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On the political economy of resource rents distribution

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On the Political Economy of Resource Rents Distribution

Insights from a Developing and Decentralized Country

Maria Antonieta Collazos - Ortiz

Propositions accompanying the thesis

On the Political Economy of Resource Rents Distribution

Insights from a Developing and Decentralized Country

By Maria Antonieta Collazos - Ortiz

1. The regulatory framework governing intergovernmental transfers plays a significant role in mitigating the impact of political party alignment on inefficient resource distribution to subnational governments. (Chapter 2)

2. An intentional and strategic structuring of policy design creates conditions that can potentially favor politically aligned subnational governments, granting them greater access to resources. (Chapter 2)

3. The influence of resource rents on Political Budget Cycles (PBCs) undermines the efficiency goals associated with fiscal decentralization and underscores the necessity of safeguarding human capital investments against resource volatility. (Chapter 3)

On the Political Economy of Resource Rents Distribution

Insights from a Developing and Decentralized Country

Over de Politieke Economie van de Verdeling van Huurprijzen voor Hulpbronnen

Inzichten van een Ontwikkelingsland en Gedecentraliseerd Land

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On the Political Economy of Resource Rents Distribution

Insights from a Developing and Decentralized Country

DISSERTATION

to obtain the degree of Doctor at Maastricht University,
on the authority of the Rector Magnificus, Prof. dr. Pamela Habibović
in accordance with the decision of the Board of Deans,
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Wednesday 7th of February 2024, at 16:00 hours

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Summary

The overarching objective of this thesis is to analyse the impact of institutional change on the political incentives driving resource distribution and on the subsequent fiscal responses of subnational governments. Through this analysis, this thesis aims to advance the understanding of fiscal federalism and its implications for development.

Despite the extensive research on fiscal federalism, further exploration is needed to better comprehend its intricate dynamics and evolution in the face of ongoing formal and informal changes, particularly in decentralised countries striving for development.

The existing literature has largely overlooked the profound influence, unintended consequences, and underlying incentives arising from institutional design in resource distribution and its ongoing adaptation. These factors significantly shape the political and fiscal responses of subnational actors, ultimately determining the outcomes of decentralisation and carrying significant implications for societal performance and overall development.

Consequently, policy design in decentralised and developing contexts no longer entails a simple trade-off between the central government's coordination capacity and decentralisation's adaptability to local circumstances. Rather, it requires addressing and overcoming the inefficiencies caused by utility-maximising agents embedded within the government structure. This thesis sheds light on the complexity involved in managing fiscal federalism and emphasises the importance of careful policy design as a tool that can either lead to improvements or pose further challenges for budget management and resource distribution.

Furthermore, by focusing on the distribution of natural resource rents, this thesis offers insights into the origins and underlying mechanisms that enable or prevent the occurrence of a resource curse at the subnational level, with potential repercussions at the national level.

The thesis comprises five chapters. Chapter 1 serves as the introduction, offering the motivation for the research and outlining the research questions that guide the core chapters. It also provides an overview of the research setting and methodology, which ends with the presenting of an outline of the thesis's structure.

Chapter 2 examines the impact of the regulatory framework design in mitigating the influence of political party alignment on resource distribution across jurisdictions. It reveals the strategic use of policy redesign to enhance the relevance of party alignment with the central government, resulting in preferential resource

distribution to politically aligned subnational governments as political objectives are prioritised over efficiency. This chapter contributes to the fiscal federalism literature by emphasising the significance of inter-governmental transfer policy design in ensuring proper fiscal decentralisation. The chapter calls for institutional design that aims for unbiased transfer distribution, striking a balance between the potential impact of political alignment on resource distribution and the need to mitigate the adverse effects of the resource curse through a fair and equitable distribution of resource rents.

Chapter 3 examines whether resource rents fuel political budget cycles (PBCs) at the subnational level. It finds that resource rents do drive PBCs by increasing investment in health and education at the subnational level. However, by fostering human capital investment the adverse effects of the resource curse can potentially be mitigated. Additionally, this chapter finds that institutional changes have the potential to limit the impact of PBCs and reduce the reliance of human capital investment on resource rents. While these institutional changes encourage responsible fiscal behavior and mitigate the magnitude of PBCs, they may also restrict human capital investment with long-term developmental consequences. The chapter contributes to the field of fiscal federalism studies by analysing the implications of inter-governmental redistribution on public investment in the presence of resource rents, as well as by exploring the relationship between PBCs and resource rents at the subnational level.

Chapter 4 investigates whether administrative efficiency is crucial for subnational governments to mitigate the substitution effect between royalty revenue and taxes, which contributes to the resource curse phenomenon. It finds that the ability of subnational governments to adjust their fiscal effort in response to changes in revenue relies on their administrative efficiency. The chapter contributes to the field of fiscal federalism studies by challenging the assumption that all subnational governments can increase the revenue they generate on their own at will and, by emphasising the pivotal role of administrative efficiency to explain the extent to which subnational jurisdictions are subject to a 'natural resource curse'.

Chapter 5 concludes the thesis by discussing main findings, policy implications, limitations, and avenues for further research.

Samenvatting

De overkoepelende doelstelling van dit proefschrift is het analyseren van de invloed van institutionele verandering op de politieke prikkels die de verdeling van middelen bepalen en op de daaropvolgende fiscale reacties van subnationale overheden. Door middel van deze analyse wil deze dissertatie het begrip van fiscaal federalisme en de implicaties ervan voor ontwikkeling vergroten.

Ondanks het uitgebreide onderzoek naar fiscaal federalisme is verder onderzoek nodig om de ingewikkelde dynamiek en evolutie ervan beter te begrijpen in het licht van voortdurende formele en informele veranderingen, met name in gedecentraliseerde landen die streven naar ontwikkeling.

De bestaande literatuur gaat grotendeels voorbij aan de diepgaande invloed, onbedoelde gevolgen en onderliggende stimulansen die voortvloeien uit het institutionele ontwerp bij de verdeling van middelen en de voortdurende aanpassing ervan. Deze factoren geven in belangrijke mate vorm aan de politieke en fiscale reacties van subnationale actoren, bepalen uiteindelijk de resultaten van decentralisatie en hebben belangrijke gevolgen voor de maatschappelijke prestaties en de algemene ontwikkeling.

Bij het ontwerpen van beleid in gedecentraliseerde contexten en ontwikkelingscontexten gaat het dan ook niet langer om een eenvoudige afweging tussen de coördinatiecapaciteit van de centrale overheid en het vermogen van decentralisatie om zich aan te passen aan lokale omstandigheden. Het vereist veeleer het aanpakken en overwinnen van de inefficiënties die worden veroorzaakt door nutsmaximaliserende agenten die zijn ingebed in de overheidsstructuur. Deze dissertatie werpt een licht op de complexiteit van het beheer van fiscaal federalisme en benadrukt het belang van een zorgvuldig beleidsontwerp als een instrument dat ofwel tot verbeteringen kan leiden, ofwel verdere uitdagingen kan vormen voor het budgetbeheer en de verdeling van middelen.

Door zich te richten op de verdeling van de opbrengsten van natuurlijke hulpbronnen, biedt deze dissertatie bovendien inzicht in de oorsprong en onderliggende mechanismen die het ontstaan van een "resource curse" op subnationaal niveau mogelijk maken of voorkomen, met mogelijke gevolgen op nationaal niveau.

Het proefschrift bestaat uit vijf hoofdstukken. Hoofdstuk 1 dient als inleiding, biedt de motivatie voor het onderzoek en schetst de onderzoeksvragen die als leidraad dienen voor de belangrijkste hoofdstukken. Het geeft ook een overzicht

van de onderzoekssetting en methodologie, dat eindigt met de presentatie van een schets van de structuur van het proefschrift.

Hoofdstuk 2 onderzoekt de invloed van het ontwerp van het regelgevend kader op het beperken van de invloed van de afstemming tussen politieke partijen op de verdeling van middelen over rechtsgebieden. Het onthult het strategische gebruik van beleidsherziening om de relevantie van partijafstemming met de centrale overheid te vergroten, wat resulteert in een preferentiële verdeling van middelen aan subnationale overheden die politiek zijn afgestemd, omdat politieke doelstellingen voorrang krijgen boven efficiëntie. Dit hoofdstuk levert een bijdrage aan de literatuur over fiscaal federalisme door de nadruk te leggen op het belang van de opzet van het beleid voor intergouvernementele overdrachten voor een goede fiscale decentralisatie. Het hoofdstuk roept op tot een institutioneel ontwerp dat gericht is op een onbevooroordeelde verdeling van overdrachten, waarbij een evenwicht wordt gevonden tussen de mogelijke invloed van politieke afstemming op de verdeling van middelen en de noodzaak om de nadelige effecten van de "resource curse" te beperken door een eerlijke en rechtvaardige verdeling van de opbrengsten van hulpbronnen.

Hoofdstuk 3 onderzoekt of de inkomsten uit hulpbronnen de politieke begrotingscycli op subnationaal niveau aanwakkeren. De conclusie is dat grondstofrenten inderdaad PBC's aanjagen door de investeringen in gezondheidszorg en onderwijs op subnationaal niveau te verhogen. Door investeringen in menselijk kapitaal aan te moedigen, kunnen de negatieve effecten van de vloek van de hulpbronnen echter worden verzacht. Daarnaast blijkt uit dit hoofdstuk dat institutionele veranderingen de impact van PBC's kunnen beperken en de afhankelijkheid van investeringen in menselijk kapitaal van de opbrengsten van natuurlijke hulpbronnen kunnen verminderen. Hoewel deze institutionele veranderingen verantwoordelijk fiscaal gedrag aanmoedigen en de omvang van PBC's verminderen, kunnen ze ook investeringen in menselijk kapitaal beperken, met gevolgen voor de ontwikkeling op de lange termijn. Het hoofdstuk levert een bijdrage aan studies naar fiscaal federalisme door de gevolgen te analyseren van intergouvernementele herverdeling op overheidsinvesteringen in de aanwezigheid van inkomsten uit natuurlijke hulpbronnen, en door de relatie te onderzoeken tussen PBC's en inkomsten uit natuurlijke hulpbronnen op subnationaal niveau.

Hoofdstuk 4 onderzoekt of administratieve efficiëntie cruciaal is voor subnationale overheden om het substitutie-effect tussen royalty-inkomsten en belastingen, dat bijdraagt aan het fenomeen van de grondstoffenvloek, te beperken. De conclusie is dat het vermogen van subnationale overheden om hun fiscale inspanningen aan te passen in reactie op veranderingen in inkomsten afhankelijk is

van hun administratieve efficiëntie. Het hoofdstuk levert een bijdrage aan het onderzoek naar fiscaal federalisme door de aanname te betwisten dat alle subnationale overheden de inkomsten die ze genereren naar eigen goeddunken kunnen verhogen en door de centrale rol van bestuurlijke efficiëntie te benadrukken bij het verklaren van de mate waarin subnationale jurisdicties onderhevig zijn aan een 'vloek van natuurlijke hulpbronnen'.

Hoofdstuk 5 sluit het proefschrift af met een bespreking van de belangrijkste bevindingen, beleidsimplicaties, beperkingen en mogelijkheden voor verder onderzoek.

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Chapter 1

Introduction

1.1 Overview: Motivation

Extensive research has been conducted to explain the uneven development across nations, encompassing various angles ranging from economics, climate, and culture to external and internal borders and all levels of government. Some of this research has focused on the responsibilities and resources shared between different levels of government, which may partly account for a country's stable environment and development. This body of literature is known as fiscal federalism and is rooted in two key models: (i) Tiebout's model of local finance, where households or individuals move to jurisdictions that offer their preferred tax levels and local public goods due to easy mobility and availability of options (Tiebout 1956) and (ii) Musgrave's three fiscal functions of government, focused on allocation, (re) distribution of resources and stabilisation of the public sector (Musgrave 1959). According to Florin (2010), fiscal federalism, also known as fiscal decentralisation, is a set of principles governing the allocation of revenue sources and budget

expenditures between the central government and lower levels of government.[1] Four key elements are central to this framework: subnational government authority to determine aspects of the political economy, such as public goods provision; adherence to hard budget constraints to prevent subnational governments from externalising the costs of providing those public goods; subnational governments' participation in a common market where barriers cannot be imposed and goods, capital, and labor can flow freely across borders; and institutionalisation that enacts and protects subnational government competencies from undue interference by the central government (Sorens 2011).

Fiscal federalism argues that efficiency can be increased when nations with regionally diverse economies decentralise fiscal responsibilities to the regions (Boadway 2001). By allowing subnational governments to be responsible for providing and financing services that directly impact their citizens, more-efficient allocation of public resources can be achieved. Subnational governments are better equipped to understand the needs and preferences of their citizens and can deliver services more efficiently as a result. At the same time, decentralisation can help achieve the goals of the central government throughout a territory. Thus, decentralisation can be viewed from the top-down perspective in terms of how well it serves the fulfillment of national policy objectives or from the bottom-up perspective in terms of how well it improves local welfare (Bird 1993).

Inequality is another driver of the institutionalising of fiscal federalism, but also a consequence that arises from it. On the one hand, vertical fiscal imbalances (VFI) can arise when there is a mismatch between the revenues and expenditures of subnational governments. On the other hand, horizontal inequalities can appear when wealthier or local entities with greater capacity are able to provide better services, such as when a local government has natural resources as an additional source of revenue. In both cases, intervention from the center may be necessary, which could involve extra transfers in the former case or redistribution in the latter.

This traditional approach to fiscal federalism, known as the normative approach or the first generation, rests on the assumption that benevolent social planners strive to allocate public resources in search of efficiency and equality. However, the normative approach fell short of matching theory and evidence. For instance, countries like Argentina and Brazil implemented well-intentioned

[1]Florin (2010) explains that while fiscal federalism and fiscal decentralisation are similar from this economic perspective, they differ in terms of their legal approach. Federalism is a constitutional framework that affects all branches of government, whereas decentralisation only applies to the exercise of power within the executive branch, with power originating from the center and being transferred to lower levels. The legislative and judicial branches may not necessarily be affected.

decentralisation efforts aiming to achieve efficiency and equality in resource allocation. Unfortunately, the decentralised levels of government exhibited destabilising and counterproductive fiscal behaviour, resulting in fiscal crises (Oates 2008). The resource curse literature also testifies to this incongruity, as it points to governments rich in resource rents being less, rather than more, efficient or developed, compared to their counterparts. This continuous mismatch led to the second generation of the fiscal federalism literature.

The second generation of the fiscal federalism literature takes a more positive approach than does the first generation by studying the fiscal and political incentives for subnational officials and by viewing public agents as utility-maximising individuals (Oates 2008; Weingast 2009, 2014). In a way, this approach seeks to explain why fiscal federalism has produced diverse results across nations and subnational governments. Faguet (2014) and Sharma (2011) suggest that inter-governmental power relations and the political motives of those in power can be responsible for a flawed decentralisation design or for distortions that can lead to unintended outcomes in decentralising. For instance, Gervasoni (2018) asserts that fiscal federalism rents enable incumbents to exert control over individuals, groups, and organizations, potentially undermining subnational democracy, even when democracy prevails at the national level. Sharma (2011) further argues for institutional mechanisms and procedures that can circumvent those political problems and lead to welfare-enhancing outcomes. Thus, decentralisation is not a one-size-fits-all model and is recognised as being an ongoing adjustable process (Smoke 2015). Consequently, the ideal fiscal arrangements under decentralisation seem to depend on each country's context and fiscal, political, and economic grounds (Faguet & Pöschl 2015).

In light of this reasoning, the role of institutions is clearly a factor in the evolution of and thus an important topic in the debate on fiscal federalism, because institutions' continuous adjustments will speak to the real effects of fiscal decentralisation (Boadway 2001). In the context of traditional fiscal federalism theory, institutions refer to a government's organisational structure and arrangements. However, institutions also encompass formal laws that incentivise social, political, and economic interactions, as well as informal conventions that may complement or substitute them. Nevertheless, the dilemma remains, as put by Oates (2008), for these fiscal and political institutions, whether formal or not, in the shaping and balancing of the trade-off between the (in)ability of the center to coordinate local provision and the (in)ability of decentralisation to tailor outcomes to the tastes and circumstances of the local. At the same time the (re)designing of fiscal institutions at any level of government must be understood as a tool for both

solving efficiency problems and addressing political problems and such a tool that affects the future structure of incentives faced by all actors and more likely generates unintended fiscal consequences in other levels of government (Oates 2008). As the institutional environment is continuously changing, studying its dynamism is key to enhancing our understanding of fiscal federalism and achieving the desired aims of decentralisation.

Although a considerable amount of theoretical and empirical research has been conducted on fiscal federalism, our understanding of the conditions under which fiscal decentralisation functions effectively, and how to address possible undesirable outcomes, remains limited. Given the pervasive role fiscal federalism plays in citizens' lives and the development of societies, improving it is an ongoing and essential endeavor. This thesis contributes to this pursuit by researching how institutional (re)designs (i.e. a policy change) can exacerbate the political incentives behind resource distribution and the fiscal responses of subnational governments.

By analyzing novel panel municipal data from a developing and decentralised country that underwent a major policy redesign, this thesis informs about the mechanisms by which resources end up inefficiently distributed and poorly managed on the local level, with potential implications for a country's stability and development. Therefore, this thesis enhances our understanding of whether and how institutional redesign can improve or worsen fiscal federalism outcomes, by for example crowding in patronage, spreading the resource curse, and reducing efficiency.

While each chapter of this thesis contributes to the political economy literature of fiscal federalism (i.e. the second generation) in its own right, they share a common thread that is crucial for advancing our understanding of the topic. Through the analysis of a policy reform in Colombia, which transitioned from strict resource distribution based on natural resource production to a more equitable distribution through a process of project submission and approval informed by socioeconomics and local knowledge, the three chapters emphasise the significance of resource redistribution policy design in ensuring effective fiscal decentralisation. Such a redesign can either magnify or mitigate mechanisms that prioritise political aims over efficient resource allocation and utilisation or reveal conditions under which the political misuse of resources can be countered or prevented (e.g. through a higher degree of local administrative efficiency).

It should be noted that in this thesis resources are thought of in their broadest possible definition. For instance, both royalty revenue and any inter-governmental transfer or external aid constitute resources. However, in studying the case of Colombia, a commodity-dependent, decentralised, and developing country

vulnerable to the resource curse, this thesis is concerned with a policy change concerning the redistribution of natural resource rents. This focus not only underscores the importance of fiscal federalism, particularly second-generation theories, in addressing the decentralisation of resource rents, it also enables each chapter to contribute to our understanding of the underlying mechanisms associated with the resource curse. Through the study of resource rent redistribution, the chapters explore whether these rents tend to serve national or subnational political aims, leading to additional inefficiencies stemming not only from the rents' initial biased distribution but also from their utilisation via political budget cycles (PBCs), thus contributing to the spread of the resource curse at the subnational level. Additionally, the thesis assesses the potential of institutional change to either amplify or mitigate fiscal misbehaviour in resource-rich jurisdictions and identifies specific characteristics that may render those jurisdictions more or less susceptible to the effects of the resource curse in certain fiscal outcomes.

Chapter 2 of this thesis examines the impact of the regulatory framework of inter-governmental transfers on the extent to which party alignment between subnational and higher levels of government matters for resource distribution across jurisdictions. The findings underscore that policy redesign in inter-governmental transfers can result in increased resources' being distributed to subnational governments that share political affiliation with the center, so that political aims are prioritised over efficiency. This chapter makes a significant contribution to the fiscal federalism literature by emphasising the crucial role of institutional crafting in mitigating the influence of party alignment on resource distribution, thereby ensuring effective fiscal decentralisation. To prevent biased resource distribution, institutional design should strike a balance between strict rules that may result in inequalities and inefficiencies and ostensibly equitable criteria that could lead to party alignment-driven inefficiencies by granting significant decision-making power to the central government. Moreover, this chapter sheds light on the mechanisms underlying the relationship between the distribution of natural resource rents and the political economy of grants distribution within a policy-change environment. It underscores the critical role played by institutional design in either preventing or promoting the pervasive effects of the resource curse in the distribution of resource rents. Therefore, this chapter's contributions are twofold: first, it demonstrates the significance of institutional crafting in ensuring proper fiscal decentralisation and second, it highlights the importance of institutional design in averting the adverse consequences of political alignment on resource distribution and mitigating the effects of the resource curse.

Chapter 3 of this thesis examines whether resource rents, redistributed to subnational governments, are strategically used to overinvest in visible and key sectors such as health and education to achieve political goals, particularly in the run-up to elections. The chapter makes a significant contribution to the political economy literature on fiscal federalism, because no prior research has explored the impact of inter-government redistribution on public investment when resource rents are present. The chapter also expands the literature by exploring the relationship between PBCs and resource rents at the subnational level. The findings demonstrate that subnational governments leverage resource rents to invest in health and education, with investment levels exhibiting a cyclic pattern that aligns with the electoral schedule. These findings suggest that subnational political considerations can compromise the efficiency objectives associated with fiscal decentralisation. Therefore, safeguarding human capital investment from resource volatility, particularly in proximity to elections, is crucial for effective fiscal decentralisation. Despite the occurrence of PBCs and the resource curse through fiscal transfers funded by royalties, it is noteworthy that the findings in chapter 3 also demonstrate that PBCs can serve as a potential mechanism for mitigating the adverse consequences of resource windfalls by facilitating increased investment in human capital. Furthermore, the study explores the influence of fiscal institutions on PBCs and illustrates that more-stringent policies can reduce subnational governments' reliance on resource revenue for decision-making regarding human capital investment. While such policies foster more-responsible fiscal behaviour and mitigate the magnitude of the PBC effect, they may also constrain key public investment, which can have long-term development implications.

Lastly, chapter 4 examines the relationship between natural resource revenue and fiscal effort of subnational governments with a focus on the moderating role of administrative efficiency. The study finds that subnational governments with efficient administrations (i.e. those with greater ability to convert inputs such as financial resources and personnel into policy outputs) have higher revenue-generating capacity and are more responsive to changes in royalty revenue. These findings challenge the assumption that all subnational governments can increase their own revenue if given the responsibility and emphasise the importance of institutional quality to explain the extent to which subnational jurisdictions are subject to a 'natural resource curse'. Furthermore, the study highlights the need for institutional design in inter-governmental transfers and resource allocation to account for the disparities in administrative efficiency across subnational governments. Only those subnational governments with sufficient administrative efficiency are able to modify their fiscal effort when necessary. These findings carry

substantial implications for the field of fiscal federalism and contribute to the existing literature by emphasising the pivotal role of administrative efficiency in the context of resource-rich subnational governments.

In essence, the three chapters demonstrate how policy design impacts the response of subnational public finances while also increasing the center's political influence, potentially compromising the original aims of fiscal federalism, most notably efficiency, equality, and the fostering of sustainable development through the proper distribution and use of resources, particularly in resource-rich regions. Ultimately, these findings contribute to a better understanding of the mechanisms at play behind policy design and their unintended consequences for lower levels of government, underscoring the need to approach and confront theoretical models with dynamic contexts. This research highlights the complexity involved in managing fiscal federalism and emphasises the importance of carefully considering distributive policy design as a crucial determinant that can either lead to improvements or further challenges in managing budgets and distributing scarce resources.

