UNIVERSITY OF GOTHENBURG
SCHOOL OF BUSINESS, ECONOMICS AND LAW

WORKING PAPERS IN ECONOMICS

No 635

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November 2015

ISSN 1403-2473 (print)
ISSN 1403-2465 (online)

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Resource Windfalls and Local Government Behavior: Evidence From a Policy Reform in Indonesia*

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November 2, 2015

Abstract

We analyze the impact of a natural experiment in Indonesia that allocated certain district governments with a windfall revenue from natural resource production. Our identification is based on a comparison between bordering districts in provinces that received the windfall with those that did not receive it, before and after the fiscal reform in 1999. We study the impact on a range of outcome variables such as regional GDP, infrastructure quality, employment, education, and household consumption. Our results demonstrate a "flypaper effect" in the sense that the increased revenue led to higher spending without any lowering of local taxes. We argue that the large relative increases in spending on public services contributed to a very strong increase in local GDP levels, led by the agricultural sector. A 100-dollar windfall further increased literacy by about 2 percent and non-food consumption by 67 USD. The strong general tendency of positive effects from the reform stands in contrast to the negative effects emphasized in the resource curse literature.

Keywords: Resource windfalls, fiscal decentralization, Indonesia

JEL Codes: H72, O20, Q33

1 Introduction

What is the impact of government revenue shocks in developing countries? What types of public spending will have the greatest effects in terms of economic growth and social welfare? Answers

*We would like to thank Thomas Aronsson, Francois Bourguignon, Michael Callen, Giacomo de Luca, Andreas Madestam, Halvor Mehlum, Dilip Mookherjee, Jakob Svensson, Alessandro Tarozzi and seminar participants at IEB (Barcelona), LICOS (Leuven), RIIE (Stockholm), EUDN Workshop (Berlin), IV Summer Workshop in Development Economics (Ascea), NYU Abu Dhabi, Gothenburg, Paris School of Economics, St Gallen, Umeå, and Wageningen for useful comments. Special thanks to Måns Söderbom for many useful discussions. Michele Valsecchi thanks the Royal Society of Arts and Sciences in Gothenburg, Knut and Alice Wallenberg Foundation and the Foundation for Economic Research in West Sweden for financial support.

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to these central policy questions are typically hard to obtain due to the difficulty of carrying out policy experiments on a macro level. At the same time, we know from past policy failures (such as the debt crises in the 1970-80s or the mismanagement of oil rents in Africa) that avoiding policy mistakes is essential for achieving economic development.

In this paper, we present an extensive analysis of a natural experiment in a developing country that provided certain local governments with an unexpected and sizeable windfall revenue. More specifically, we track the impact of policy change in Indonesia, initiated shortly after the dramatic resignation of president Suharto in 1998, that re-allocated part of Indonesia's resource revenues (oil and gas) from the federal government to resource-producing provinces. The reform introduced a new rule whereby all districts in resource producing provinces were to obtain a percentage of the natural resource revenues collected by the central government. The reform also decentralized the responsibility for the provision of public goods to local governments. Our analysis tracks the effect of the resource windfalls over time from the highest federal level via levels of district revenues, spending and GDP, through the actual reported provision of public goods like roads and schools, down to observed educational, labor market and consumption outcomes on household and invividual level.

Our identification strategy in the empirical analysis is to compare local government behavior in districts that received the resource windfalls with outcomes in neighboring districts across the border that did not receive the windfall, before and after the reform. The first category makes up our "treatment group" whereas the second category is our "control" group. Our analysis suggests that the districts on either side of the province borders are very similar geographically and culturally and that the quasi-random assignment of the windfall on one side makes our study close to a natural experiment. The districts in the sample are all located on two of the most resource-rich islands in the country; Sumatra and the Indonesian part of Borneo (referred to as Kalimantan). Our data allows us to study government revenues, expenditures, regional GDP and public goods outcomes on district level during 1995–2011 and on household level between 2001-2009.

The results of our analysis show the following: i) There is clear evidence of a "flypaper effect" in the sense that all of the resource windfall appears to have stuck with the local government without accompanying decreases in local taxation. Given a 100-dollar revenue windfall per capita (roughly equivalent to the mean level of extra resource revenue in treatment districts after the reform), total district expenditure increased by 67 USD in the following year. ii) The extra revenue was mainly spent on education, infrastructure and on staff. iii) The windfall led to a very large relative increase in non-oil regional GDP by a factor of 2.7, which in turn was led by the output boost in the agricultural sector. iv) The increased spending on education resulted in more primary and junior high schools on village level and led to generally higher school enrollment and completion rates on household level. A 100-dollar windfall increased literacy among children aged 6-15 by 2 percent and years of schooling by 0.14 years. v) Whereas the impact of the windfalls on employment and hours worked were not significant, household expenditure on non-food consumption increased by 67 USD in districts that received a 100-dollar windfall. In summary, our analysis indicate a relatively strong impact of the reform.

The theoretical framework in the paper suggests a number of interpretations of these results. Our model proposes that increased public services such as education and infrastructure should increase labor productivity with a lag, which in turn explains the rise in GDP a few years after each windfall. The boost in the agricultural sector might be explained by an improvement in road infrastructure. Labor productivity increases should also have resulted in higher wages, which in turn might explain the very strong increase in household expenditure. A notable feature of these results is the consistent non-negative results of the new policy, which suggests that the reform escaped most of the previously observed problems, such as corruption or crowding-out effects, that have been described in the literature on the curse of natural resources.

Our work is related to several different research traditions. First, our paper is connected to a very large literature on various aspects of fiscal policy such as the pros and cons of fiscal decentralization.[1] Perhaps more importantly, our work contributes to a recent and growing research agenda where researchers exploit natural experiments in order to establish causal effects in macroeconomics.[2] For instance, Nakamura and Steinson (2014) use unpredictable national military spending in the US as an instrument for local government spending and find a local fiscal multiplier on GDP growth to be about 1.5. Using a sample of 102 developing countries, Kraay (2014) exploits the exogenous variation in government spending caused by the long lags involved in lending from official creditors to governments. Such multi-year spending plans are arguably uncorrelated to growth shocks in subsequent years. Kraay finds that the one-year fiscal multiplier is about 0.4 percent. Whereas these papers are primarily concerned with the estimation of multipliers for government spending on GDP growth, our approach includes a more disaggregated analysis of how spending and economic growth filter down to household level outcomes.

Our study is also related to research on the "flypaper effect", referring to the phenomenon that an extra unconditional grant from the government leads to more public spending than an equivalent sum of extra citizen income.[3] Such a "crowding-in" effect, which are not borne out by standard theoretical models, has for instance been observed in Sweden where Dahlberg et al (2008) find that block grants from central government results in a 1:1 increase in local spending, whereas taxes are left unaltered. The result in our study that spending increases by 67 USD for every 100 of windfall, is clearly lower than in Sweden but shows the same pattern of no effect on local taxes. Gordon

[1] In order to assess whether fiscal decentralization is associated with improved economic outcomes, some studies use cross-regional variation within large countries such as United States (Akai and Sakata, 2008) or China (Zhang and Zou, 2008). Our paper is closest to Skoufias et al's (2011) analysis of the recent reform towards direct elections in districts in Indonesia, showing that the electoral reforms had a positive impact on public goods spending. Unlike their study, our treatment is resource windfalls rather than the introduction of direct elections.

[2] See Fuchs-Schuendeln and Hassan (2015) for an overview of this literature.

[3] See Hines and Thaler (1995) and Inman (2008) for overviews.

(2004) shows that intergovernmental transfers increase educational spending in the United States whereas a recent paper by Lundqvist et al (2014) find no effect of the same type of grant on local employment.

Second, our research also links up with the extensive literature on the so called "resource curse" in developing countries.[4] As discussed by Collier (2007), Dalgaard and Olsson (2008) and others, inflows of resource revenues have often led to rent seeking, patronage politics, and corruption to such an extent that the net growth effect is often negative. The question how developing countries should best handle their booming natural resource revenues has high policy relevance and there is no general agreement on what type of policy that resource-rich countries should choose.

The policy chosen by Indonesia in 1999 was to decentralize resource revenue from the central level of government to a regional or local level. Apart from Indonesia, Brazil has also chosen to pursue a policy of oil revenue decentralization. The Brazilian experience has been the subject of numerous studies. Litschig and Morrison (2013) is perhaps the study that is closest to ours. The authors exploit a discontinuity in the level of grants from central to local governments in 1982-85, based on municipal population levels, to identify the effect of extra revenue on public service provision. They find that local government spending increased by about 20 percent, schooling years increased by 0.3 years, literacy increased by about 4 percent and poverty was reduced.

Also using data on Brazilian municipalities, Monteiro and Ferraz (2010) show that extra oil revenue appears to have led to an increase in the number of public employees but not to the provision of public services like health and education. Their main focus is on political economy aspects and their analysis demonstrates that the windfall created a large incumbency advantage in local elections. Brollo et al (2013) use a regression discontinuity design and provide evidence that larger oil windfalls increase corruption and lower the quality of political candidates on the local level.[5] Both Brollo et al (2013) and Caselli and Michaels (2013) recognize that municipalities with oil revenues have increased their spending, but like Monteiro and Ferraz (2010), these studies emphasize that the increased spending has not improved public services as much as one would have expected. Caselli and Michaels (2013) further show that oil windfalls are associated with illegal activities by mayors, suggesting an increase in corrupt behaviors.

Our paper obviously makes a contribution by having a different and, for this purpose, a novel object of study; Indonesia. Unlike most of the studies above (with the exception of Caselli and Michaels, 2013), we investigate the impact of the windfall on district level GDP. We further follow a longer chain of impacts from federal grants down to household level outcomes. In addition, as far as we know, our paper is the first study in this literature to use a border between a producing and a non-producing province as our forcing variable and exploit the time variation in public goods

[4] See van der Ploeg (2011) for an overview of this large literature. Several recent studies question if there has really been any resource curse during the last decade.

[5] See also Vicente (2010) who compares outcomes in Sao Tome and Principe with Cape Verde as a "control country".

outcomes. The methodology that we employ is most similar to an otherwise unrelated study by Dell (2010) who also uses a border as a forcing variable in a historical analysis of the long-run legacy of a colonial institution in Peru.

Third, our quasi-experimental approach is related to the large literature on randomized control trials in developing countries (see for instance Duflo et al, 2007). In recent research, it has often been emphasized that an upscaling of micro field experiments is a natural direction for future work (Bold et al, 2013). The current paper might be seen as an attempt to contribute to this agenda. Our paper adds to the findings of Duflo (2001, 2004) who investigated the consequences of a major primary school construction program in Indonesia in 1974-78 on schooling and labor market outcomes. Furthermore, our approach is related to that of Reinikka and Svensson (2004) who study the extent to which a new grant from the Ugandan government actually reached 250 schools. In a similar spirit, we combine data on grants from a central government with district, village, and household level data on educational spending and observed schooling outcomes.

The paper is structured as follows: Section 2 presents a theoretical framework for understanding the impact of a resource windfall on spending decisions, public good provision, GDP levels, and household consumption. Section 3 outlines the context of the empirical study and section 4 discusses the data and identification strategy. The main results are presented in section 5 and are discussed in section 6. Section 7 concludes.

2 Theoretical framework

In this section, we provide a simple framework for analyzing the behavior of a local government in response to a revenue shock. We will start with a very simple model where we assume a representative individual getting utility from a single private and a single public good. We then expand the model to two public goods and two periods and a lifetime budget constraint. The first section analyzes the flypaper effect, the second and third considers the impact of a windfall gain on public goods provision, whereas sections 2.4-2.6 analyze the impact on regional GDP, labor markets, and household consumption. The main purpose of the model is to serve as a simple framework for our interpretation of the empirical analysis.

2.1 The flypaper effect

Imagine a local government that is run by a representative (median) voter who gets utility U from the consumption of private goods c and from publicly provided goods g such that $U(c, g)$.[6] For instance, we might think of c as food and g as an individual's benefits from a school.[7] For now, let

[6] The analysis in this section builds on Inman (2008).

[7] For now, we assume that the publicly provided goods below are *private goods* by nature, i.e. rival and excludable.

us assume a standard Cobb-Douglas utility function: $U(c,g) = \alpha \ln c + (1-\alpha)\ln g$ where $\alpha > 0$ is the relative preference for private consumption.

Let us further make the simplifying assumption that in this community, the consumption of food and school services is financed by the pooled resources from private income w and lump-sum per capita grants $b > 0$ from a higher-level government such that $pc + g \leq w + b$ where p is the relative price of private consumption. Part of the private income w might thus be used for schools and part of the lump-sum grants might be used for private consumption.

It is then easily shown that the demand functions for the two goods will be $g^d = (1-\alpha)(w+b)$ and $c^d = \alpha(w+b)/p$. What is the impact on the demand for schools of an unexpected windfall increase in government grants by one unit $\Delta b = 1$? The simple answer is[8]

$$\frac{\partial g^d}{\partial b} \cdot \Delta b = 1 - \alpha.$$

It is thus immediately clear that $\frac{\partial g^d}{\partial b} \cdot \Delta b < 1$. In other words, a windfall increase in government grants will increase the consumption of schooling but not by the full amount of the windfall. Since the median voter also values private consumption in the form of food, part of the windfall will be spent on food, i.e. on private goods. The exact magnitude of the impact depends only on the relative preference for schooling $1-\alpha$.

Note also that the source of the extra income, b or w, does not matter for the outcome. One unit increase in government grants $\Delta b = 1$ will have exactly the same effect as an equivalent increase in private income $\Delta w = 1$; $\frac{\partial g^d}{\partial w} \cdot \Delta w = (1-\alpha)$.

As discussed by Inman (2008) and others, many studies have shown that this theoretical prediction does not hold empirically. More specifically, empirical studies have shown that $\frac{\partial g^d}{\partial b} > \frac{\partial g^d}{\partial w}$, i.e. an increase in government grants typically results in politicians reacting with a much greater increase in public services than if the windfall had originated from private income. Some studies have even found extreme results such that $\frac{\partial g^d}{\partial b} \cdot \Delta b = 1$ (for instance Dahlberg et al, 2008). In this sense, it appears that money "sticks where it hits" so that windfalls in government grants mainly lead to increases in publicly provided services whereas windfalls in private income mainly lead to increases in private consumption. In the empirical section, we will investigate whether this anomaly prevails also in our Indonesian sample.

2.2 An extended model

Let us now consider the impact of a government windfall when there are more than one public good and when we have an overlapping generation, two-period setting with a current ($t = 0$) and a future period ($t = 1$). For simplicity, let us imagine that are only two publicly provided goods,

[8] The symbol Δ henceforth refers to the change in the level of a variable from one period to the next.

schools (S) and *roads* (R) with quantities $x_{St}, x_{Rt} \geq 0$ at $t \in \{0, 1\}$. Let us assume that the utility function of the median voter who runs the local government is given by a general function

$$U = u(c_0, x_{S0}, x_{R0}) + \beta u(c_1, x_{S1}, x_{R1})$$

where, for instance, x_{S1} refers to the quantity of schools in the future period 1 and where $\beta < 1$ is a time discount rate. The utility function $u(\cdot)$ is increasing and concave in all its arguments.

