South Africa, municipal mergers are determined by an independent governmental board, called "Municipal Demarcation Board (MDB)" in every five years, not municipalities by their own. If municipalities decide mergers by themselves, the random assignment is failed and their observed opportunistic behaviours may have an endogeneity. However, the treatment, the determination of mergers, was considered to be almost randomly because MDB was founded to integrate peoples in post apartheid society through the mergers. Moreover, for some municipalities, treatments were sometimes suddenly assigned by MDB. This situation enable us to make a quasi-experimental setting for the analysis. Secondly, since the demarcation change of each municipality was implemented in the same time, we can easily capture

the behavioural changes by mergers employing DID method. Some previous papers use annual data where each merging municipality merges in different timings. This may cause biased weight setting for treatment period: for example, when municipality A get merged on January 1 of 2017 and municipality B get merged on December 31, can a year dummy variable of 2017 for capturing treatment effect be the same one? In this paper, the timing of mergers is the same across all merged municipalities and it is ideal for DID method. Thirdly, we can obtain several time-span data of municipalities such as quarterly, half-yearly, and annual data in South Africa. Since the announcement of mergers' determination was delivered from August 2015 to January 2016 to municipalities, annual data may fail to capture the behavioural changes after the announcement, but we mainly use half-yearly data and can confirm it using other time-spanned data to check the robustness.

Utilizing these good features of the South African situation, we analyzed the fiscal common pool problem and did interviews for some municipalities and institutions related to a municipal demarcation change*[3]. Throughout these interviews, we could obtain some supportive information for the results of the regressions.

This paper consists of six parts. The next section explains the South African mergers in 2016 and the institutional background. Section 3 describes our hypotheses and the identification strategy. Section 4 outlines the data and summary statistics. Section 5 reports the regression results and we also discuss the implication of the results there. Section 6 concludes.

2 Institutional background

2.1 Overview of Local Government in South Africa

South Africa earned its democratic status in April 1994. Though the government before that had adopted the Apartheid policy, it was fully changed after that and the new governance system has been constructed from then.

The country is now administratively governed via a three tier system consisting of national government, provincial government and local government. The constitution makes provision for three categories of local government i.e. metropolitan municipalities, local municipalities and district municipalities. Metropolitan municipalities exist in the eight biggest cities and collectively accounts for the largest population size which is estimated at 21 million people. These metropolitan municipalities accounts for about 80 percent of the country's Gross Domestic Product. There are 205 local municipalities which are areas that fall outside of the eight metropolitan municipalities with an estimation of 31 million population. The size and scale of each local municipality can be varied while the duties of each local municipality are the same and all municipalities have their own local council. District municipalities consist of several local municipalities and have cross - jurisdictional works. However, most of works are done by local mu-

*[3] We had interviews with MDB, the National Treasury, the Department of Cooperative Governance and Traditional Affairs (CoGTA), South African Local Government Association (SALGA), Mbombela Local Municipality, Polokwane Local Municipality, JB Marks Municipality, and Rand West Municipality.

nicipalities and a role of district municipalities is limited*4. Metropolitan municipalities are sometimes called 'Metro' and are known as a big city. In addition, there is a subcategory of local municipalities called 'Secondary city'. 'Secondary city' is well-developed and is consider to have a better management skills than the other local municipalities, though 'Secondary city' is included in the category of local municipalities and the duties of it is almost the same as the other local municipalities.

Municipalities in South Africa are primarily responsible for services such as water, sanitation, municipal roads, refuse removal, electricity reticulation, environmental health services and town planning. Furthermore, they develop and maintain parks, recreational facilities, local markets and local transport facilities. For these services, municipalities are often allocated funding through the process of the division of the collected revenue. In addition to these constitutionally guaranteed functions and depending on the capacity of the municipalities, municipalities often perform other extended functions including housing delivery, primary health care and community services such as libraries and museums. These extended functions are mainly provided in 'Metros' and 'Secondary cities'.

2.2 Municipal Revenue and Expenditure in South Africa

The constitution requires that municipalities be an autonomous and financially self-sufficient sphere of government, and be responsible for creating its own economic development path. This means that the national government does not necessarily guarantee the finance of municipalities and the financial situation of each municipality can be varied a lot.

The municipal governance system in South Africa substantially started from 2003 and has a different system from national and provincial system. For example, although national and provincial financial year starts from April, municipal financial year starts from July. Furthermore, the timing of municipal election is different from national and provincial election although both elections are hold in every five years*5.

The main revenue sources for municipalities are generated from service charges, property tax and transfers from the national government. The greatest source of own revenues is service charges which municipalities collect for providing water, sanitation, electricity and refuse removal to households and businesses. However, municipalities cover the cost of services provided to poor households with an unconditional general transfer from the national government since they cannot pay for the services and the constitution obliges municipalities to provide services to them. This unconditional general transfer is called 'equitable share' and the amount of this is calculated depending on the number of poor households. The national government also distributes conditional grants to municipalities and these conditional grants can be used for specific purposes. Across all municipalities, transfers including both conditional and unconditional grants account for about a quarter of revenues and own revenues for three quarters. However, in the case of poorer municipalities, transfers account for the majority of revenues.

*4 In addition, district municipalities have little fiscal relation with local municipalities. So, usually they do not affect the activity of local municipalities. When we refer to a "municipality" in the following part, it means metropolitan or local municipality.

*5 Local election were implemented in 2011 and 2016 while national and provincial election were implemented in 2009 and 2014.

Property tax is an only tax which municipalities are allowed to levy, although the amount of revenue is smaller than service charges. Municipalities are further allowed to borrow to supplement their capital budgets. This borrowing, namely debt issuance, accounts for about 3% of total revenue and about 19% of capital budget revenue across all municipalities. Municipal expenditures are divided into two categories: operating expenditures and capital expenditures, which respectively account for about 85% and 15% of total expenditure of municipalities. Municipal operating expenditures are dominated by salaries, bulk purchases for water and electricity and provision for working capital and capital expenditures are dominated by investments in infrastructure of water, sanitation, roads and electricity.

Municipalities are required by law to submit financial reports to the National Treasury on a monthly basis, and these are published on the National Treasury website on a quarterly basis. Therefore, the financial information of each municipality is available in the quarterly basis and we will utilize this later. Municipalities are also required to have an audit annually. There are six audit outcomes and, if a municipality receives a bad outcome, the National Treasury warns it to fix financial basis and monitors it[*6]. The National Treasury regards the audit outcomes as the index of transparency.