1.2 Objectives

According to fiscal federalism theory, the institutional arrangements of a nation, particularly how the authority and responsibilities for revenue generation flow from one level of government to another, determine how fiscal federalism plays out in practice. However, the contextual formal and informal institutions ultimately dictate the actual benefits or drawbacks of fiscal decentralisation, because they either provide the right incentives for the utility-maximising agents involved in the process or fail to do so. This suggests that efforts to address the undesired outcomes of fiscal decentralisation might require further institutional changes. However, given the challenges associated with implementing extensive structural changes or attempting to alter informal norms, policy changes within the realm of fiscal federalism present a more feasible option. Consequently, such policy changes are actively taking place worldwide, underscoring the dynamic nature of the subject.

Although policy changes are often perceived as key to extending positive impacts and fixing mistakes resulting from decentralisation, they can have unintended consequences. What might appear to be a fiscal solution for one level of government can become a source of perverse fiscal and political incentives and outcomes for another. For instance, the redesign of policies aimed at addressing local resource misuse may inadvertently spread political influence in a territory while

leading to an ineffective fragmentation of resources. The overarching objective of this thesis is precisely to analyse the fiscal responses to institutional change at the subnational level, thereby contributing to a better understanding of the dynamics and evolution of fiscal federalism and ultimately,its impact on development.

The chapters of the thesis separately address the following research questions:

Chapter 2: Does the impact of party alignment on revenue distribution depend on the design of inter-governmental transfer policy?

Chapter 3: Can investment in human capital be jeopardised by (re)distributive policy changes, the political budget cycle, and resource rents?

Chapter 4: Can local administrative efficiency limit the substitution effect caused by inter-governmental resources?

The party congruence effects found in chapter 2 direct more resources to subnational governments politically aligned with the center. These additional and redistributed resources then shape the results of chapters 3 and 4 by potentially interfering with local investment and collection decisions. Hence, it should come as no surprise that the strongest common thread across the chapters is the dynamism of fiscal federalism and its impact on the efficiency with which scarce resources are distributed and used. The next section outlines the methodological approaches and similarities across the chapters.

1.3 Research setting and methodology

The research for this thesis was conducted in Colombia, a developing, decentralised, commodity-dependent country with 1101 municipalities in 32 departments. In 2012 Colombia underwent a significant fiscal reform that involved a constitutional amendment altering the distribution of royalty revenue between subnational governments.

The three chapters in this thesis rely on and integrate municipal-level panel data collected by national-level entities. Quantitative analysis is subsequently conducted on these data using econometric and statistical inference techniques to detect patterns and establish relationships. In the chapters, theoretical propositions in the form of hypothesis are stated, their functioning is explained, and the central

causal mechanisms behind them are tested through the empirical case study of Colombia.

Fundamentally, the chapters in this thesis study the fiscal responses to an institutional change in Colombia over a 15-year time frame. In all three chapters the institutional change (i.e. the policy change) is included as an identification strategy that helps with gauging the effectiveness of the intervention following economic theory. At the same time, the (re)design of the policy provides an opportunity to explore and understand how the previously established relationships in the theory may be influenced by such a change. As stated by Pepinsky (2019), changes in policies or procedures in single-country studies become quasi-experiments, because they might generate random variation in causal variables of interest that in turn can uncover or clarify causal effects. Therefore, studying the intervention clearly helps with the identification of keys for successful future policy design and with answering why the results predicted by theory typically end up being different once the empirical analyses are run.

Because Colombia has an identical institutional structure across all municipalities, the panel data analysis is more suitable than a cross-country or cross-state analysis in terms of internal validity, the robustness of causal inferences from the data, and unconfoundedness (Pepinsky 2019; Badeeb et. al. 2017). Moreover, this same structure allows for the co-existence of several heterogeneous subsets as recognized by Gervasoni (2018), enabling the examination of the diverse responses of similar yet different types of municipalities that were affected by the policy change. Thus, the thesis analyses in detail the potential heterogeneous impacts of the institutional change on different subgroups of subnational governments to determine whether the change alters or reinforces the existing results of fiscal federalism for all or some.

The three chapters in this thesis use municipal fixed effects (FE) to minimise the impact of confounding factors, such as a municipality's culture or ideology, or unobserved, time-invariant effects. The FE estimator is preferred, because it exploits within-unit variations to identify model parameters and because, compared to the random-effects (RE) estimator, it avoids the reliance on strong assumptions (i.e. municipalities' FE are uncorrelated with independent variables) for macro-panel data, ensuring consistency (Wooldridge 2010). Additionally, the three chapters conduct robustness tests by using additional data, adding variables as controls, and using different estimation approaches. For instance, in chapter 3 a system generalised method of moments (GMM) estimator is used to explore short-term dynamics that may be present in PBCs. In chapter 4, a difference in difference model approach is employed. These approaches strengthen the validity and reliability of the findings.

1.4 Outline

The thesis is organised as follows. Chapter 2 examines whether the impact of party congruence on the distribution of resource rents to subnational governments depends on the design of the regulatory framework for inter-governmental transfers. Chapter 3 investigates whether these resources fuel PBCs and whether the policy redesign can limit PBCs' impact on human capital investment. Chapter 4 explores whether subnational administrative efficiency can counteract the substitution effect brought by these resources. Chapter 5 concludes the thesis by answering the research questions and identifying the policy implications and the limitations of the thesis before suggesting avenues for future research.

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Chapter 2

The Impact of Regulatory Framework Design on Party Alignment in Government Revenue Distribution[1]

Abstract

The literature has debated the conditions under which inter-governmental transfers are directed to buy political support. This chapter examines the impact of the regulatory framework of inter-governmental transfers, an understudied area, on the extent to which party alignment between subnational and higher levels of government matters for resource distribution across jurisdictions. By analysing a 2012 policy reform in Colombia using municipal-level panel data and fixed-effects methods, it is found that policy redesign strengthens the relevance of party alignment with the president, favoring politically aligned subnational governments without prior resource access or contribution. The findings underscore the relevance of balanced policy design in ensuring unbiased transfer distribution, thus avoiding

[1] This chapter is based on:
Collazos-Ortiz, MA (2023): The impact of regulatory framework design on party alignment in government revenue distribution, *working paper*.

inequality and inefficiency caused by strict rules or party-alignment-driven inefficiencies tied to universal access criteria. Strategic design safeguards resource-rich subnational governments from the resource curse by preventing biased resource-rents distribution while promoting government trust and legitimacy in the face of political interests.

Keywords: party alignment, policy design, inter-governmental transfers, regulatory framework, royalty revenue, subnational governments, Colombia

2.1 Introduction

The efficient distribution of governmental revenues is a major challenge in countries with multiple levels of government. Party alignment—where subnational governments belong to the same party or coalition as higher levels of government—has been identified in the literature as a key factor contributing to 'political bias' regarding fiscal transfers from the central to subnational governments[2]. Subnational governments aligned with the central government's party tend to receive more inter-governmental transfers so as to increase political support for the center. Often this is referred to in the literature as 'buying votes' or as 'buying support'.

Scholars have engaged in significant theoretical debate about the conditions under which party alignment distorts efficient distribution of inter-governmental transfers. Some suggest 'buying support' strategies depend on voter location, distributing resources to jurisdictions with strong political support for the ruling party in the core voters model (Cox & McCubbins 1986) or targeting areas where there is close competition with the opposition in the swing voters model (Lindbeck & Weibull 1987; Dixit & Londregan 1996). Others suggest that party alignment effects are contingent on margin of victory (Brollo & Nannicini 2012) or the central government's desire to garner support for policy implementation (Baskaran & Hessami 2017). The empirical findings are ambiguous, with some studies finding party alignment results in higher grants (e.g. Baskaran & Hessami 2017; Arulampalam et al. 2009; Dey & Sen 2016; Brollo & Nannicini 2012; Bracco et al. 2015; Psycharis et al. 2021; Migueis 2013; Jarocinska 2022), but others not

[2] The terms 'political alignment', 'party alignment', 'partisan alignment', and 'party congruence' are used interchangeably in this chapter.

(Dellmuth 2011; Dellmuth et al. 2017; Gonschorek et al. 2018; Gainza & Livert 2021).

This chapter focuses on the regulatory framework of inter-governmental transfers and argues that the impact of party alignment on revenue distribution largely depends on the framework's design. Limited attention has been given to the dynamic nature of this framework and its potential heterogeneous effects, which may explain the diverse findings observed in the literature.

Party alignment can impact royalty revenue distribution, potentially perpetuating the resource curse in developing countries by not distributing resources on the basis of efficiency-based criteria. While the literature has primarily focused on the effects of resource rents and their distributional mechanisms (Arellano-Yanguas & Mejía-Acosta 2020; Kauder et al. 2016; Bonilla-Mejía 2017), there is a lack of evidence on the underlying mechanisms linking the political economy of grants distribution to the distribution of natural resource rents. By exploring the impact of party alignment, within a policy change context, this chapter contributes to the understanding of the political determinants of natural resource rents distribution.

This chapter analyses how policy design impacts party alignment's effect on resource rents distribution to local governments, providing empirical evidence from Colombia. The analysis covers 2002–2017, coinciding with a policy change where the central government redirected 80 percent of royalty revenue from producer municipalities to be partially redistributed to other municipalities[3]. Colombia provides an ideal case study, because the central government transitioned from allocating and disbursing resource rents to producers only through a rule-based formula to a rule-based allocation to all municipalities, with the additional requirement of project submission and approval for resource disbursement[4]. This new approval process could have increased party alignment influence, because resources were now earmarked for municipal rather than regional projects and the mechanism for approval was centralised to a small body where the center could exert political bias. Colombia's case presents a unique opportunity to explore to what extent policy design in resource distribution counteracts the use of resources to 'buy political support', particularly in a unitary, decentralised developing country characterised by presidential power and weak institutions.

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[3] Producers refer to municipalities with an oil field or a coalmine. Hydrocarbons and coal account for over 80 percent of royalty revenue in Colombia (Ministerio de Energía 2011).

[4] In this paper, 'allocated' refers to resources that are assigned on paper to a specific municipality based on production or social indicators criteria. 'Distributed' or 'disbursed' refers to resources that are actually delivered to the municipality.

This chapter finds that political goals of higher government levels (i.e. re-election) shape resource rents distribution through policy redesign, enabling clientelistic intervention in the distribution of royalty revenue to local governments. The center redirects royalty revenue to aligned municipalities, making access contingent on party congruence with this higher level of government. This effect is stronger in non-producer municipalities lacking prior legal access to royalties and that do not contribute to their generation, rendering those municipalities more vulnerable to political bias. Furthermore, the findings support the core voters model, where loyal supporters are rewarded (Cox & McCubbins 1986). These findings highlight the key role of policy design in determining whether and when party alignment distorts efficient inter-governmental transfer distribution and as such are particular relevant for resource-rich developing countries seeking to evade the 'paradox of plenty'. Balanced policy design is essential for unbiased transfer distribution, because strict rules can lead to inequality, inefficiency, and worsen the resource curse, while universal access can result in party-alignment-driven inefficiencies by granting significant decision-making power to the central government. Strategic policy redesign prevents political prioritisation in resource rents distribution, ensuring government trust and legitimacy and safeguarding resource-rich subnational governments from the resource curse effects.

In the next section, an overview of the relevant distributive politics literature is presented. The third section outlines the Colombian context and the policy reform, followed by the development of this chapter's hypotheses. The fourth section discusses data and methods, while the results are presented in the fifth section. The last section concludes and discusses the implications of the findings.

2.2 Literature review

This chapter follows the political economy approach of fiscal federalism, which points to resources being distributed following political interests (Oates 2008). Within this theoretical framework, studies on grants distribution have explored the impact of political alignment between different tiers of government. Subnational governments aligned with the central government's party or coalition may receive more grants, allowing them to invest in more and improved public goods and services without raising taxes, thereby strengthening their electoral prospects. This could help them maintain their position in office while securing support for the central government in future elections (Baskaran & Hessami 2017). This preferential

treatment seems to respond to internal political processes such as party politics or power distribution within the government, and according to Brollo and Nannicini (2012) could disadvantage unaligned governments and further strengthen the position of aligned ones.

Nevertheless, the literature has engaged in vigorous theoretical debate about the conditions under which party alignment distorts the efficient allocation of inter-governmental transfers. One perspective suggests that central governments or politicians may adopt 'buying support' strategies based on voter location (Schneider et al. 2022). Some state grants are targeted towards loyal jurisdictions with strong political support for the ruling party per the core voters model (Cox & McCubbins 1986) while others suggest grants are targeted towards areas where the ruling party faces close competition from the opposition per the swing voters model, (Lindbeck & Weibull 1987; Dixit & Londregan 1996). In the latter case, more resources may be allocated to unaligned constituencies in an attempt to convince uncommitted voters. Though extensive evidence has been gathered on both the core voters and swing voters models, that evidence does not strongly support either model nor does it indicate whether transfers primarily favor one group of voters over the other (Jarocinska 2022; Golden & Min 2013; Fumey & Egwaikhide 2019)[5].

Additionally, Brollo and Nannicini (2012) state that party alignment effects are contingent on winning margins. When aligned incumbents win by narrow margins, they receive increased grants that impact future elections, while unaligned incumbents with narrow-margin victories receive fewer resources, limiting their electoral prospects. Furthermore, Baskaran and Hessami (2017) highlight that the impact of party alignment depends on whether the central government seeks broad support for policy implementation, which leads to more grants' being allocated to opposition-led local governments (Baskaran & Hessami 2017)[6].

Several empirical studies have shown a positive relationship between political alignment and grants distribution concerning either national and regional party congruence or national and local party alignment (Borcan 2016; Dellmuth et al. 2017). Similar findings are reported at the supranational level where political alignment between regions and the national government positively influenced the distribution of EU funds (Bouvet & Dall'Erba 2010; Chalmers 2013). However, the

[5] Larcinese et al. (2006), Kauder et al. (2016), Jarocinska (2010; 2022), Dellmuth et al. (2017), Diaz-Cayeros et al. (2008), Arulampalam et al. (2009), and Brollo and Nannicini (2012) provide evidence to support the core voters model, while Veiga and Pinho (2007), Abbott et al. (2017), Banful (2011), and Fumey and Egwaikhide (2019) provide evidence to support the swing voters model.

[6] In any case, ambiguity persists concerning whether partisan alignment translates into electoral advantages for the ruling party (Dey & Sen 2016).

use of different empirical designs and approaches in this literature has been acknowledged (Baskaran & Hessami 2017), while ongoing theoretical and empirical debates surround the potential bias associated with partisan alignment (Dey & Sen 2016). Empirical studies have employed various methods, from selection on observables to quasi-experimental designs (Baskaran & Hessami 2017) and have considered other factors such as political systems at the local level[7], budget cycles, and ideology alongside party alignment (Baskaran & Hessami 2017; Psycharis et al. 2021; Dey & Sen 2016). As a result, varied findings have been reported worldwide. For instance, at the supranational level, regional party alignment may not impact the distribution of structural funds across regions (Dellmuth 2011), and partisan congruence between regional and national governments may not influence county-level distribution (Dellmuth et al. 2017). Moreover, political alignment may not impact grant program allocation (Gonschorek et al. 2018) and aligned mayors might not be consistently favored by inter-governmental transfers (Gainza & Livert 2021).

Evidence also suggests that the relationship between partisan alignment and grants distribution is better established in federal countries, regardless of their level of development[8]. In the case of unitary countries, evidence is mainly available for developed countries (e.g. Bracco et al. 2015; Migueis 2013; Jarocinska 2022; Solé-Ollé & Sorribas-Navarro 2008; Psycharis et al. 2021). However, there is limited research on unitary developing countries, with only a few studies having been conducted in these contexts (e.g. Borcan 2016; Bonilla-Mejía 2017)[9].

This chapter adds to the existing literature on the political determinants of resource distribution. Specifically, it extends previous analyses by studying how the design of a regulatory framework can offer a window for party congruence effects to emerge in the distribution of revenue across subnational governments. None of the previous studies addresses the role of partisan alignment on distribution of resources under such a policy redesign context. In addition, this chapter expands the literature by studying the political determinants in natural resource rents distribution and not the effects of royalty revenue (i.e. the resource curse literature). To date, only Arellano-Yanguas and Mejía-Acosta (2020) have stated that central governments' willingness to share resource rents depends on subnational political strength and alignment (i.e. whether the subnational entity belongs to the national governing coalition or to the opposition, because rents will bolster either position). Tonts et al.

[7] Either centered on the mayor or focused on the local council.

[8] For example, evidence can be found for Germany (Baskaran & Hessami 2017), the US (Larcinese et al. 2006), India (Arulampalam et al. 2009; Dey & Sen 2016) and Brazil (Brollo & Nannicini 2012).

[9] Bonilla-Mejía (2017) found that mayors aligned with the current national government coalition receive significantly more discretionary funds (via co-financing) for municipal road investments.

(2013) suggest that the decision to redirect royalties to their regions of origin in Western Australia has faced criticism for potentially perpetuating pork barrel politics. [10] Besides these arguments, empirical support for the role of party congruence in the access to resource rents is rare. Finally, this chapter makes a contribution to the literature on distributive politics by providing empirical evidence on the political determinants of resource distribution in a unitary, fiscally decentralised developing country.

2.3 Context and hypothesis

Colombia is divided into 32 departments and 1101 municipalities. Due to a major decentralisation reform in 1991, these local governments became responsible for the provision of public services in the areas of education, health, sanitation, and drinking water. To deliver these services municipalities rely on earmarked transfers, taxes, and royalties from the extraction of natural resources[11].

In Colombia, the president is elected for a single four-year term. However, in 2005 legislation was enacted that permitted a president to serve a second term upon re-election; this legislation was repealed in 2015[12]. To win, a presidential candidate needs to obtain an absolute majority, but if this is not achieved, the two leading candidates go to a run-off (Bonilla-Mejía 2017). Mayors and governors are elected for four-year terms and the candidate who obtains the highest vote share wins the election.[13] Immediate re-election is also not allowed; however, the incumbent's party can again gain the majority, and the incumbent may pursue election to other positions in subsequent years or seek re-election to the same post in the future[14].

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[10] Pork barrel politics channels public spending to gain re-election by trading votes for projects, typically in the home districts of US Congress members (Weingast et al.1981; Schneider et al. 2022).

[11] In the data used in this chapter, earmarked transfers, taxes, and royalties accounted for 57.5, 12.8, and 5.5 percent, respectively, of total municipal revenue. Additional sources (i.e. non-tax current revenue, current transfers, co-financing resources and other revenue) amounted to 24 percent of revenue.

[12] The presidents elected during this period, Mr. Uribe and Mr. Santos, were re-elected in 2006 and 2014, respectively (Bonilla-Mejía 2017).

[13] Mayors have been directly elected since 1988 and governors since 1992, in both cases to three-year terms, with a change to four-year terms going into effect in 2003.

[14] Drazen and Eslava (2010) highlight these as the two primary reasons why incumbents ineligible for re-election are motivated to engage in electoral manipulation of fiscal policy, a common political practice in Colombia.

Every candidate must belong to just one political party. In addition, candidates cannot switch parties during elections and when elected they must maintain their affiliation. Lastly, in Colombia the two traditional political parties (right – *conservadores* and left –*liberales*) have lost power since the passage of the constitution in 1991, which paved the way for the transition from the previous bipartisan system to the current multi-party system (Líppez-De Castro 2020).[15]

Regarding royalty revenue, prior to 2012 producer municipalities—i.e. municipalities that have an oil field or a coalmine within their jurisdiction[16]—received 80 percent of the royalty revenue collected by the national government, which was then transferred to them directly based on production levels. The remaining 20 percent was centralised in the National Fund of Royalties (FNR). Non-producer municipalities could compete for about 8 percent of that remaining portion via regional projects, applications to which could be submitted by any municipality regardless of its producing status[17]. These projects were required to have a regional impact (i.e. their population and spatial scope had to extend beyond municipal or state limits) and follow established criteria set by the ministry with jurisdiction over the area of intervention. After gaining the approval of the corresponding ministry, a project had to be accepted by the royalty advisory council, which consisted of four ministers, five governors, and two mayors[18]. The FNR faced criticism because the majority of its funds were earmarked for and benefited producer municipalities (Ministerio de Energía 2011).

After a policy change in 2012, the central government recentralised 50 percent of the royalty revenue.[19] Of the remaining 50 percent to be distributed, the

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[15] The transition to a multi-party system brought forth numerous weak, candidate-based parties lacking supporter discipline, and this fragmented party landscape made presidential coalitions the center of political alignment (Bonilla-Mejía, 2017). For instance, Mr. Uribe (2002-2010), a former Liberal Party dissident, founded the *Movimiento Primero Colombia* (Colombia First Movement), welcoming support from Conservatives and Independents (Dugas 2003). In his second term, Uribe was reelected with a coalition including the newly formed National Unity Party (the U), Conservative Party, and Radical Change party (Posada-Carbó 2006). Santos inherited Uribe's political capital, running for the U, which he had helped establish, and also included the Liberal party (Pachón & Hoskin 2011).

[16] Before 2012, municipalities with maritime or river ports that were used to transport natural resources were also considered producers (Bonet et al. 2015).

[17] Of this 20 percent, 50 percent was directed to the Pension Fund for Territorial Entities (FONPET). Of the remaining 50 percent, 25.5 percent was earmarked for projects in specific areas of the country, many in producer departments, and 1 percent was allotted for the operation of the FNR.

[18] Elected by the Colombian federation of governors and mayors, respectively.

[19] Of this 50 percent, up to 30 percent goes to the Savings and Stabilization Fund (FAE), 10 percent goes to the Regional Pension Savings Fund (FONPET), and 10 percent goes to the Fund for Science, Technology and Innovation (FCTel) (Bonet et al. 2015).

share of royalty revenue for producer municipalities was gradually reduced, first in 2012 to 25 percent of the total revenue collected, then in 2013 to 17.5 percent, in 2014 to 12.5 percent, and finally to 10 percent from 2015 onwards (Legislative Act No. 5, 2011) but its allocation continued to follow production criteria.[20] However, before any of that royalty revenue is transferred to producers, producers must also develop projects that need to be approved. Non-producer municipalities, on the other hand, as of 2012 gained access to 10 percent of total royalty revenue, which is directly allocated to them following poverty and population criteria. However, funds are only transferred to them as well after project proposals have been submitted and approved (see Figure 2.1 for pre- and post-policy royalty revenue distribution).

The new approval process for producers and non-producers alike requires them to follow established criteria for project submission.[21] However, these projects no longer need to have a regional impact or extend beyond municipal limits, as was the case previously. Subsequently, the projects have to be approved by a municipal Collegiate Body of Administration and Decision (OCAD). This body consists of (i) the mayor from the municipality that submits the project proposal, (ii) the governor of the state where the municipality is located, and (iii) a representative of the national government, usually a consultant from the National Planning Department (Departamento Nacional de Planeación, DNP). Each level has one vote and a project needs a minimum of two yes votes to be approved[22].