Food and public services are purchased in an open market where the representative individual is a price taker. The local budget constraint is given by

$$\sum_{t=0}^{1} (pc_t + p_S x_{St} + p_R x_{Rt}) \leq \sum_{t=0}^{1} (w_t + b_t(1 - z)) = m$$

where w_t is private income at time t, p is the price of food, p_g is the price of public service $g \in \{S, R\}$, b is the level of grants received from the federal government as before, and z is the share of grants that disappear as a result of unproductive government activities, sloppy book-keeping or direct capture by local politicians. The level of z might be thought of as reflecting the general quality of government. Prices do not change over time. For simplicity, we abstract from other sources of tax income for the median voter in charge, as well as from private capital and interest rates. Note that the budget constraint implies that total "lifetime" expenditures over the two periods on the left hand side must not exceed total revenue m on the right.[9]

The aggregate production function in the economy is $y_t = f(L_t, x_{St-1}, x_{Rt-1})$ where marginal products are $f_{L_t}(\cdot) > 0$, $f_{x_{St-1}}(\cdot) > 0$, $f_{x_{Rt-1}} > 0$. We assume that production in period t is a function of total labor input in the same period L_t and on investments in schools and roads one period prior to the current one. Labor is paid its marginal product so that $w_t = f_{L_t}(\cdot) > 0$. The generation that is young in period 0 passively inherits the schools and roads provided by the old generation; $w_0 = f_{L_0}(L_0, x_{S-1}, x_{R-1})$. We further assume that the marginal product of labor typically increases with x_{St-1} and x_{Rt-1} so that $f_{L_t, x_{St-1}}(\cdot) \geq 0$ and $f_{L_t, x_{Rt-1}}(\cdot) \geq 0$.

Combining the functions above gives a standard optimization problem:

$$\begin{aligned} \Gamma \quad = \quad & u(c_0, x_{S0}, x_{R0}) + \beta u(c_1, x_{S1}, x_{R1}) + \qquad (1) \\ & + \lambda \left[w_0 + f_{L_1}(L_1, x_{S0}, x_{R0}) + (b_0 + b_1)(1 - z) - p(c_0 + c_1) - p_S(x_{S0} + x_{S1}) - p_R(x_{R0} + x_{R1}) \right]. \end{aligned}$$

As usual, λ is a Lagrangean multiplier. The representative individual gets a direct utility from consumption, schools, and roads in both periods. Note also that the intertemporal spillover, arising

[9] This might be too flexible compared to reality where local governments often have to balance revenues and expenditures every time period.

from the fact that $w_1 = f_{L_1}(L_1, x_{S0}, x_{R0})$, implies that public good investments x_{S0} and x_{R0} in the initial period also have an indirect utility effect by boosting labor incomes and hence the existing resources in period 1.

In the sections below, we will not derive explicit solutions to the standard model above but only use it to discuss general points. The first-order conditions on the basis of the optimization problem in (1) can be used to define demand functions for the public goods in the standard way: $x^d_{gt}(p, p_S, p_R, m)$. We denote the supply of schools by x^s_S. Supply is assumed to be perfectly elastic to start with so that entrepreneurs can supply any quantity that the local government demand at a fixed price. The same assumption applies for roads (R). Below, we will also discuss the implications of a more inelastic supply curve.

Let us assume that we are initially in equilibrium where supply equals demand ($x^s_{St} = x^d_{St}(p, p_S, p_R, m) = x^*_{St}$) when an unexpected windfall grant of size Δb is handed out by the national government. Will this lead to an increase in the equilibrium level of school facilities and, if so, by how much?

2.3 Impact of a revenue windfall

A key comparative static for the empirical section concerns the impact of a revenue windfall on the equilibrium level of public services, i.e. the impact of an increase Δb on Δx^*_S or Δx^*_R. To start with, it is of course very important to understand the temporal character of the windfall. Does it lead to an increase in b_0 as well as in b_1 or do people only believe it is a temporary gain that will be withdrawn (so that $\Delta b_0 > 0$ is matched by an offsetting decrease in b_1? In the latter case, the intertemporal budget constraint m will be unaffected and the forward-looking representative individual will not change her demand. We will henceforth assume that the representative individual recognizes that the positive change in windfalls is a change in long-run policy and is thus permanent.

From the intertemporal budget constraint m, it is clear that the impact of an increase in b will depend importantly on the general competence and honesty of the local government as captured by z. If z is high, then much of the extra money will be wasted or embezzled which implies a generally low Δx^*_g. Second, the relative preference for schools as compared to roads should matter for the relative impact $\Delta x^*_S/\Delta x^*_R$. This is well in line with intuition.

Third, to what extent does the provision of schools depend on prices p_S and p_R? Typically, when schools and roads are substitutes, a relatively high price p_S/p_R should be associated with a relatively low marginal increase in schools, even if preferences for schools might be as strong as for roads. Analogously, an increase in p_R should lead to a substitution effect such that Δx^*_S becomes higher. If, however, schools and roads are complements, then a higher p_R might lead to a somewhat lower provision of schools.

In the setting above, the prices are set by producers and do not respond to government revenue windfalls from outside. Clearly, one could think of situations when a windfall gives rise to increases in p, p_S and p_R or just in one of them, i.e. more inelastic supply curves. In an isolated village, there might for instance only be a single supplier of tarmac for road construction. In such cases, a general increase in the price level should imply a lower provision of public goods in response to a windfall. In the extreme case of a perfectly inelastic supply curve, the only result of a windfall will be a spike in local prices.

What if schools can only be provided in a "lumpy" fashion so that one extra unit can only come in discrete amounts whereas roads can be increased in a continuous fashion? In that case, if the resource windfall is $\Delta b < p_S \cdot \Delta^{\min} x_S^*$ where $\Delta^{\min} x_S^*$ is the minimum feasible level of a school investment, there cannot be a new school. Instead, the local government will have to spend the money on more roads. Hence, even if there is a political preference for investments in larger discrete public goods like new schools, these might not materialize due to the specific character of the required investment.

The model further abstracts from regulations such as a law stating that there has to be a school or a health clinic in every village. In any case, such public services should be the first to be put in place and should not be very responsive to unexpected windfall gains.

In summary, the simple framework illustrates how the marginal impact of a revenue windfall on the equilibrium level of a particular publicly provided good like schools will critically depend on the general *competence and honesty of the local government*, on the *weight of political preferences* for the particular good, on the *relative price*, on the *price elasticity of supply*, on the *level of complementarity* with other public goods, on the *minimum feasible unit of investment* of the good in question, and on *regulations regarding mandatory public goods*.

2.4 Regional GDP

How does the provision of public services affect aggregate measures of the regional economy, such as the gross regional domestic product (GRDP)? We assumed above that $y_t = f(L_t, x_{St-1}, x_{Rt-1})$. For instance, investments in infrastructure should mainly improve productivity only after a while, when people and markets have adjusted to the new conditions. Educational investments probably take an even longer time to have an effect on productivity.

Let us define economic growth in period $t+1$ as $\Delta y_{t+1} = y_{t+1} - y_t = f(L_{t+1}, x_{St}, x_{Rt}) - f(L_t, x_{St-1}, x_{Rt-1})$. The expression makes it clear that growth will be determined mainly by the changes in the equilibrium levels of public goods Δx_{St}^* and Δx_{Rt}^*.[10]

In order to analyze the growth response to a windfall gain, it is first necessary to consider the first-order condition of the intertemporal optimization problem above. The comparative static on

[10] The eveolution of L_t is exogenous in this framework.

the basis of (1) tells us that

$$\frac{\partial \Gamma}{\partial x_{s0}} = u_{x_{S0}}(\cdot) + \lambda \left(f_{L_1 x_{s0}}(\cdot) - p_S \right) = 0.$$

An increase in schools thus has both a direct effect and an indirect effect. The direct effect, captured by the marginal utility $u_{x_{S0}}(\cdot)$, arises from the fact that the representative individual will increase her demand of schools in period 0 because she enjoys to consume that good per se. The indirect effect arises from the fact that an increase in x_{s0} also leads to a marginal increase in labor productivity and in wages earned in period 1 ($f_{L_1 x_{s0}}(\cdot) = \partial w_1/\partial x_{s0} > 0$) and thus boosts the lifetime budget m.

Hence, the impact of a windfall gain Δb on x_{g0} and on economic growth should depend on: (i) The strength of its impact on marginal utility in period 0 ($u_{x_{g0}}(\cdot)$) and (ii) the strength of its impact on the marginal sensitivity of future labor productivity to current public good increases ($f_{L_1 x_{g0}}(\cdot)$). If the latter link to productivity is weak, then the individual will rationally choose less public goods and growth will be slower.

As a natural consequence of our assumption about the production function $f(L_t, x_{St-1}, x_{Rt-1})$, a windfall gain in period 0 will only have an effect on income and growth in period 1. We will test this simple conjecture in the empirical section (using GDP per capita as a proxy).

2.5 Labor market

We assumed above that wages were equal to the marginal product of labor: $w_t = f_{L_t}(L_t, x_{St-1}, x_{Rt-1})$. The straightforward insight from this standard expression is that an increase in public services at $t-1$ should increase wages one period later at time t. However, in our data, we do not observe wages. What we do observe is whether people work and the number of hours people work. These outcomes arguably reflect an equilibrium between labor demand and labor supply.

Labor demand is implicity defined by the wage equation above such that $L_t^d(w_t, x_{St-1}, x_{Rt-1})$. Since we know from above that the marginal product of labor f_{L_t} increases with public goods x_{gt-1}, then it must be the case that $\partial L_t^d/\partial x_{gt-1} > 0$, i.e. demand for labor increases one period after the windfall gain.

The labor market clears when labor demand equals labor supply: $L_t^d = L_t^s = L_t^*$. What typically happens with labor supply L^s after a windfall revenue shock is less clear.[11] In case of a positively sloped labor supply curve ($\partial L_t^s(w_t)/\partial w_t > 0$ at all $w_t > 0$), both wages and the employment of labor in the economy will increase. If the supply curve is backward-bending at higher wages

[11] In a richer model, we might have explicitly derived labor supply by including leisure in a representative individual's utility function and a tradeoff between leisure and earning money for consumption. We leave out this standard step for space considerations.

$(\partial L_t^s(w_t)/\partial w_t < 0$ at $w_t > \bar{w})$, then although labor demand and wages increase as a result of the windfall, labor supply might actually fall, resulting in a similar or even a lower equilibrium level of total hours worked.

One might also imagine that labor supply is fixed in the short run at some $L^s = \bar{L}$. In that case, the rise in productivity would not raise hours worked but have an even more pronounced effect on wages. We will return also to this issue in the empirical analysis.

2.6 Household consumption

Total lifetime household income is, as specified above, given by $m = \sum_{t=0}^{1}(w_t + b_t(1-z))$. A permanent boost in federal government grants b_0 and b_1 should thus increase consumption of all goods in period 0 as well as in period 1. An underlying assumption here is of course that credit markets work well so that individuals are able to smooth their consumption over the life cycle. Since we know that credit markets typically are far from perfect in developing countries, we might instead expect a "Keynesian" increase in overall short-run expenditure so that people spend while they have cash on hand. We investigate this issue in the empirical section.

Another consideration concerns the impact of the time discount rate β. If β is low so that people discount the future heavily, then the immediate increase in consumption should be relatively large after a windfall. Furthermore, in a mid-income country like Indonesia where people are not typically undernourished, we would expect the revenue shock to primarily increase the private consumption of non-food items.

3 The Indonesian Context

In this section, we briefly outline the Indonesian context for the empirical study.

3.1 The 1999 Fiscal Decentralization Reform

The Indonesian administrative structure is composed of different levels: central government, provinces (like US states), districts (US counties), sub-districts and villages. During the 1966-1998 autocratic regime, most of the power was retained by the central government. After the fall of Suharto, the government undertook a massive decentralization process and redistributed a large part of this power to districts and some to provinces. The transfer of authority concerned all fields other than macro-policies[12]: public works, health, education and culture, agriculture, transportation, industry and trade, investment, environment, land, cooperatives, and labor (art 11.2).[13] The reform became

[12] Macro policies include foreign relations, defense, justice, monetary, fiscal and religious policies.

[13] It is difficult to find additional details on these responsibilities. About education: since 1994 education is mandatory until the 9th grade, therefore districts are particularly responsible for primary and junior-high education. It is not clear how provinces and districts share the responsibility for school building and for hiring and paying

law in November 1999 and came into power simultaneously across all Indonesian districts in January 2001.[14]

Laws 22/1999 and 25/1999 regulate the sources of local revenue. They consist of: Own income (local taxes and fees, returns from regional-owned enterprises), revenue sharing (local share of taxes, local share of revenues from natural resources) and grants (transfers from the central government). The greatest part of local revenue used to come from transfers from the central government in the pre-decentralization period (called SDO) and continues to be so even after decentralization (DAU and DAK). Among the other sources of income, one was deeply affected by the reform and constitutes the focus of this paper: the redistribution of revenues from natural resources. Natural resources are oil, natural gas, mining, forestry and fishing. While state income from fishing was redistributed equally across all districts, the revenues from all the other resources were redistributed according to location. Table 1 shows the exact shares which went to central and regional governments (art. 6 of Law 25/1999).

Following decentralization, the central government retained a lower percentage of the natural resource tax revenues, while resource-abundant districts retained a greater percentage. Resource-abundant districts (henceforth: producing districts) were not the only beneficiaries of this re-allocation. The fiscal decentralization law states also that non-producing districts within producing provinces are entitled to a share of natural resource tax revenues. This share varies depending on the type of natural resource (see Table 1). Although it is relatively high for forestry and mining and low for oil and gas, the latter are a lot more valuable. Therefore, this legislative change seems to benefit mainly the non-producing districts within "oil and gas" provinces.

Table 1

A noteworthy feature of the revenue sharing originating from natural resources is that the law does not specify how the receiving districts should spend these additional revenues, i.e. there are no obligations attached to them.

3.2 Study areas: Sumatra and Kalimantan

The two areas that we study in this paper are Sumatra and the Indonesian part of Borneo (Kalimantan). There are several oil and gas producing provinces in Indonesia. However, only few of them produce a quantity of oil and gas that qualifies transfers to non-producing districts located within

teachers. About infrastructures: districts are not directly responsible for electricity provision because that is typically provided by a State-owned enterprise (PLN); they are directly responsible for water provision because that is typically provided by local branches of the water utilities (PDAM). About roads: the central government is directly responsible for highways; provinces are directly responsible for roads crossing more than one district; districts are directly responsible for all the others.