2.3 Municipal mergers in South Africa

The post-apartheid South Africa has experienced strategic institutional restructuring mainly affecting municipalities. In an attempt to rationalize municipalities, South African government has progressively and systematically reduced the number of municipalities. After the abolition of apartheid, divided societies were aimed to be well-integrated and the municipal mergers have been determined by national independent authority called MDB. It is responsible for the determination of municipal boundaries in South Africa and an independent institution established in terms of the Constitution of the Republic of South Africa.

Municipal demarcation change is done at the same time that the local election every five years is implemented. As a result the number of municipalities reduced from 1262 in the 1995/96 financial year down to 257 after the 2016 local elections. On the other hand, the number of provinces remained unchanged as nine provinces which is the number that was originally agreed to at the dawn of the democratic South Africa. Provinces share different numbers of municipalities, some of which includes metropolitan municipalities and others do not have metropolitan municipalities within their provincial boundaries.

Figure1 and Figure2 here.

The municipal demarcation change has several procedure and starts from the request (see Figure2[*7].). To begin with, MDB receives the request of determination and re-determination of municipal demarcation change from Ministers, the cabinet of provincial government (called Member of the Executive

[*6] Concretely, the six audit outcomes consist of "Adverse opinion", "Disclaimer of opinion", "Qualified", "Unqualified - With findings", "Unqualified - No findings", and "Outstanding". The first, second and third outcomes are considered as bad outcome and the National Treasury publish warns. The others are considered as good and clean outcomes.

[*7] The process of demarcation change written here and the Figure2 are based on Municipal Demarcation Board (2017).

Council, MEC) responsible for municipalities in a province, other person or other institution such as a municipality itself. In addition, MDB can submit a request by themselves. The municipality which wants to request MDB to consider their boundary change must obtain the consensus of any other municipality which will be affected by the proposed boundary change. Other person or institution can submit their request without getting such a consensus.

Before MDB considers a boundary change, MDB must publish a notice using a newspaper or appropriate media such as radio of the areas of the affected municipalities with declaring that MDB intend to consider the matter. MDB must also set a period to gather the opinion about the matter, which must not be shorter than 21 days. At the same time of publishing the notice, MDB send the notice to the MEC of affected province, affected municipalities, the magistrate of the affected district, and the assembly of traditional leaders. MDB invite them to submit their views on the matter within the period not less than 21 days. After the period, MDB must consider all submitted views and make a decision. MDB can hold a public meeting and conduct an investigation before it make a decision.

MDB publishes its determination in the relevant provincial gazette. Person related to the determination can submit objections to MDB within 30 days. After the 30 days, MDB must consider objections and either confirm, vary or withdraw its determination. There are 16 criteria for making a decision here and they are listed in the Municipal Demarcation Act. According to MDB, there is no crucial criterion within the listed criteria and MDB make the final decision of municipal mergers depends only on all of these criteria. This means that other institution and people than MDB cannot tell which municipalities will get merged exactly and the decision of mergers can be considered as a random assignment.

MDB must also send the information of the determination to the Electoral Commission because the boundary change of municipalities may affect the result of election. If the Electoral Commission confirms that the boundary determination will affect the representation of voters in the relevant councils, the boundary changes will only take effect from the date of the next elections. Thanks to this the demarcation change will not materially affect the representation of voters in the councils.

After necessary process has done, the determination will take effect from a date to be determined by notice in the provincial gazette by the MEC which is responsible for municipalities in a province. MEC is expected to make provision for transitional measures to facilitate the disestablishment and establishment of municipalities by publication of a notice in the provincial gazette. While the concrete transitional measurements were published in the gazette, from our interviews and gazettes it turned out that some transitional committees obliged municipalities to stop making new contracts and issuing new borrowing before their mergers[*8]. This might strongly affect the behavior of municipalities because municipalities to be merged perhaps could not issue debt even if they want to take free-ride behaviors.

The final decision of demarcation change made by MDB was published in August 2015 by provincial gazettes. However, most of staffs in the interviewed municipalities told that they started to know their demarcation suddenly in January 2016, when MEC announced them to establish the transitional committees for their mergers. Therefore, treatment period might start from August 2015 or from January

[*8] For example, you can confirm that a provincial gazette issued in KwaZulu-Natal province states that the transitional committee takes measurements regarding 'the negotiation and approval of long term loans and the utilisation of reserves' (KwaZulu-Natal Province, 2014, p.4).

2016.

3 Hypotheses and identification strategy

The main aim of this paper is to investigate whether there is a free-ride behavior caused by the fiscal common pool problem along with municipal mergers. As many papers show, municipalities may increase their debt and expenditure just before their mergers after receiving the announcement of their mergers. However, as explained, there were the policy for pre-merged municipalities to suspend new contracts involving the borrowing contract before the mergers. If this policy worked well, the municipalities would reduce their debt issuance rather than increase it. Thus, the first hypothesis is below.

Hypothesis 1 Municipalities reduced their debt after receiving the announcement of their mergers.

In addition, some papers such as Hinnerich (2009) suggests that the extent of free-ride behavior depends on the relative size of municipalities to be merged. However, if the policy to suspend the new contract worked well, municipalities will reduce the debt before their merger irrelevant to their relative size in the merger. Thus, the second hypothesis is the following.

Hypothesis 2 The relative size of municipalities does not have an effect on the debt issuance even after receiving the announcement of their mergers.

These two hypotheses are very basic ones and can be verified by DID strategy. To verify the two hypotheses, we use two treatment variables. The first one is just a treatment dummy for merged municipalities. This dummy means whether municipalities will get merged or not. The second one is the index of free-ride made by Population data as many papers did. We can regard the index as to what extent each municipality could enjoy the free-ride behavior as Hinnerich (2009) has already used.

Figure3 here.

The way how we made the index of free-ride depends on types of mergers. In the 2016 demarcation, there were 21 mergers and 49 old municipalities get merged into 28 new municipalities. There were three types of mergers as Figure3 shows.

The first one was that municipalities simply got merged into one municipality. This type of merger did not entail the split of any municipality. Consider municipalities A and B get merged here and n_i shows population of a municipality i. For calculation, we employ population in the first half year of FY2014/15. It is very simple to calculate the index of free-ride since municipality A's and B's index of free-ride will be respectively $1 - \frac{n_A}{n_A+n_B}$ and $1 - \frac{n_B}{n_A+n_B}$ for a newly formed municipality $A + B$. 17 examples are in line of this merger type.