[20] This policy change was partly driven by the fact that from 2002 to 2011, 70 percent of royalties went to seven production-based departments, despite constituting only 14 percent of the country's population (Bonet & Urrego 2014). Furthermore, these direct recipients showed limited progress in achieving social impacts, failing to meet targets, overspending, and facing numerous irregularities (Benítez Ibagué 2015).

[21] See Figure 2.4 in the appendix for a project's trajectory and submission requirements. Despite these requirements, in practice, projects submission exhibit significant deficiencies in project formulation. Advisory committees, with non-binding opinions, are viewed as bureaucratic entities lacking essential information and influence on investment decisions. Additionally, reasons for negative votes within the OCAD are frequently unspecified, often attributed to a lack of information or project impracticality, obscuring key actors' positions and rationale (Transparencia Colombia 2018). In 2013, nearly triple the projects were approved compared to 2012, yet 2014 and 2015 saw a 46% average annual decrease (Guzmán-Finol & Estrada-Jabela, 2016). Finally, Bonilla-Mejia (2017) notes that while the reform successfully expanded beneficiaries of royalties across the country, it also introduced greater discretionary in resource distribution.

[22]Municipal OCADs, of which there are over 900, meet every 2 months.

Before	**After**
Producer Municipalities → 80% directly transferred by production levels Non Producer Municipalities → to compete for 8% (FNR) via: **1. Regional** projects (i.e. extend beyond municipal limits) 1.1 Approved by corresponding **Ministry in the area of the project** - Sectorial requirements 1.2 Approved by FNR **Commission*** - **11 Votes from**: - 4 Ministers: national - 5 Governors and 2 Mayors - *Both, project's approval by the Ministry and the FNR Commission (1.1. and 1.2) was a prerequisite for the project to proceed. Commission's approval was reached by majority (Law 141 1994).	Producer Municipalities → 10% allocated by production levels Non Producer Municipalities → 10% allocated by poverty and population criteria But, **both types of municipalities** to obtain it (i.e. disbursed) via: 1. **Local** Projects (i.e. do not extend beyond municipal limits) 1.1. Established methodology/criteria 1.2 Approved by a municipal **OCAD, 3 Votes from**: - National government representative, ususally a consultant to DNP (1) - Governor of the state where the project will be implemented(1) - Mayor of the municipality where the project will be implemented (1)

2012

Figure 2.1 Royalty revenue distribution before and after the policy

Source: Own elaboration based on Law 141 (1994) and Legislative Act No. 5 (2011).

In 2012, the year of the policy reform, the national government led by President Santos was looking forward to 2014, when it would be seeking to be re-elected[23]. This led to an increased incentive for the executive to exercise discretion in the distribution of resource rents to municipalities via a policy change. Additionally, incentives increased because commodities production was expanding and the international prices of those commodities was continuing to trend upwards, implying more resources were available for disbursement among municipalities[24]. Therefore, the policy reform, which made all municipalities eligible for receiving grants, opened up the possibility for the (party of the) president to 'buy votes' through the steering of the distribution of grants. Second, the introduction of OCADs

[23] Santos pursued a political reform to eliminate presidential re-election only after being re-elected (Reyes L. 2015). If he had not sought re-election, he would have pursued the reform earlier.

[24]The coal and mining industries doubled their production from 2002 to 2012 (Bonet & Urrego 2014).

granted the central government decision-making power over the disbursement of at least 20 percent of the funds, as opposed to before, when the only duty of the central government was to transfer 80 percent of the fixed funds directly to producers. Thus, with the implementation of OCADs throughout the country, the central government sought to institutionalise the increased relevance of political affiliation (i.e. alignment of the mayor with the president's party), especially with more resources being available. It is reasonable to suppose the institutionalisation of OCADs across the country was key to the central government's rewarding of local supporters, thus gaining their future support and getting the president re-elected in 2014.

Figure 2.1 shows that after 2012, the central government had greater project approval discretion. Before the policy change, resources were allocated exclusively to regional projects encompassing multiple municipalities rather than to local projects specific to individual municipalities, which made it challenging to exercise discretion in favor of politically aligned municipalities. Another reason why it became possible to exercise more discretion after the policy change is that only one body was left in charge of approving projects, as opposed to before 2012, when two separate entities were in charge (the ministry and the royalty advisory council) and they could have checked each others decisions. Moreover, the previous national advisory council had a much larger and more diverse membership than do municipal OCADs, which could have prevented political bias from emerging. Finally, after the policy change, central government representatives in OCADs were more likely to use their discretion to favor projects from municipalities with mayors from the same party as the president out of the fear that the executive would cut short their career trajectories. Indeed, central government representatives in the municipal OCADs were basically advisers to DNP, which is the executive body in charge of implementing the policy (Transparencia Colombia 2018). Therefore, their current and future contracts as consultants were likely linked to agreeing with the current government and supporting its re-election.[25]

H1 The positive impact of party congruence between a mayor and president on receiving royalty revenue is larger following the policy change of 2012.

After the policy change, discretion on the part of the central government in the distribution of royalty revenue could have played a greater role in the case of non-producers. On the one hand, the general consensus was that producers were still

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[25]Public servants, whose careers are not dependent on the elected government, may have been more objective in evaluating projects.

entitled to this royalty revenue, because they were the ones who had generated it, even if they had to present projects and get them approved[26]. The political cost of not approving projects coming from producers was therefore greater for members of the national government in the OCADs. The slightest suspicion that a project's not being approved was based on political alignment could have ended in a scandal on the part of the producers, who were already disappointed with the new distribution policy and were suffering from a large reduction in their share of royalty revenue.[27] On the other hand, it was easier for representatives of the central government in the OCADs to condition non-producers' access to royalty revenue on the latter's political alignment. Because non-producers were never assigned royalty resources before, and had no prior access to them, a project's rejection could simply be justified as part of the new process, masking political bias. Therefore, the political cost of rejecting a non-producer's project was lower.

H2A After the policy, the positive impact of party congruence between the mayor and the president is stronger for non-producer municipalities in their obtaining of royalty revenue.

As indicated, Colombia's party system weakened after the 1991 Constitution, as traditional parties lost influence and many new parties emerged, often centered around a single leader and lacking stability and discipline (Bonilla-Mejía 2017). Such a context makes it riskier for the ruling party or coalition to influence the decisions of indecisive voters by providing more resources in every election. If parties are assumed to be risk averse, they would rather invest in loyal voters than in swing voters (Jarocinska 2022). Indeed, as indicated by Diaz-Cayeros et al. (2008), parties can jeopardise the loyalty of their core voters if they deliver benefits to groups outside the core in an attempt to win their support, because the unreliable groups could eventually switch sides again. Thus, the ruling party in Colombia would be less willing to risk their core electoral support due to the unstable multi-party context. Therefore, the ruling party will deliver benefits primarily

[26] Producers' entitlement to royalty revenue was self-evident, because the 1991 Constitution had established their right to directly access these rents.

[27] The reform faced severe criticism for centralising resources and reducing funding to producers, undermining their autonomy (Moreno González 2019). Rejecting producer's projects could inflict greater political costs on the central government by fueling scandals and accusations of discrimination based on political alignment, potentially resulting in reputation damage and electoral losses from producers.

towards non-producers that already provide strong support, making party congruence effects to be expected and to hold over mayor's vote share.

H2B After the policy, the positive impact of party congruence between the mayor and the president on the obtaining of royalty revenue by non-producer municipalities does not decrease with mayor's vote share.

It can be argued that party congruence between the mayor and the governor can counteract the bias imposed by the central government, because it only takes two votes to get the project approved, so that the mayor could simply pressure or lobby the governor, whose willingness to give a vote is in play. Thus, party congruence between the mayor and the governor is likely to guarantee the acceptance of the project. However, a mayor's party congruence with the governor is expected to be irrelevant to the obtaining of royalty revenue either before or after the policy, because states have never collected, managed, or transferred this revenue for municipalities.[28]

Before the policy, governors had no real say in municipalities' access to royalty revenue, because a relatively small number of them were included as members of the FNR's advisory council. After the policy change, even if the mayor and governor were aligned but not with the president, a governor's willingness to provide a yes vote could be limited, because governors still do not collect, manage, or transfer this revenue for municipalities and thus access to royalty revenue for the municipalities in their jurisdiction is not really within their domain. And, even though mayors could have lobbied governors to obtain their vote in the municipal OCADs, governors could have been reluctant to respond for two reasons. First, they might not want to challenge the decisions of the national government, the support of which governors need to carry out their activities in the future (Arellano-Yanguas & Acosta 2014). Second, they might believe that by interfering with a municipality's access to royalty revenue, they could eventually affect their own access under the new royalty system, because they also had to submit projects and get them approved by another type of OCAD, which included 10 percent of mayors in their jurisdiction (Decree 1075 of 2012). Thus, governors have their hands tied in the municipal

[28] The non-statistically significant effect of mayors' alignment with the governor's party is confirmed in appendix A.

OCADs and are hesitant to cast the decisive vote, which makes them more inclined to play a conciliatory role to avoid possible repercussions against their states.[29]

2.4 Data

The analysis in this chapter relies on a panel data set constructed from various sources. The data set consists of 1101 municipalities in Colombia over the period of 2002–2017. Data are collected from the National Administrative Department of Statistics (DANE), the National Department of Planning (DNP), the National Register Office, and the Center for Economic Development Studies (CEDE)[30].

The key dependent variable is royalty revenue, expressed as a share of total municipal revenue. Our main model has three key independent variables: party congruence, vote share, and a post-policy reform dummy. The variable *party congruence* is a dummy variable equal to 1 if there is party alignment between the mayor and the president and 0 otherwise[31]. *Voteshare* is defined as the proportion of votes for the mayor in each election. The policy reform indicator (*reform*) is a binary variable equal to 1 for the year after the reform (i.e. 2012 and onwards) and 0 otherwise.

The model used in the analysis includes three control variables. The first two, number of *people affiliated with the subsidised health regime* and *population density*, control for poverty and population, respectively, because both criteria were part of the formula for allocating royalty revenue to non-producers after the policy change[32]. As the variables were skewed, the variables are log-transformed. The third control variable, *administrative capacity*, is included to account for a municipality's ability to submit or not submit successful projects. *Administrative capacity* is an indicator that assigns a score of 0 to 100 percent to municipalities on the basis of an average across five indicators: the share of civil servants with an undergraduate degree, executive staff turnover, computer availability, the extent to which processes are systematised, and the extent to which an internal control system is applied (DNP

[29] The governor's role is stronger when it comes to deciding which projects are presented to and approved by the regional OCAD, because funds are transferred to the states (Contraloría 2017).

[30] The data from DANE and DNP can be found at www.dane.gov.co and www.terridata.dnp.gov.co, respectively.

[31] Political alignment is measured with respect to both the government coalition and the political party of the president (Brollo & Nannicini 2012).

[32] The subsidised regime offers health coverage to the poorest who can't afford it.

2012, 2017).[33] For brevity, these variables are not shown in model 2.1 (and the subsequent models), but are included in the estimation (see Table 2.1 for the summary statistics of all variables).

Table 2.1: Descriptive statistics of dependent and control variables

Variable	Obs	Mean	Std.dev.	Min	Max
royalties	19,771	5,45	11,39	0,00	87,45
Presidentaffiliation	19,818	0,37	0,48	0,00	1,00
Governoraffiliation	19,818	0,13	0,33	0,00	1,00
VoteShare	19,772	0,48	0,13	0,01	1,00
log_densidadpoblacion	19,786	3,85	1,23	0,14	9,69
log_AfiliadosRS	19,747	9,03	0,99	5,74	14,33
AdmCap	13,180	69,46	23,77	0,00	100,00

Notes: Observations are clustered within 1,101 municipalities.

2.5 Methods

The models are constructed using a stepwise approach. First, the impact of party congruence (between the mayor and the president) and the policy change on municipalities' access to royalty revenue is assessed by using the following panel data model (model 1 in the results).

$$(2.1)\ RoyRev_{it} = \alpha_1 + \beta_1 PartyCong_{it} + \beta_2 R_t + \delta Z_{it} + \mu_i + \lambda_t + \epsilon_{it},$$

where i = 1 ... n municipalities, t = the years 2002 ... 2017, and $\epsilon_{i,t}$ represents the error term. $RoyRev_{it}$ denotes royalty revenue by municipality i in year t. $PartyCong_{it}$ refers to the political alignment between the mayor and the president by municipality i in year t. R is the post-policy reform dummy and Z_{it} is a vector of control variables. Municipal fixed effects, μ_i, are added to account for differences within municipalities and a linear time trend, λ_t, is included as a control.[34] The same model is used for producer and non-producer municipalities.

[33] Table 2.6 in the appendix provides further detail.

[34] Year fixed-effects are not included because they will be collinear with the reform dummy.

The next step is to observe whether the policy change made municipalities' access to royalty revenue more responsive to political alignment (model 2 in results) following hypothesis 1.

$$(2.2)\ RoyRev_{it} = \alpha_1 + \beta_1 PartyCong_{it} + \beta_2 R_t + \beta_3 (PartyCong_{it} * R_t) + \delta Z_{it} + \mu_i + \lambda_t + \epsilon_{it}$$

Second, the impact of vote share or proportion of votes obtained by the elected mayor on access to royalty revenue is assessed (model 3 in the results).

$$(2.3)\ RoyRev_{it} = \alpha_1 + \beta_1 PartyCong_{it} + \beta_2 R_t + \beta_3 VoteShare_{it} + \delta Z_{it} + \mu_i + \lambda_t + \epsilon_{it},$$

where $VoteShare_{it}$ denotes mayor's proportion of votes by municipality i in year t.

Then, the possibility of an interaction between the independent variables (party congruence, policy change, vote share) is evaluated (models 4 to 7 in the results).

$$(2.4)\ RoyRev_{it} = \alpha_1 + \beta_1 PartyCong_{it} + \beta_2 R_t + \beta_3 VoteShare_{it} + \beta_4 (PartyCong_{it} * R_t) + \delta Z_{it} + \mu_i + \lambda_t + \epsilon_{it}$$

$$(2.5)\ RoyRev_{it} = \alpha_1 + \beta_1 PartyCong_{it} + \beta_2 R_t + \beta_3 VoteShare_{it} + \beta_4 (PartyCong_{it} * R_t) + \beta_5 (PartyCong_{it} * VoteShare_{it}) + \delta Z_{it} + \mu_i + \lambda_t + \epsilon_{it}$$

$$(2.6)\ RoyRev_{it} = \alpha_1 + \beta_1 PartyCong_{it} + \beta_2 R_t + \beta_3 VoteShare_{it} + \beta_4 (PartyCong_{it} * R_t) + \beta_5 (PartyCong_{it} * VoteShare_{it}) + \beta_6 (R_t * VoteShare_{it}) + \delta Z_{it} + \mu_i + \lambda_t + \epsilon_{it}$$

$$(2.7)\ RoyRev_{it} = \alpha_1 + \beta_1 PartyCong_{it} + \beta_2 R_t + \beta_3 VoteShare_{it} + \beta_4 (PartyCong_{it} * R_t) + \beta_5 (PartyCong_{it} * VoteShare_{it}) + \beta_6 (R_t * VoteShare_{it}) + \beta_7 (PartyCong_{it} * VoteShare_{it} * R_t) + \delta Z_{it} + \mu_i + \lambda_t + \epsilon_{it}$$

Third, in light of hypotheses 2, party congruence effects for producers and non-producers may not be the same, especially with regard to the policy change and mayor's vote share. To capture this form of heterogeneity, the analysis in the first two steps for producers and non-producers is repeated. For consistency and

comparison, the same specification across models and type of municipality is preserved.

Finally, a robustness test is included where the royalty revenue allocated to each municipality after the policy change is added as an additional control to the models to determine whether or not its inclusion compromises the party congruence effects found so far. This additional analysis is presented in appendix B.

2.6 Results

The results for models 1 and 2 shown in Table 2.2 reveal that following the policy change in 2012, royalty revenue increased (significant at the 1 percent level) but not for all municipalities, only for non-producers. Table 2.2 also reveals a clear positive association between mayor's alignment with the president's party and royalty revenue in all models and in model 1, the estimated coefficient is positive and statistically significant at the 1 percent level for all municipalities and for non producers. On average, being aligned implies a 0.611 percent increase in royalty revenue (as a percentage of total municipal revenue), while being aligned and a non-producer increases royalty revenue (as a percentage of total municipal revenue) by 0.828 percent. These findings are consistent with Psycharis et al. (2021), who find aligned Greek municipalities received 3.9 perceive higher levels of total grants compared to unaligned counterparts. Similarly, the results are consistent, albeit to a lesser degree, with Migueis (2013), who finds aligned Portuguese municipalities receive 19 percent more targetable per capita transfers than unaligned municipalities. Further, the results align with the findings of Gainza and Livert (2021), indicating a 6.9 percent rise in inter-governmental per capita transfers for aligned Colombian municipalities.

The smaller size of the increase observed here is consistent with the data set's spanning both pre- and post-policy periods, suggesting that the effects of alignment are likely attenuated. This is attributed to the fundamental formula-based (i.e. production-oriented) royalty revenue distribution towards producer municipalities before the policy implementation. Notably, it was anticipated that the alignment effects would strengthen after the policy change due to policy redesign, allowing for increased political involvement, particularly on the part of non-producers (hypothesis 2a). Furthermore, variations in effect sizes compared to those found in other studies might arise from those studies' focus on grants or inter-governmental transfers, often characterised by discretion. In contrast, the present

analysis uniquely centers on transfers exclusively funded by royalty revenue. For instance, Migueis (2013) examines inter-governmental transfers, which are additionally subject to targeting or discretion; Gainza and Livert (2021) address formula-based inter-governmental transfers, though they acknowledge discretionary elements in the overall distribution and criteria application; and Psycharis et al. (2021) consider total grants from central to municipal entities, encompassing both regular and exceptional inflows.

Table 2.2: Impact of mayor's party congruence with the president's party and the policy change on municipalities' access to royalty revenue

	ALL		NON PRODUCERS		PRODUCERS	
	Model 1	Model 2	Model 1	Model 2	Model 1	Model 2
Presidentaffiliation	0.611***	0.398	0.828***	0.339	0.231	0.858
	(0.192)	(0.261)	(0.172)	(0.226)	(0.507)	(0.720)
R	2.440***	2.142***	4.081***	3.385***	-2.246***	-1.400
	(0.304)	(0.430)	(0.286)	(0.355)	(0.778)	(1195)
Presidentaffiliation X R		0.409		0.946***		-1.191
		(0.407)		(0.342)		(1.069)
Trendline	YES	YES	YES	YES	YES	YES
Controls	YES	YES	YES	YES	YES	YES
Municipality FE	YES	YES	YES	YES	YES	YES
Observations	13,155	13,155	9,717	9,717	3,438	3,438
Municipality	1,100	1,100	811	811	289	289

Robust standard errors in parentheses *** p<0.01, ** p<0.05, * p<0.10

Model 2 shows a positive interaction term between the policy change and being aligned with the president's party for all municipalities and non-producers. This coefficient is only statistically significant (at the 1 percent level) for non-producers, which does not support hypothesis 1. However, it does support hypothesis 2a, so the positive impact of party congruence between the mayor and the president *on receiving royalty revenue* is stronger after the policy change for this type of municipality. After the reform, non-producers as a whole received 3.385 percent more royalty revenue (as a percentage of total municipal revenue), but if they were aligned with the president the increase reached 4.331 percent.

Table 2.3 depicts the results of models 3 to 7 for non-producers and producers. All of the results confirm that after the policy change, non-producers obtain more royalty revenue (significant at the 1 percent level) while producers do

not. The results for model 3 reveal party congruence effects are maintained for non-producers when controlling for vote share. The results for all models indicate a negative association between mayor's vote share and royalty revenue; however, the estimated coefficients are statistically significant only in the results of models 3 and 4 for producers (at the 5 percent level).

The results for models 4 to 6 support hypothesis 2a, because after the policy change, the effects of party congruence on royalty revenue are positive and statistically significant for non-producers (at the 1 percent level). For instance, as can be observed in the results for model 4, after the reform aligned non-producers achieved a 4.326 percent increase in royalty revenue (as a percentage of total municipal revenue) when controlling for voteshare. This result is consistent with model 2 in Table 2.2. However, margin plots are required to clarify whether there is support for hypothesis 2b, that is, whether after the policy change, the positive impact of party congruence on obtaining royalty revenue (for aligned non-producers) does not decrease with vote share.

Figures 2.2 and 2.3 depict, respectively, the predicted royalty revenue by non-producer and producer municipalities, whether or not they are aligned with the president's party and over mayor's vote share and before and after the policy change. These figures reveal three important findings. First, after the change, royalty revenue was higher for non-producer municipalities, regardless of their alignment with the president's party, but for producers it was neither lower nor higher. Second, the effect of mayor's alignment with the president's party is statistically significant for non-producers—but only after the policy change and for a vote share equal or above 40 percent. This supports hypothesis 2a and suggests additional resources were sent to aligned non-producers who have a chance to win. For producers, this effect is not statistically significant when comparing aligned to the non-aligned either before or after the policy and regardless of voteshare.

Third, royalty revenue decreases with vote share as shown by the negative slope of the lines, except for non-producers aligned with the president's party after the policy change. This suggests that before the change, fewer resources were given to all municipalities aligned or not, the higher the vote share. One might think a high-vote-share municipality does not need as many resources as one with a low vote share for achieving political goals (i.e. more votes). This applied to all municipalities, because before the policy change discrimination based on party congruence was harder to exercise (i.e. 80 percent of the resources was already allotted to producers). After the policy change, fewer resources were still given to municipalities with high vote share. However, for aligned non-producers a political bias seems to have been introduced, because the positive impact of party congruence

does not decrease with vote share, so that aligned non-producers obtain more resources the higher the vote share. This result supports hypothesis 2b: apparently the ruling party is rewarding its loyal supporters and is less willing to risk its core electoral support due to the unstable multi-party context. These results are consistent with the findings of Gainza and Livert (2021) concerning inter-governmental transfers targeting Colombian municipalities with aligned mayors who secure significant electoral victories, a pattern attributed to the challenges coalition governments face in implementing a swing strategy.

These results are consistent with hypothesis 2. After the policy, the positive impact of party congruence between the mayor and the president on obtaining royalty revenue is stronger for non-producer municipalities and it does not decrease with vote share.

The results suggest the policy change caused party congruence to result in greater resource distribution to non-producers, probably because after the policy revenue was transferred following the approval of local projects (rather than regional ones) by a single (instead of two), smaller, and less-diverse entity where the center could exert political bias. Non-producers were more vulnerable to this political bias after the reform because, unlike producers, they were not considered entitled to royalty revenue, as they never generated it.

Figures 2.2 and 2.3 reinforce these results, because they show that contrary to non-producers, producers, whether aligned or not, obtained the same resources before and after the policy, probably because the political cost of not approving their projects was higher than for not approving the projects of non-producers. Thus, non-producers were more subject to the effects of party congruence after the policy change, even though their access to royalty revenue was supposed to depend solely on the quality and approval of the projects submitted.