[14] See Fadliya and McLeod (2010) for a broader discussion about the new policy.

the same province greater than 5 percent of their district budget. These provinces are located in Sumatra and Kalimantan.

Figure 1 shows the parts of Sumatra that are included in our study. The most central province, called Riau (or Rumbai), has received substantial new revenues from natural resources after the recent reform and so has the province of South Sumatra. Also a northern province, Aceh (not shown), receives large flows of rents. However, this province has for a long time sought independence from Indonesia and has been plagued by civil strife. Aceh is also one of the provinces that was hardest hit by the 2004 tsunami, just like all the provinces with shores along the Sumatran west coast.[15] In order to avoid these confounding effects, our main analysis will exclusively focus on the provinces Riau and South Sumatra as treatment regions and its neighboring districts in North Sumatra in the northwest and Jambi in the south as control regions. The dotted lines in Figure 1 specify more exactly the borders that we focus on. In the empirical section, we will use data from districts with a centroid that is within 120 km from the border on each side.

Figure 1

As is well known, spatial regression discontinuity designs require all determinants of the outcome of interest, except the treatment variable, to change *smoothly* at the border. One potential threat to this strategy is that the province border was drawn in correspondence of geographic or socioeconomic cleavages which are themselves correlated with the outcomes of interest (see for instance Dell, 2010). Figure 1 provides a basic overview of the geography of our treatment and control areas. The figure shows that there are no obvious discontinuities along the border in terms of terrain. Jambi, located in between the two treament areas, has a very similar lowland geography to Riau and South Sumatra, whereas North Sumatra has lowland plains close to the border but also mountains in the west. In the empirical section, we discuss further how we exclude mountain villages in order to check robustness.

The province Riau is located by the Strait of Malacca and has the Singapore and Kuala Lumpur metropolitan areas as neighbors across the strait. Riau province has currently about 5.5 million inhabitants and has experienced a steady growth of population and of its economy since the 1970s, largely due to natural resource exploitation. South Sumatra's population is about 7.4 million. The capital city, Palembang, hosts about 1.5 million of the province's inhabitants. Jambi's population is about 3 million whereas North Sumatra's is about 12 million, according to the 2010 census. Population density on the island as a whole is just below 100 people per km^2. In the four provinces in our study, population density is fairly evenly distributed except for coastal North Sumatra which has a higher population density than the other areas. Malay is the main language spoken in Riau and other dialects of the same family are also the main tongue in Jambi and in South Sumatra.

[15] The big tsunami in december 2004 had its epicenter in the Indian Ocean right west of Aceh. Hence, Aceh and the provinces on the western coast of Sumatra were affected but not the eastern coasts.

In the interior of North Sumatra, languages of a somewhat different family dominate (Ethnologue, 2012).[16]

The current situation in the four provinces has of course been heavily influenced by general historical developments on Sumatra. A key turning point in the history of Sumatra was the Portuguese arrival and conquest of Malacca across the strait in 1511, which had until then dominated central Sumatra. From about the 16th century, Aceh was the dominant indigenous political unit on the island and acted together with the Dutch East India Company (VOC) to expulse the Portuguese from Malacca in 1641. Aceh then resisted the increasing Dutch influence until the Aceh War 1873-1903. Trade was always a central part of the Sumatran economy, in particular during the Dutch East Indies-era when Dutch traders dominated the spice trade. In 1945, Sumatra became part of newly independent Indonesia (Ricklefs, 2008).

We also investigate the impact of resource windfalls within four provinces of central-eastern Kalimantan (see Figure 2), the other major oil-producing region in the country. Kalimantan is made up of the Indonesian parts of Borneo. Before the colonial period, the southern parts of Kalimantan that make up our control area, belonged to the Banjar sultanate (1526-1860). The Dutch colonial power increased its presence in the 19th century from their bases on Java but the current Indonesian borders of the Dutch colony were not established until in the early 20th century. Colonial efforts were somewhat greater in the southern part of the island than in the eastern part where most of current oil resources are located. Kalimantan was always considered a peripheral part of the colony. Like Sumatra, Kalimantan became part of independent Indonesia in 1945.

Figure 2

Kalimantan province split into three provinces in 1956; West, South, and East. The following year, South Kalimantan split into South and the geographically larger Central Kalimantan in order to give the indigenous Dayak population of Central province greater autonomy from the Muslim populations in South Kalimantan. Kalimantan hosts numerous ethnic groups of which the most important language families are Malayic, Barito, Dayak, and North Borneo.[17] A simplified description, Dayak groups dominate the interior whereas Muslim groups control the lands closer to the coast.

In terms of natural resources, Kalimantan is perhaps the richest region in the country, whereas it is relatively undeveloped economically (like most of the areas outside Java). In terms of population density and the geographic dispersion of economic activity, Kalimantan is similar to the many African countries currently experiencing a resource boom. Total population in 2010 is estimated to be just below 14 million and population density is only 25 people per km^2, which can be compared with Sumatra's 100 people per km^2 and Java's equivalent figure of more than 1000 per km^2.

[16] These language are Batak Mandailing, Batak Angkola, and Batak Toba.

[17] Data is from Ethnologue (2012). Kalimantan as a whole has 74 distinct languages.

East Kalimantan is the only province where oil is produced whereas no oil is produced in South, Central, and West Kalimantan. Our analysis focuses on the border area between East Kalimantan and the other three provinces, as shown in Figure 2. Just like in Sumatra, the area that we consider includes districts with a centroid at most 120 kms from the border. As is evident from Figure 2, the terrain is not obviously different on either side of the border. On the contrary, the topography is typically quite similar on both sides.

In terms of ethnicity, our investigations show that at least the southern and central parts of the border cut right through the traditional lands of ethnic groups within the Barito language family.[18] The logic of the current drawing of province borders is probably somewhat related to the historical geographical extension of the Banjarmasin sultanate and the Dutch colonial rule during the 19th century. However, all evidence points to that the border areas that we study were never clearly demarcated either culturally, politically or geographically. Hence, they should constitute a suitable study area for our analysis.

Figure 3 shows a more detailed map of the districts along the province borders on both islands that are included in the study. The dark blue districts are treatment areas whereas light blue districts are control units. In total, our main sample includes 49 districts.

Figure 3

4 Data and empirical strategy

4.1 Data

In this paper we make use of district, village level and household data. The first type of data that we use is district budget data collected annually by the Ministry of Finance. The data include information on types of revenue and areas of expenditure. The revenue components include numbers on natural resource related transfers that constitute our explanatory variable of interest. District level data also exist for regional gross domestic product (GRDP) and for the supply of specific public goods like road quality.

Our second type of data is village data taken from the census of Indonesian villages (PODES). This is collected every three years by Indonesian Institute of Statistics (BPS). We make use of the 2002, 2005 and 2008 waves. The PODES data include details on the presence of primary, junior-high and senior-high schools in villages.

The third type of data is household data taken from a large household survey called SUSENAS. This is collected every year by BPS. We make use of all waves between 2001 and 2009. The SUSENAS data include details at the individual level, like education, employment status and days/hours worked and details at the household level, like total, food and non-food average consumption.

[18] See maps on Indonesia in Ethnologue (2012).

4.2 Identification strategy

In the two sections below, we outline in detail the identification strategy and the econometric specifications for the district, village and household level analyses.

The legislative change in 1999 is the key exogenous intervention that we study in this paper. The change in policy generated automatically two groups: districts located in producing provinces and districts located in non-producing provinces. Below we check whether districts belonging to the first group have experienced a significant increase in the revenue associated with oil and gas transfers.

We first apply a straightforward Difference-in-Difference (DD) strategy exploiting data before and after the policy change. Since we have the precise georeferenced location of all the districts in the sample, we push the identification strategy one step further by restricting our analysis to districts within 120 kilometers from the closest border. We aggregate the observations from Sumatra and Kalimantan into one sample of 49 districts (not all of which had available info on district level in 2000). The main sample includes 15 treated districts and 34 control districts. Table 2A-2B show the descriptive statistics.

Table 2A: Descriptive statistics (district level) of control and treatment districts

Table 2B: Descriptive statistics (village, household and individual level) of control and treatment districts

Table 2A displays the statistics for control and treatment districts before and after the reform. Ideally, we would of course like to see balanced pre-treatment subsamples. On the revenue side in A), we see that the two types of districts are quite similar before the reform whereas government expenditure in B) is markedly higher in control districts.

The disaggregated data on local GDP in C) shows that the control and treatment districts are quite dissimilar. Control districts are substantially poorer pre-reform than treatment districts, even when excluding oil and gas (593 vs 925 USD per capita). These differences are most likely due to the fact that treatment districts belonged to provinces where oil had been extracted for decades before the reform. This heterogeneity should be kept in mind when interpreting the results for GDP. Road quality in D), on the other hand, seems to be better in control districts before the reform.

Table 2B shows the descriptive statistics on village, individual and household level for different variables during the reform period.

Within our restricted sample, we also use a continuous measure of the resource windfall in order to assess the more exact impact of a marginal increase in revenue. Figure 4 shows the distribution of resource revenues across treatment and control districts. Most control districts receive zero resource revenues but some control districts receive small amounts. These amounts are mainly revenues from other natural resources than oil and gas.

Figure 4: Distribution of Resource Revenues across treatment and control districts

4.3 Econometric specification

We estimate two main equations. The first is a straightforward Difference-in-difference regression with a binary treatment variable for districts in provinces that benefitted from the windfall after the 1999 legislative change:

$$y_{drt} = \beta_d + \sum_{t=1995}^{2000} \beta_{0t} \left(TREAT_d * YEAR_t \right) + \sum_{t=2001}^{2011} \beta_{1t} \left(TREAT_d * YEAR_t \right) + ISLAND_r * YEAR_t + \varepsilon_{drt}, \tag{2}$$

where y_{drt} is the (linear or logged) outcome in district d, island r at time t, β_d is a district fixed effect, $TREAT_d$ is a binary indicator for whether the district received the extra windfall ($TREAT_d = 1$) or not ($TREAT_d = 0$) after 1999, $ISLAND_r$ is an island dummy for either Sumatra or Kalimantan, $YEAR_t$ is the year fixed effect, and ε_{drt} is the error term clustered at the district level. Island-year fixed effects are captured by the coefficient for the interaction term $ISLAND_r * YEAR_t$.

Our outcomes of interest y_{drt} measure the district-year amounts of government revenues, expenditures, and GRDP. Our treatment variable $TREAT_d$ is interacted with $YEAR_t$ before and after the policy change in 1999. Obviously, if our empirial design is justified, we expect $\beta_{0t} = 0$ and non-significant. In this sense, the estimates for β_{0t} might be regarded as falsification tests. The key parameters of interest are β_{1t}. These coefficients should capture the true impact of the resource windfall on our outcome variables as long as there are no systematic differences between treatment and control districts (other than the resource windfall) that vary over time and are correlated with y_{drt} (identification assumption). If $\beta_{1t} > 0$, this means that treated districts experienced a greater increase in public revenue, expenditure, and GRDP after the legislative change than control districts.

Our second main specification allows for analyzing more closely the dynamics of the impact of the resource windfall. The equation is now

$$y_{drt} = \alpha_d + \alpha_0 REVENUES_{dt} + \alpha_1 REVENUES_{dt-1} + \alpha_2 REVENUES_{dt-2} + ISLAND_r * YEAR_t + \epsilon_{drt}. \tag{3}$$

Like before, y_{drt} is the outcome in district d, island r at time t, α_d is a district fixed effect and $ISLAND_r * YEAR_t$ estimates the island-specific time trend. The main variable of interest is now the continuous treatment variable $REVENUES_{dt}$ which measures the per capita resource revenues in constant prices in units of 100 USD. The regression coefficients α_0, α_1 and α_2 measure the relative impact of resources compared to control districts without any resource windfalls. The treatment variable is lagged up to two periods in order to highlight the dynamics of the impact. For instance, as discussed in the theoretical section, our conjecture is that the impact of the windfall on GDP and wages runs mainly through public services and labor productivity, which should imply a lagged effect on most outcomes of interest. Standard errors are clustered at district level.

When we switch to village and household level analysis in the later part of the empirical analysis, we still use equation (3) as the basic format with the important difference that the outcome variable is y_{idrt} for individual i in district d, on island r at time t. The treatment variable $REVENUES_{dt}$ is then still on district level.

5 Results

In this section, we track the resource windfalls through district government expenditure decisions, down to education, employment and expenditure outcomes on individual level. First, we study how district revenues and public good expenditures changed as a result of the fiscal decentralization reform. The second part investigates the impact of the windfall on district level GDP. We then move to household level analysis and investigate the impact of the windfall on education and employment outcomes. Lastly, we study the impact on household expenditures.

5.1 District level

5.1.1 Total revenue and expenditure

The first results concern district government revenues and expenditures. All budget measures are per capita and in constant prices. Figure 5 shows a first set of results, based upon the specification in (2). The graph shows the point estimates for each year before and after the reform during 1995-2010. All revenue and expenditure measures are expressed in million IDR (i.e., 100 USD) for convenience.

A very striking result is that, in 2001, revenues from natural resources in the upper left corner increases drastically in the treated districts. The peak is reached in 2006, when treated districts received about 120 USD per capita more than the control districts. The graph in the upper right corner confirms that this resource windfall indeed drives the net relative gains in total revenues.

Figure 5

An equally striking finding in the lower left corner shows that the relative level of locally managed taxes hardly changed at all after the reform. In other words, there are no signs that the treated districts lowered taxes in response to the windfall. The increased revenues allowed treated districts to boost expenditure significantly from at least 2002, as seen in the lower right corner. During the period, the treated districts typically spent about 50 USD more per capita than non-treated districts.

In Table 3, we use the specification in (3) where the windfall is a continuous measure that is different even among treated districts. The sample has 332-361 district-year observations from the post-reform period 2001-2010. Panel A shows the contemporaneous effect effect of the windfall in the same year whereas panel B shows the dynamics including also a one- and a two-year lag. Resource revenues are again expressed in units of 100 USD for convenience. Columns 1-4 show the results from the linear specification and columns 5-8 the log-linear specifications.

Table 3

Column 1 shows that a 100 USD flow of resource revenues leads to a contemporaneous increase in total revenues of about 93 USD. This immediate increase is well in line with the tendency in figure 5. However, total revenues are the sum of resource revenue, locally managed taxes and grants from the federal governments.

Column 2 shows the effect on grants (Panel A for the contemporaneous effect; Panel B for the lagged effect). Grants are largely dominated by a set of unconditional grants called DAU (Dana Alokasi Umum), which are allocated according to a formula, where resource revenues appear as negative term.[19] Importantly, these grants are allocated based on data dating back to one or two years before. It is therefore not surprising that: i) the effect of resource revenues on grants is negative; ii) such negative effect appears after two lags. The sum of the lagged effects on grants suggests a decrease of 23 USD (with a p-value lower than 0.01). Hence, the effect of resource revenues on grants seems to be second order relative to the direct effect on total revenue. In fact, the sum of the lagged effects on total revenue (Column 1) is still positive, large (73 USD) and precisely estimated. This demonstrates that the policy had a very substantial effect on local government revenue.