The second one entailed the split of a municipality and the divided parts absorbed into other existing municipalities. Consider municipalities C will be divided and its split parts get merged into A and B. In this case, C's index of free-ride is calculated as $1 - \frac{n_C}{n_A+n_B+n_C}$ and $A(B)$'s index of free-ride is $1 - \frac{n_A}{n_A+\frac{n_C}{2}}$ $(1 - \frac{n_B}{n_B+\frac{n_C}{2}})$. This index of free-ride is actually approximated since we cannot know what extent one part of municipal C is merged into A and the other part goes into B.

The third one entailed the split of municipalities and the parts of them were not absorbed but did form a newly municipality. Only one example can be applied in this case and we cannot calculate the index of free-ride in this case since existing municipalities can leave a newly formed municipality with their burden fully. In addition, since there is only one example here, we omit this sample.

One important point in the DID analysis is the assumption that the treatment is not the result of self-selection. In other words, the samples in treatment group should not have attempted to be a member of treatment group as they select themselves and the assignment of treatment should not be biased. In South Africa, the decisions for the municipal demarcation were made not by municipalities but by MDB. In addition, the decisions are also announced by MDB. Although municipalities had several chances to submit their opinions about the demarcation to MDB, basically MDB made final decisions depending the criteria listed in the Municipal Demarcation Act. This means that the treatment may be assigned randomly and there is little room for the endogeneity[*9].

The municipal demarcation change in 2016 was implemented on 3 August simultaneously among the all announced municipalities. The final decision for the delimitation of the ward, which is the basic component of municipalities' demarcation, was announced in August 2015 (Municipal Demarcation Board, 2016). However, from several our interviews, we heard that the first time municipalities knew their merger was around January 2016 and it was a sudden announcement for most municipalities. In addition, the staff in the interviewed municipalities said that it was an unexpected content for even municipalities which had expected the mergers. The establishment of the transitional committees for municipal mergers were announced and municipalities noticed the merger in January 2016 for sure. Thus, the treatment period should start from August 2015 or January 2016 at least. Since we mainly employ half-yearly data, we set the treatment period for the first and the second half year of FY2015/16, which will capture treatment effect.

4 Data and summary statistics

For the analysis we mainly employ the half-yearly panel data from FY2011/12 to FY2015/16. The timing of demarcation comes every five years and we omit the data before FY2011/12 since there may be a structural change caused by the demarcation change in August 2011. Year data and Quarter data were also available and used for a robustness check. The data set contains the data of 232 municipalities although the number of all municipalities are 234 and we omit two municipalities from them because the way of their demarcation change was special and exceptional[*10]. In the data, 47 municipalities got

[*9] In addition, there is an example which shows that MDB was not affected by another institution. The Department of Cooperative Governance and Traditional Affairs (CoGTA) intended to make municipalities better through the municipal demarcation. They analyzed the functionality of each municipality and submit their opinion and report to MDB. However, the decisions for demarcation were made by MDB independently and the opinion of CoGTA was rejected. Finally, the functionality of municipalities did not improved through the demarcation (Ncube and Monnakgotla, 2017). This fact may show that the treatment of mergers was fairly exogenous.

[*10] The omitted data is the data about Thulamela Local Municipality and Makhado Local Municipality. In the demarcation change of 2016, a part of these two municipalities newly formed Collins Chabane Local Municipality while the other parts of the municipalities remains to be original municipalities. This is the only one case of 3) Split and No absorption in Figure3. Thus, we omit them.

merged and the other 185 municipalities were remained.

The dependent variable in this paper is borrowing per capita by municipalities. This is not stock index but flow index. In particular, the borrowing shows that the amount of capital expenditure funded by external borrowings and the external borrowings are not utilized for the other expenditure, namely operational expenditure. South African municipalities are very different from each other, especially in terms of the living standard of their residents. Under such a circumstance, additional debt issuance has a different meaning in each municipality. Therefore, we take a natural logarithm of borrowing capita.

What is important for DID strategy is the assumption of parallel trend. Under this assumption, the trends of treatment group and control group are parallel before treatment is assigned and there is no big difference between the groups. The mean trends of the borrowing per capita based on a natural logarithm are shown in Figure4. At a glance, Figure4 shows that the parallel trend assumption probably holds. From the graph, we can confirm that the borrowing of treatment group seems to reduce after the first half year of FY2015/16. In addition, the result of the Placebo test is $F(8, 2292) = 1.41$ and it shows the parallel trend may be satisfied. Thus, we can consider that the parallel trend assumption holds here.

Figure4, Table1 and Table2 here.

As a baseline model, we specify the following model.

$$ln(Y)_{it} = \alpha_0 + \alpha_1 Treatment_i + \boldsymbol{\alpha_2 T_t} + \boldsymbol{\alpha_3} Treatment_i \times \boldsymbol{T_t} + \boldsymbol{X_{it}\beta} + \varepsilon_{it} \tag{1}$$

This model is set to verify Hypothesis 1. Y corresponds to "the borrowing per capita+1"[*11]. $Treatment_i$ takes 1 if municipality i belongs to the treatment group and takes 0 otherwise. $\boldsymbol{T_t}$ consist of two dummy variables which take 1 if the first (or second) half year of FY2015/16 and takes 0 otherwise. Since MDB published the final decision of demarcation in August 2015 and municipalities could reach the information, we include the first half year of FY2015/16 as a treatment period. However, because MEC formed the transitional committee from January 2016, municipalities to be merged were announced in January 2016 for sure. Capturing the control variables in $\boldsymbol{X_{it}\beta}$, the effect of treatment will be shown in the coefficient of cross term, $\boldsymbol{\alpha_3}$.