Lastly, the results suggest this additional support directed to aligned non-producers was strategic, as it excluded those with a very low vote share. Such municipalities are more likely to lose elections even if higher resources are distributed to them. Moreover, the results might suggest the presence of the core voters model, because support directed to aligned non-producers via royalty revenue increases with vote share as shown by the positive slope of the first line in Figure 2.2. Thus, resources were aimed at rewarding core voters and maintaining their support.

Table 2.3: Impact of mayor’s party congruence with the president’s party, the policy change and vote share on non-producers’ and producers’ access to royalty revenue

	NON PRODUCERS					PRODUCERS				
	Model 3	Model 4	Model 5	Model 6	Model 7	Model 3	Model 4	Model 5	Model 6	Model 7
Presidentaffiliation	0.827***	0.334	-0.605	-0.385	0.244	0.203	0.800	-0.350	-0.886	-1.091
	(0.172)	(0.226)	(0.653)	(0.651)	(0.747)	(0.509)	(0.721)	(2.384)	(2.389)	(2.878)
R	4.074***	3.372***	3.367***	2.352***	3.014***	-2.169***	-1.359	-1.369	0.372	0.162
	(0.286)	(0.355)	(0.356)	(0.617)	(0.742)	(0.783)	(1.212)	(1.210)	(2.443)	(3.600)
Presidentaffiliation*R		0.954***	0.973***	0.937***	-0.290		-1.135	-1.110	-1.073	-0.668
		(0.343)	(0.345)	(0.345)	(1.138)		(1.074)	(1.074)	(1.070)	(3.901)
VoteShare	-0.300	-0.255	-1.291	-2.281***	-1.678*	-5.029**	-5.017**	-6.265*	-4.840	-5.016
	(0.731)	(0.731)	(0.812)	(0.871)	(0.879)	(2.307)	(2.306)	(3.737)	(4.139)	(4.650)
Presidentaffiliation*VoteShare			2.004	1.599	0.256			2.439	3.540	3.984
			(1.329)	(1.317)	(1.503)			(4.660)	(4.676)	(5.809)
R*VoteShare				2.302*	0.855				-3.882	-3.413
				(1.191)	(1.472)				(4.632)	(7.487)
Presidentaffiliation*R*VoteShare					2.638					-0.884
					(2.372)					(8.165)
Trendline	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES
Controls	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES
Municipality FE	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES
Observations	9,713	9,713	9,713	9,713	9,713	3,434	3,434	3,434	3,434	3,434
Municipality	811	811	811	811	811	289	289	289	289	289

Robust standard errors in parentheses *** p<0.01, ** p<0.05, * p<0.10

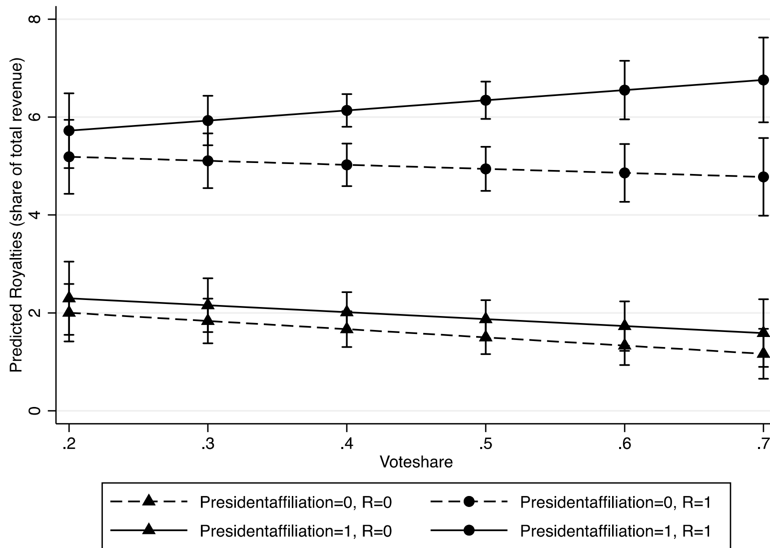

Figure 2.2: Effects of mayor's party congruence with the president's party before and after the policy change for non-producers

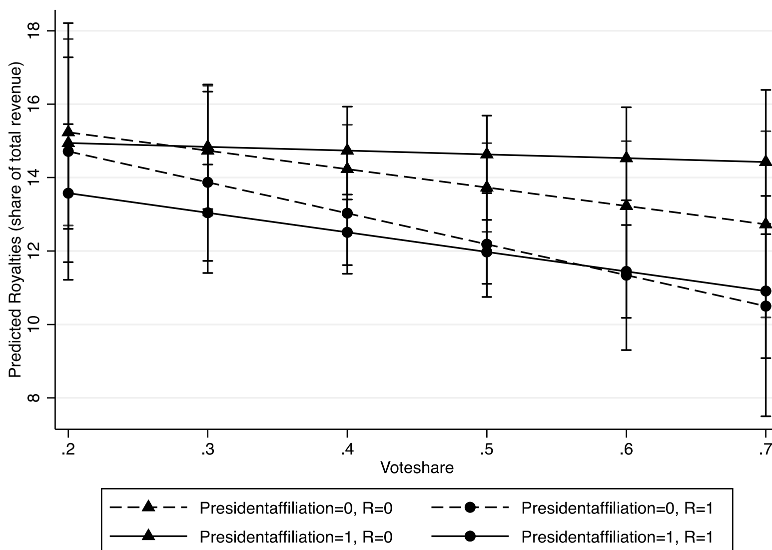

Figure 2.3: Effects of mayor's party congruence with the president's party before and after the policy change for producers

2.7 Conclusions

The distribution of governmental revenues in multi-level-government countries is complex, with party alignment identified as a key factor contributing to political bias in inter-governmental transfers. Aligned subnational governments often receive more transfers in order to secure political support. While the existing literature discusses the conditions under which party alignment distorts efficient allocation, empirical findings on its impact remain inconclusive and furthermore limited attention has been given to the impact of the regulatory framework of inter-governmental transfers on the extent to which party alignment matters for revenue distribution across jurisdictions. This chapter examines this impact, considering the dynamic nature of the framework and its potential to explain the diverse findings in the literature.

The results indicate that municipalities with aligned mayors receive an increase of 0.611 percent in royalty revenue (as a percentage of total municipal revenue), which rises to 0.828 percent for aligned non-producers. These findings are consistent with Psycharis et al. (2021), Migueis (2013), and Gainza and Livert (2021). Furthermore, the findings suggest that redesigning inter-governmental transfer policies can strengthen the impact of party alignment between the mayor and the president, leading to increased revenue distribution. However, this advantage primarily benefits aligned subnational governments without prior legal access to royalties and that do not contribute to resource generation, exposing them to political bias. Following the policy reform, aligned non-producers experienced a 4.326 percent increase in royalty revenue (as a percentage of total municipal revenue), while controlling for voteshare. These results suggest a tendency for government funding to favor aligned localities following political outcomes. Additionally, the analysis presented in this chapter reveals that within a multi-party context, resources are directed to loyal subnational governments with high voteshare as a kind of reward, aligning with the core voters model (Cox and McCubbins 1986) and congruent with the findings of Gainza and Livert (2021) regarding inter-governmental transfers. Lastly, the findings underscore the pivotal role of party alignment with the president in terms of accessing royalty revenue, particularly following policy redesign and in unitary developing countries where the national government traditionally handles resource collection.

The findings reveal the significance of the regulatory framework governing inter-governmental transfers in encouraging potential distortions in resource distribution resulting from party alignment. The framework's design is essential to

preventing politically biased distribution and resource misuse. Balancing efficiency and equality is crucial for unbiased transfer distribution. However, policy designs often fall short. Strict rules against political support in transfers can lead to unequal and inefficient distribution favoring specific groups, resulting in ineffective investments and even the resource curse. Conversely, designs aiming for equitable distribution may introduce inefficiencies when party alignment influences resource distribution, particularly when the center is granted significant decision-making power. Therefore, redesign attempts can introduce new inefficiencies driven by political motives. Furthermore, public awareness of party alignment's impact on distribution, resulting from policy design, can erode trust and government legitimacy. These findings are relevant for resource-rich developing countries, because they emphasise policy design as a crucial determinant of resource rent distribution. Appropriate redesigning efforts can mitigate adverse consequences of distorted distribution patterns and the negative effects of the resource curse, especially in resource-rich subnational governments. However, achieving the right policy design is challenging in developing countries, where institutions may be vulnerable to the undermining of adherence to efficiency-based criteria by political interests.

The external validity of the findings presented in this chapter could be enhanced by examining the impact of the regulatory framework on party alignment's influence on resource distribution in other unitary developing and decentralised countries. Additionally, the study of the framework's impact on different levels of government, including departments and considering potential heterogeneous effects, could deepen the understanding of the subject. Moreover, exploring scenarios with policies and data that enable alternative methodological approaches, such as difference-in-differences analysis, or analysing the impact of institutional changes on subnational governments with narrow electoral margins, can further validate the findings presented here. Continuing to explore the framework's effects on party alignment and resource rents distribution across diverse contexts and government levels could expand understanding of the underlying mechanisms behind the resource curse. Future supranational studies should also address the implications and challenges of institutional dynamism within individual countries and across government levels. Lastly, exploring the interplay between a dynamic institutional environment and party alignment's impact on other development-relevant variables and outcomes is crucial.

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Appendix

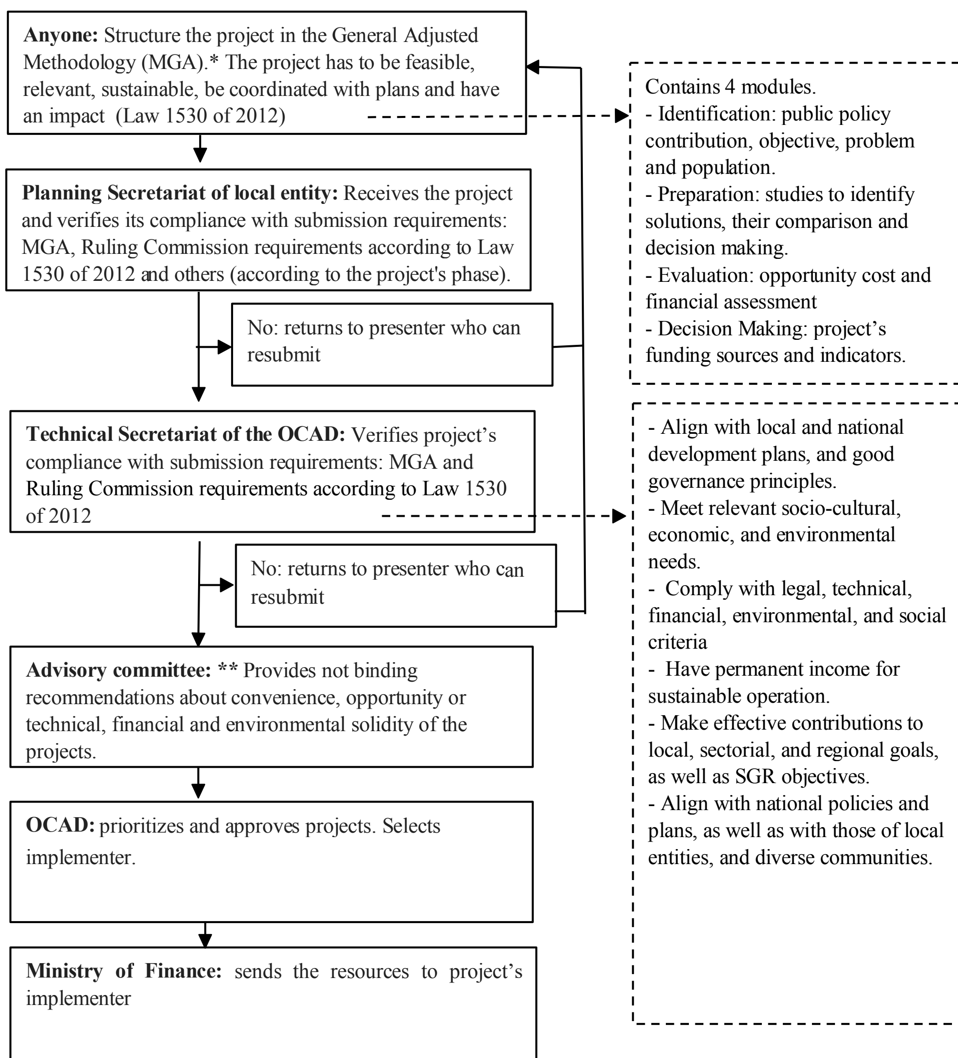

Figure 2.4: Project trajectory in the SGR and submission requirements

Source: DNP (2012).

* A project's profile/idea can also be submitted and obtain resources for feasibility studies.
** It can involve representatives from various groups, such as Regional Competitiveness Commissions; territorial planning councils; economic and professional associations; social organisations; delegates of district, departmental, and national consultative committees for diverse communities; higher education institutions; jurisdiction authorities; and technical institutes.

Appendix A: Robustness check: Party congruence between mayor and governor

Table 2.4 confirms that after the policy change in 2012, non-producers obtained more royalty revenue, and producers obtained less (significant at the 1 percent level). Table 2.4 also reveals party congruence between the mayor and the governor does not have a clear association with royalty revenue and the estimated coefficient is not statistically significant in any of the models. Moreover, model 2 shows non-statistically-significant coefficients for the interaction term between the policy change and being aligned with the governor's party for all municipalities. Thus, party congruence between a mayor and governor does not appear to secure more royalty revenue after the policy change.

Table 2.5 depicts the results for models 3 to 7 for both non-producers and producers. The results for models 3 to 6 show that after the policy change, non-producers obtained more royalty revenue (significant at the 1 percent level), and producers obtained less. The results also reinforce that alignment with the governor's party still does not have a clear association with royalty revenue and the estimated coefficient is not statistically significant in the results for any of the models. The results for models 3 and 4 also indicate a negative relationship between mayor's vote share and royalty revenue, which is statistically significant for producers (at the 5 percent level).

The results for models 4 to 6 indicate that after the policy change, alignment with the governor's party did not secure more royalty revenue. In the results for model 7, the effects of party congruence between the mayor and the governor after the policy change seem to be conditional on vote share and especially for producers. However, to clarify these results margin plots are run for producers and non-producers.

Table 2.4: Impact of mayor's party congruence with governor's party and the policy change on municipalities' access to royalty revenue

	ALL		NON PRODUCERS		PRODUCERS	
	Model 1	Model 2	Model 1	Model 2	Model 1	Model 2
Governoraffiliation	-0.054	0.171	-0.345	-0.463	0.209	0.474
	(0.328)	(0.436)	(0.280)	(0.321)	(0.782)	(0.995)
R	2.588***	2.643***	4.271***	4.247***	-2.187***	-2.089***
	(0.301)	(0.299)	(0.284)	(0.286)	(0.755)	(0.763)
Governoraffiliation X R		-0.620		0.322		-0.748
		(0.762)		(0.605)		(1.668)
Trendline	YES	YES	YES	YES	YES	YES
Controls	YES	YES	YES	YES	YES	YES
Municipality FE	YES	YES	YES	YES	YES	YES
Observations	13,155	13,155	9,717	9,717	3,438	3,438
Municipality	1,100	1,100	811	811	289	289

Robust standard errors in parentheses *** p<0.01, ** p<0.05, * p<0.10

Table 2.5: Impact of mayor's party congruence with the governor's party, the policy change, and vote share on non-producers and producers access to royalty revenue

	NON PRODUCERS					PRODUCERS				
	Model 3	Model 4	Model 5	Model 6	Model 7	Model 3	Model 4	Model 5	Model 6	Model 7
Governoraffiliation	-0.332	-0.445	0.282	0.045	-1.012	0.208	0.466	-0.426	-0.142	-6.172
	(0.281)	(0.322)	(1.007)	(1.013)	(1.150)	(0.783)	(0.995)	(3.436)	(3.388)	(3.795)
R	4.264***	4.241***	4.242***	3.161***	2.923***	-2.116***	-2.020***	-2.026***	-0.671	-2.069
	(0.284)	(0.287)	(0.287)	(0.572)	(0.605)	(0.760)	(0.769)	(0.770)	(2.198)	(2.227)
Governoraffiliation X R		0.308	0.285	0.314	3.290*		-0.729	-0.730	-0.713	16.493***
		(0.605)	(0.615)	(0.616)	(1.917)		(1.646)	(1.651)	(1.637)	(5.649)
VoteShare	-0.372	-0.368	-0.234	-1.524*	-1.802**	-5.074**	-5.073**	-5.268**	-3.676	-5.400
	(0.740)	(0.740)	(0.798)	(0.815)	(0.826)	(2.297)	(2.299)	(2.385)	(3.374)	(3.452)
Governoraffiliation*VoteShare			-1.545	-1.061	1.193			1.914	1.291	14.033*
			(1.839)	(1.853)	(2.055)			(6.560)	(6.485)	(7.697)
R*VoteShare				2.396**	2.889**				-2.983	0.205
				(1.194)	(1.270)				(4.575)	(4.618)
R*Governoraffiliation*VoteShare					-6.541*					-36.588***
					(3.965)					(11.697)
Trendline	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES
Controls	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES
Municipality FE	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES
Observations	9,713	9,713	9,713	9,713	9,713	3,434	3,434	3,434	3,434	3,434
Municipality	811	811	811	811	811	289	289	289	289	289

Robust standard errors in parentheses *** $p<0.01$, ** $p<0.05$, * $p<0.10$

Figures 2.5 and 2.6 depict, respectively, the predicted royalty revenue by non-producer and producer municipalities, whether or not they are aligned (to the governor's party) and over mayor's vote share and before and after the policy change. Figures 2.5 and 2.6 reveal two important findings. First, after the policy change, royalty revenue was higher for non-producer municipalities, regardless of their party alignment, but for producers it was neither lower nor higher. Second, the effect of mayor's alignment with the governor's party is not statistically significant for non-producers or producers before or after the policy change and regardless of vote share.

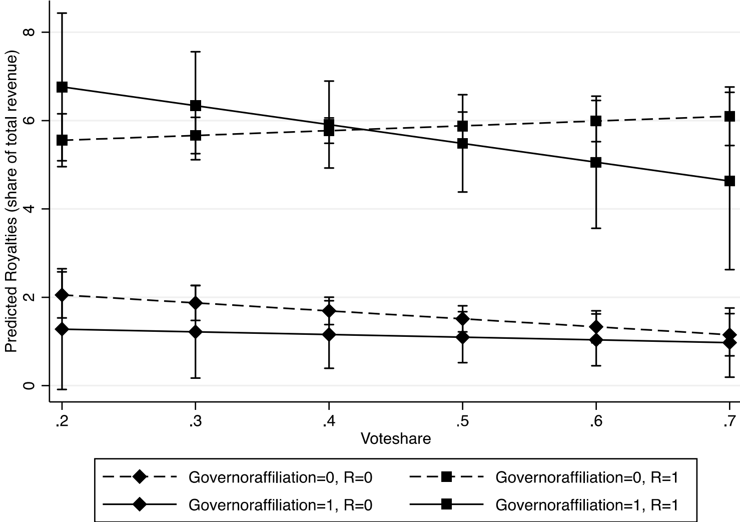

Figure 2.5: Effects of mayor's party congruence with governor's party before and after the policy change for non-producers

Mayors' party congruence with the governor's party was expected to be irrelevant for obtaining increased royalty revenue either before or after the policy change, because states have never collected, managed or transferred this revenue to municipalities. Before the policy change, governors as a whole exercised very little authority when it came to allocating or distributing these resources to municipalities, because only few of them were advisory council members. Even after the policy change, governors still lack the authority to collect, manage, or transfer royalty revenue to municipalities, leading to their reluctance to cast the deciding votes. Additionally, governors are constrained by need to balance the interests of both the central government and municipalities, as they require support from both levels to

secure approval for their own projects in a different type of OCAD. Finally, they rely on the cooperation of both levels of government to effectively execute their own activities.

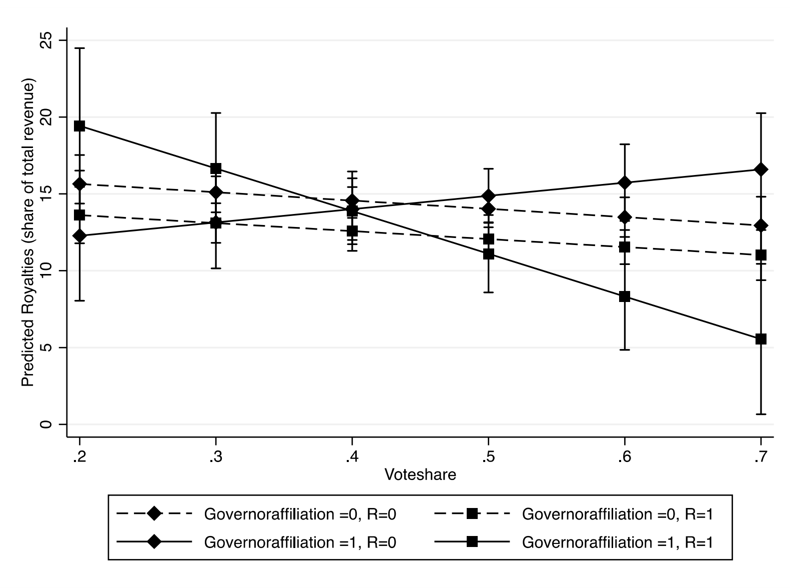

Figure 2.6: Effects of mayor’s party congruence with governor’s party before and after the policy change for producers

Table 2.6: Indicators for calculating the administrative capacity of municipalities

Indicator	Formula
Executive staff turnover	The share of civil servants –on temporary and fixed contracts- at the executive level who remained in their position during the past year relative to the total number of positions.
Share of civil servants with an undergraduate degree	The share of civil servants with undergraduate degree who held positions at the managerial, advisory and professional levels during the past year relative to the total number of staff positions at the managerial, adviser and professional levels.
Computer availability	The share of civil servants at the managerial, advisory, professional, and technical levels who in the past year had a computer relative to the total number of staff positions.
The extent to which processes are systematized	Systematization refers to the use of information systems and / or software tools (custom or free software) to manage, streamline, improve and / or facilitate twelve different processes such as contracting, payroll, budgeting, stratification, accounting, etc. This indicator is an average of 12 processes that are scored as being systematized (= 1) or not (= 0).
Application of the Standard Model of Internal Control - MECI	Sum of the result obtained in each of the following components with their respective weights in the MECI Annual Survey which is conducted by the Department of the Public Service (DAFP) of the central government: Public communication 20% Strategic direction 15% Information (secondary) 5% Information (primary) 10% Control activities 15% Self-evaluation 5% Improvement plans 5% Control environment 10% Risk Management 10% Independent evaluation 5%

Source: Departamento Nacional de Planeación (2012, 2017).

Appendix B: Robustness check: Allocated royalty revenue as a control variable

Party congruence between mayor and president

As stated above, after the policy change resource rents were allocated following production criteria for producers and, demographic and social criteria (population and poverty) for non-producers and the disbursement of these resources to municipalities was conditioned on the approval of projects they submitted. The analyses presented so far have been limited to the resource rents effectively disbursed to municipalities. Therefore, one may question whether the results hold when including the royalty revenue allocated to each municipality as a control variable or whether doing so could compromise the party congruence effects found so far.