Column 3 shows the effect on total expenditure. Panel B suggests that a windfall of 100 USD increases expenditure by 67 USD one year after. The lagged response is consistent with the future resource revenues are unknown, and therefore can only be incorporated in the budget after the central government calculated them and distributed them. Since the level and composition of district expenditure is planned throughout the previous year (Fadliya and McLeod 2010), their effect on expenditure appears one year after their reception.

Hence, during the year of windfall, the local government and the local parliament plan the budget incorporating the resource windfall, as well as the partial compensation they expect in terms of grants.[20] The positive shock on total spending is positive and large, but not as large as the effect

[19] The formula is meant to work as a mechanism to redistribute wealth from rich to poor districts. Besides resource revenues, it is based on factors like population, Human Development Index, and local GDP.

[20] No regulation makes clear that such compensation takes place with an additional lag, so the local governments might not know this and adjust their expenditure fully and immediately for such compensation.

on total revenue: the local government actually planned to spend less than the shock because it anticipates the grant reduction; one year later (two years from the resource windfall), the negative shock on grants actually happens, but the estimates show that the total spending does not suffer from it. Numerically speaking, it is easy to check that the sum of all lags in total revenue (0.735) closely matches the sum of the first and second lag in total spending (0.672 + 0.095 = 0.767).

Column 4 shows the effect on local revenue, i.e., revenue raised through locally managed taxes. The estimates confirm once again the finding in figure 4 that the resource windfalls do not result in lower taxes. At least in the short run, we thus seem to observe a strong flypaper effect. The resource windfall stuck at the district government.

5.1.2 Expenditure composition

How is then the increase in district revenues spent? Table 4 reveals the impact of the windfall on expenditures disaggregated by function. As the means demonstrate, the four functions included in the table together make up about 80 percent of total expenditures.[21] Our discussion in the theoretical section suggested that local governments should, for instance, spend on public services that were complementary to each other like schools and roads. Column 2 suggests that a 100-dollar resource windfall in $t-1$ leads to a relative increase in expenditure on education by about 10 USD in the following year from a mean of about 38 USD. The equivalent net impact on infrastructure is even stronger; about 30 USD from a mean of 36 USD. However, the estimates for infrastructure are not significant. Interestingly, the net impact of the windfall on administration and housing expenditures are actually negative (although insignificant).

Table 4

Table 5 disaggregates district expenditure by category of public good. To start with, column 1 confirms the previous finding that expenditures appears to increase markedly in treated districts one year after the windfall.[22] The increase in staff in column 2 is statistically significant in panel A and the sum of the lags are jointly significant in panel B. From a mean of 60 USD per capita, the sum of lags 0.157 implies that a 100-dollar windfall for the years $t-1$ and $t-2$ gives rise to a relative increase in staff expenditure by about 25 percent of the initial mean in year t. Capital is the other major category, although the estimates are measured with less precision. In terms of our theoretical discussion, one explanation for the results regarding staff might be that personnel has the advantage of being a type of expenditure that can be increased in a continuous fashion whereas capital often requires lumpy investments.

Table 5

[21] The number is reached by summing all the means in columns 1-5 in panel B and then dividing by mean total expenditure (1.577) in table 3, column 3, panel B.

[22] Note that the lag structure is now different from that in table 3, which explains the different coefficients.

Combining the results in tables 4 and 5, one possible interpretation is that the resource windfall has resulted in an increase in non-administrative staff and in capital spending, mainly within education and infrastructure. In the analysis below, we will therefore pay particular attention to analyzing whether these spending booms have resulted in actual improvements "on the ground".

5.1.3 Local GDP

The first such assessment is found in table 6 where we analyze the relative impact of the windfall on district levels of GDP. In our theoretical framework, we proposed that increases in public goods should affect labor productivity with a lag and hence have a delayed positive effect on total GDP even outside the resource sector. It should also be kept in mind that districts obtaining the windfall typically had a higher level of GDP even before the reform.

Column 1 shows that total GDP increases very markedly two periods after the windfall. Column 3 shows that this effect is indeed very strong in the non-oil sectors of the district economies. 100-dollar resource windfalls in $t-2$ and $t-1$ increases district non-oil GDP by as much as 340 USD in year t. Even the estimate in panel B, column 3 (2.78) suggests a GDP growth that is equivalent to about 1/4 of the initial mean. This dramatic effect is probably the most surprising result of our study.[23]

Table 6

In table 7, we try to reach a more complete understanding of which sectors lead this very strong GDP effect. Column 1 indicates that the strongest effect by far is found in agriculture. The net effect of the two lagged windfalls in panel B is an increase of 128 USD (equivalent to a 36 percent increase compared to the total value of agricultural production). In manufacturing, there appears to be a crowding-out effect of windfalls from one period back but a positive effect after two periods but the effects are not jointly significant (panel B, column 2). Also hotels and restaurants experience a distinct boom as a result of the windfall, although it is much smaller in percentage terms than in agriculture.

Table 7

Combining the results so far, we have demonstrated increased spending on infrastructure, capital and staff, as well as a drastic increase in GDP led by the agricultural sector. One potential explanation to these facts could be that the windfalls were largely spent on materials and personnel employed to work on infrastructure that benefitted the rural countrysides of Sumatra and Kali-

[23] Note that this effect should not be interpreted as a local fiscal multiplier since such multipliers estimate the effect of government *spending* rather than *revenue* on GDP.

mantan. The most obvious type of infrastructure is local roads.[24] Did these actually improve as a result of the increased spending?[25]

In table 8, we have compiled some evidence on the net effect of resouce windfalls on the actual quality of local roads in our sample districts. The results indicate that the share of roads with asphalt has increased by about 10 percent (18 percent relative to the mean) as a result of the windfall treatment. The share with asphalt and gravel has also increased. On the other hand, estimates for the share of roads in good, or even fair, conditions are more mixed: the comtemporaneous effect is positive and large (but imprecisely estimated), whiled the lagged estimates are negative (and marginally significant). While the two sets of results are not easily interpreted in combination, note that data on the share of roads with asphalt (and gravel) are available for four waves (2002, 2005, 2008, 2011), while data for the share of roads in good (or fair) conditions are available only for two waves (2002, 2008). Hence, the first set of estimates might be more reliable than the second.

Table 8

5.2 Village level

One of the clearest results from the analysis of spending patterns in table 4 was that education expenditures increased one year after a resource windfall. A 100-dollar windfall resulted in about 10 USD per capita trickling down to schools. But does this money actually lead to observed improvements in the villages of each district?

In this section, we exploit village level data to analyze whether the resource revenue resulted in more schooling facilities in the villages. As before, our sample contains villages in districts close to the border between provinces that received the windfalls and those that did not. Our results are shown in table 9, where the dependent variable is a binary dummy for whether there is a primary, a junior high, or a senior high school in the village.

Table 9

Column 1 indicates that the probability of finding a primary school in a village increased by 2.8 percent as a result of a 100-dollar windfall on district level. Column 2 shows a similar effect for junior high schools: the probability of finding a junior high school in a village increased by 4.3 percent following a 100-dollar windfall. No robust results of the windfall can be traced for the presence of a senior high school in the villages.

[24] See Casaburi, Glennerster and Suri (2013), and references therein, for evidence on the effect of rural roads on development.

[25] Note that our theoretical discussion incorporates the possibility that a substantial portion of expenditures might disappear in the hands of corrupt public officials. Olken's (2007) study of road construction on Java showed that about 25 percent of allocated funds went missing, probably due to local capture.

Since junior high schools are much more rare than primary schools in villages, the relative magnitudes are very different. The effect for primary schools correspond to a 3.2 percent increase relative to the mean (0.865), while the effect for junior high schools correspond to a 14 percent increase relative to the mean (0.303). This is consistent with district governments rightly targeting disproportionately junior high school education, where enrollment is relatively low, rather than primary school education, where enrollment is nearly universal.

5.3 Household level

5.3.1 Schooling

In this section, we use household data on invidual level outcomes. We saw from tables 4-5 that district spending on education and on non-administrative staff had increased as a result of the windfall. Table 9 showed that the presence of primary and junior high schools increased in the villages that received a windfall. Are these improvements also reflected in schooling choices and outcomes on household level?

In table 10, we show the impact of the windfall on school enrollment and completion in primary, junior high, and senior high school.[26] The sample includes all children in the relevant ages in our included districts. In, for instance, column 1, we analyze primary school enrollment among 111,280 children aged 7-12. This level is actually mandatory for all children in Indonesia, as indicated by the very high mean (98.5 percent were enrolled before the reform). Still, the standard resource windfall of 100 USD appears to have resulted in an increase of about 0.8 percent in primary school enrollment and about 1.5 percent increase in primary school completion.

Table 10

Also junior high school is mandatory, according to a law from 1994.[27] However, enrollment before the reform was only 57.7 percent. The coefficients for enrollment are insignificant but the impact on completion is positive and significant. The standard windfall size increases junior high school completion by about 4 percent, which corresponds to a 7.3 percent increase relative to the mean (0.518). This effect is roughly of the same magnitude as implied by the coefficients for senior high school enrollment (4.3 percent, i.e., 10.7 percent relative to the mean). Households in windfall districts also experienced a significant increase in senior high school completion (1.7 percent, i.e., 5.6 percent relative to the mean).

The outcome variable in column 7 provides a summary statistic for education; years of schooling. Among children and youth aged 10-22, a 100-dollar windfall resulted in an increse in about 0.13

[26] Pupils in Indonesia typically graduate from primary school at age 12, from junior high school at age 15 and from senior high school at age 18.

[27] Senior high school was not mandatory during the period covered by our study but became mandatory in 2013 (Jakarta Post, 2013).

years of eduction, which corresponds to a 1.7 percent increase relative to the mean (7.57 years). Even more importantly perhaps, column 8 has an actual vital skill as the outcome variable; literacy among young 180,000 individuals. The sum of lags in panel B implies that lagged windfalls increased literacy by roughly 2 percent, equivalent to about 3600 individuals. In total, it therefore seems as if the incresed spending on education also resulted in improvements in actual outcomes on individual level.

5.3.2 Labor market

Tables 11-12 show the impact on labor markets in terms of employment status and actual hours worked. The only significant effect in table 11 is found in column 5, showing the linear probability of employment in agriculture among 25-54 year old males (1.8 percent decrease, i.e., 3.1 percent decrease relative to the mean). Interestingly, the net effect of the windfall is negative on agricultural employment. Combined with the previous result that value added in agriculture increased substantially due to the windfall, a picture emerges of great labor productivity increases, possibly due to important increases in public goods and services benefitting agriculture. Column 8 further suggests that some of the redundant male rural workers actually ended up as formal employees.

Table 11

The dependent variables in table 12 are the actual number of days and hours worked per week among adult men and women. In the theoretical section, we discussed whether the likely increase in labor demand emanating from the increase in labor productivity should be expected to be accompanied by an increase in labor supply. Whereas the result of the windfall on working days are not significant in columns 1-2, quite interesting effects appear in columns 3-4 of panel B. Both men and women appear to increase the number of hours worked one period after a windfall but then decrease hours worked after two years. The net effect for men in column 4 is a negative and significant change in hours worked, whereas the net effect on women is about 1 hour more work per week. The results are consistent with an explanation where men choose to decrease labor supply as a result of a wage increase since they already work a lot every week (on average 41.3 hours) and hence should earn a relatively high amount. Women, who are less likely to work at all and who worked less hours before the reform, choose instead to increase their labor supply somewhat.

Table 12

5.3.3 Household consumption

Finally, in table 13, we investigate the impact of resource windfalls on household consumption expenditures. In our model, as well as in most other macro models, individuals get utility from the discounted sum of lifetime consumption. Hence, the impact on household consumption should be a very important indicator of the welfare gains of the reform. In the theoretical section, we suggested that whereas wages and thus household incomes most likely increased due to labor productivity improvements, household expenditures might not increase dramatically if individuals viewed the windfall as temporary and had good options for saving.

Table 13

The total effects on household expenditure in columns 1-3 certainly seem to imply a fairly strong increase, although the estimates are not significant in panel B. Interestingly, it turns out that the increase in expenditure derives mainly from the increase in non-food consumption. The sum of lags in column 5, panel B imply that 100-dollar windfalls in years $t-1$ and $t-2$ gives rise to a significant net increase in non-food consumption of 67 dollars. This increase is equivalent to a rise by about 19 percent compared to the pre-reform mean. Furthermore, judging by the parameters, most of the windfall appears to be consumed in the short term rather than being saved. We leave it for future research to investigate this relationship further. The main tendency of a boom in consumption, and thus also in standards of living, is however very clear.

6 Discussion

Although we think our results raises several interesting questions of interpretation, we will mainly focus on four aspects: i) The flypaper effect, ii) the large increase in regional GDP, iii) the improvements in education, and iv) overall interpretation and the effect on welfare.

To start with, our results clearly indicate a flypaper effect. A 100 USD resource windfall leads to a contemporaneous increase of 93 USD in total revenue, and a total 74 USD increase over a two years period (thanks to the partial reduction in inter-governmental transfers). Total expenditure increases by 67 USD after one year and 76 USD over the same two years period, which suggests that the local government spent all additional revenue. Consistent with this, local tax revenue revenue does not respond to the resource windfall. Hence, it appears that money tended to stick pretty firmly at local governments.

Second, how can we explain the very strong lagged effect on regional GDP per capita? The result is even more striking considering that treated districts had substantially higher incomes already before the reform. On the basis of our theoretical framework, we propose the following interpretation. The windfall revenue boosted education and infrastructure spending and our objective measures of road quality suggest a clear improvement. Although we do not know the detailed allocation of the infrastructure budget, our conjecture is that it also helped to improve other important parts of the logistical network. In particular, the very strong increase in agricultural production might potentially have been partly caused by the improvements in rural infrastructure. Still, the magnitude of the effects in table 6 are extraordinary (GDP increases by a factor of 2.7) and calls for further work. They also stand in sharp constrast to some results reported in the literature on the resource curse where extra oil money sometimes even lead to lower GDP growth. Considering that treated districts had a much higher pre-reform income, we should however be cautious about our interpretations of these results.

Third, our findings indicate that much of the windfall from the reform was spent on education. The increased spending resulted in more junior high schools on village levels and an almost 15 percentage point higher rate of junior high school completion. Perhaps the most important results in terms of actual human capital improvements were probably that overall schooling increased with 0.14 years and that literacy increased by about 2 percent. This can be compared with the results from Brazil reported in Litschig and Morrison (2013) of a 0.3 extra years of education and a 4 percent increase in literacy. The investments in education should have a positive effect on Sumatra and Kalimantan districts in the longer term.