In the regression, eight control variables are used in the vector $\boldsymbol{X}_{it}$. First one is Population. This is available not half-yearly, but in every five years. Therefore, it is constructed by a linear interpolation using the data of 2011 and 2016. Second one is Gross Value Added (GVA), which is calculated by municipalities and corresponds to Gross Domestic Product. This is based on millions of South African Rand at 2010 prices. Third and Fourth variables are Area and ANC seat. Area is measured by the square meters. ANC seat shows the occupancy rate of the party called African National Congress (ANC) in a municipal assembly. ANC is a ruling party in the most of municipalities and in the national parliament. South Africa has local election every five years and this data is based on the result of 2011 local election. Metro and Secondary city is the fifth and sixth variables. In South Africa, large cities are called as metropolitan municipalities or 'Metro'. Their role and structure is expected to be more comprehensive than the other municipalities and is distinct from the others in laws including the constitution. Secondary city is a

[*11] Here, we add 1 to the borrowing per capita because the borrowing tends to be 0 in some municipalities and the data will be omitted there if we take a natural logarithm.

category of municipalities and relatively large cities are listed as secondary cities. The seventh one is debt stock, which shows the amount of debt stock of the municipality. Since, when the data of debt stock shows the current data, debt stock and borrowing are determined simultaneously though they are respectively independent variable and dependent variable, we use the previous period's data, in other words lagged data, for debt stock data. If debt stock is large, the amount of debt issuance would be large. The last control variable is Clean Audit. This is a dummy variable taking 1 if municipality's audit outcome was clean at that year and taking 0 otherwise[*12]. This captures the innate characteristics and the budget transparency of each municipality. In the regression, Population, GVA, and Area take natural logarithm values. The data which are only available in the yearly data, namely Population, GVA, and Crean Audit, are divided to the half-yearly data. We use a liner prediction for dividing Population and GVA data, while we just substitute the current year's value to each half-year's value for Clean Audit data[*13].

The source of data and summary statistics of utilized variables are listed in Table1 and Table2, respectively. From Table2, the most of statistics seem to be similar between control and treatment groups. One outstanding point is the statistics of borrowing. However, since the difference will be captured by the dummy of $Treatment_i$ and we can confirm that the Placebo test support the parallel trend, this may not affect the parallel trend assumption. Moreover, note that some variables take natural logarithm in the regression.

In addition to the models above, we set the alternative models as follows and Hypothesis 2 will be tested using the index of free-ride there.

$$ln(Y)_{it} = \alpha_0 + \alpha_4 Index_i + \boldsymbol{\alpha_2 T_t} + \boldsymbol{\alpha_5} Index_i \times \boldsymbol{T_t} + \boldsymbol{X_{it}\beta} + \varepsilon_{it} \tag{2}$$

$$ln(Y)_{it} = \alpha_0 + \alpha_1 Treatment_i + \boldsymbol{\alpha_2 T_t} + \boldsymbol{\alpha_3} Treatment_i \times \boldsymbol{T_t} + \alpha_4 Index_i + \boldsymbol{\alpha_5} Index_i \times \boldsymbol{T_t} + X_{it}\beta + \varepsilon_{it} \tag{3}$$

The dependent variable and the control variables are the same as the baseline model. However, in this model we introduce, $Index_i$, which shows the free-ride index made by the data of population. $\boldsymbol{\alpha_5}$ captures the effect of the extent of free-ride. From the results of (2) and (3), we can see whether the amalgamation itself has an effect for the fiscal common pool, the extent of free-ride affects it, or both do.

For the robustness check, we introduce the fixed effect model and analyze the yearly data and the quarterly data. The introduced fixed effect model is as follows:

$$ln(Y)_{it} = \alpha_0 + \boldsymbol{\alpha_2 T_t} + \boldsymbol{\alpha_3} Treatment_i \times \boldsymbol{T_t} + \boldsymbol{X_{it}\beta} + \mu_i + \varepsilon_{it} \tag{4}$$

$$ln(Y)_{it} = \alpha_0 + \boldsymbol{\alpha_2 T_t} + \boldsymbol{\alpha_5} Index_i \times \boldsymbol{T_t} + \boldsymbol{X_{it}\beta} + \mu_i + \varepsilon_{it} \tag{5}$$

$$ln(Y)_{it} = \alpha_0 + \boldsymbol{\alpha_2 T_t} + \boldsymbol{\alpha_3} Treatment_i \times \boldsymbol{T_t} + \boldsymbol{\alpha_5} Index_i \times \boldsymbol{T_t} + \boldsymbol{X_{it}\beta} + \mu_i + \varepsilon_{it}. \tag{6}$$

[*12] Since the National Treasury considers the audit outcomes of "Unqualified - With findings", "Unqualified - No findings", and "Outstanding" are clean outcomes, we make Clean Audit dummy, which takes 1 if the outcome was one of these three and 0 otherwise.

[*13] Concretely saying, the value of Clean Audit in the first half year and the second half year of FY2015/16 are the same as the value in FY2015/16. Since Clean Audit shows whether the result of audit in the year was clean or not, it can be interpreted to show the accounting process of that year. Therefore, we simply substitute the the current year's value to each half-year's value for Clean Audit.

Since time invariant variables are omitted for the existence of the fixed effect, these equations do not contain time invariant variables such as $Treatment_i$[*14].

The analyses for the yearly data and the quarterly data will be implemented in the same manner as the analyses for the half-yearly data. The yearly data is constructed along with financial years and contains five years of data. Note that this data may capture the treatment period less precisely although the variables of this data is considered to have less fluctuation. The quarterly data is constructed using the quarterly financial data of each municipality. Therefore, it may capture the treatment effect more precisely while the data may fluctuate quarter by quarter. As well as the half-yearly data, we made the quarterly data dividing the data which only available in yearly data[*15]. Summary statistics are listed in Table3 and Table4.

Table3 and Table4 here.

Examining these models, we could see whether Hypothesis 1 holds or not.

5 Results

Table5 and Table6 here.

The results for the OLS regressions used half-yearly data are shown in Table5. The treatment effect of the announcement of mergers will be captured in the cross term of Treatment× FY2015/16-F and Treatment× FY2015/16-S. As hypothesis 1 predicts, the coefficient of cross term for the second half year of FY2015/16, namely Treatment× FY2015/16-S, is negatively significant in the regression for the borrowing. This result is totally different from the previous research, where the most of papers show that the cross term of treatment dummy and treatment period is significantly positive and show that pre-merger municipalities increase their debt and the fiscal common pool happens before the mergers. However, the significance levels are not so good and the magnitudes of the cross term are different in column 1 and column 3. Therefore, the result might be vulnerable. To check the robustness, we implement the fixed effect model as well in the Table6. You can see that the significance level of the cross term is somewhat improved and the magnitude of the cross term is near to the results of OLS. This means that the results obtained here are robust[*16].

In addition to that, we can see that the cross term for the first half year of FY2015/16, namely Treatment× FY2015/16-F, is not significant. This means that merged municipalities reduced their

[*14] In addition to these, for the robustness, we also analyzed the model with a linear control for year interacted with control variables as Jensen and Oster (2009) do. However, the results are not affected by these interact terms. These additional analyses with the interaction terms are available if you request to us.