In Table 2.7, the results are presented for the re-estimation of models 1, 3, and 5 with each municipality's allocated royalty revenue after the policy included as a control variable[36]. The results for models 1 and 3 confirm the previous results: after the policy change, party congruence with the president's party has a positive and statistically significant impact on non-producers' transferred royalty revenue (at the 1 percent level). On the other hand, this congruence has a negative and statistically significant effect on producers' transferred royalty revenue (at the 10 percent level). These results appear to support hypothesis 2a, because the positive impact of party congruence with the president's party is stronger after the policy change for non-producers when obtaining royalty revenue and when controlling for allocated resources.

The results for model 3 shown in Table 2.7 indicate a negative and statistically significant relationship between mayor's vote share and royalty revenue for all municipalities (at the 10 percent level) and for producers (at the 1 percent level). However, margin plots are required to clarify whether there is support for hypothesis 2b, that is, whether after the policy change the positive impact of mayor's party congruence with the president's party (for aligned non-producers) does not decrease with vote share.

[36] Models 2, 4, 6, and 7 are not run because the data for allocated royalty revenue only correspond to periods in and after 2012.

Table 2.7: Impact of mayor's party congruence with the president's party, the policy change, and vote share on municipal access to royalty revenue when controlling for allocated royalty revenue

	ALL			NON PROD			PROD		
	Model 1	Model 3	Model 5	Model 1	Model 3	Model 5	Model 1	Model 3	Model 5
Presidentaffiliation	0.404	0.418	-1.002	1.186***	1.185***	-0.179	-1.468*	-1.433*	-3.027
	(0.325)	(0.326)	(1.053)	(0.315)	(0.316)	(1.058)	(0.751)	(0.755)	(2.400)
VoteShare		-1.975*	-3.950**		-1.044	-2.902*		-6.379***	-8.768**
		(1.048)	(1.531)		(1.144)	(1.525)		(2.372)	(3.997)
Presidentaffiliation*VoteShare			3.109			2.982			3.507
			(2.179)			(2.350)			(4.609)
Trendline	YES	YES	YES	YES	YES	YES	YES	YES	YES
Controls	YES	YES	YES	YES	YES	YES	YES	YES	YES
Municipality FE	YES	YES	YES	YES	YES	YES	YES	YES	YES
Observations	6,567	6,561	6,561	4,844	4,841	4,841	1,723	1,720	1,720
Municipality	1,100	1,100	1,100	811	811	811	289	289	289

Robust standard errors in parentheses *** $p<0.01$, ** $p<0.05$, * $p<0.10$

Figures 2.7 and 2.8 confirm royalty revenue decreases with vote share only for those mayors unaligned with the president's party. They also confirm that, after the policy change, the effect of mayor's alignment with the president's party is statistically significant for non-producers after controlling for allocated revenue and, for a vote share equal or above 40 percent. These results provide more support for hypotheses 2a and 2b, because they suggest after the policy change a greater amount of resources was in fact sent to aligned non-producers with a higher chance of winning (i.e. party congruence effects do not decrease with vote share), providing additional support for the core voters model. For producers, this effect is not statistically significant, regardless of vote share.

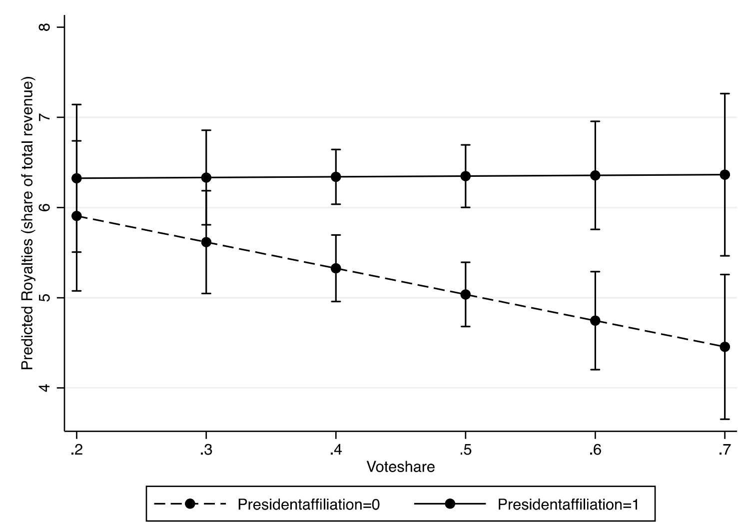

Figure 2.7: Effects of mayor's party congruence with the president's party on non-producers' access to royalty revenue after the policy change and over vote share when controlling for allocated royalty revenue

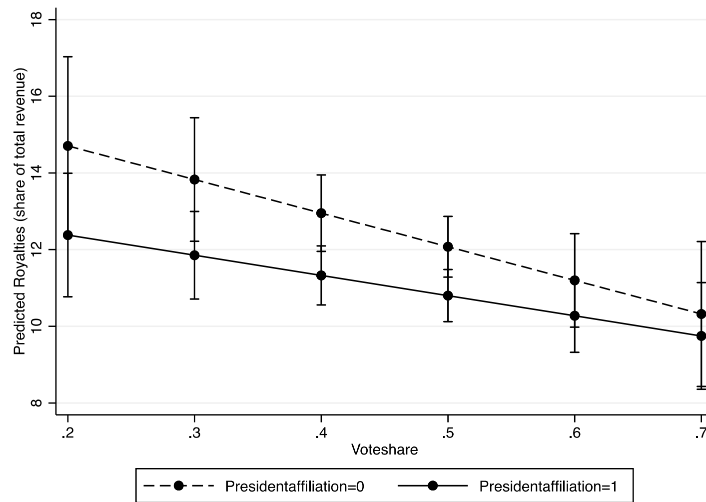

Figure 2.8: Effects of mayor's party congruence with the president's party on producers' access to royalty revenue after the policy change and over vote share when controlling for allocated royalty revenue

Party congruence between mayor and governor

The impact of mayor's party congruence with the governor's party on disbursed royalty revenue when controlling for allocated royalty revenue is shown in Table 2.8. This table presents the results of the running of models 1, 3, and 5 for all municipalities, non-producers, and producers. Models 1 and 3 confirm the previous results: mayor's party congruence with the governor's party does not have an impact on royalty revenue after the policy change, as indicated by the estimated coefficients' not being statistically significant for any of the municipalities. The results for model 3 also confirm vote share continues to have a negative impact on municipalities' royalty revenue, an impact that is statistically significant for all municipalities (at the 10 percent level) and for producers (at the 1 percent level). Figures 2.9 and 2.10 confirms these results: the lines that depict aligned and non-aligned municipalities constantly touch regardless of type of municipality and vote share.

Table 2.8: Impact of mayor's party congruence with the governor's party, the policy change, and vote share on municipal access to royalty revenue when controlling for allocated royalty revenue

	ALL			NON PRODUCER			PRODUCER		
	Model 1	Model 3	Model 5	Model 1	Model 3	Model 5	Model 1	Model 3	Model 5
Governoraffiliation	0.521	0.525	2.473	0.102	0.113	1.933	0.811	0.702	5.172
	(0.560)	(0.558)	(1.847)	(0.654)	(0.653)	(1.726)	(1.081)	(1.064)	(4.614)
VoteShare		-2.004*	-1.782		-1.132	-0.925		-6.277***	-5.765**
		(1.044)	(1.097)		(1.143)	(1.225)		(2.407)	(2.396)
Governoraffiliation*VoteShare			-4.273			-4.036			-9.615
			(4.179)			(4.429)			(9.497)
Trendline	YES	YES	YES	YES	YES	YES	YES	YES	YES
Controls	YES	YES	YES	YES	YES	YES	YES	YES	YES
Municipality FE	YES	YES	YES	YES	YES	YES	YES	YES	YES
Observations	6,567	6,561	6,561	4,844	4,841	4,841	1,723	1,720	1,720
Municipality	1,100	1,100	1,100	811	811	811	289	289	289

Robust standard errors in parentheses *** p<0.01, ** p<0.05, * p<0.10

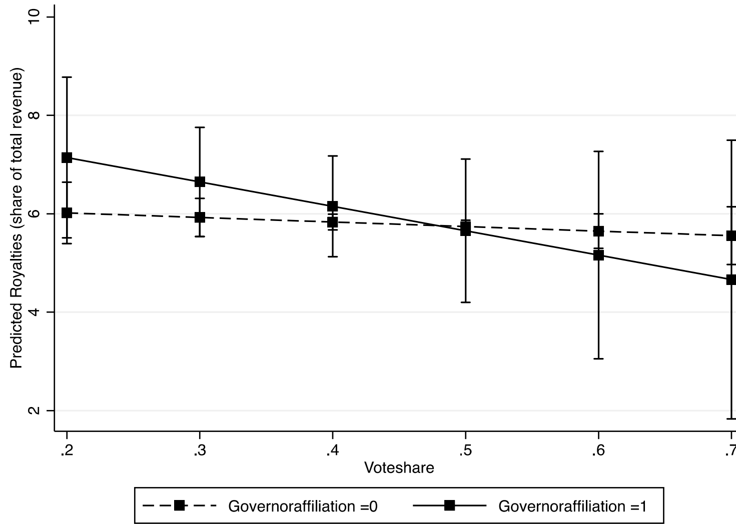

Figure 2.9: Effects of mayor’s party congruence with governor’s party on non-producers’ transferred royalty revenue after the policy change and over vote share when controlling for allocated royalty revenue

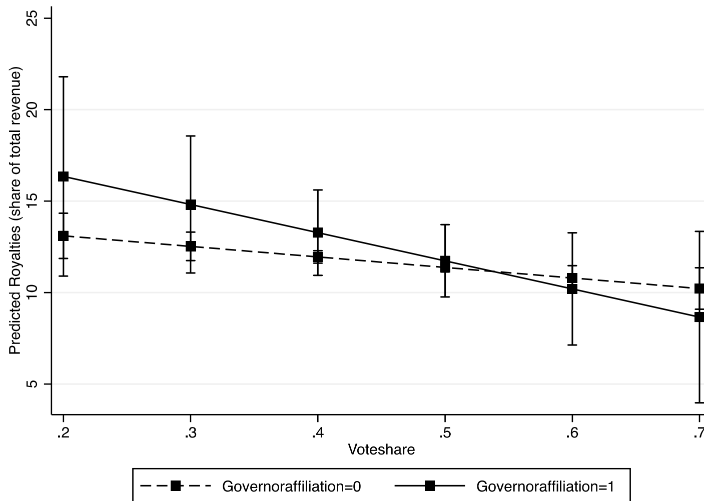

Figure 2.10: Effects of mayor’s party congruence with governor’s party on producers’ transferred royalty revenue after the policy change and over vote share when controlling for allocated royalty revenue

Chapter 3

Doubly Cursed? The Effects of Resource Rents and Elections on Human Capital Investment in Colombia[1]

Abstract

Previous studies have shown that politicians tend to behave opportunistically by promoting expansionary fiscal policies before elections in order to advance their careers. While there is ample evidence of political budget cycles (PBCs) on the national level, subnational-level analysis remains scant. To address this gap, this chapter examines whether resource rents fuel PBCs in Colombia at the subnational level. In particular, it analyses whether a fiscal reform that redistributes royalty revenue between subnational governments limits the negative development impacts of resource rents and PBCs. Using municipal-level data and system generalised method of moments (GMM) estimation to account for potential endogeneity, the

[1] This chapter is based on:
Collazos-Oritz, MA & Wong, P.H. (2023). Doubly Cursed? The Effects of Resource Rents and Elections on Human Capital Investment in Colombia. The paper was presented at the 62th European Regional Science Association Congress, Alicante, 28 August - 1 September, 2023. We would like to thank the anonymous referees for a journal for their comments.

analysis finds that municipalities invested in health and education according to the magnitude of the resource rents they received. In addition, for municipalities the fiscal policy reform in Colombia made decisions about investment in human capital less reliant on resource revenue, especially producer municipalities. However, this was much more the case with investment in education than with investment in health.

Keywords: political budget cycle, resource rents, health investment, education investment, municipal governments, Colombia

3.1 Introduction

Conventional wisdom holds that resource abundance is a curse to a developing country. However, countries endowed with abundant natural resources also have clear advantages if they manage the resources well (Van der Ploeg 2011). More recent empirical studies also suggest that resource can benefit less developed economies through industrial linkages, and in a sub-national setting through regional agglomeration, job multipliers, and infrastructural development (Aragón & Rud 2013; Aroca & Atienza 2011; Fleming & Measham 2014; Fleming et al. 2015). On the political side, the picture is bleaker. It is a source of corruption, unaccountable governments, weak institutions and state capacity, civil conflicts, and rent-seeking behaviors (Kolstad & Søreide 2009; Van der Ploeg 2011; Wick & Bulte 2006). In their theoretical model, Robinson et al. (2006) set out that incumbent politicians can distribute resource revenue to influence the outcome of the election through political patronage. Along this line of literature, this study examines the resource curse through the lens of the fiscal federalism. Recent scholarship has scrutinized the resource curse at the regional or local level (e.g., Fleming et al. 2015; Lawer et al. 2017; Oyarzo & Paredes 2021) and considered the role of regional spillovers (e.g., Fleming & Measham 2014). Yet, few studies have examined the issue of resource curse from an intergovernmental perspective. An exception is Gervasoni (2018), who argues that intergovernmental revenue-sharing rules could be used by the central government to weaken checks and balances, resulting to democratic variations at the subnational level. Following Robinson et al. (2006) and Gervasoni (2018), this study empirically tests whether resource rents can incentivize political opportunisms in the form of political budget cycles at the subnational level. We then hypothesize and test whether intergovernmental revenue-sharing rules propagate

resource rents to other regions like a windfall, or they may quench irresponsible fiscal behaviors and electoral manipulation of the rentier regions.

Decades of research on political budget cycles (PBCs) has found that politicians tend to behave opportunistically by promoting expansionary fiscal policies before elections in order to advance their careers[2]. PBCs have been shown to have deleterious effects on the economy and government. They cause economic distortions and inefficiency (Nordhaus 1975), fiscal deficits, and debt problems (Brender & Drazen 2005; Raveh & Tsur 2020). PBCs have also been linked to electoral manipulation (Drazen & Eslava 2010) and political clientelism (Corvalan et al. 2018). Due to the economic and political implications of PBCs, this chapter looks at PBCs in the context of resource abundance, with a focus on the case of Colombia. Resource rents provide additional financial resources to governments and have the potential to reinforce the negative impact of PBCs. The PBC effect also provides a supplementary explanation to the resource curse hypothesis, which has been studied extensively in the development economics literature (e.g. Boyce & Emery 2011; Sachs & Warner 2001). The focus on Colombia here is particularly interesting, because the country introduced a fiscal reform regarding the distribution and the use of royalty revenue in 2012. The reform in essence reduced the power of resource-rich municipalities regarding their access and the use of royalty revenue[3]. As such, the policy change provides a unique opportunity to study the effects of resource rents on PBCs in the context of inter-government redistribution, which is important because the implications of resource curse in a multi-level government setting remain under-studied in the public finance literature.

This chapter aims to determine whether the PBC effect is stronger among resource-rich municipalities in Colombia. It also investigates the extent to which fiscal institutions (broadly defined) can limit the negative development impact associated with PBCs and resource curse. Scholarly interest in the effect of fiscal institutions on PBCs is burgeoning. However, thus far the scope has been limited to fiscal transparency (Alt & Lassen 2006), fiscal decentralisation (Köppl Turyna et al.

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[2] The theory was first introduced by Nordhaus (1975), who used the term 'political business cycles' in his research on the relationship between inflation and unemployment (i.e. the Phillips curve) within a political framework. The theory argues that public investment decisions can be seen as political choices, by which politicians attempt to maximise their plurality in the next election. Rogoff (1990) extends the framework to study fiscal policies during election years. See de Haan and Klomp (2013) for a review and Mandon and Cazals (2019) for a more recent meta-analysis.

[3] Producer refers to a municipality that has an oil field or a coalmine within its jurisdiction. In the data analysed in this chapter, 289 (26 percent) of the 1,001 municipalities in Colombia had the status of producer.

2016), central government's financial supervision (Baskaran et al. 2016), political checks and balances (Bostashvili & Ujhelyi 2019; Garmann 2018), and fiscal rules (Bonfatti & Forni 2019; Gootjes et al. 2021). So far, no study has examined the impact of inter-governmental redistribution of public investment in the presence of resource rents. The focus here is particularly interesting, because it leads to a novel hypothesis: resource curse and PBC may propagate through fiscal transfers funded by royalties. While the present analysis shows that the PBC effect is indeed stronger among resource-rich municipalities in Colombia, it finds that PBCs may counteract some of the negative consequences of resource windfalls through higher levels of human capital investment. Regarding the effect of fiscal institutions, the present analysis finds that a policy reform in Colombia made investment in human capital less reliant on resource revenue, especially for producer municipalities, once their ability to finance electoral transfers towards sectors visible to voters had been restricted. The two findings present a policy dilemma. On the one hand, limited fiscal power contributes to more responsible fiscal behaviours and a smaller PBC effect. On the other hand, it dampens public investment, which can be crucial to the long-term development of a country.

The present chapter contributes to the literature in two other ways. Firstly, in contrast to the resource curse literature, which usually relates resource abundance to all forms of economic pathologies and under-development, the findings presented here suggest that resource rents can be associated with higher levels of investment in human capital in producer municipalities, which are often relatively under-developed. Although public investment under PBCs is likely to be deviated from the first-best level, leading to over-investment and dynamic inefficiency, it could contribute to long-run economic growth of resource-rich regions through human capital accumulation and positive externalities. In other words, PBCs might counteract some of the negative impacts related to resource curse, turning the curse into a blessing. Secondly, few studies have examined PBCs and resource rents in parallel at the subnational level. The present analysis advances this research agenda using municipality-level data in Colombia. Because the effects of PBCs are usually conditional on other factors such as the level of development (Brender & Drazen 2005; Shi & Svensson 2006), the subnational design here may explain why typical cross-country level analyses fail to uncover the effect of resource rents on PBCs (e.g. Klomp & de Haan 2016). This new finding is in line with another recent subnational-level analysis, that of Raveh & Tsur (2020), which uses state-level data in the US to examine the effect of resource windfalls. A major difference in the analyses of this chapter is the use of a different indicator of PBC. While Raveh & Tsur (2020) look at public debt, the present chapter focuses on investment expenditure, a popular

indicator of PBCs in the literature (e.g. Akhmedov & Zhuravskaya 2004; Bostashvili & Ujhelyi 2019; Castro & Martins 2018; Katsimi & Sarantides 2012; Sakurai & Menezes-Filho 2011).

The next section reviews the evidence of PBCs around the world and discusses their implications to human capital investment. After that, the Colombian context and the policy reform in 2012 are outlined and the hypotheses are developed. Data and methods are discussed in the fourth section and the results are presented in the fifth section. The final section concludes and discusses the implications of the results.

3.2 Theories and empirical evidence of PBCs

A PBC is defined as the recurrent use of expansionary fiscal policies by politicians before elections to generate a pre-election boom and signal their competence or ability to provide public goods (Akhmedov & Zhuravskaya 2004; Castro & Martins 2018; Veiga & Veiga 2007). Theories of PBCs usually assume that economic agents form expectations either adaptively (Nordhaus 1975) or rationally (Rogoff & Sibert 1988; Rogoff 1990). In the Nordhausian world, voters are assumed to be myopic and do not learn from history (Akhmedov & Zhuravskaya 2004; Veiga & Veiga 2007). Consequently, the model predicts that voters will systematically get fooled by pre-election booms. With the rational expectations revolution, this model was mostly abandoned (Veiga & Veiga 2007; Sakurai & Menezes-Filho 2011). More-recent theories usually reason that, in the presence of imperfect information, voters interpret pre-electoral increases in public spending as a positive signal of politicians' ability to provide public goods (Akhmedov & Zhuravskaya 2004; Castro & Martins 2018; Veiga & Veiga 2007). This explains why PBCs exist.

Early empirical evidence of PBCs is primarily based on cross-country comparison using data from OECD or European countries (e.g. Buti & Van den Noord 2004; Katsimi & Sarantides 2012; Mink & De Haan 2006). However, when developing countries are included in the sample, evidence of PBCs is weaker (De Haan & Klomp 2013). This led to the hypothesis and later on consensus that the effects of PBCs are conditional on the level of development (Shi & Svensson 2006) and other characteristics such as the political system (Persson & Tabellini 2003) and the age and level of democracy (Akhmedov & Zhuravskaya 2004; Brender & Drazen 2008). Several studies employ a subnational design and look at local elections, where stronger evidence of PBCs is identified. For example, evidence of PBCs has been

identified in Brazil (Sakurai & Menezes-Filho 2011), India (Khemani 2004), Israel (Baskaran et al. 2016), Italy (Bonfatti & Forni 2019), Poland (Köppl Turyna et al. 2016), Portugal (Veiga & Veiga 2007), Russia (Akhmedov & Zhuravskaya 2004), and the US (Rose 2006).

Another advance is the focus on disaggregated items in the government balance sheet. If re-election incentives drive PBCs, shifts in expenditures towards spending categories that are more visible to voters should be observed. Bove et al. (2017) test this hypothesis and find that during election times, countries tend to increase social expenditure and reduce military expenditure. In another cross-country analysis, Castro and Martins (2018) find evidence of political opportunism in big budgetary items such as education, social protection, and some subcomponents of health expenditure. Nevertheless, many studies have found otherwise, specifically that shifts can be from current to capital expenditures (Drazen & Eslava 2010; Khemani 2004; Klein & Sakurai 2015; Veiga & Veiga 2007), and at present there is no consensus in the literature.

Only a handful of studies have investigated PBCs in resource-rich countries. Vergne (2009) shows that developing countries with higher levels of natural-resource production have larger political cycles. Klomp and de Haan (2016) argue that the incumbent of a resource-rich country faces a double incentive to remain in power. As resource rents usually inflate the value of staying in power and those rents enable the incumbent to manipulate fiscal policy in order to remain in office, PBC effects should be stronger in countries with abundant resources. Although both studies find favourable evidence for the hypothesis in their dynamic panel analysis, they also note that the election effects could mainly be identified among young democracies with a presidential system, which were usually characterised by a limited free media and limited political checks and balances. More recently, Aaskoven (2020) argues that oil rents provide governments with additional non-tax revenues, which will soften governments' budget constraint and enable local governments to increase public spending during election years. Similar to Klomp and de Haan (2016), Aaskoven (2020) shows that fiscal transparency helps to mitigate oil-induced electoral budget cycles [4]. However, similar to the first-generation studies, these three studies are based on cross-country comparison. Implications that arise in a multi-level setting (e.g. inter-government redistribution) remain uncharted territory and the election effects on different social expenditures have also been left unexplored. This chapter fills these two literature gaps by

[4] Following the literature (e.g. Shi & Svensson 2006), the terms 'political budget cycles' and 'electoral budget cycles' are used interchangeably.

studying how subnational-level public investment in education and health reacts to the political incentives of re-election in resource-rich municipal governments before and after a reform in the inter-government redistribution system. In the following section, the case of Colombia is introduced and a policy reform in that country that provides an excellent opportunity to study how fiscal behaviours can be affected by PBCs in the presence of resource rents is discussed.