In order to interpret the magnitude of these effects, we can also compute the marginal cost of an additional year of schooling implied by these estimates. We know that a 100 USD increase in resource revenues led to a 7.5 USD increase in education spending per capita (Table 4, Column 2). Assuming this spending benefitted primarily young people between 10 and 22 years old, which constitute about 28 percent of the population, the increase in education spending amounts to 27 USD per *school-aged individual*. We also know that the same revenue shock led to a 0.14 increase in years of schooling (Table 10, Column 7), i.e., for example, one out of seven pupils completed an additional year of schooling. The implied marginal cost of this additional year of schooling is therefore USD 27/0.14=193 USD. We can compare this cost with the average cost of schooling implied by the data. The average annual education spending per capita is 0.385, i.e., 38.5 USD (Table 4, Column 2). Assuming again that this is entirely spent on pupils aged 10-22, the average cost of a year of schooling ranges from 137 USD and 220 USD.[28]

The similarity of the marginal cost to the average cost not only suggests that our estimates are plausible, but also suggests that the additional education funds, which the resource windfalls generated, might not have been embezzled on a large scale.

Fourth, our theoretical framework suggests that whereas (unobserved) wages, mainly in agriculture, should have been boosted as a result of the labor productivity increase, the lack of effects in terms of employment might be explained by a backward-bending or fixed labor supply curve. Such a shape of labor supply would strengthen the increase in wages from a rise in labor productivity. This interpretation is consistent with the fact that household expenditures increased by substantial amounts, in particular non-food consumption.

In summary, our results show that positive effects from the 1999 reform can be observed through-

[28] The average cost of a year of schooling corresponds to 137 USD if we simply divide 38.5 USD by 0.28 (percentage of pupils aged 10-22). It corresponds to 220 USD if we divide it further by 0.625, which could be a rough measure of completed years of schooling for each started year of schooling (Litschig and Morrison 2013). The survey questionnaire does not make clear whether it measures years or completed years of schooling.

out our different observation points, from district revenues down to household level effects. The overall picture that emerges is one of oil money that sticks at local government but is then spent on public goods which greatly boosts GDP and household consumption. In this simple sense, the reform has certainly had clear positive effects for the communities and our study do not show any signs of a resource curse being present.

7 Conclusions

In this paper, we study the impact of a fiscal decentralization programme in Indonesia that provided districts in producing provinces with a greater share of resource revenues from oil and gas. We argue that our research design with cross-border comparisons between districts in two natural-resource rich regions makes it possible to analyze the new policy as a natural experiment. Our main research question is whether the windfall in local government revenue actually led to an observed increase in the provision of local public goods, such as education, on district, village and household level.

Our results suggest that a flypaper effect was evident in the district governments, that spending on education and infrastructure increased, resulting in more schools in villages, more high school attendance, a higher literacy and better roads. The windfall appears to have caused a dramatic increase in regional GDP which was led by a boost to agriculture. The increase in incomes is also evident on household level where household expenditures increased a lot.

Overall, the 1999 fiscal decentralization reform thus displayed mainly positive effects and no symptoms of increased corruption or other pathologies associated with the resource curse. We believe the Indonesian fiscal decentralization program might provide poor, resource-abundant countries with an interesting policy experiment that has not previously been widely tested in countries throughout the world.

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TABLE 1: ALLOCATION OF REVENUES FROM NATURAL RESOURCES

	Before 2001			After 2001			
	Center	Province	Districts	Centre	Province	Districts	
		Producing			Producing		Non-prod
Resources studied							
Oil	100	0	0	84.5	3.1	6.2	6.2
Gas	100	0	0	69.5	6.1	12.2	12.2
Other resources							
Mining, land rent	65	19	16	20	16	6.4	0
Mining, royalties	30	56	14	20	16	32	32
Forestry	55	30	15	20	16	32	32

Note: All numbers in the table are percentages. Source: World Bank (1994) and Law 25/1999.

TABLE 2A

DESCRIPTIVE STATISTICS AT THE DISTRICT LEVEL

	YEAR = 2000						YEAR >=2001								
	CONTROL			TREATMENT			CONTROL			TREATMENT			TOTAL		
	obs	mean	s.d.	obs	mean	s.d.	obs	mean	s.d.	obs	mean	s.d.	obs	mean	s.d.
A) Revenue															
Total Revenue	23	0,38	0,19	10	0,36	0,13	320	1,44	0,81	158	2,03	1,28	478	1,63	1,02
Grants	23	0,29	0,16	10	0,27	0,11	317	1,00	0,60	158	0,55	0,35	475	0,85	0,57
Resource Revenues	23	0,02	0,02	10	0,00	0,00	301	0,13	0,19	148	1,03	0,85	449	0,42	0,66
Tax Revenue Sharing	23	0,05	0,04	10	0,06	0,03	315	0,15	0,12	156	0,27	0,31	471	0,19	0,21
Local Tax Revenue	23	0,02	0,02	10	0,02	0,02	317	0,07	0,11	157	0,10	0,09	474	0,08	0,10
Other Revenue	9	0,00	0,01	5	0,02	0,01	308	0,12	0,10	148	0,16	0,19	456	0,13	0,14
B) Expenditure															
B.1) Economic Categorization															
Total Expenditure	21	0,41	0,18	11	0,28	0,18	287	1,40	0,82	143	1,91	1,42	430	1,57	1,08
Staff Expenditure	N/A						284	0,61	0,32	143	0,59	0,37	427	0,61	0,33
Capital Expenditure	N/A						283	0,43	0,40	142	0,75	0,80	425	0,54	0,59
Goods and Services Expenditure	N/A						282	0,27	0,17	143	0,39	0,27	425	0,31	0,21
Other Expenditure	N/A						276	0,10	0,07	139	0,19	0,15	415	0,13	0,11
B.2) Functional Categorization	N/A														
Administration	N/A						216	0,44	0,37	112	0,67	0,55	328	0,52	0,45
Education	N/A						264	0,40	0,22	131	0,35	0,21	395	0,39	0,22
Infrastructure	N/A						261	0,30	0,28	131	0,54	0,69	392	0,38	0,47
Housing and Urban Infrastructure	N/A						170	0,03	0,06	78	0,09	0,20	248	0,05	0,12
C) Local GDP															
Including Oil and Gas	23	6,21	3,05	11	18,13	12,13	297	9,08	4,37	145	21,77	11,60	442	13,24	9,61
Excluding Oil and Gas	23	5,93	2,54	11	9,25	4,10	297	8,35	3,68	145	14,81	7,55	442	10,47	6,08
Agriculture	23	2,29	0,86	11	3,74	2,21	297	2,80	1,23	145	5,35	4,03	442	3,64	2,79
Manufacturing	23	0,82	1,00	11	4,21	7,33	297	1,12	1,35	145	4,70	6,66	442	2,29	4,31
Trade, Retail, Hotels and Restaurants	23	0,98	0,48	11	1,69	2,46	297	1,26	0,63	145	1,95	1,99	442	1,49	1,29
D) Roads															
Share with Asphalt	21	0,60	0,21	9	0,46	0,21	124	0,58	0,22	60	0,48	0,24	184	0,55	0,23
Share with Asphalt or Gravel	21	0,81	0,15	9	0,70	0,16	124	0,81	0,17	60	0,77	0,17	184	0,80	0,17
Share in Good Conditions	19	0,28	0,14	6	0,17	0,05	52	0,20	0,15	24	0,23	0,24	76	0,21	0,18
Share in Good or Fair Conditions	19	0,53	0,14	6	0,40	0,08	52	0,41	0,16	24	0,53	0,20	76	0,45	0,18
Observations	24			12			332			160			492		

Note: District level data from Ministry of Finance and World Bank. Revenue, expenditure and local GDP indicators are in million IDR (i.e., 100 USD) and constant prices.

TABLE 2B

DESCRIPTIVE STATISTICS AT THE VILLAGE, HOUSEHOLD AND INDIVIDUAL LEVEL

	CONTROL			TREATMENT			TOTAL		
	obs	mean	s.d.	obs	mean	s.d.	obs	mean	s.d.
PANEL A: VILLAGE LEVEL									
Education infrastructures									
Primary School in the village	16272	0,84	0,37	6751	0,95	0,21	23023	0,87	0,34
Junior High School in the village	16272	0,26	0,44	6751	0,40	0,49	23023	0,30	0,46
Senior High School in the village	16272	0,13	0,33	6751	0,18	0,38	23023	0,14	0,35
Observations	16272			6751			23023		
PANEL B: INDIVIDUAL LEVEL									
Schooling									
Primary school, enrolled (7-12 years)	91224	0,99	0,12	45256	0,98	0,13	136480	0,98	0,12
Primary school, completed (12-15)	57725	0,65	0,48	28507	0,65	0,48	86232	0,65	0,48
Junior high school, enrolled (12-15)	58020	0,58	0,49	28692	0,58	0,49	86712	0,58	0,49
Junior high school, completed (15-18)	54542	0,52	0,50	26735	0,52	0,50	81277	0,52	0,50
Senior high school, enrolled (15-18)	54889	0,41	0,49	26943	0,41	0,49	81832	0,41	0,49
Senior high school, completed (18-22)	57443	0,31	0,46	29833	0,33	0,47	87276	0,31	0,46
Schooling, years of (10-22)	172968	7,58	2,90	86765	7,60	2,96	259733	7,58	2,92
Literacy (6-15)	148235	0,88	0,32	73448	0,88	0,32	221683	0,88	0,32
Employment									
Working	509049	0,58	0,49	255579	0,52	0,50	764628	0,56	0,50
Working (25-54 years)	260839	0,78	0,42	133684	0,70	0,46	394523	0,75	0,43
Working, female (25-54)	130674	0,58	0,49	65645	0,43	0,49	196319	0,53	0,50
Working, male (25-54)	130165	0,97	0,16	68039	0,97	0,18	198204	0,97	0,17
Working in agriculture, male (25-54)	126551	0,58	0,49	65828	0,56	0,50	192379	0,57	0,49
Self-employed, male (25-54)	126551	0,63	0,48	65828	0,57	0,50	192379	0,61	0,49
Employed, male (25-54)	126551	0,28	0,45	65828	0,35	0,48	192379	0,30	0,46
Work days, female (25-54)	55558	5,63	1,56	20148	5,71	1,45	75706	5,65	1,53
Work days, male (25-54)	96022	5,95	1,24	49947	6,01	1,17	145969	5,97	1,22
Work hours, female (25-54)	55558	33,60	15,35	20147	33,97	16,31	75705	33,70	15,61
Work hours, male (25-54)	96020	41,07	14,59	49946	41,46	15,35	145966	41,20	14,85
Observations	569472			285627			855099		

PANEL C: HOUSEHOLD LEVEL									
Household Expenditure									
Average monthly expenditure, total	141334	948 851	615 730	68738	1 136 625	825 427	210072	1 010 293	696 971
Average monthly expenditure, food	141334	635 922	324 350	68738	703 929	380 487	210072	658 175	345 206
Average monthly expenditure, non-food	141334	312 929	400 084	68738	432 696	576 028	210072	352 118	468 422
Observations	141334			68738			210072		

Note: Village level data in Panel A come from PODES 2002, 2005, 2008; individual and household level data in Panel B and C come from Susenas 2001-2009. "Work days" and "work hours" refer to the previous week. Average household expenditure measured in million IDR (i.e., 100 USD) at constant prices.

TABLE 3: TOTAL REVENUE AND EXPENDITURE

MODEL	LINEAR				LOG-LINEAR			
VARIABLES	TOTAL REVENUE	GRANTS	TOTAL EXPENDITURE	OWN REVENUE	TOTAL REVENUE	GRANTS	TOTAL EXPENDITURE	OWN REVENUE
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
PANEL A: CONTEMPORANEOUS EFFECT								
RESOURCE REVENUES	0.926***	-0.080	0.354	0.043	0.207***	-0.057	0.073	0.031
	(0.071)	(0.080)	(0.262)	(0.028)	(0.047)	(0.036)	(0.049)	(0.020)
Mean	1.648	0.768	1.582	0.0824				
R-squared	0.768	0.453	0.667	0.115	0.756	0.416	0.731	0.151
Observations	449	446	403	445	449	446	403	445
Number of districts	49	49	49	49	49	49	49	49
Number of clusters	29	29	29	29	29	29	29	29
PANEL B: DYNAMICS								
RESOURCE REVENUES	0.957***	0.091	-0.199	0.031	0.258***	0.052	-0.000	0.019
	(0.079)	(0.068)	(0.211)	(0.040)	(0.053)	(0.039)	(0.057)	(0.026)
L1.RESOURCE REVENUES	-0.034	-0.018	0.672***	0.002	-0.015	-0.009	0.108**	0.003
	(0.124)	(0.070)	(0.200)	(0.024)	(0.024)	(0.034)	(0.051)	(0.016)
L2.RESOURCE REVENUES	-0.188***	-0.301***	0.095	0.022	-0.089***	-0.187***	-0.029	0.017
	(0.051)	(0.055)	(0.274)	(0.017)	(0.023)	(0.033)	(0.052)	(0.011)
Sum lags	0.735	-0.229	0.568	0.0553	0.154	-0.144	0.0790	0.0383
Sum lags se	0.162	0.113	0.353	0.0363	0.0573	0.0562	0.0792	0.0229
Sum lags p	9.47e-05	0.0517	0.119	0.139	0.0118	0.0158	0.327	0.106
Joint P	0	3.32e-06	0.0115	0.411	0.000215	3.73e-08	0.221	0.266
Main diff from sum lags p	0.109	0.00330	0.0159	0.318	0.00588	0.00218	0.182	0.260
Mean	1.646	0.755	1.577	0.0871				
R-squared	0.758	0.559	0.654	0.111	0.790	0.545	0.723	0.135
Observations	361	358	332	359	361	358	332	359
Number of districts	48	48	48	48	48	48	48	48
Number of clusters	29	29	29	29	29	29	29	29

Resource revenues are per capita and in constant (2005) prices. They are expressed in million IDR (i.e., 100 USD). Standard errors (in brackets) clustered at the district level, using district boundaries as in 1993. All specifications include year fixed effects and district fixed effects. The sample period is 2001-2010. All outcomes are also expressed in per capita terms, constant (2005) prices and million IDR (i.e., 100 USD) unless otherwise specified.