[*15] The data only available in yearly data are Population, GVA, and Clean Audit. We use a liner prediction to divide population and GVA data, while we just substitute the current year's value to the each quarterly data for constructing Clean Audit data. These are exactly the same procedure as we made the half-yearly data.

[*16] One problem here is that we cannot tell how much the exact magnitude of treatment is because the magnitudes of column 1 and column 3 in both Table5 and Table6 are very different. From the Akaike's Information Criterion (AIC), the model of column 1 seems preferable than the model of column 3 and we guess that the magnitude is near to the result of column 1.

borrowing not after August 2015, when the announcement officially published, but after January 2016, when the transitional committees were formed. From the interviews, staffs of many municipalities said that they had suddenly noticed the merger when the provincial government, namely MEC, had formed the transitional committees for the mergers around January 2016. This fact supports the result of the cross term for the first half year of FY2015/16 since this result shows that municipalities did not increase or decrease their borrowing until January 2016. As explained in the institutional background part, the transitional committees were established by the initiatives of MEC. Although the exact rules were different by each committee, the typical transitional committee controlled municipalities and kept them from making new contracts and issuing new borrowing before their mergers. From the result of analysis, this measurement was considered to have a strong effect on the borrowing of municipalities before the mergers and keep them from taking free-ride behaviors.

On the contrary to the results for treatment dummy, the results for free-ride index are not significant in both OLS and fixed effect models, and their signs vary depending on the model. This result means that the possibility of free-ride did not affect the behaviors of municipalities so much before the mergers.

From this regression, we can observe that the differences of borrowing among municipalities are not explained by the difference of treatment but by the other variables such as population and gross value added. These control variables are fairly significant and the magnitudes of coefficients of control variables are almost the same in either column. This may show that these control variables capture the trend of borrowing well in this analysis.

To check the robustness of this result, we implemented the regression analyses using the yearly data and the quarterly data. Both regressions show that the borrowing in treatment municipalities reduced after the announcement was published (Table7, Table8, Table9, and Table10). Although some results show that the cross term about the free-ride index is significant, the signs of it is not stable. Therefore, the free-ride index is not considered to have an effect on the amount of borrowing. When we see the quarterly data, the treatment effect can only be seen in the last quarter. This may show that the control of the transitional committees were strengthen in the last quarter and municipalities had to stop borrowing money.

Table7, Table8, Table9, and Table10 here.

The results obtained here are totally different from the results obtained in previous studies. Different from the countries investigated before, South African municipal mergers were well-controlled by the upper government and prevented the occurrence of the fiscal common pool problem. These results clarify that the free-ride behaviors of municipalities to increase debts just before their mergers can be reduced by taking proper policy.

6 Conclusion

Employing South African data, this paper analyzed the fiscal common pool problem entailed by municipal mergers. Although many papers show that municipalities to be merged increase their debt issuance before their mergers, this paper shows that South African municipalities reduce their borrowing before

their mergers. This result may be difficult to understand considering the previous literature. However, this result shows that, with the proper regulation to stop borrowing, the fiscal common pool problem can be prevented.

This paper also shed the new light to the literature about the fiscal common pool problem in terms of expanding the field to the developing countries. More and more developing countries will need the reform of the local public finance and more research about developing countries are needed. This paper shows that the South African municipal demarcation system prevents the fiscal common pool problem and this result may be a good example for other countries. However, we also find that other problems such as poor fiscal viability with South African municipalities. It is true that the municipal demarcation is a tool for more integrated administrations. However, it does not solve all problems and more sophisticated policies are needed. In order to seek such policies, more research should be done in this field.

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Figure1　The structure of South African governmental system

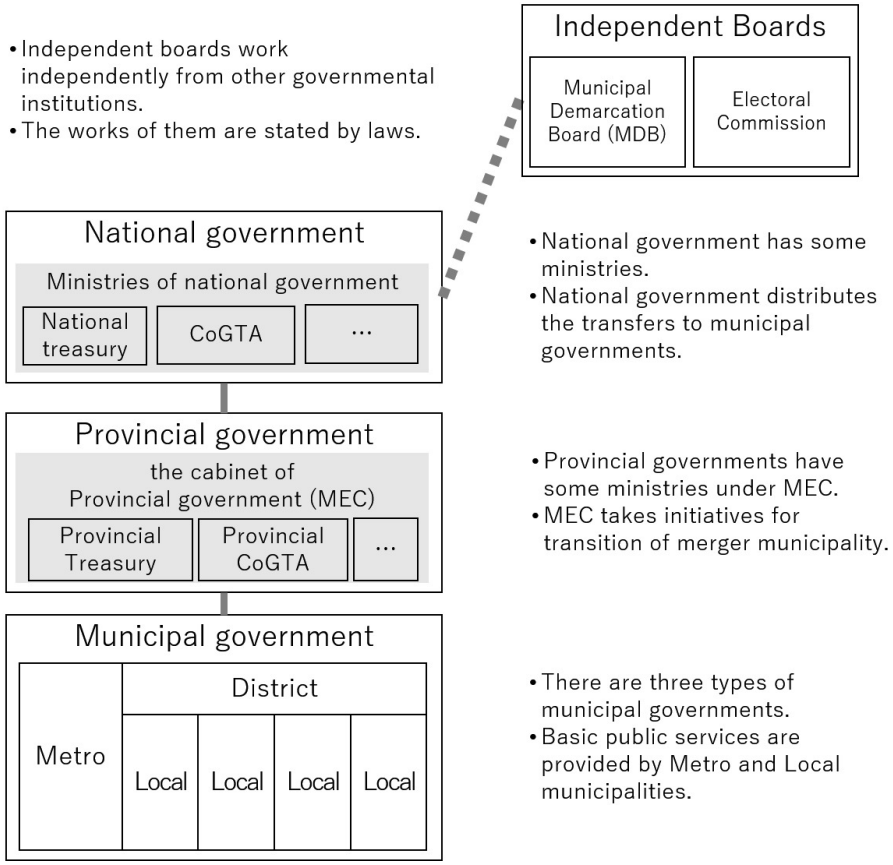
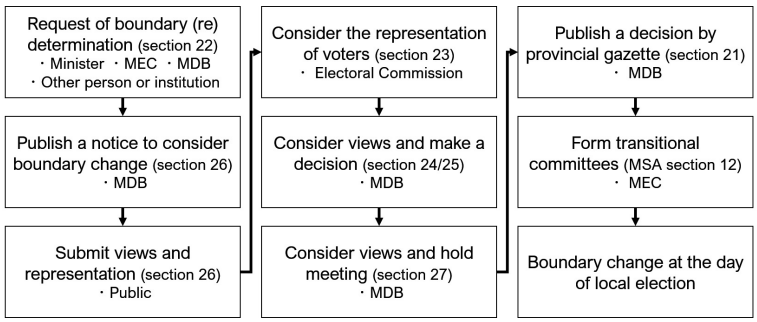


Figure2　The Process of municipal demarcation change



Note: A section in each parentheses basically corresponds to the section of the Municipal Demarcation Act. As an exception, the parentheses in the eighth box refers to the Municipal Structures Act. Institutions after a bullet point is the subject of the action.