3.3 Royalty revenue, inter-governmental transfers, and PBCs in Colombia

Colombia has 1,101 municipalities and 32 departments. The country saw a major decentralisation reform in 1993 by which municipalities became responsible for the provision of public services in the areas of education, health, sanitation, and drinking water. Municipal revenue to fulfill this task consists of earmarked transfers, taxes, and royalties, which account for 57.5, 12.8, and 5.5 percent of total municipal revenue, respectively[5].

Investment on health and education is partly financed through earmarked transfers from the central government to municipalities. However, mayors in Colombia are allowed to use non-earmarked resources such as municipal current revenue (i.e. tax revenue, non-tax current revenue, other non-earmarked revenue) and royalty revenue to invest more in these sectors. Moreover, politicians can obtain additional resources by reducing certain types of expenditure such as current spending (Drazen & Eslava 2010). These additional sources give mayors in Colombia flexibility to direct more resources towards these visible sectors, especially in years close to elections.

Regarding royalty revenue, before 2012 producer municipalities (i.e. municipalities that have an oil field or a coalmine within their jurisdictions) were allowed to keep 80 percent[6]. Additionally, 75 percent of the royalty revenue received by any producer municipality was earmarked towards health, education, and water and sanitation, if the municipality had not reached certain targets according to a

[5] Additional sources such as non-tax current revenue, current transfers, co-financing resources, and other revenue amount to 24 percent of municipal revenue.

[6] Before 2012, municipalities with maritime or river ports that were used to transport natural resources were also considered to be producer municipalities (Bonet et al. 2015).

specific set of indicators (Martinez 2014)[7]. Of the remaining 25 percent, 15 percent could be spent in investment projects from any sector, as long as they were included in the municipality's development plan. The remaining 10 percent was directed mainly to operational expenses and start-up costs (Rentería Rodríguez et al. 2007).

Beginning in 2012, the proportion of royalty revenue received by producer municipalities was gradually reduced, first to 25 percent of the total revenue collected in that year, then to 17.5 percent in 2013, 12.5 percent in 2014, and to 10 percent from 2015 onwards (Legislative Act No. 5, 2011). Since then, producer municipalities have had to develop projects and have them approved by the central government before they could receive any royalty revenue[8]. At the same time, non-producer municipalities, which used to benefit less from royalty revenue, could get up to 10 percent of total natural resource revenue through inter-government transfers, although they were also required to develop projects and have them approved by the central government before receiving the transfers.[9] Contrary to the old system, under the new policy, projects are no longer constrained by specific priority sectors and are instead encouraged to target broader social, economic, and environmental development of territorial entities (Benítez Ibagué 2015).

As would be expected, the policy reform in 2012 changed the spending behaviours of municipalities, especially producer municipalities, for which royalty revenue had been a significant source of funds, to the extent that some municipalities were dependent on it. In an extreme case, royalty revenue accounted for as much as 87 percent of total government revenue in Chiriguaná in 2007. With the reform, producer municipalities saw their royalty share decline from 80 percent to 10 percent and they lost direct access to this financial resource, which could be used to fund electoral transfers towards sectors visible to voters, such as health and education.

[7] Examples of indicators include infant mortality rate, net enrollment rate in basic education, and population with access to drinking water. Indeed before the policy, producer municipalities showed limited progress in meeting these targets (Benítez Ibagué 2015) and exhibited lower education coverage rates than their counterparts, however, they had higher coverage rates in health and better municipal road infrastrucure (Perry & Olivera 2009).

[8] See Bonet et al. (2015) for further details on the development and approval of municipal development projects.

[9] Before 2012, non-producer municipalities had to compete for 8.2 percent of total natural resource revenue from the pool and were also required to submit projects to the central government. These projects underwent closer scrutiny and analysis by the corresponding sectorial ministry and had to be approved by the Royalties Advisory Council.

Municipal mayors in Colombia have been directly elected since 1988 and immediate re-election is not allowed in the country[10]. However, manipulation of fiscal policy in years close to elections is a typical political practice, because it can positively affect the chances of the incumbent's party's being re-elected. This in turn paves the way for the advancement of political careers, which may include better opportunities for being elected or holding other positions in the government (Drazen & Eslava 2010; Klein & Sakurai 2015).

Manipulations of fiscal policy before elections are more likely to be detected on the expenditure side of the budget due to its direct and fast impact on voters' welfare (Vergne 2009). Fiscal opportunism on the revenue side (i.e. less tax revenue) is less likely to occur, because tax bases are small in developing countries and the effects of a tax cut are usually indirect and with a delay (Schuknecht 2000). In theory, mayors in Colombia could use royalty revenue and current non-earmarked revenue or could change the composition of expenditures (i.e. by reducing expenditures in other places) to add or redirect resources towards more-visible sectors in years close to elections. Drazen and Eslava (2010), for example, find that in Colombia, spending on infrastructure, including construction of roads and of power and water plants, increases before elections at the expense of interest payments, transfers to retirees, and payments to temporary workers during election years.

Here it is hypothesised that investment on health and education will be higher in municipalities that have higher levels of royalty revenue (hypothesis 1). Hypothesis 1 does not specifically reference the timing of the investment; thus it is necessary to further postulate that, in relation to PBCs, municipalities are more likely to increase their health and education investment one to two years before elections (hypothesis 2). Health and education investment are the sectors of interest because they are highly visible and can be easily targeted towards particular groups of voters, for example, by building a school or a medical centre in a specific neighborhood. In the literature a number of studies have looked at sector-specific spending in developing countries. Potrafke (2010) and Herwartz and Theilen (2014), for example, find that incumbents increase public health expenditures in election years in OECD countries. Castro and Martins (2018) find that there is an increase in the spending categories related to medical products, appliances and equipment, hospital services, and research and development in health in election years. A similar finding was reported in a study using data from Russia (Akhmedov & Zhuravskaya 2004). On the other hand, Bellido et al. (2019) fail to find any evidence using data in OECD

[10] Mayors were elected every three years before 2003 and every four years after. Elections take place by the end of the year and the electoral calendar is exogenous and known in advance.

countries and Sáez and Sinha (2010) find a *decrease* in health expenditures before elections for Indian states. Regarding education investment spending, similar negative or non-findings are documented in a meta-analysis (Philips 2016) and in analyses using data from Poland (Olejnik 2021). In light of the lack of consensus, more empirical evidence is required.

Given that the spending of royalty revenue is likely to be used by producer municipalities as an additional mechanism to boost electoral performance, one would expect to see greater investment by producers in the two sectors mentioned above. Therefore, it is hypothesised that electoral cycle effects are stronger in resource-rich municipalities (hypothesis 3). However, the scenario described above is less likely to hold after the policy reform in 2012, as producer municipalities lost direct access to royalty revenue and hence a funding source of investment in these sectors before elections. Furthermore, it should be noted that because royalty revenue will be collected from producer municipalities and re-distributed to non-producer municipalities after the reform, the resource rent effect might propagate to non-producers. Consequently, it is hypothesised that resource-rich municipalities' investment decisions on health and education became less influenced by resource revenue after the policy. And because non-producers will benefit more from the resource rents, now redistributed by the central government, than before (the policy change), it is expected that the PBC effects diminish (but remain) after the reform (hypothesis 4).

In sum, it is here argued that Colombian mayors used the education and health sectors as targets of their pre-election fiscal opportunism to gain electoral support for either their parties or their future political careers. In addition, the electoral budget cycle will be felt more in resource-rich municipalities, because these could easily direct resource rents towards these sectors via development plans or projects. Nevertheless, the reform took fiscal power away from mayors and curbed PBCs in Colombia.

3.4 Data

In order to identify the dynamics of public investment of local governments in relation to elections and resource revenues, a panel data set is constructed from various sources for this chapter's analysis. The unbalanced panel data set consists of 1101 municipalities in Colombia over the period of 2002–2017. Data are collected from the National Administrative Department of Statistics (DANE), the National

Department of Planning (DNP), and the National Registry. Table 3.1 provides the summary statistics of all variables included in the analysis.

The key dependent variables are public investment in health and in education. As the variables are skewed, they are log-transformed. The main model has three key independent variables: resource rents (also log-transformed), years to election, and a post-policy reform dummy. The variable *resource rents* is defined as the amount of royalty revenue received by municipalities in year *t*. Years to election (*election*) represents the number of years before the next election, so it takes the value 0 for the election year, 1 for one year before the next election, 2 for two years before the next election, and so on. The post-policy reform indicator (*reform*) is a binary variable equal to 1 for the years after the reform (i.e. 2012 and onwards) and 0 otherwise. To test this chapter's hypotheses, the model needs to be flexible. It should allow for a non-linear PBC effect as well as for the PBC effect to vary before and after the policy reform. For these reasons, a quadratic term for the variable election and three-way interactions between the three key independent variables are included[11].

The model includes several control variables. *Transfers* from the national government are controlled for, because they financed part of the investment in education and health. Municipalities' *deficit* and *property tax* are also included in order to control for possible increases (decreases) in other sources of funds. Property tax revenue is included because municipality governments had greater fiscal autonomy to determine the tax rates and its use. *Affiliates* to the municipal subsidised regime and the *rural* population help with accounting for the demand for health and education services and (dis)economies of scale in investment costs (Cockx and Francken 2014, 2016). The affiliations of a mayor with the political party of the *governor* and of the *president* is also included, because one may suspect that there was political favouritism. Finally, the shares of the *population above 65* (in the case of health investment) and *population below 18* (in the case of education) are included to control for their importance to these sectors.

[11] See Corvalan et al. (2018) for evidence of a non-linear PBC effect.

Table 3.1: Summary statistics of the panel variables

Variable	Description	Unit	Mean	Standard	
Health	Per capita public investment in health	Colombian peso, log-transformed	11.944	overall	1.976
				between	0.634
				within	1.872
Education	Per capita public investment in education	Colombian peso, log-transformed	10.615	overall	1.781
				between	0.754
				within	1.614
Royalty	Proportion of government revenue generated from royalty revenue	Percent, log-transformed	1.005	overall	1.219
				between	0.807
				within	0.918
Transfers	Earmarked national transfers corresponding to the General System of Participation (*Sistema General de Participaciones*)	Colombian peso, log-transformed	22.377	overall	0.931
				between	0.834
				within	0.415
Deficit	Difference between the capital revenue and capital expenditures, plus the current savings	Million Colombian peso, inverse hyperbolic sine transformed (due	-0.872	overall	7.414
				between	2.064
				within	7.122
Affiliates	Number of affiliates to the municipal subsidized regime	Persons, log-transformed	9.07	overall	1.022
				between	1.006
				within	0.267
Population below 18	Proportion of population aged below 18	Proportion	0.366	overall	0.096
				between	0.089
				within	0.036
Population above 65	Proportion of population aged above 65	Proportion	0.082	overall	0.037
				between	0.034
				within	0.012
Rural Population	Size of the rural population	Persons, log-transformed	8.843	overall	0.879
				between	0.877
				within	0.082
President party	Whether mayor was affiliated to president's political party	Binary: 1 = yes, 0 = no	0.103	overall	0.304
				between	0.137
				within	0.272
Governor party	Whether mayor was affiliated to governor's political party	Binary: 1 = yes, 0 = no	0.137	overall	0.344
				between	0.175
				within	0.297
Property tax	Property tax revenue per capita	Peso, log-transformed	9.48	overall	1.875
				between	1.468
				within	1.173

Notes: Standard deviations are decomposed into within and between components. Number of Colombian municipalities: 1101. Period coverage: 2002-2017. Total number of observations = 17,542. Data source: National Administrative Department of Statistics (DANE); National Department of Planning (DNP); National Registry

3.5 Models and estimation methods

The first test is whether investment in health and education will be higher in municipalities that have higher levels of royalty revenue (hypothesis 1) using the following panel data model (models 1 and 2 in Table 3.2).

$$(3.1)\ \ I_{i,t} = \beta_0 + \beta_1 Royalty_{i.t} + \delta Z_{it} + \mu_i + \epsilon_{i,t},$$

where $I_{i,t}$ denotes health (or education) investment made by municipality i in year *t*. $Royalty_{i.t}$ denotes royalty revenue received by municipality i in year t. Z_{it} is a vector of control variables, μ_i is the municipality fixed effects, and $\epsilon_{i,t}$ is the error term, which is assumed to be independent and identically distributed. Instead of adding year fixed-effects to the model, a linear time trend is included as a control, as year-fixed effects will absorb the PBC effects. The same model will be used to model both health and education investment.

The next test is whether municipalities are more likely to increase their health and education investment before elections (hypothesis 2). For this, the first step is adding the variable *election* and the second is adding its quadratic term to allow possible nonlinearity (models 1 and 3, and models 2 and 4, respectively, in Table 3.3).

$$(3.2)\ \ I_{i,t} = \beta_0 + \beta_1 Royalty_{i.t} + \beta_2 Election_{i,t} + \delta Z_{it} + \mu_i + \epsilon_{i,t}$$

$$(3.3)\ \ I_{i,t} = \beta_0 + \beta_1 Royalty_{i.t} + \beta_2 Election_{i,t} + \beta_3 Election_{i,t}^2 + \delta Z_{it} + \mu_i + \epsilon_{i,t}$$

Then two tests are run, whether electoral cycle effects are stronger in resource-rich municipalities (hypothesis 3) and whether the reform makes resource-rich municipalities' investment decisions on health and education less influenced by resource revenue, curbing PBCs (hypothesis 4). To account for these potential heterogeneous effects, three-way interactions between royalty revenue, years to election, and policy change variables are introduced in the following model (models 1 and 3 in Table 3.4).

$$(3.4)\ I_{i,t} = \beta_0 + \beta_1 Royalty_{i.t} + \beta_2 Election_{i,t} + \beta_3 Election_{i,t}^2 + \beta_4 Policy_t + \beta_5 Policy_t * Election_{i,t} + \beta_6 Policy_t * Election_{i,t}^2 + \beta_7 Royalty_{i,t} * Election_{i,t} + \beta_8 Royalty_{i,t} * Election_{i,t}^2 + \beta_9 Policy_t * Royalty_{i,t} + \beta_{10} Policy_t * Royalty_{i,t} * Election_{i,t} + \beta_{11} Policy_t * Royalty_{i,t} * Election_{i,t}^2 + \delta Z_{it} + \mu_i + \epsilon_{i,t}$$

As Table 3.1 shows, in the sample used in this study variations of the key continuous variables (i.e. health investment, education investment, and royalty revenue, all log-transformed) largely come from within-unit variations. While the fixed-effects (FE) estimator exploits mainly the within-unit variations to identify model parameters, one may want to use the variations across municipalities as well. This can be done by giving proper weights to between-unit variations with the random-effects (RE) estimator (Wooldridge 2010). However, the FE estimator is used in the present analysis, as it does not assume municipality FEs to be *uncorrelated* with royalty revenue, which is a strong assumption to make for a macro-panel. While efficiency may be lost by not exploiting between-variations with the RE estimator, the use of FEs estimator ensures consistency when the RE assumption is violated, which renders the RE estimates biased (Wooldridge 2010).

Although the fixed-effects estimator allows the estimation of the association between elections and public investment in the presence of unobserved, time-invariant effects, if one is also interested in the short-term dynamics, one may want to append the model with the lagged dependent variable. The presence of the lagged dependent variable, however, requires a more advanced estimation method to account for the various endogeneity problems associated to a dynamic panel data model. With a small-T large-n dynamic panel (n = 1101, T = 16, N = 17542), the system generalised method of moments (GMM) estimator, which controls for endogeneity, is the preferred estimation approach (e.g. Arellano & Bond 1991; Blundell & Bond 1998; Bun & Sarafidis 2015). This estimator has been widely used and become a standard estimation method in recent PBC studies (Bostashvili & Ujhelyi 2019; Castro & Martins 2018; Corvalan et al. 2018; Gainza & Livert 2021; Gootjes et al. 2021; Janků & Libich 2019).

The main idea behind the estimation approach is to use past differences (e.g. $\Delta x_{t-k}, k = 1, 2, 3, ...$) to instrument current level-variables (e.g. x_t). The validity of the instrument hinges on the assumption that the error term is not serially correlated (Roodman 2009b), which may not be realistic. Here the two-step GMM estimator is used with Windmeijer's finite-sample correction in the estimation. The two-step estimator is robust to autocorrelation and heteroscedasticity and the finite-sample

correction prevents the standard errors from being downwardly biased (Roodman 2009b; Windmeijer 2005). In addition, the number of instruments is limited by using only 1 to 2 periods to avoid an overfitting problem. Roodman (2009a) shows that estimates can become biased as the number of instruments proliferates. Following the dynamic panel literature, the validity of the instruments employed here is tested using the Arellano-Bond test for AR(1) and AR(2) in first differences and the Hansen test for over-identification. The difference-in-Hansen tests to test the exogeneity of instrument are also used (Roodman 2009b). Finally, heteroskedasticity-robust standard errors, clustered at the municipality level, are used in all estimations.

When model 3.4 is appended with the lagged dependent variable, model 3.5 becomes the main dynamic panel data model. The same model will be used to model both health and education investment for all municipalities (models 2 and 4 in Table 3.4) and producers and non-producers (models 1 and 2 in Table 3.5).

$$(3.5)\ I_{i,t} = \beta_0 + +\beta_1 I_{i,t-1} + \beta_2 Royalty_{i.t} + \beta_3 Election_{i,t} + \beta_4 Election_{i,t}^2 + \beta_5 Policy_t + \beta_6 Policy_t * Election_{i,t} + \beta_7 Policy_t * Election_{i,t}^2 + \beta_8 Royalty_{i,t} * Election_{i,t} + \beta_9 Royalty_{i,t} * Election_{i,t}^2 + \beta_{10} Policy_t * Royalty_{i,t} + \beta_{11} Policy_t * Royalty_{i,t} * Election_{i,t} + \beta_{12} Policy_t * Royalty_{i,t} * Election_{i,t}^2 + \delta Z_{it} + \mu_i + \epsilon_{i,t}$$

3.6 Results

Figure 3.1 illustrates the temporal change of average health and education investments of Colombian municipalities between 2002 and 2017. In the diagram the years of election are marked by vertical lines. It is clear that the average level of investment in health was systematically higher than that of education. In general, investment increased over time and followed a cyclical pattern. However, investment in both health and education consistently peaked about two years before elections in a cycle, suggesting that electoral budget cycles may start before the election years for the investment projects to mature and become visible to voters (Brender & Drazen 2005; Shi & Svensson 2006).

Investment levels, however, are likely to be correlated with other variables. To control for the impact due to time-invariant variables, the fixed-effects estimator is used to obtain the first results. Tables 3.2 to 3.4 report the results when health and education investments are regressed with a similar set of variables, which include a

set of demographic and macroeconomic variables with municipal-level fixed effects and a linear time trend. Also included are royalty revenue, years to elections, a policy change dummy, and their interaction terms.

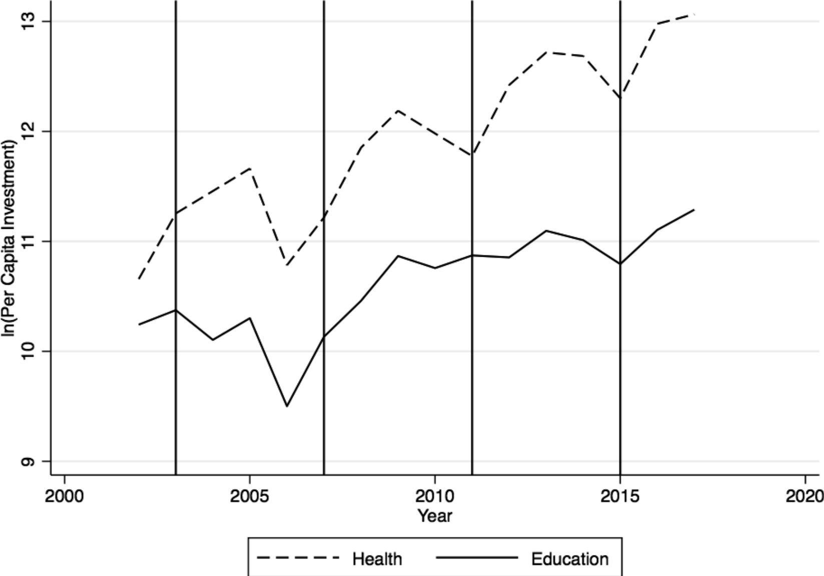

Figure 3.1: Average municipality investment in health and education over time

i. Hypothesis 1

Table 3.2 reveals a clear positive association between royalty revenue and investment in health and education. In models 1 and 2 the estimated coefficient for royalty revenue is positive and statistically significant at the 1 percent level. This provides empirical support to hypothesis 1, which proposes that royalty revenue is positively associated with investments on health and education. This is probably because royalty revenue provides additional resources to local governments for financing their investments.

Theoretically, resource-rich municipalities have a different industrial structure, a slower growth rate, failures of institutions, and lower government revenue than municipalities that do not rely on resource rents (i.e. the resource curse hypothesis; Adams et al. 2019; Boyce & Emery 2011), which may lead to lower

levels of public investment. However, the analysis conducted in this chapter does not find evidence of a resource curse in terms of public investment. The findings in fact suggest that a 1 percent increase in royalty revenue is associated to a 0.12% *increase* in investment in health and 0.17% *increase* in education. Resource abundance is not a curse in itself. The consequence of the plenty is determined by state behaviours rather than resources themselves (Hilmawan & Clark 2019; Shahbaz et al. 2019). The findings presented here align with prior studies conducted by Caselli and Michaels (2013), which reported increases in health (0.10%) and education spending (0.13%) in Brazilian municipalities due to oil royalties. Additionally, the results are in line, although to a lesser magnitude, with the 0.27% increase in education expenditures per capita attributed to oil royalties Chan and Karim (2023) find.

ii. Hypothesis 2

To test hypothesis 2, which states that municipalities are more likely to increase their health and education investment before elections, the variable *election* is appended to models 1 and 2 from Table 3.2. Recall that the variable counts the number of years to the next election. In the context of Colombia, it can take the value of 0 (i.e. election year), 1, 2, or 3. Furthermore, as Figure 3.1 shows, PBCs could be non-linear. For this reason, a quadratic term is included to allow possible nonlinearity (see models 2 and 4 in Table 3.3). The estimation results are reported in Table 3.3. While the estimated coefficients of royalty revenue remain positive and statistically significant in all models, the coefficients for *election* are statistically significant only in models 1–3. The size of the coefficients for royalty revenue is also comparable to what was reported: 0.16 percent for health and 0.18 percent for education. The effect of the elections is positive, which means that the PBC effect is the strongest three years before the next election (i.e. *election* = 3). This may be explained by the fact that it takes time for investment projects to materialise (Rogoff 1990). However, there is no strong evidence of nonlinearity. But as will be shown later, this could be due to different dynamics between producers and non-producers and before and after the policy reform in 2012. In the interest of flexibility, a similar quadratic structure is applied in the rest of the analysis. Overall, because the coefficients of election are statistically significant at the 1 percent level most of the time, there is some preliminary evidence for hypothesis 2. Governments' investment expenditures on health and education increase before elections.