TABLE 4: LOCAL GOV EXPENDITURE (BY FUNCTION)

MODEL	LINEAR				LOG-LINEAR			
VARIABLES	ADMIN	EDU-CATION	INFRASTR.	HOUSING	ADMIN	EDU-CATION	INFRASTR.	HOUSING
	(1)	(2)	(3)	(4)	(8)	(9)	(10)	(11)
PANEL A: CONTEMPORANEOUS EFFECT								
L1.RESOURCE REVENUES	-0.132	0.0907*	0.308	-0.0764	-0.0504	0.0567*	0.0705	-0.0535
	(0.213)	(0.0446)	(0.182)	(0.0840)	(0.0754)	(0.0316)	(0.0777)	(0.0575)
Mean	0.509	0.385	0.370	0.0463				
R-squared	0.195	0.618	0.414	0.278	0.280	0.600	0.499	0.297
Observations	300	371	368	242	300	371	368	242
Number of districts	45	49	49	49	45	49	49	49
Number of clusters	29	29	29	29	29	29	29	29
PANEL B: DYNAMICS								
L1.RESOURCE REVENUES	-0.116	0.109*	0.174	-0.0705	-0.0365	0.0672	0.0312	-0.0498
	(0.168)	(0.0582)	(0.168)	(0.0596)	(0.0569)	(0.0414)	(0.0893)	(0.0378)
L2.RESOURCE REVENUES	0.00155	-0.0341	0.117	-0.0360	0.00178	-0.0217	0.0220	-0.0178
	(0.0819)	(0.0403)	(0.171)	(0.0639)	(0.0391)	(0.0296)	(0.0644)	(0.0437)
Sum lags	-0.114	0.0750	0.292	-0.107	-0.0347	0.0455	0.0532	-0.0676
Sum lags se	0.229	0.0478	0.199	0.117	0.0837	0.0345	0.0795	0.0750
Sum lags p	0.623	0.128	0.154	0.368	0.681	0.198	0.509	0.375
Joint P	0.659	0.183	0.347	0.433	0.746	0.277	0.787	0.341
Mean	0.498	0.379	0.357	0.0443				
R-squared	0.169	0.610	0.384	0.298	0.244	0.591	0.462	0.320
Observations	279	349	346	238	279	349	346	238
Number of districts	45	48	48	48	45	48	48	48
Number of clusters	29	29	29	29	29	29	29	29

Resource revenues are per capita and in constant (2005) prices. They are expressed in million IDR (i.e., 100 USD). Standard errors (in brackets) clustered at the district level, using district boundaries as in 1993. All specifications include year fixed effects and district fixed effects. The sample period is 2001-2010. All outcomes are also expressed in per capita terms, constant (2005) prices and million IDR (i.e., 100 USD) unless otherwise specified.

TABLE 5: LOCAL GOVERNMENT EXPENDITURE

MODEL	LINEAR					LOG-LINEAR				
VARIABLES	TOTAL	STAFF	CAPITAL	GOODS AND SERVICES	OTHER EXP	TOTAL	STAFF	CAPITAL	GOODS AND SERVICES	OTHER EXP
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
PANEL A: CONTEMPORANEOUS EFFECT										
L1.RESOURCE REVENUES	0.482**	0.114**	0.266*	0.0660*	0.0319	0.0438	0.0510***	0.0328	0.0297	0.0247
	(0.188)	(0.0428)	(0.131)	(0.0367)	(0.0215)	(0.0454)	(0.0183)	(0.0550)	(0.0200)	(0.0176)
R-squared	0.687	0.707	0.537	0.351	0.184	0.726	0.747	0.636	0.373	0.200
Observations	397	397	394	395	385	397	397	394	395	385
Number of districts	49	49	49	49	49	49	49	49	49	49
Number of clusters	29	29	29	29	29	29	29	29	29	29
Mean	1.573	0.609	0.533	0.312	0.129					
PANEL B: DYNAMICS										
L1.RESOURCE REVENUES	0.442**	0.0713	0.209	0.0916**	0.0567***	0.0702	0.0340	0.0375	0.0496**	0.0463***
	(0.203)	(0.0449)	(0.157)	(0.0403)	(0.0192)	(0.0554)	(0.0216)	(0.0718)	(0.0236)	(0.0159)
L2.RESOURCE REVENUES	0.0336	0.0862***	0.0194	-0.0133	-0.0404**	-0.0428	0.0377***	-0.0327	-0.0125	-0.0336**
	(0.191)	(0.0303)	(0.159)	(0.0213)	(0.0187)	(0.0386)	(0.0132)	(0.0563)	(0.0132)	(0.0146)
Sum lags	0.476	0.157	0.228	0.0783	0.0164	0.0274	0.0717	0.00478	0.0371	0.0126
Sum lags se	0.219	0.0492	0.147	0.0376	0.0300	0.0520	0.0202	0.0608	0.0229	0.0239
Sum lags p	0.0380	0.00343	0.132	0.0466	0.590	0.602	0.00140	0.938	0.117	0.601
Joint P	0.0666	0.00526	0.252	0.0905	0.000990	0.382	0.00122	0.824	0.125	0.00106
Mean	1.544	0.599	0.518	0.308	0.128					
R-squared	0.666	0.738	0.500	0.375	0.198	0.722	0.773	0.609	0.396	0.218
Observations	373	373	370	371	365	373	373	370	371	365
Number of districts	48	48	48	48	48	48	48	48	48	48
Number of clusters	29	29	29	29	29	29	29	29	29	29

Resource revenues are per capita and in constant (2005) prices. They are expressed in million IDR (i.e., 100 USD). Standard errors (in brackets) clustered at the district level, using district boundaries as in 1993. All specifications include year fixed effects and district fixed effects. The sample period is 2001-2010. All outcomes are also expressed in per capita terms, constant (2005) prices and million IDR (i.e., 100 USD) unless otherwise specified.

TABLE 6: EFFECT ON GROSS REGIONAL DOMESTIC PRODUCT (GRDP)

MODEL	LINEAR			LOG-LINEAR		
VARIABLES	GRDP INCL. OIL	MINING/ QUARRYING	GRDP EXCL. OIL	GRDP INCL. OIL	MINING/ QUARRYING	GRDP EXCL. OIL
	(1)	(2)	(3)	(4)	(5)	(6)
PANEL A: CONTEMPORANEOUS EFFECT						
L1.RESOURCE REVENUES	2.817	1.729	2.678***	0.0764	0.119	0.114*
	(1.873)	(1.383)	(0.872)	(0.0696)	(0.0884)	(0.0567)
Mean	13.44	3.369	10.57			
R-squared	0.458	0.166	0.522	0.599	0.332	0.652
Observations	399	399	399	399	399	399
Number of districts	49	49	49	49	49	49
Number of clusters	29	29	29	29	29	29
PANEL B: DYNAMICS						
L1.RESOURCE REVENUES	0.540	0.743	0.624	0.0544	0.0704	0.0628
	(1.536)	(1.092)	(0.498)	(0.0579)	(0.0552)	(0.0468)
L2.RESOURCE REVENUES	3.277**	1.068	2.783***	0.0225	0.0351	0.0779**
	(1.307)	(0.743)	(0.946)	(0.0472)	(0.0905)	(0.0358)
Sum lags	3.817	1.811	3.407	0.0769	0.106	0.141
Sum lags se	2.363	1.726	1.059	0.0924	0.122	0.0714
Sum lags p	0.117	0.303	0.00327	0.412	0.394	0.0587
Joint P	0.0494	0.305	0.0120	0.647	0.452	0.107
Mean	13.49	3.324	10.58			
R-squared	0.490	0.167	0.563	0.601	0.325	0.662
Observations	367	367	367	367	367	367
Number of districts	47	47	47	47	47	47
Number of clusters	29	29	29	29	29	29

Resource revenues are per capita and in constant (2005) prices. They are expressed in million IDR (i.e., 100 USD). Standard errors (in brackets) clustered at the district level, using district boundaries as in 1993. All specifications include year fixed effects and district fixed effects. The sample period is 2001-2010. All outcomes are also expressed in per capita terms, constant (2005) prices and million IDR (i.e., 100 USD) unless otherwise specified.

TABLE 7: EFFECT ON GROSS REGIONAL DOMESTIC PRODUCT (GRDP)

MODEL	LINEAR			LOG-LINEAR		
VARIABLES	AGRICULTURE	MANUFACT.	TRADE/ HOTEL/REST.	AGRICULTURE	MANUFACT.	TRADE/ HOTEL/REST.
	(1)	(2)	(3)	(4)	(5)	(6)
PANEL A: CONTEMPORANEOUS EFFECT						
L1.RESOURCE REVENUES	0.912*	0.0570	0.141*	0.128**	0.0369	0.0569*
	(0.457)	(0.273)	(0.0776)	(0.0619)	(0.0513)	(0.0318)
Mean	3.588	2.393	1.532			
R-squared	0.384	0.165	0.441	0.435	0.378	0.538
Observations	399	399	399	399	399	399
Number of districts	49	49	49	49	49	49
Number of clusters	29	29	29	29	29	29
PANEL B: DYNAMICS						
L1.RESOURCE REVENUES	0.287	-0.430	0.0214	0.0769	0.00743	0.0217
	(0.178)	(0.293)	(0.0776)	(0.0474)	(0.0382)	(0.0276)
L2.RESOURCE REVENUES	0.998*	0.904	0.218**	0.0889**	0.0662	0.0576**
	(0.522)	(0.532)	(0.0867)	(0.0380)	(0.0517)	(0.0237)
Sum lags	1.284	0.474	0.239	0.166	0.0736	0.0794
Sum lags se	0.629	0.408	0.0941	0.0777	0.0669	0.0390
Sum lags p	0.0508	0.256	0.0168	0.0416	0.281	0.0512
Joint P	0.139	0.228	0.0317	0.0813	0.449	0.0629
Mean	3.547	2.476	1.559			
R-squared	0.415	0.189	0.469	0.446	0.391	0.563
Observations	367	367	367	367	367	367
Number of districts	47	47	47	47	47	47
Number of clusters	29	29	29	29	29	29

Resource revenues are per capita and in constant (2005) prices. They are expressed in million IDR (i.e., 100 USD). Standard errors (in brackets) clustered at the district level, using district boundaries as in 1993. All specifications include year fixed effects and district fixed effects. The sample period is 2001-2010. All outcomes are also expressed in per capita terms, constant (2005) prices and million IDR (i.e., 100 USD) unless otherwise specified.

TABLE 8: ROADS

MODEL	LINEAR			
VARIABLES	SHARE WITH ASPHALT	SHARE WITH ASPHALT/ GRAVEL	SHARE IN GOOD CONDITION	SHARE IN GOOD/ FAIR CONDITION
	(1)	(2)	(3)	(4)
PANEL A: CONTEMPORANEOUS EFFECT				
L1.RESOURCE REVENUES	0.099***	0.058**	0.129	0.156
	(0.026)	(0.027)	(0.171)	(0.244)
Mean	0.545	0.797	0.208	0.451
R-squared	0.342	0.375	0.091	0.056
Observations	165	165	70	70
Number of districts	49	49	44	44
Number of clusters	29	29	29	29
PANEL B: DYNAMICS				
L1.RESOURCE REVENUES	0.069**	0.024	-0.093*	-0.183*
	(0.025)	(0.027)	(0.050)	(0.103)
L2.RESOURCE REVENUES	0.033**	0.027	-0.048	-0.058
	(0.014)	(0.016)	(0.031)	(0.069)
Sum lags	0.102	0.0510	-0.141	-0.241
Sum lags se	0.0223	0.0207	0.0774	0.145
Sum lags p	8.98e-05	0.0204	0.0792	0.108
Joint P	0.000145	0.0168	0.197	0.221
Mean	0.563	0.806	0.220	0.473
R-squared	0.366	0.391	0.072	0.165
Observations	146	146	59	59
Number of districts	48	48	41	41
Number of clusters	29	29	29	29

Resource revenues are per capita and in constant (2005) prices. They are expressed in million IDR (i.e., 100 USD). Standard errors (in brackets) clustered at the district level, using district boundaries as in 1993. All specifications include year fixed effects and district fixed effects. The sample period is 2002,2005,2008,2011 (Col.1-2) and 2002,2008 (Col.3 and 4). All dependent variables are binary indicators.

TABLE 9: EDUCATION OUTCOMES: SCHOOLS

MODEL	LINEAR		
VARIABLES	PRIMARY SCHOOL IN VILLAGE	JUNIOR HIGH SCHOOL IN VILLAGE	SENIOR HIGH SCHOOL IN VILLAGE
	(1)	(2)	(3)
PANEL A: CONTEMPORANEOUS EFFECT			
L1.RESOURCE REVENUES	0.028**	0.043	0.033
	(0.012)	(0.029)	(0.021)
Mean	0.865	0.303	0.142
R-squared	0.301	0.256	0.239
Observations	20,263	20,263	20,263
Number of clusters	29	29	29
PANEL B: DYNAMICS			
L1.RESOURCE REVENUES	-0.000	0.005	-0.017
	(0.011)	(0.031)	(0.037)
L2.RESOURCE REVENUES	0.034***	0.044***	0.022
	(0.006)	(0.012)	(0.014)
Sum lags	0.0344	0.0491	0.00596
Sum lags se	0.0122	0.0360	0.0405
Sum lags p	0.00879	0.184	0.884
Joint P	9.86e-06	0.00395	0.231
Mean	0.883	0.310	0.145
R-squared	0.294	0.258	0.245
Observations	16,722	16,722	16,722
Number of clusters	29	29	29

Resource revenues are per capita and in constant (2005) prices. They are expressed in million IDR (i.e., 100 USD). Standard errors (in brackets) clustered at the district level, using district boundaries as in 1993. All specifications include year fixed effects, district fixed effects, and control for geographical characteristics (whether the village is located, separately, on the coast, in a valley, or in a slope; whether the village is crossed by a river), for urban status, and control flexibly for population (in level, squared and cubic). The sample period is 2002,2005,2008. Data at the village level. Dependent variables in all columns are binary indicators.