Figure3 Three types of municipal demarcation

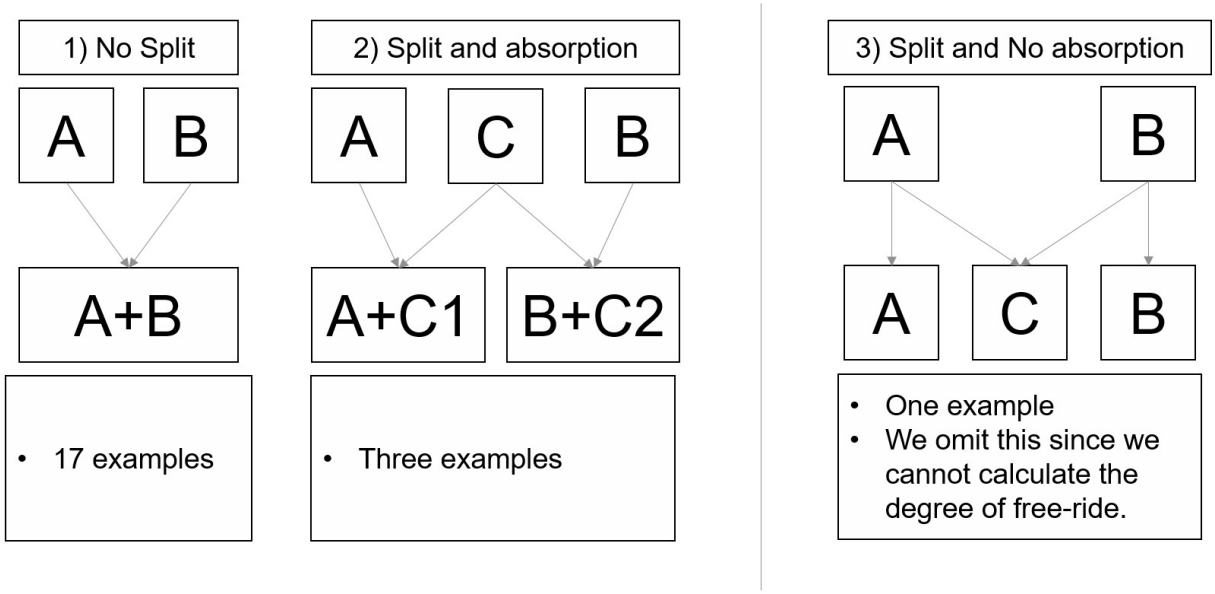


Figure4 Trend of ln(borrowing per capita+1)

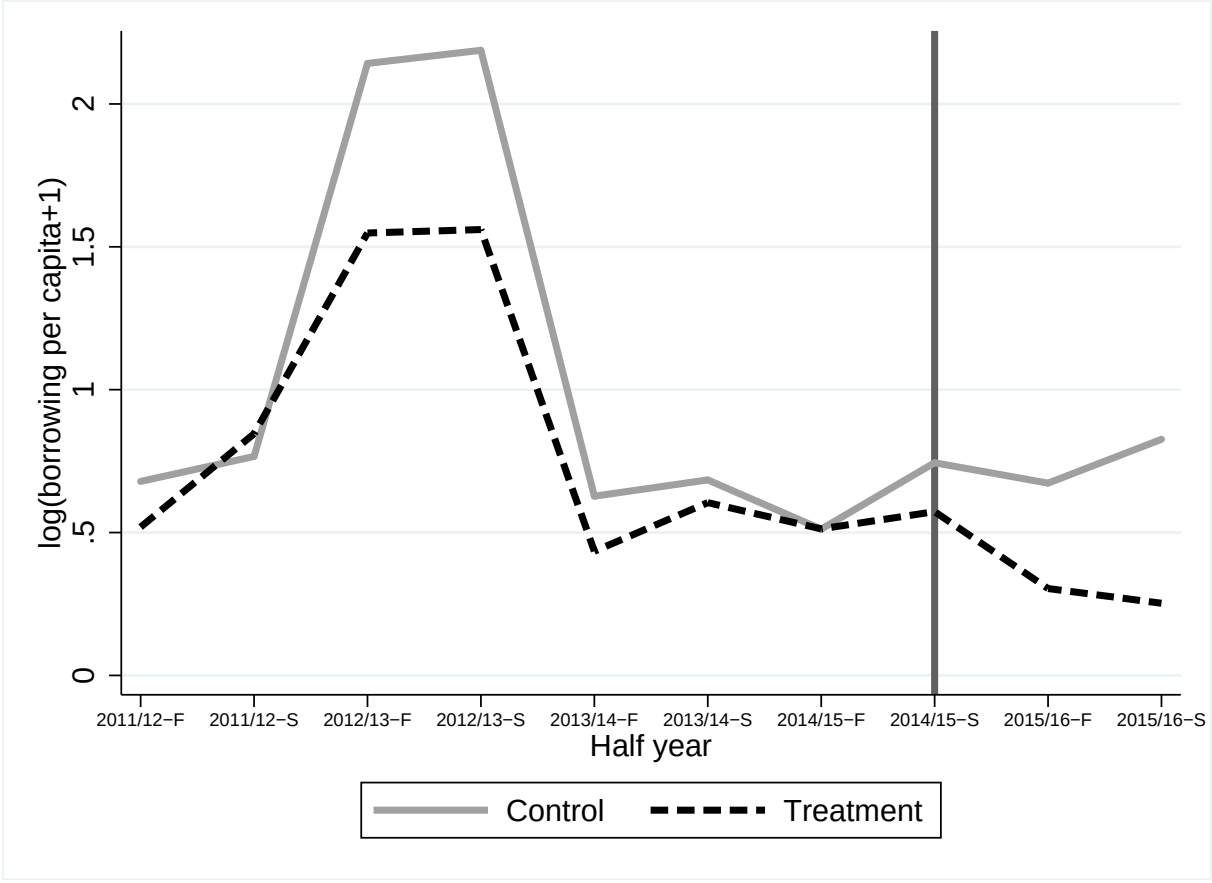


Table1 Sources of data and scale

Variables	Data source	Scale
Population	Quantec easy database	Person
Gross Value Added	Quantec easy database	Millions Rand
Area	Quantec easy database	Square kilo-meter
ANC seat	Electoral commission of South Africa, Municipal Election Result	Ratio to the whole number of local assembly seats
Metro	National Treasury, MFMA website	Dummy
Secondary city	National Treasury, MFMA website	Dummy
Borrowing	National Treasury, MFMA section 71 data	Rand
Debt stock	National Treasury, Annual Financial Statement	Dummy