Table 3.2: Royalty revenue and public investment

	All	All
	(1)	(2)
Dependent variable	Health	Education
Royalty	0.124***	0.170***
	(0.017)	(0.016)
Transfers	0.397***	0.754***
	(0.039)	(0.218)
Deficit	-0.003	-0.009***
	(0.002)	(0.002)
Affiliates	0.230***	-0.229**
	(0.061)	(0.075)
Population > 65	2.445	
	(2022)	
Population < 18		0.401
		(0.713)
Rural population	-0.029	-0.076
	(0.205)	(0.190)
President party	-0.049	0.021
	(0.057)	(0.050)
Governor party	0.061	0.086#
	(0.054)	(0.048)
Property tax	0.409***	0.363***
	(0.038)	(0.035)
Time trend	0.055***	-0.015
	(0.006)	(0.016)
Constant	-113.726***	22.197
	(12.292)	(29.338)
Municipality FEs	Yes	Yes
Observations	17,541	17,542
R-squared	0.188	0.136
Number of Municipalities	1,101	1,101

Notes: Robust clustered standard errors at the municipality level are in parentheses. Panel regressions with municipality fixed effects and a linear time trend. The dependent variable is health investment and education. The sample includes 1101 municipalities in Colombia. See Table 3.1 for more detailed data definitions. *** p<0.001, ** p<0.01, * p<0.05, # p<0.10.

Table 3.3: Royalty revenue, time to election, and public investment

	All (1)	All (2)	All (3)	All (4)
Dependent variable	Health Investment		Education Investment	
Royalty	0.157***	0.156***	0.179***	0.179***
	(0.017)	(0.017)	(0.016)	(0.016)
Election	0.188***	0.220***	0.053***	0.054
	(0.014)	(0.044)	(0.012)	(0.039)
Election^2		-0.011		-0.000
		(0.013)		(0.012)
Transfers	0.395***	0.394***	0.754***	0.754***
	(0.041)	(0.041)	(0.216)	(0.216)
Deficit	-0.012***	-0.012***	-0.011***	-0.011***
	(0.002)	(0.002)	(0.002)	(0.002)
Affiliates	0.203***	0.203***	-0.236**	-0.236**
	(0.061)	(0.061)	(0.075)	(0.075)
Population > 65	2.376	2.352		
	(1.990)	(1.990)		
Population < 18			0.405	0.405
			(0.708)	(0.708)
Rural population	0.011	0.010	-0.064	-0.064
	(0.205)	(0.205)	(0.189)	(0.189)
President party	-0.017	-0.016	0.030	0.030
	(0.057)	(0.057)	(0.050)	(0.050)
Governor party	0.058	0.057	0.086#	0.086#
	(0.054)	(0.054)	(0.048)	(0.048)
Property tax	0.404***	0.404***	0.361***	0.361***
	(0.038)	(0.038)	(0.035)	(0.035)
Time trend	0.047***	0.047***	-0.017	-0.017
	(0.007)	(0.007)	(0.016)	(0.016)
Constant	-97.276***	-97.662***	26.845	26.832
	(12.584)	(12.520)	(29.064)	(29.083)
Municipality FEs	Yes	Yes	Yes	Yes
Observations	17,541	17,541	17,542	17,542
R-squared	0.199	0.199	0.137	0.137
Number of Municipalities	1,101	1,101	1,101	1,101

Notes: Robust clustered standard errors at the municipality level are in parentheses. Panel regressions with municipality fixed effects and a linear time trend. The dependent variable is health investment for models 1 and 2, and for education investment, models 3 and 4. For all models, the sample includes 1101 municipalities in Colombia. See Table 3.1 for more detailed data definitions. *** p<0.001, ** p<0.01, * p<0.05, # p<0.10.

These results go beyond Nguyen and Tran (2023), who find a 0.6 percent increase in welfare spending as a percentage of GDP in the year prior to elections for developing and emerging countries, but who do not disaggregate by health and education. In this chapter, when health and education expenditures specifically are analysed at the subnational level, the existence of a cycle for these two types of spending categories can be identified, resulting in an 18.8 percent increase in per capita health expenditure and a 5.3 percent increase in per capita education expenditure in the year before elections. In addition, the increase peaks about three years before an election. This could be due to a lagged effect for future election campaigns, a finding commonly observed in less-developed countries, probably due to corruption, bureaucracy, inefficiency, and lower state capacity (Akhmedov & Zhuravskaya 2004; Ebeke & Ölcer 2013; Gonzalez 2002). This result is consistent with the findings of Nazir et al. (2022) regarding the extension of electoral cycles beyond the election year at the subnational level. However, unlike Nazir et al. (2022), we also find that this applies to education spending, as well as health care, as he suggests.

iii. Hypothesis 3

The models specified in hypotheses 1 and 2 assume that the PBC effect does not vary by royalty revenue. However, it is reasonable to suspect that the dynamic of PBC is dissimilar, depending on the size of resource rents. Also important is the difference before and after the policy reform. One potential effect of the reform is to reduce incentives to over-invest before elections. Therefore, the PBC effect is likely to be more pronounced before 2012. To account for the heterogeneous effects, three-way interactions between royalty revenue, years to election, and policy change variables are introduced. Estimation results are reported in columns 1 and 3 of Table 3.4. While only some of the interaction terms have a statistically significant impact on investments, given the complexity of the interactions the best way to evaluate the impact of these variables is to examine the margin plots.

Hypothesis 3 states that the electoral cycle effects are stronger in municipalities receiving a greater amount of royalty revenue. Figures 3.2a and 3.2b plot the average marginal effects of royalty revenue on investment in health and education, respectively, over an electoral cycle. The marginal effects are positive and statistically different from zero. In other words, municipalities that received higher royalty revenue did invest more in both sectors over the cycle. This is consistent with hypothesis 3 and with was found by Klomp and de Haan (2016) for young

democracies with higher resource endowments being more often subject to an election cycle in government spending (as a percentage of GDP) funded with natural resource rents.

Table 3.4: Static and dynamic panel regressions with interaction effects

	All (1)	All (2)	All (3)	All (4)
Dependent variable	Health investment		Education investment	
Health investment$_{t-1}$		-0.079		
		(0.091)		
Education investment$_{t-1}$				0.045
				(0.095)
Election	0.062	0.538***	-0.082	0.319**
	(0.064)	(0.145)	(0.056)	(0.108)
Election^2	0.034	-0.117*	0.031	-0.067#
	(0.021)	(0.048)	(0.019)	(0.038)
Reform	0.071	0.418	-0.068	0.641*
	(0.198)	(0.313)	(0.175)	(0.314)
Reform x Election	0.431*	-0.625#	0.511**	-0.558#
	(0.196)	(0.319)	(0.171)	(0.303)
Reform x Election^2	-0.125**	0.165*	-0.135**	0.115
	(0.049)	(0.077)	(0.043)	(0.071)
Royalty	0.159***	0.114	0.272***	0.267***
	(0.032)	(0.075)	(0.031)	(0.061)
Royalty x Election	-0.048	0.157	-0.032	0.114
	(0.051)	(0.143)	(0.048)	(0.106)
Royalty x Election^2	0.018	-0.037	0.012	-0.040
	(0.017)	(0.049)	(0.016)	(0.037)
Reform xRoyalty	-0.047	-0.249	-0.194*	-0.642***
	(0.098)	(0.184)	(0.087)	(0.183)
Reform x Royalty x Election	0.102	0.242	0.031	0.279
	(0.110)	(0.224)	(0.098)	(0.229)
Reform x Royalty x Election^2	-0.039	-0.068	-0.010	-0.047
	(0.029)	(0.064)	(0.027)	(0.061)
Transfers	0.411***	-0.098	0.768***	0.683**
	(0.039)	(0.234)	(0.227)	(0.237)
Deficit	-0.014***	-0.023	-0.013***	-0.038*
	(0.002)	(0.016)	(0.002)	(0.015)

Table 3.4: (Continued from previous page)

	All (1)	All (2)	All (3)	All (4)
Dependent variable	Health investment		Education investment	
Affiliates	0.261***	-0.043	-0.193*	-0.149
	(0.064)	(0.349)	(0.078)	(0.318)
Population > 65	2.224	0.061		
	(2.030)	(4.416)		
Population < 18			0.450	-0.082
			(0.711)	(1931)
Rural population	-0.029	0.083	-0.009	-0.122
	(0.204)	(0.270)	(0.193)	(0.277)
President party	-0.051	0.176	0.016	0.767*
	(0.058)	(0.380)	(0.050)	(0.381)
Governor party	0.070	-0.177	0.087#	-0.959#
	(0.054)	(0.646)	(0.048)	(0.537)
Property tax	0.406***	0.071	0.358***	0.243**
	(0.038)	(0.065)	(0.035)	(0.083)
Time trend	0.023**	0.144***	-0.022	0.003
	(0.008)	(0.021)	(0.017)	(0.015)
Constant	-50.970***	-274.871***	36.386	-10.995
	(14.973)	(39.420)	(31.612)	(28.414)
Arellano-Bond test for AR(1)	-	0.000	-	0.000
Arellano-Bond test for AR(2)	-	0.273	-	0.980
Hansen test of over-identification	-	0.125	-	0.153
Difference-in-Hansen test of exogeneity	-	0.444	-	0.365
Municipality FEs	Yes	Yes	Yes	Yes
Observations	17,541	16,441	17,542	16,443
R-squared	0.202	-	0.143	-
Number of municipalities	1,101	1,101	1,101	1,101

Notes: Robust clustered standard errors at the municipality level are in parentheses. Static and dynamic panel regressions with municipality fixed effects and a linear time trend. Results are based on the fixed effects estimator (models 1 and 3) and the system GMM estimator (models 2 and 4). The dependent variable is health investment for models 1 and 2, and for education investment, models 3 and 4. For all models, the sample includes 1101 municipalities in Colombia. See Table 3.1 for more detailed data definitions. *** p<0.001, ** p<0.01, * p<0.05, # p<0.10.

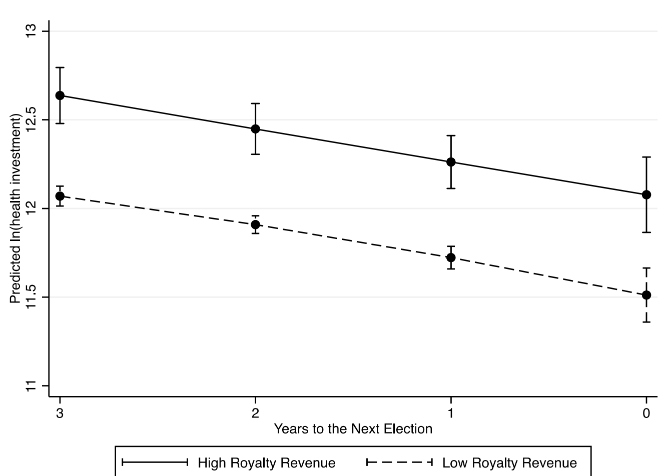

Figure 3.2a: Predicted levels of health investment over an electoral cycle

Note: Predictions based on model 1 in Table 3.4. Predicted values are on a logarithmic scale. The solid line corresponds to municipalities with a high level of royalty revenue (i.e. log(royalty) = 4). The dash line corresponds to municipalities with a low level of royalty revenue (i.e. log(royalty) = 0). The range of log(royalty) is from 0 and 4.5. Confidence intervals of 95 percent are included in the diagram.

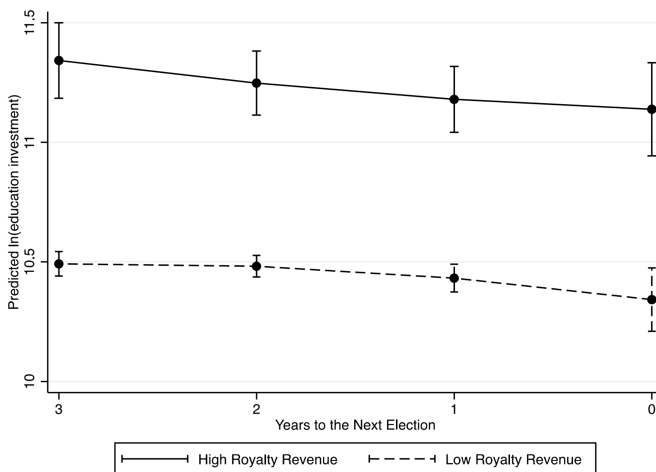

Figure 3.2b: Predicted levels of education investment over an electoral cycle

Note: Predictions based on model 3 in Table 3.4. Predicted values are on a logarithmic scale. The solid line corresponds to municipalities with a high level of royalty revenue (i.e. log(royalty) = 4). The dash line corresponds to municipalities with a low level of royalty revenue (i.e. log(royalty) = 0). The range of log(royalty) is from 0 and 4.5. Confidence intervals of 95 percent are included in the diagram.

iv. Hypothesis 4

Finally, hypothesis 4 postulates that the policy change curbs PBCs. Based on models 1 and 3 reported in Table 3.4 above, the marginal effects of royalty revenue over an electoral cycle both before and after the policy change are plotted. The results are illustrated in Figures 3.3a (health) and 3.3b (education). From the diagrams, the marginal effect of resource rents remains positive, but the marginal effects do not subside after the reform. In contrast, there is such evidence only for education investment (Figure 3.3b), where the line in the right-hand panel is lower than the one on the left-hand panel, and the differences are statistically significant at the 5 percent level, as the confidence intervals do not overlap when the variable *election* = 1, 2, or 3. Thus, the fiscal change does limit the PBC effects but only during the pre-election years, reducing the royalty-induced increase in education investment by about two-thirds.

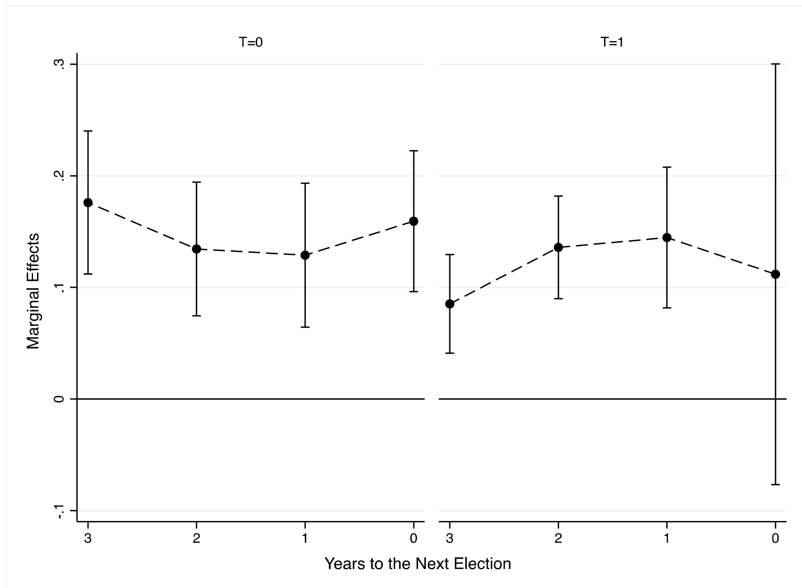

Figure 3.3a: Average marginal effects of royalty revenue on health investment before and after the policy change.

Note: Calculations based on model 1 in Table 3.4. Marginal effects before and after the policy change are plotted in the left-hand and right-hand panels, respectively. The marginal effects are in logarithm scale. Confidence intervals of 95 percent are included in the diagram.

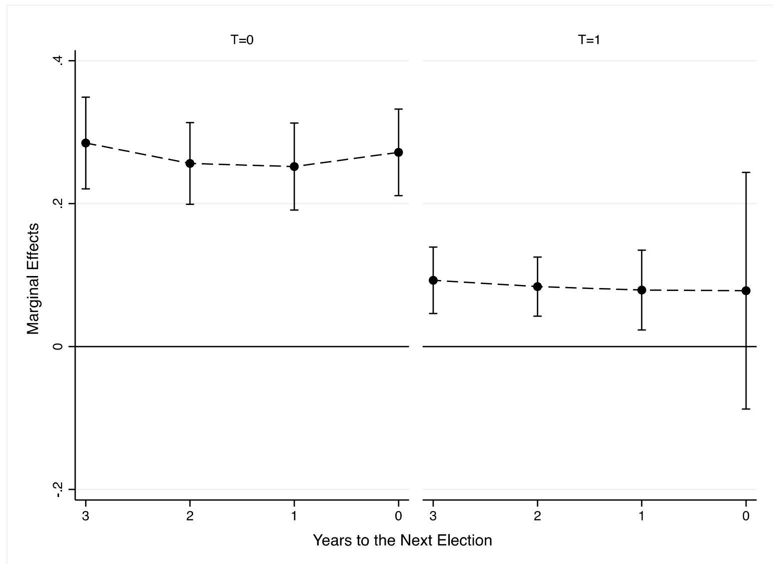

Figure 3.3b: Average marginal effects of royalty revenue on education investment before and after the policy change

Note: Calculations based on model 3 in Table 3.4. Marginal effects before and after the policy change are plotted in the left-hand and right-hand panels, respectively. The marginal effects are in logarithm scale. Confidence intervals of 95 percent are included in the diagram.

3.7 Robustness checks

i. System GMM Estimation

One may suspect that the models suffer from endogeneity. Here the main models are re-estimated with a lagged dependent variable using system GMM. The estimates are reported in columns 2 and 4 of Table 3.4. In what follows the hypotheses will be revisited based on the estimated dynamic panel data models reported in Table 3.4. First, the average marginal effect of royalty revenue is equal to 0.173 (p = 0.000). For each additional percent increase in royalty revenue, health investment on average will increase by 0.173 percent, holding other factors constant. For education, the marginal effect is 0.157 percent (p = 0.001). After de-trending, the coefficients of the lagged variable are less than 1, meaning that the series is stationary. However, they are not statistically significant at the 5 percent level. This may explain why the

findings are very close to those obtained from the fixed effects models, as will be seen below. Nevertheless, the results based on system GMM are preferred, because they take potential endogeneity into consideration. Overall, the findings are consistent with hypothesis 1, which proposes that public investment is higher in municipalities that have higher levels of royalty revenue.

Second, Figures 3.4a and 3.4b plot the average marginal effects of royalty revenue on health and education investments at different years in an electoral cycle. Again, similar to what was reported in the previous section, investments are significantly higher and peak at two years before elections. This is consistent with hypothesis 2, which proposes that PBCs can be identified in Colombia, and is in agreement with the findings in the literature that investments are usually made years before elections.

Third, Figures 3.5a and 3.5b show the predicted levels of health and education investment over an electoral cycle for municipalities receiving high and low levels of royalty revenue. Consistent with hypothesis 3, the PBC effect is higher among resource-rich municipalities. The dynamics are similar between the two types of investment. For health, the value is significantly higher all three years before the election (at the 5 percent level). For education, a similar pattern is observed.

Finally, Figures 3.6a and 3.6b plot the marginal effects of royalty over an electoral cycle before (left-hand panel) and after the policy change (right-hand panel). For both types of investment, the PBC effect can be detected before the change. The PBC effect is similar after the reform for health investment. For education, the evidence is stronger and the marginal effect of royalty revenue statistically cannot be distinguished from 0 after the policy change in 2012, except during the election year.

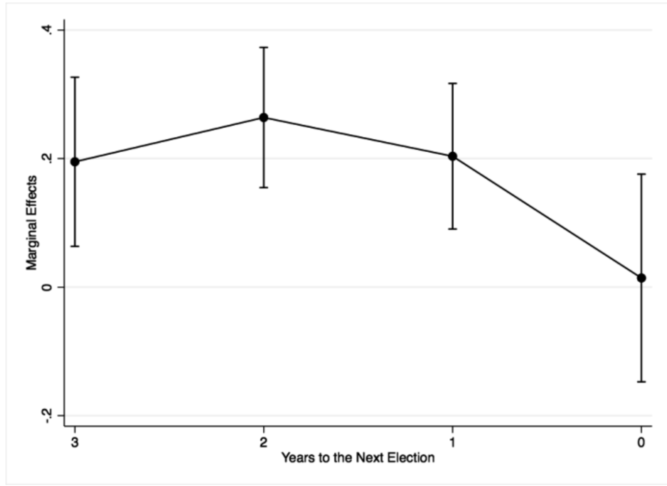

Figure 3.4a: Average marginal effects of royalty revenue on health investment

Note: Calculations based on model 2 in Table 3.4. The marginal effects are in logarithm scale. Confidence intervals of 95 percent are included in the diagram.

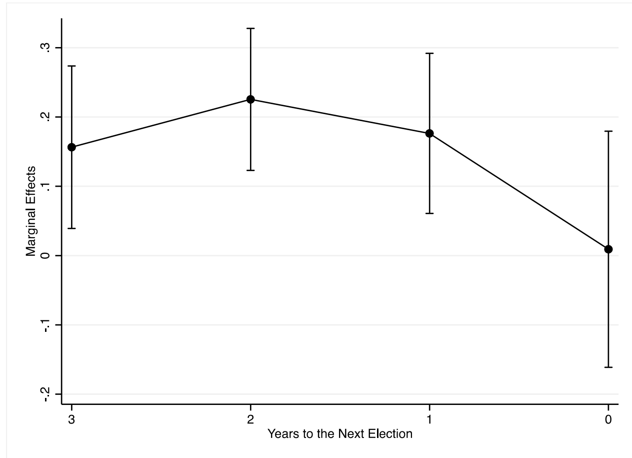

Figure 3.4b: Average marginal effects of royalty revenue on education investment

Note: Calculations based on model 4 in Table 3.4. The marginal effects are in logarithm scale. Confidence intervals of 95 percent are included in the diagram.

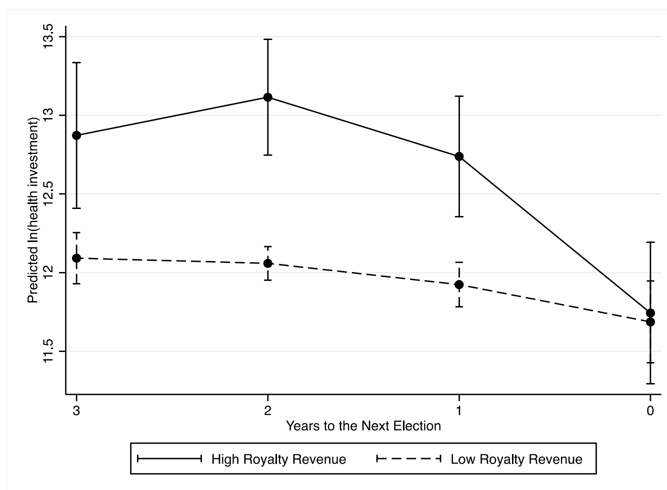

Figure 3.5a: Predicted levels of health investment over an electoral cycle

Note: Predictions based on model 2 in Table 3.4. Predicted values are on a logarithmic scale. The solid line corresponds to municipalities with a high level of royalty revenue (i.e. log(royalty) = 4). The dash line corresponds to municipalities with a low level of royalty revenue (i.e. log(royalty) = 0). The range of log(royalty) is from 0 and 4.5. Confidence intervals of 95 percent are included in the diagram.