TABLE 10: EDUCATION OUTCOMES

MODEL	LINEAR							
VARIABLES	PRIMARY ENROLL-MENT 7-12	PRIMARY COMPLE-TION 12-15	JUNIOR ENROLL-MENT 12-15	JUNIOR COMPLE-TION 15-18	SENIOR ENROLL-MENT 15-18	SENIOR COMPLE-TION 18-22	SCHOOL-ING 10-22	LITE-RACY 6-15
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
PANEL A: CONTEMPORANEOUS EFFECT								
L1.RESOURCE REVENUES	0.0085***	0.0150	0.0199	0.0379***	0.0431***	0.0176*	0.1303**	0.0159
	(0.0017)	(0.0138)	(0.0127)	(0.0104)	(0.0115)	(0.0102)	(0.0624)	(0.0096)
Mean	0.985	0.649	0.577	0.518	0.403	0.311	7.567	0.882
R-squared	0.0046	0.0199	0.0343	0.0475	0.0720	0.0684	0.0366	0.0084
Observations	121,497	76,742	77,179	72,434	72,947	77,981	231,403	197,378
Number of clusters	29	29	29	29	29	29	29	29
PANEL B: DYNAMICS								
L1.RESOURCE REVENUES	0.0087***	0.0136	0.0204*	0.0439***	0.0434***	-0.0017	0.1265	0.0080
	(0.0021)	(0.0108)	(0.0103)	(0.0149)	(0.0129)	(0.0102)	(0.0867)	(0.0083)
L2.RESOURCE REVENUES	-0.0010	0.0046	-0.0007	-0.0116	-0.0037	0.0330**	0.0155	0.0117**
	(0.0018)	(0.0126)	(0.0116)	(0.0161)	(0.0166)	(0.0137)	(0.0851)	(0.0047)
Sum lags	0.00770	0.0183	0.0197	0.0323	0.0397	0.0313	0.142	0.0197
Sum lags se	0.00151	0.0177	0.0151	0.0104	0.0115	0.0117	0.0588	0.00991
Sum lags p	2.15e-05	0.311	0.202	0.00445	0.00177	0.0125	0.0225	0.0569
Joint P	4.82e-05	0.452	0.163	0.00252	0.000340	0.0328	0.0606	0.0485
Mean	0.984	0.646	0.574	0.512	0.397	0.307	7.553	0.882
R-squared	0.0045	0.0204	0.0351	0.0472	0.0720	0.0684	0.0381	0.0088
Observations	111,280	70,094	70,500	66,349	66,822	71,498	211,903	180,535
Number of clusters	29	29	29	29	29	29	29	29

Resource revenues are per capita and in constant (2005) prices. They are expressed in million IDR (i.e., 100 USD). Standard errors (in brackets) clustered at the district level, using district boundaries as in 1993. All specifications include year fixed effects and district fixed effects. The sample period is 2001-2009. Data at the individual level. Dependent variables in Col. 1-6 and 8 are binary indicators. Dependent variable in Col. 7 is number of years of schooling.

TABLE 11: EMPLOYMENT STATUS

MODEL	LINEAR						
VARIABLES	WORKING	WORKING 25-54	WORKING 25-54 FEMALE	WORKIN G 25-54 MALE	AGRICULTUR AL JOB 25-54 MALE	SELF-EMPLOYED 25-54 MALE	EMPLOYEE 25-54 MALE
	(1)	(2)	(3)	(4)	(5)	(6)	(7)
PANEL A: CONTEMPORANEOUS EFFECT							
L1.RESOURCE REVENUES	0.0050	0.0047	0.0180	-0.0050	-0.0180*	-0.0014	0.0122
	(0.0078)	(0.0074)	(0.0161)	(0.0038)	(0.0106)	(0.0101)	(0.0095)
Mean	0.557	0.749	0.525	0.971	0.567	0.604	0.307
R-squared	0.0234	0.0361	0.1100	0.0075	0.1478	0.0801	0.0973
Observations	681,104	351,907	174,912	176,995	171,781	171,781	171,781
Number of clusters	29	29	29	29	29	29	29
PANEL B: DYNAMICS							
L1.RESOURCE REVENUES	0.0011	-0.0001	0.0064	-0.0048	-0.0280**	0.0217	-0.0110
	(0.0080)	(0.0084)	(0.0167)	(0.0059)	(0.0108)	(0.0158)	(0.0091)
L2.RESOURCE REVENUES	0.0021	0.0026	0.0091	-0.0008	0.0065	-0.0323*	0.0302***
	(0.0056)	(0.0059)	(0.0122)	(0.0053)	(0.0083)	(0.0184)	(0.0088)
Sum lags	0.00328	0.00252	0.0155	-0.00555	-0.0215	-0.0107	0.0192
Sum lags se	0.00924	0.00923	0.0201	0.00359	0.0125	0.0150	0.0109
Sum lags p	0.725	0.787	0.447	0.133	0.0964	0.481	0.0899
Joint P	0.914	0.902	0.695	0.316	0.0455	0.219	0.00696
Mean	0.554	0.746	0.520	0.971	0.567	0.605	0.307
R-squared	0.0237	0.0365	0.1111	0.0077	0.1538	0.0839	0.1029
Observations	621,412	320,694	159,450	161,244	156,491	156,491	156,491
Number of clusters	29	29	29	29	29	29	29

Resource revenues are per capita and in constant (2005) prices. They are expressed in million IDR (i.e., 100 USD). Standard errors (in brackets) clustered at the district level, using district boundaries as in 1993. All specifications include year fixed effects and district fixed effects. The sample period is 2001-2010 unless otherwise specified. All dependent variables are binary indicators.

TABLE 12: LABOR SUPPLY

MODEL	LINEAR				LOG-LINEAR			
VARIABLES	WORK DAYS 25-54 FEMALE	WORK DAYS 25-54 MALE	WORK HOURS 25-54 FEMALE	WORK HOURS 25-54 MALE	WORK DAYS 25-54 FEMALE	WORK DAYS 25-54 MALE	WORK HOURS 25-54 FEMALE	WORK HOURS 25-54 MALE
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
PANEL A: CONTEMPORANEOUS EFFECT								
L1.RESOURCE REVENUES	0.1187	-0.0085	1.7126	0.4314	0.0139	0.0008	0.0427	0.0097
	(0.0944)	(0.0538)	(1.1856)	(0.9067)	(0.0195)	(0.0085)	(0.0420)	(0.0235)
Mean	5.664	5.971	33.81	41.30				
R-squared	0.0362	0.0256	0.0431	0.0684	0.0397	0.0280	0.0383	0.0659
Observations	69,188	134,237	69,187	134,234	67,408	132,725	67,403	132,722
Number of clusters	29	29	29	29	29	29	29	29
PANEL B: DYNAMICS								
L1.RESOURCE REVENUES	0.1485	-0.0061	2.6048**	1.1493	0.0215	-0.0000	0.0847**	0.0272
	(0.0927)	(0.0635)	(1.2234)	(0.9787)	(0.0157)	(0.0099)	(0.0341)	(0.0291)
L2.RESOURCE REVENUES	-0.0911	-0.0131	-1.5821	-1.2392**	-0.0251	0.0009	-0.0702*	-0.0276
	(0.0843)	(0.0497)	(1.0253)	(0.5525)	(0.0200)	(0.0086)	(0.0370)	(0.0227)
Sum lags	0.0574	-0.0192	1.023	-0.0899	-0.00364	0.000858	0.0145	-0.000421
Sum lags se	0.109	0.0572	1.324	1.061	0.0219	0.00975	0.0478	0.0276
Sum lags p	0.604	0.739	0.446	0.933	0.869	0.931	0.765	0.988
Joint P	0.232	0.931	0.0857	0.0707	0.273	0.994	0.0206	0.447
Mean	5.671	5.975	33.83	41.31				
R-squared	0.0373	0.0261	0.0426	0.0696	0.0411	0.0287	0.0373	0.0669
Observations	65,140	126,664	65,139	126,661	63,482	125,273	63,478	125,270
Number of clusters	29	29	29	29	29	29	29	29

Resource revenues are per capita and in constant (2005) prices. They are expressed in million IDR (i.e., 100 USD). Standard errors (in brackets) clustered at the district level, using district boundaries as in 1993. All specifications include year fixed effects and district fixed effects. The sample period is 2001-2009. Data at the individual level (Susenas). All dependent variables are count variables.

TABLE 13: AVERAGE MONTHLY HOUSEHOLD EXPENDITURE

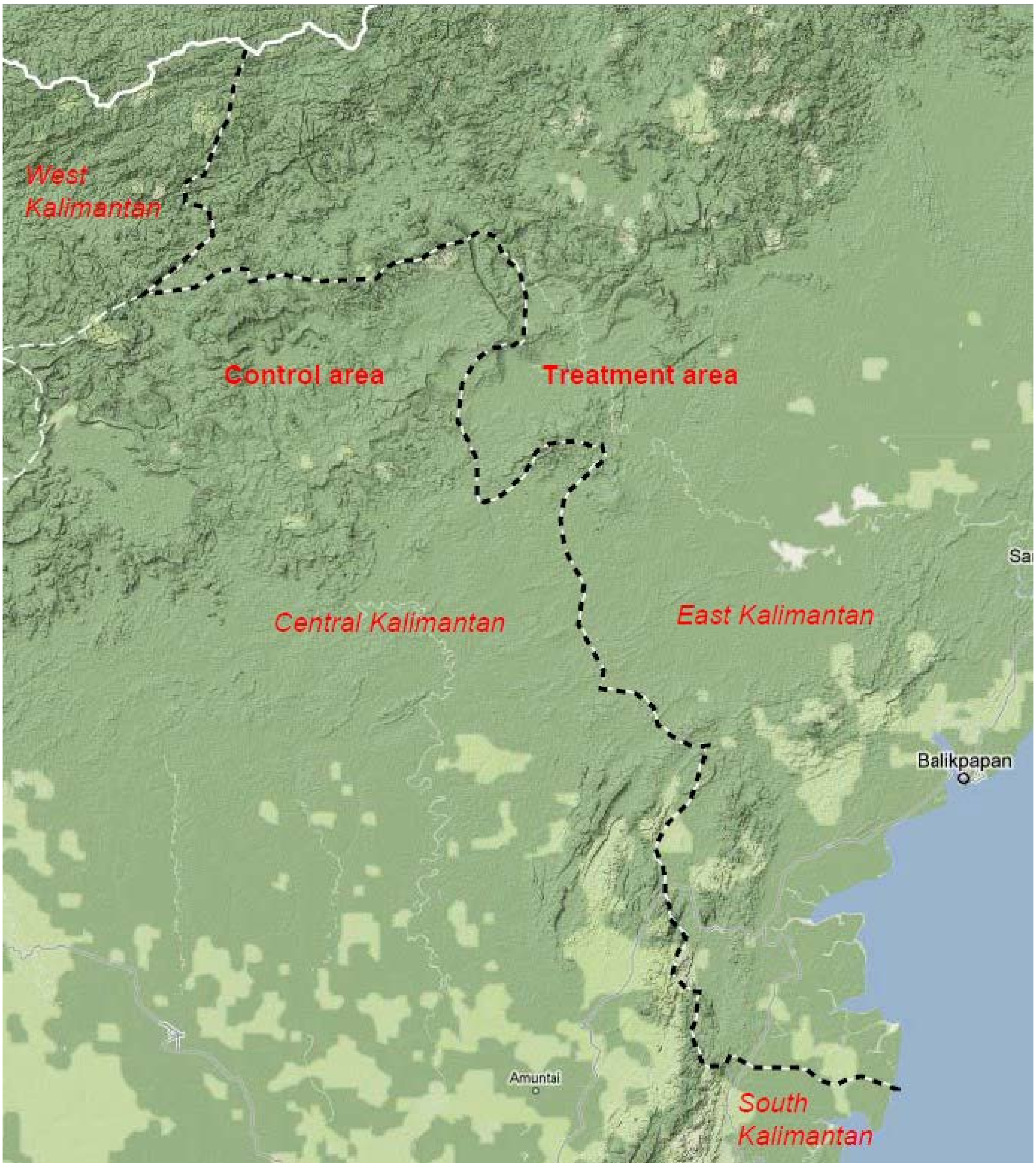
MODEL	LINEAR					LOG-LINEAR				
VARIABLES	TOTAL	TOTAL (TRIMMED)	TOTAL (WINSORED)	FOOD	NON-FOOD	TOTAL	TOTAL (TRIMMED)	TOTAL (WINSORED)	FOOD	NON-FOOD
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
PANEL A: CONTEMPORANEOUS EFFECT										
L1.RESOURCE REVENUES	89,435***	68,444**	76,876**	31,458	57,977***	0.0519	0.0507	0.0510	0.0333	0.0706
	(30,704)	(30,723)	(30,820)	(24,244)	(14,063)	(0.0315)	(0.0316)	(0.0315)	(0.0334)	(0.0420)
Mean	1 015 000	981 285	999 752	659 991	355 479					
R-squared	0.139	0.158	0.174	0.088	0.133	0.174	0.160	0.175	0.094	0.259
Observations	187,354	183,543	187,354	187,354	187,354	187,354	183,543	187,354	187,354	187,354
Number of clusters	29	29	29	29	29	29	29	29	29	29
PANEL B: DYNAMICS										
L1.RESOURCE REVENUES	46,834	33,863	38,377	17,952	28,883	0.0377	0.0373	0.0377	0.0277	0.0638*
	(30,132)	(27,138)	(28,312)	(16,849)	(20,796)	(0.0269)	(0.0269)	(0.0268)	(0.0267)	(0.0367)
L2.RESOURCE REVENUES	45,844	31,582	38,254	7,284	38,560	0.00650	0.00475	0.00497	-0.00526	-0.00453
	(36,399)	(22,807)	(29,474)	(17,356)	(26,612)	(0.0239)	(0.0213)	(0.0230)	(0.0230)	(0.0395)
Sum lags	92 678	65 446	76 631	25 236	67 443	0.0442	0.0420	0.0426	0.0224	0.0593
Sum lags se	36 339	33 319	34 908	28 273	20 135	0.0372	0.0364	0.0369	0.0412	0.0488
Sum lags p	0.0165	0.0595	0.0366	0.380	0.00233	0.244	0.258	0.258	0.591	0.234
Joint P	0.0475	0.158	0.108	0.573	0.00679	0.381	0.396	0.384	0.476	0.233
Mean	1 013 000	978 776	997 383	659 448	353 741					
R-squared	0.146	0.165	0.181	0.091	0.142	0.180	0.166	0.182	0.097	0.267
Observations	174,999	171,404	174,999	174,999	174,999	174,999	171,404	174,999	174,999	174,999
Number of clusters	29	29	29	29	29	29	29	29	29	29

Resource revenues are per capita and in constant (2005) prices. They are expressed in million IDR (i.e., 100 USD). Standard errors (in brackets) clustered at the district level, using district boundaries as in 1993. All specifications include year fixed effects and district fixed effects. The sample period is 2001-2009. Data at the household level (Susenas). All outcomes are also expressed in per capita terms, constant (2005) prices and million IDR (i.e., 100 USD) unless otherwise specified. In order to deal with outlier, the dependent variable has been trimmed (Col. 2 and 7) and winsored (Col. 3 and 8). In both cases the thresholds were the top and bottom 1 percent.