Table2 Summary statistics by groups

Variables	Control Mean	Control Std Dev.	Treated Mean	Treated Std Dev.	Total mean	Total Std Dev.
Population	229844.9	548769.1	209201.6	517678.8	225662.9	542568.8
Gross Value Added	11806.33	41247.71	10620.3	34893.51	11566.06	40037.72
Area	5434.833	5587.035	4259.935	4690.16	5196.815	5436.952
ANC seat	0.6438	0.1766	0.6676	0.1529	0.6486	0.1723
Metro	0.0324	0.1771	0.0425	0.2020	0.0344	0.1825
Secondary city	0.0810	0.2730	0.08510	0.2793	0.0818	0.2742
Borrowing	1.64e+07	1.26e+08	9524138	7.80e+07	1.50e+07	1.18e+08
Debt stock	1.85e+08	1.07e+09	2.16e+08	1.37e+09	1.91e+08	1.14e+09
Clean Audit	0.4956	0.5000	0.4972	0.5001	0.4893	0.5004

Table3 Summary statistics of yearly data by groups

Variables	Control Mean	Control Std Dev.	Treated Mean	Treated Std Dev.	Total mean	Total Std Dev.
Population	231739.3	565357.4	209196.2	520245.8	227172.3	556370.2
Gross Value Added	11919.15	41668.62	10638.84	35236.75	11659.78	40437.27
Area	5434.83	5588.54	4259.93	4695.16	5196.81	5438.12
ANC seat	0.6438	0.1766	0.6676	0.1529	0.6486	0.1723
Metro	0.0324	0.1772	0.0425	0.2022	0.0344	0.1825
Secondary city	0.0810	0.2731	0.0851	0.2796	0.0818	0.2743
Borrowing	3.71e+07	2.45e+08	1.85e+07	1.15e+08	3.33e+07	2.25e+08
Debt stock	1.53e+08	9.67e+08	3.31e+08	1.68e+09	1.89e+08	1.15e+09
Clean Audit	0.4956	0.5001	0.4972	0.5002	0.4893	0.5009

Table4 Summary statistics of Quarterly data by groups

Variables	Control Mean	Control Std Dev.	Treated Mean	Treated Std Dev.	Total mean	Total Std Dev.
Population	231341.1	563525.1	208930	518728.8	226800.9	554761.2
Gross Value Added	11830.11	41345.69	10642.34	34947.71	11589.49	40131.31
Area	5434.833	5586.28	4259.935	4687.661	5196.815	5436.366
ANC seat	0.6438	0.1766	0.6676	0.1529	0.6486	0.1723
Metro	0.0324	0.1771	0.0425	0.2020	0.0344	0.1825
Secondary city	0.0810	0.2729	0.0851	0.2791	0.0818	0.2742
Borrowing	8194647	7.01e+07	4762069	5.01e+07	7499254	6.65e+07
Debt stock	1.59e+08	9.77e+08	3.29e+08	1.64e+09	1.93e+08	1.14e+09
Clean Audit	0.4956	0.5000	0.4972	0.5000	0.4893	0.5001

Table5　Results for the OLS model

VARIABLES	(1)OLS	(2)OLS	(3)OLS
	log(Borrowing per capita+1)		
Treatment× FY2015/16-F	-0.153		-0.406
	(0.196)		(0.534)
Treatment× FY2015/16-S	-0.317*		-0.580
	(0.179)		(0.429)
Treatment	-0.146*		0.0774
	(0.0788)		(0.167)
ANCseat	-1.172***	-1.178***	-1.176***
	(0.180)	(0.181)	(0.180)
Metro	0.887**	0.895**	0.912**
	(0.376)	(0.371)	(0.372)
SecondaryCity	1.033***	1.039***	1.039***
	(0.174)	(0.174)	(0.174)
log(Pop)	-0.364***	-0.377***	-0.377***
	(0.0475)	(0.0481)	(0.0483)
log(GVA)	0.485***	0.473***	0.474***
	(0.0462)	(0.0463)	(0.0466)
log(Area)	-0.0144	-0.0268	-0.0263
	(0.0392)	(0.0393)	(0.0390)
Debt stock	1.83e-10***	1.89e-10***	1.85e-10***
	(5.96e-11)	(5.99e-11)	(5.97e-11)
CleanAudit	0.247***	0.230***	0.233***
	(0.0593)	(0.0596)	(0.0592)
Index× FY2015/16-F		-0.0399	0.513
		(0.185)	(0.750)
Index× FY2015/16-S		-0.255	0.535
		(0.202)	(0.593)
Index		-0.371***	-0.474*
		(0.104)	(0.247)
Constant	1.634***	1.994***	1.964***
	(0.603)	(0.630)	(0.629)
Time dummy	Yes	Yes	Yes
Observations	2,317	2,317	2,317
R-squared	0.348	0.348	0.349

Robust standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

Table6　Results for the fixed effect model

VARIABLES	(1) FE	(2) FE	(3) FE
	log(Borrowing per capita+1)		
Treatment× FY2015/16-F	-0.159		-0.437
	(0.156)		(0.408)
Treatment× FY2015/16-S	-0.346**		-0.704*
	(0.154)		(0.366)
log(Pop)	0.591	0.507	0.732
	(2.195)	(2.203)	(2.208)
log(GVA)	4.249*	4.175*	4.340*
	(2.200)	(2.190)	(2.211)
Debt stock	9.50e-11	1.07e-10	8.18e-11
	(7.83e-11)	(8.58e-11)	(7.03e-11)
CleanAudit	-0.0607	-0.0616	-0.0596
	(0.129)	(0.129)	(0.129)
Index× FY2015/16-F		-0.0332	0.562
		(0.152)	(0.570)
Index× FY2015/16-S		-0.243	0.718
		(0.176)	(0.502)
Constant	-40.14	-38.60	-42.50
	(27.19)	(27.25)	(27.45)
Time dummy	Yes	Yes	Yes
Observations	2,317	2,317	2,317
R-squared	0.228	0.227	0.229
Number of code	232	232	232