Figure 1: Borders between treatment (Riau, South Sumatra) and control areas (Northern Sumatra and Jambi) on Sumatra

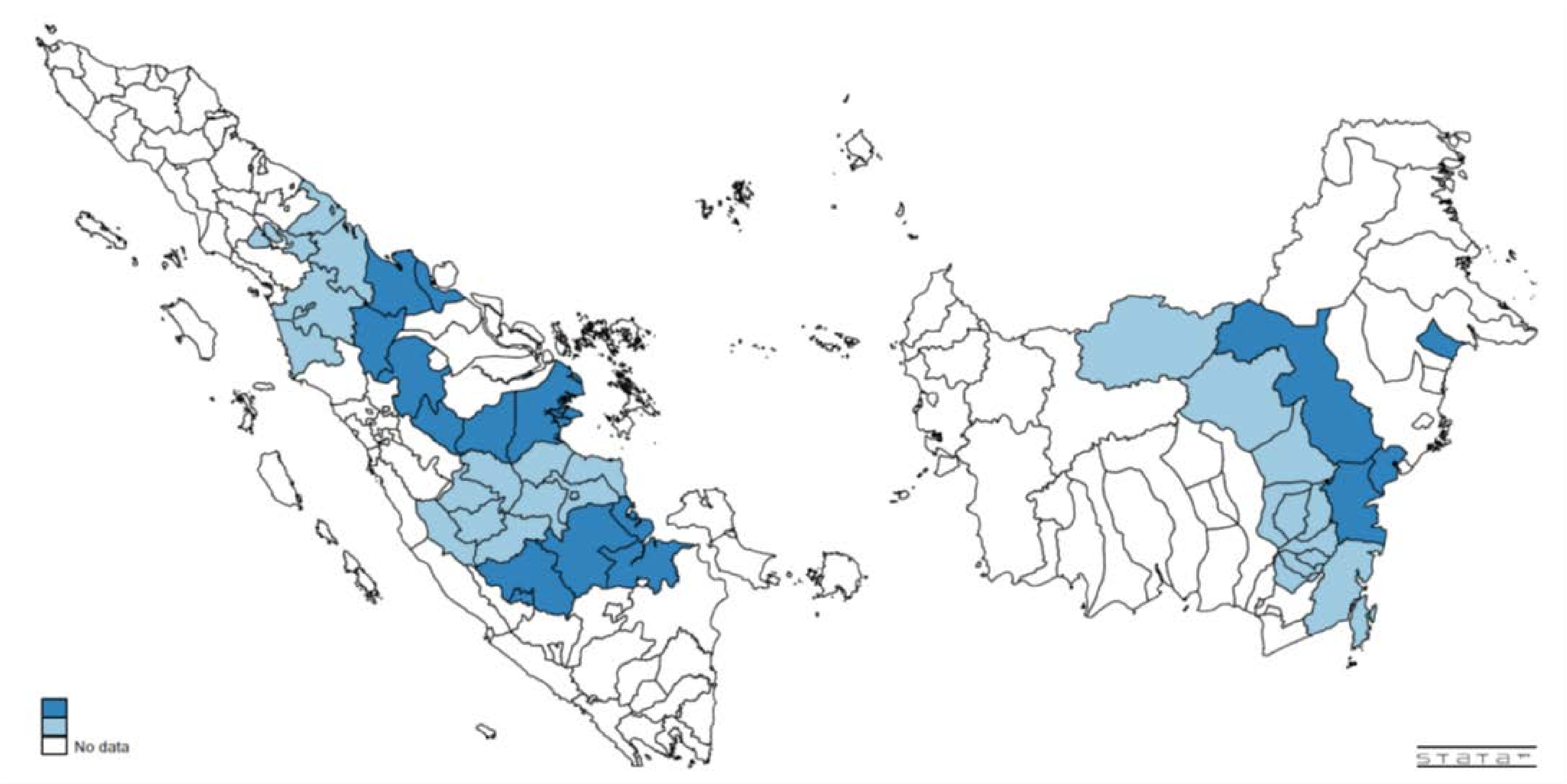
Note: The three dotted lines show the borders exploited in the empirical study between treatment and control areas. The northeastern dotted line is between Riau (treatment) and North Sumatra (control), the central line between Riau (treatment) and Jambi (control), and the southernmost line is between South Sumatra (treatment) and Jambi (control). The black lines show the borders to provinces not included in the study.

Figure 2: Border between treatment (East Kalimantan) and control areas (West, Central, and South Kalimantan)



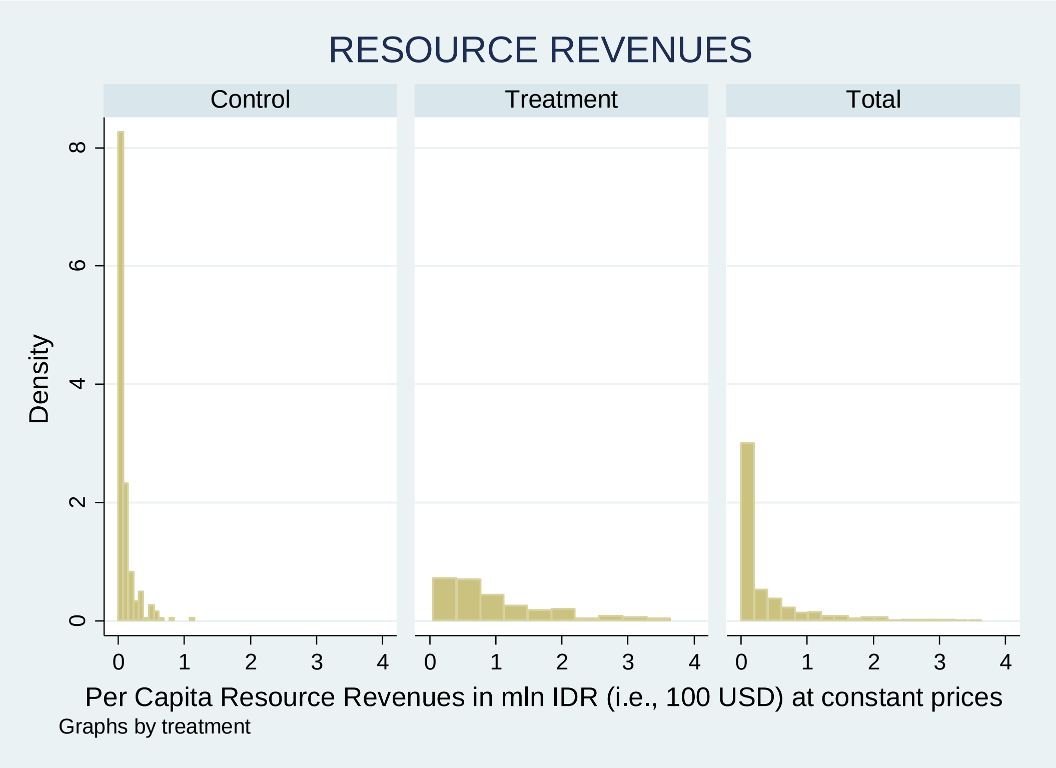
Note: The dotted lines show the borders exploited in the empirical study between the treatment area East Kalimantan and the control areas West, Central, and South Kalimantan.

Figure 3: Indonesian districts on Sumatra and Kalimantan included in the study



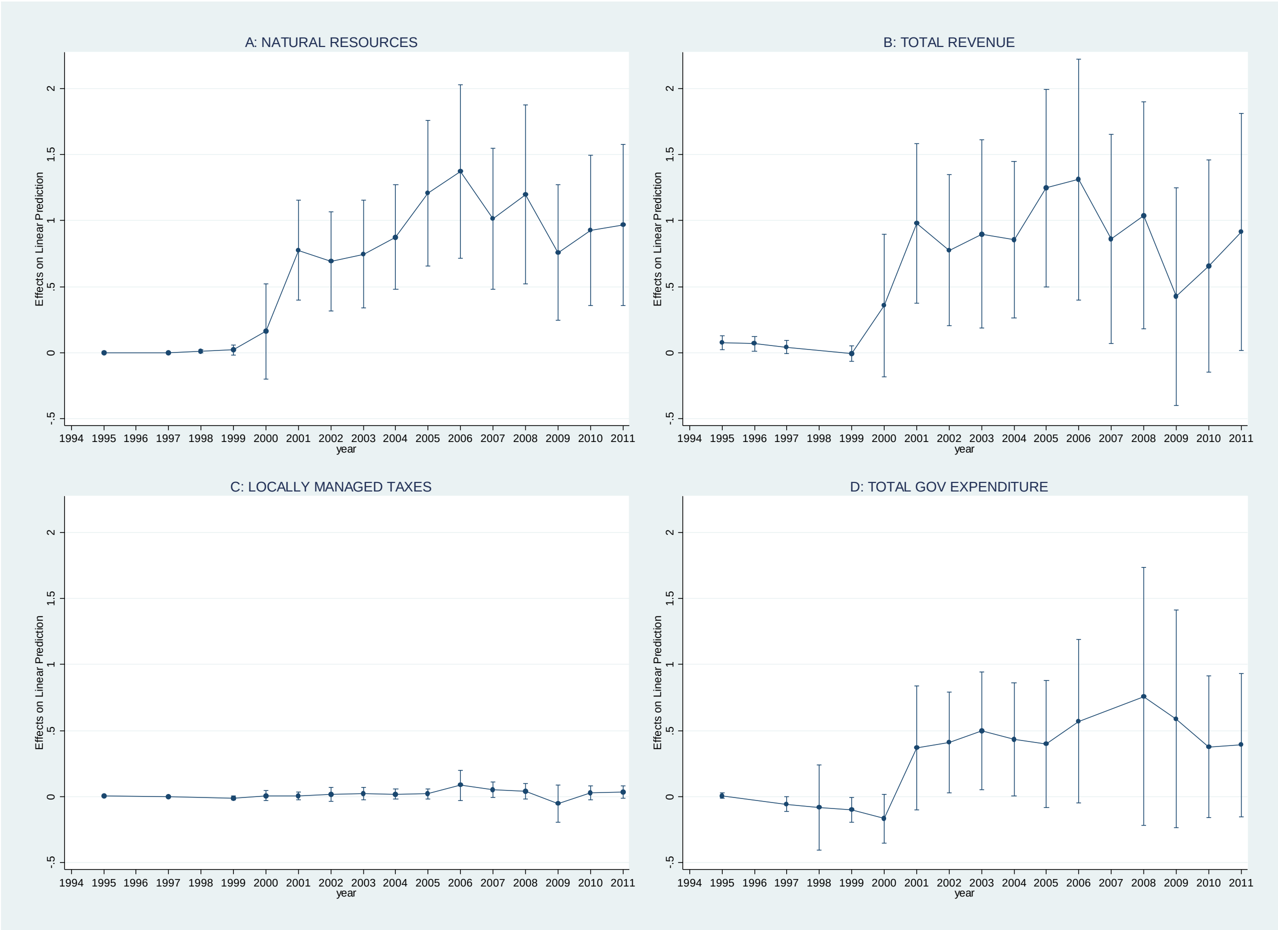
Note: The dark blue districts received extra revenues from oil and gas after 1999 whereas the light-blue districts did not.

Figure 4: Distribution of resource revenues across treatment and control districts.



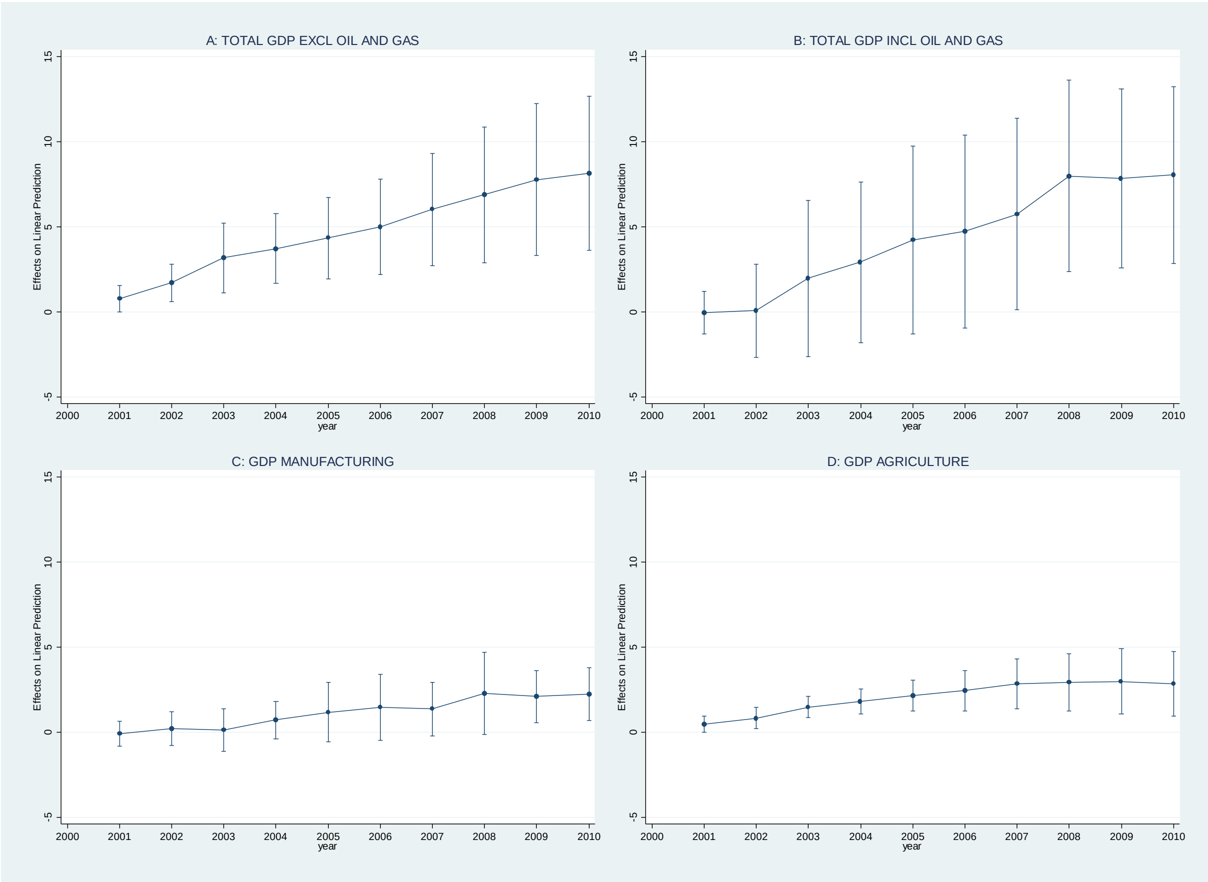
Note: The figure shows density (number of districts) on the vertical axis and resource revenues per capita (in units of constant (2005) 100 USD) on the horizontal axis.

Figure 5: Evolution of district revenue and expenditure across treatment and control districts.



Note: All revenue and expenditure indicators are per capita and in constant (2005) prices. They are expressed in million IDR (i.e., 100 USD). The figures show estimates (circles) and standard errors (vertical lines) from a Fixed Effect model including treatment indicator (1 if the district received oil and gas transfers), year FE and district FE. Standard errors are clustered at the district level.

Figure 6: Evolution of district GDP across treatment and control districts.



Note: All revenue and expenditure indicators are per capita and in constant (2005) prices. They are expressed in million IDR (i.e., 100 USD). The figures show estimates (circles) and standard errors (vertical lines) from a Fixed Effect model including treatment indicator (1 if the district received oil and gas transfers), year FE and district FE. Standard errors clustered at the district level.