Robust standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

Table7 Results based on yearly data

VARIABLES	(1)OLS	(2)OLS	(3)OLS
	log(Borrowing per capita+1)		
Treatment× FY2015/16	-0.622***		-1.228**
	(0.233)		(0.558)
Treatment	0.0633		0.434*
	(0.128)		(0.262)
ANCseat	-1.858***	-1.848***	-1.866***
	(0.290)	(0.291)	(0.290)
Metro	2.137***	2.193***	2.187***
	(0.433)	(0.439)	(0.436)
SecondaryCity	1.330***	1.347***	1.340***
	(0.278)	(0.277)	(0.277)
log(Pop)	-0.338***	-0.350***	-0.354***
	(0.0794)	(0.0795)	(0.0793)
log(GVA)	0.549***	0.538***	0.532***
	(0.0790)	(0.0795)	(0.0795)
log(Area)	-0.121*	-0.136**	-0.137**
	(0.0632)	(0.0630)	(0.0616)
Debt stock	-0	-0	-0
	(0)	(0)	(0)
CleanAudit	0.544***	0.531***	0.524***
	(0.0974)	(0.0979)	(0.0972)
Index× FY2015/16		-0.443*	1.228
		(0.261)	(0.774)
Index		-0.176	-0.784**
		(0.149)	(0.358)
Constant	2.249**	2.627***	2.712***
	(0.951)	(0.970)	(0.944)
Time dummy	Yes	Yes	Yes
Observations	1,160	1,160	1,160
R-squared	0.334	0.332	0.336

Robust standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

Table8 Results based on yearly data

VARIABLES	(1) FE	(2) FE	(3) FE
	log(Borrowing per capita+1)		
Treatment× FY2015/16	-0.642***		-1.187**
	(0.208)		(0.511)
log(Pop)	-3.784	-3.744	-3.415
	(2.549)	(2.565)	(2.542)
log(GVA)	0.255	-0.102	0.379
	(2.264)	(2.256)	(2.271)
Debt stock	0	0	0
	(0)	(0)	(0)
CleanAudit	0.0525	0.0501	0.0551
	(0.147)	(0.149)	(0.146)
Index× FY2015/16		-0.511***	1.108
		(0.190)	(0.685)
Constant	42.56	44.97	37.31
	(31.01)	(31.12)	(31.09)
Time dummy	Yes	Yes	Yes
Observations	1,160	1,160	1,160
R-squared	0.023	0.013	0.028
Number of code	232	232	232

Robust standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

Table9 Results based on quarterly data

VARIABLES	(1)OLS	(2)OLS	(3)OLS
	log(Borrowing per capita+1)		
Treatment× FY2015/16-Q1	0.00690		-0.111
	(0.147)		(0.388)
Treatment× FY2015/16-Q2	-0.0683		-0.199
	(0.149)		(0.397)
Treatment× FY2015/16-Q3	-0.0752		-0.224
	(0.144)		(0.382)
Treatment× FY2015/16-Q4	-0.287*		-0.542
	(0.150)		(0.364)
Treatment	-0.136***		-0.0387
	(0.0468)		(0.0993)
ANCseat	-1.002***	-1.013***	-1.004***
	(0.108)	(0.108)	(0.108)
Metro	1.468***	1.481***	1.481***
	(0.169)	(0.170)	(0.170)
SecondaryCity	0.844***	0.843***	0.846***
	(0.107)	(0.107)	(0.107)
log(Pop)	-0.268***	-0.275***	-0.273***
	(0.0281)	(0.0285)	(0.0286)
log(GVA)	0.388***	0.381***	0.384***
	(0.0274)	(0.0274)	(0.0275)
log(Area)	-0.00245	-0.00794	-0.00695
	(0.0232)	(0.0233)	(0.0232)
Debt stock	-0**	-0**	-0**
	(0)	(0)	(0)
CleanAudit	0.186***	0.176***	0.180***
	(0.0348)	(0.0351)	(0.0347)
Index× FY2015/16-Q1		0.0883	0.239
		(0.138)	(0.539)
Index× FY2015/16-Q2		-0.00506	0.266
		(0.143)	(0.555)
Index× FY2015/16-Q3		-0.00263	0.303
		(0.140)	(0.532)
Index× FY2015/16-Q4		-0.226	0.511
		(0.168)	(0.500)
Index		-0.267***	-0.206
		(0.0610)	(0.145)
Constant	0.918**	1.101***	1.043***
	(0.364)	(0.379)	(0.378)
Time dummy	Yes	Yes	Yes
Observations	4,629	4,629	4,629
R-squared	0.322	0.322	0.322

Robust standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

Table10 Results based on quarterly data

VARIABLES	(1) FE	(2) FE	(3) FE
	log(Borrowing per capita+1)		
Treatment× FY2015/16-Q1	0.00517		-0.133
	(0.126)		(0.325)
Treatment× FY2015/16-Q2	-0.0848		-0.242
	(0.126)		(0.339)
Treatment× FY2015/16-Q3	-0.0833		-0.263
	(0.125)		(0.325)
Treatment× FY2015/16-Q4	-0.281**		-0.536*
	(0.133)		(0.312)
log(Pop)	0.0518	0.0914	0.168
	(1.724)	(1.725)	(1.722)
log(GVA)	4.170***	4.108***	4.223***
	(1.585)	(1.577)	(1.595)
Debt stock	0	0	0
	(0)	(0)	(0)
CleanAudit	-0.0631	-0.0637	-0.0621
	(0.101)	(0.101)	(0.101)
Index× FY2015/16-Q1		0.0989	0.282
		(0.120)	(0.449)
Index× FY2015/16-Q2		-0.0112	0.320
		(0.113)	(0.472)
Index× FY2015/16-Q3		0.00639	0.366
		(0.121)	(0.452)
Index× FY2015/16-Q4		-0.221	0.509
		(0.147)	(0.425)
Constant	-33.52	-33.48	-35.30
	(22.18)	(22.17)	(22.29)
Time dummy	Yes	Yes	Yes
Observations	4,629	4,629	4,629
R-squared	0.203	0.202	0.203
Number of code	232	232	232

Robust standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1