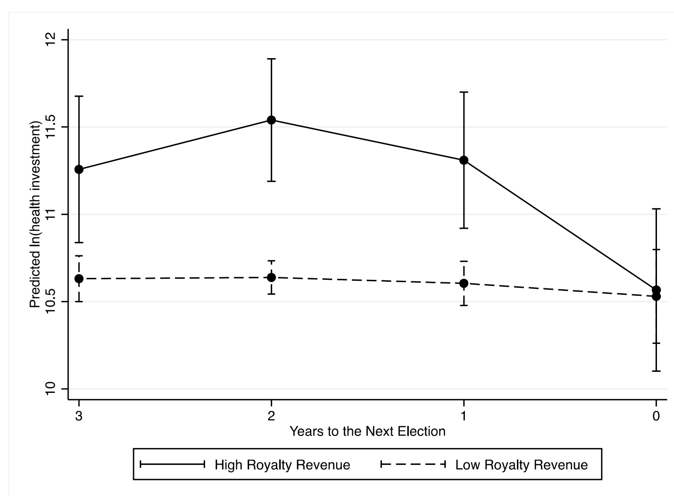

Figure 3.5b: Predicted levels of education investment over an electoral cycle

Note: Predictions based on model 4 in Table 3.4. Predicted values are on a logarithmic scale. The solid line corresponds to municipalities with a high level of royalty revenue (i.e. log(royalty) = 4). The dash line corresponds to municipalities with a low level of royalty revenue (i.e. log(royalty) = 0). The range of log(royalty) is from 0 and 4.5. Confidence intervals of 95 percent are included in the diagram.

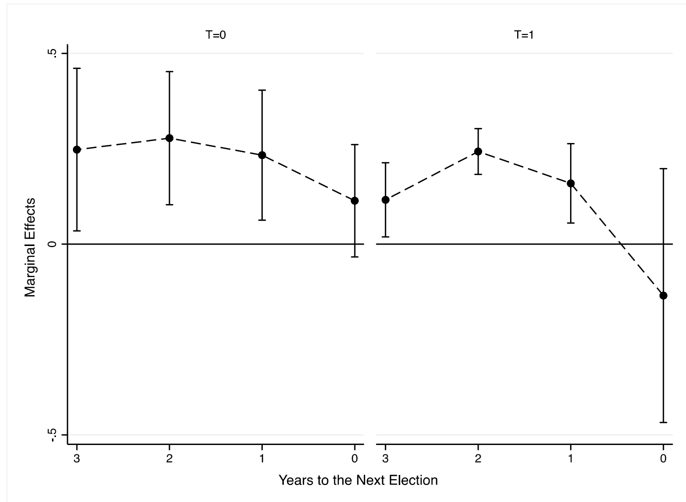

Figure 3.6a: Average marginal effects of royalty revenue on health investment before and after the policy reform

Note: Calculations based on a system GMM of a dynamic panel model (column 2) in Table 3.4. Marginal effects before and after the policy change are plotted in the left-hand and right-hand panels, respectively. The marginal effects are in logarithm scale. Confidence intervals of 95 percent are included in the diagram.

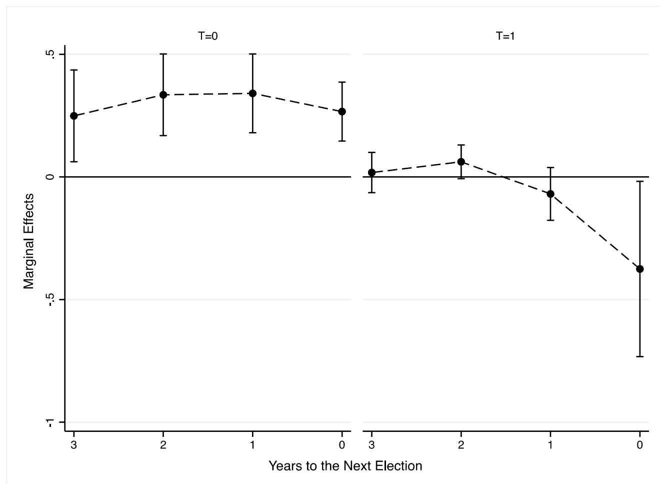

Figure 3.6b: Average marginal effects of royalty revenue on education investment before and after the policy reform

Note: Calculations based on a system GMM of a dynamic panel model (column 4) in Table 3.4. Marginal effects before and after the policy change are plotted in the left-hand and right-hand panels, respectively. The marginal effects are in logarithm scale. Confidence intervals of 95 percent are included in the diagram.

ii. Heterogeneous Effects for Producer and Non-Producer Municipalities

As discussed above, producer and non-producer municipalities may follow distinct electoral cycle dynamics. To avoid imposing a common structure to both types of municipalities, in this section, separate GMM models are re-estimated for each type of municipality. If higher levels of human capital investment are directly related to resource abundance, a larger positive effect should be expected among producer municipalities than among non-producer municipalities before the policy change. This idea is tested by restricting the samples to producers and non-producers and then re-estimating results from system GMM models. The estimation results are reported in Table 3.5. For producer municipalities, the average marginal effect of royalty revenue on health investment before the policy change is 0.261 (p = 0.001). For non-producers, the average marginal effect is 0.262 (p = 0.082), but statistically it cannot be distinguished from 0.[12] The evidence is clearer for education investment. The average marginal effects are 0.458 (p = 0.000) for producers and 0.182 (p = 0.250) for non-producers.

Secondly, as discussed above, non-producer municipalities to some extent may also benefit from the transfers funded by royalties, as they will have gained access to a larger pool of funds by submitting projects to the central government. If the pool becomes significantly larger, the effects of resource rents may propagate to non-producer municipalities after the policy reform. Based on the same estimation results reported in Table 3.5, the average marginal effects of royalty revenue on both types of investment before and after the policy reform for each type of municipality are plotted. The results are reported in Figures 3.7a through 3.7d.

Beginning with health investment, as can be seen in Figure 3.7a, the investment levels are quite similar after the policy reform, although the marginal effect of royalty revenue is not statistically significant in some years. An opposite pattern can be observed for non-producers (Figure 3.7b). The marginal effects seem to be similar, although the marginal effect of royalty revenue statistically speaking is positive in some years. For education investment, the marginal effect after the reform is slightly smaller for both producers (Figure 3.7c) and non-producers (Figure 3.7d).

In short, there is not strong evidence for the propagation effects. The resource rents effects may depend on a municipality's capacity and the politics

[12] The larger standard error might be due to non-producer municipalities' having non-zero royalty revenue through other means (e.g. non-producers could have competed and obtained part of the 8.2 percent of total natural resource revenue available before the policy change).

between the central and local governments. Two factors may explain why the propagation effects are not detected: municipalities with lower capacity may choose not to submit projects or fail to get those projects approved and party affiliations can influence whether a municipality gets a project approved.

Table 3.5: Dynamic panel regressions for producers and non-producers

	Producers	Non-Producers	Producers	Non-Producers
	(1)	(2)	(1)	(2)
Dependent variable	Health investment		Education investment	
Health investment$_{t-1}$	0.024	0.131		
	(0.133)	(0.123)		
Education investment$_{t-1}$			0.112	-0.045
			(0.087)	(0.130)
Election	0.540#	0.481*	-0.109	0.406**
	(0.300)	(0.223)	(0.218)	(0.144)
Election^2	-0.064	-0.101	0.060	-0.096*
	(0.097)	(0.078)	(0.075)	(0.048)
Reform	0.875#	-0.338	0.272	0.515
	(0.509)	(0.726)	(0.441)	(0.482)
Reform x Election	-0.729	-0.026	-0.082	-0.632
	(0.496)	(0.742)	(0.467)	(0.524)
Reform x Election^2	0.151	0.060	0.022	0.138
	(0.137)	(0.174)	(0.129)	(0.128)
Royalty	0.270***	0.124	0.436***	0.115
	(0.079)	(0.216)	(0.066)	(0.194)
Royalty x Election	0.028	0.020	-0.001	0.283
	(0.168)	(0.473)	(0.113)	(0.310)
Royalty x Election^2	-0.015	0.036	0.007	-0.100
	(0.060)	(0.163)	(0.041)	(0.107)
Reform x Royalty	-0.443#	0.106	-0.595**	-0.476
	(0.239)	(0.448)	(0.205)	(0.322)
Reform x Royalty x Election	0.398	0.056	0.395	0.099
	(0.287)	(0.639)	(0.246)	(0.489)
Reform x Royalty x Election^2	-0.097	-0.078	-0.103	0.011
	(0.086)	(0.196)	(0.073)	(0.145)

Table 3.5: (Continued from previous page)

	Producers	Non-Producers	Producers	Non-Producers
	(1)	(2)	(1)	(2)
Dependent variable	Health investment		Education investment	
Transfers	-0.222	0.044	0.929**	1.122***
	(0.294)	(0.265)	(0.296)	(0.279)
Deficit	-0.046#	-0.023	-0.052**	-0.035**
	(0.025)	(0.022)	(0.016)	(0.012)
Affiliates	0.169	0.001	-0.658#	-0.488
	(0.347)	(0.332)	(0.377)	(0.325)
Population > 65	7.793*	5.577		
	(3.704)	(3.747)		
Population < 18			-0.732	-1.994
			(2.393)	(1.477)
Rural population	0.145	-0.124	-0.036	-0.373
	(0.261)	(0.257)	(0.273)	(0.321)
President party	0.284	0.248	0.352	0.811*
	(0.330)	(0.352)	(0.371)	(0.404)
Governor party	-0.179	0.235	0.134	-1.884**
	(0.416)	(0.538)	(0.451)	(0.699)
Property tax	0.036	-0.026	0.359**	0.104#
	(0.133)	(0.070)	(0.112)	(0.060)
Time trend	0.110***	0.092***	-0.012	-0.008
	(0.027)	(0.027)	(0.023)	(0.018)
Constant	-209.280***	-175.029***	14.374	8.340
	(50.970)	(50.371)	(42.438)	(33.587)
Municipality FEs	Yes	Yes	Yes	Yes
Arellano-Bond test for AR(1)	0.000	0.000	0.000	0.000
Arellano-Bond test for AR(2)	0.880	0.784	0.251	0.990
Hansen test of over-identification	0.813	0.400	0.339	0.396
Difference-in-Hansen test of exogeneity	0.808	0.953	0.773	0.447
Observations	4,293	12,148	4,293	12,15
Number of municipalities	289	812	289	812

Notes: Robust clustered standard errors at the municipality level are in parentheses. Dynamic panel regressions with municipality fixed effects and a linear time trend. Results are based on the system GMM estimator. The dependent variable is health investment for models 1 and 2, and for education investment, models 3 and 4. For all models, the sample includes 1101 municipalities in Colombia. See Table 3.1 for more detailed data definitions. *** p<0.001, ** p<0.01, * p<0.05, # p<0.10.

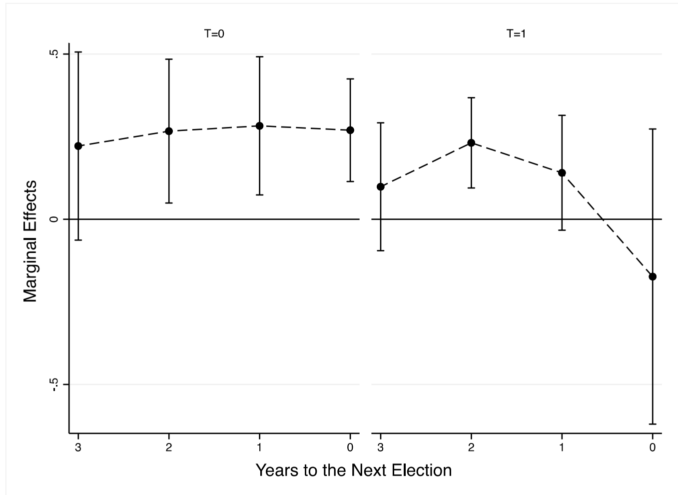

Figure 3.7a: Average marginal effects of royalty revenue on health investment before and after the policy reform for producer municipalities

Note: Calculations based on a system GMM estimation of a dynamic panel model (column 1) in Table 3.5. Marginal effects before and after the policy change are plotted in the left-hand and right-hand panels, respectively. The marginal effects are in logarithm scale. Confidence intervals of 95 percent are included in the diagram.

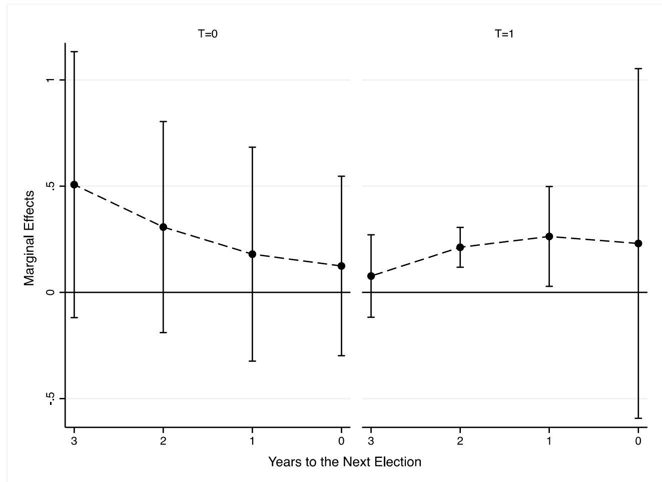

Figure 3.7b: Average marginal effects of royalty revenue on health investment before and after the policy reform for non-producer municipalities.

Note: Calculations based on a system GMM estimation of a dynamic panel model (column 2) in Table 3.5. Marginal effects before and after the policy change are plotted in the left-hand and right-hand panels, respectively. The marginal effects are in logarithm scale. Confidence intervals of 95 percent are included in the diagram.

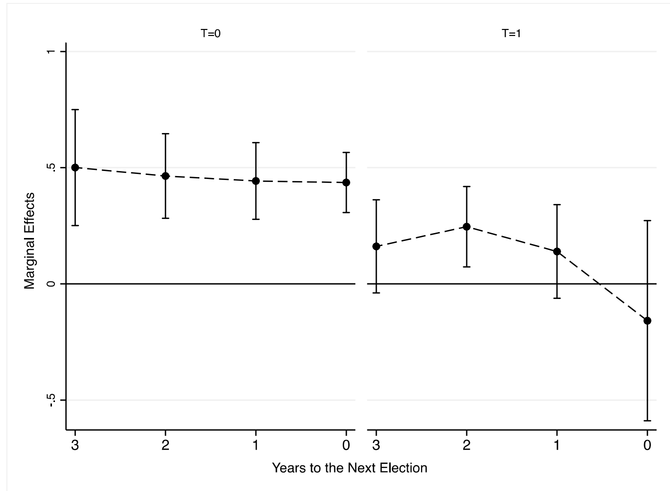

Figure 3.7c: Average marginal effects of royalty revenue on education investment before and after the policy reform for producer municipalities

Note: Calculations based on a system GMM estimation of a dynamic panel model (column 3) in Table 3.5. Marginal effects before and after the policy change are plotted in the left-hand and right-hand panels, respectively. The marginal effects are in logarithm scale. Confidence intervals of 95 percent are included in the diagram.

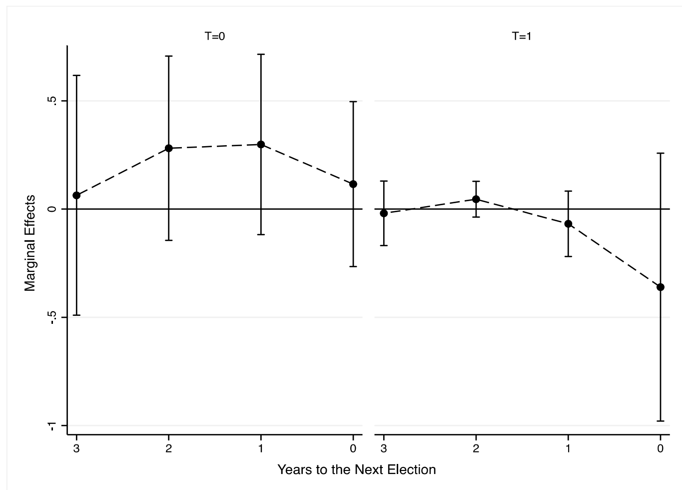

Figure 3.7d: Average marginal effects of royalty revenue on education investment before and after the policy reform for non-producer municipalities

Note: Calculations based on a system GMM estimation of a dynamic panel model (column 4) in Table 3.5. Marginal effects before and after the policy change are plotted in the left-hand and right-hand panels, respectively. The marginal effects are in logarithm scale. Confidence intervals of 95 percent are included in the diagram.

3.8 Conclusions

The findings presented in this chapter reveal that municipalities invest in health and education according to the amount of the resource rents that they receive. As such, health and education investment on average will increase by 0.173 percent and 0.157 percent, respectively, for every additional percent increase in royalty revenue, making these important investments dependent on resource revenue, as has been shown by prior research (Chan & Karim 2023; Caselli & Michaels 2013).

Regarding elections, in this chapter it has been shown that in the presence of resource rents, health and education investment follow the electoral cycle. Notably, there is an 18.8 percent increase in per capita health expenditure and a 5.3 percent rise in per capita education expenditure during the pre-election year, extending the findings of Nguyen and Tran (2023) regarding welfare spending. Moreover, the results are in line with those of Nazir et al. (2022) regarding the extension of electoral cycles beyond election years in health care spending, while further demonstrating the applicability of this pattern to education investment. Additionally, subnational governments with high resource revenue often end up investing more in health and education in anticipation of an election, aligning with country-level results presented by Klomp and de Haan (2016).

Policymakers should consider the impact of resource revenue in the electoral budget cycle and its implications for municipalities' investment decisions on health and education. Human capital investment for subnational jurisdictions should be consistent throughout time and mayors' terms, guaranteeing the correct use of resources and safeguarding service and quality levels.

In relation to the redistribution of resource rents, the fiscal change did reduce the royalty-induced increase in education investment by about two-thirds, but this decrease is only observed during pre-election years. It is evident that policy design should prevent subnational governments that are not used to having access to windfalls of resource revenue from becoming resource dependent in their health and education investment. Furthermore, policy should also support the transition of jurisdictions, which are used to receive resources windfalls, towards a less-resource-dependent fiscal policy, safeguarding essential investments for development.

Further research could focus on whether PBC investment in health and education in the presence of resource revenue has a greater effect on the capital or current side and on its consequent impact on these sectors' outcomes. In addition, research could clarify the role of royalty income in PBCs when there is affiliation of mayors to the national or state government. Finally, future research could focus on

how investment in other key development sectors, such as infrastructure, is affected by PBCs in the presence of resource rents.

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Chapter 4

Avoiding a Natural Resource Curse? The Impact of Administrative Efficiency on Colombian Municipalities' Fiscal Effort[1]

Abstract

The term 'paradox of the plenty' was coined to describe an often-found inverse relationship between royalty revenue and economic development. The main causal mechanism is thought to be a substitution effect whereby governments use royalty revenue to lower taxes instead of investing in activities that promote long-term economic growth. However, the occurrence of a 'natural resource curse' differs widely both for countries and subnational jurisdictions. Based on a data set that traces 1,078 municipalities in Colombia from 2006 to 2017 and utilising a policy reform in 2012 that reduced royalty revenue for producer municipalities, this chapter argues and finds that municipal fiscal effort is higher when producer municipalities

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[1] This chapter is based on:
Collazos-Oritz, MA, Schakel, A. (2023): Avoiding a natural resource curse? The impact of administrative efficiency on Colombian municipalities' fiscal effort. A revised version of this paper has been accepted for publication in the journal *Local Government Studies*.

have more-efficient administrations. The findings have important implications for the design of policy that allocates royalty revenue across subnational jurisdictions, in particular for developing countries where administrative efficiency tends to vary widely between local governments.

Keywords: natural resource curse, administrative efficiency, royalty revenue, municipalities, paradox of the plenty, fiscal effort

4.1 Introduction

Countries with many natural resources often perform worse economically than countries without any or with fewer natural resources (Sachs & Warner 1995; Van der Ploeg & Venables 2012). This finding is known as the 'natural resource curse' or the 'paradox of the plenty', because one would expect countries with natural resource abundance to economically outperform those without or less access to natural resources. One of the reasons brought forward to explain this paradox is that governments tend to substitute taxation with royalty rents (Bornhorst et al. 2009; Carnicelli & Postali 2014; Crivelli & Gupta 2014) instead of investing natural resources revenue in infrastructure and human capital development that advance long-term economic growth (Badeeb et al. 2017; Cockx & Francken 2014). However, a 'resource curse' is not a given and various studies have found that both national and subnational governments have been able to overcome it. This raises the question: under which conditions do governments substitute tax revenue with royalty revenue?

In this chapter the focus is on municipal fiscal effort of 1,078 municipalities in Colombia between 2006 and 2017. A policy reform effective since 2012 significantly altered the allocation of royalty revenue in the country. Municipalities that produce natural resources saw their royalty share decline from 80 percent to 10 percent of the total amount of revenue collected by the national government, whereas non-producing municipalities experienced an increase, receiving 10 percent instead of 8 percent of the total. The 2012 reform enables the exploration of whether administrative efficiency is an important enabling condition for governments to (partly) avoid off-setting taxation by natural resource revenue. This chapter argues that the extent to which governments can and will modify their fiscal effort depends on their administrative efficiency, i.e. the extent to which municipal administrations turn inputs such as finances and personnel into policy outputs. Governments with

more-efficient administrations can generate more tax revenue per percentage point tax rate than governments with low administrative efficiency. Hence, it is hypothesised here that producer municipalities with higher administrative efficiency are more responsive to a decrease in royalty revenue and will increase their fiscal effort to a larger extent after the 2012 reform than producer municipalities with lower administrative efficiency.

Through the employing of regression models that include fixed effects for municipalities and years and several control variables, strong support is found for these hypotheses. Most importantly, the results reveal an important modifying role of administrative efficiency on the extent to which producer municipalities increase or decrease their fiscal effort. This result highlights the importance of institutional quality for the questions of whether and to what extent a natural resource curse occurs for subnational governments (Badeeb et al. 2017; Boschini et al. 2013; Bulte et al. 2005; Sachs & Warner 1995). This finding is especially relevant for developing countries where administrative efficiency tends to be highly unequal across subnational jurisdictions.

In the next section the literature that has focused on the 'paradox of the plenty' and the causal mechanism that underlies this paradox, i.e. the substitution of tax revenue with royalty revenue, is discussed. In the third section, the policy reform in Colombia implemented in 2012 is outlined and the hypotheses are developed. Data and methods are discussed in the fourth and fifth sections and the results are presented in the sixth section. The final section concludes and discusses the implications of the results.

4.2 The 'paradox of the plenty': Substitution effect between royalty revenue and taxation and the intervening role of administrative efficiency

Resource endowment can potentially be a great advantage for economic development. Countries with an abundance of natural resources can transform those natural resources into assets such as human capital, domestic private and public capital, and foreign financial assets, which foster economic development and growth (Van der Ploeg & Venables 2012). However, in practice it has found repeatedly that resource-abundant countries are weakly developed economically. This has induced scholars to coin the terms 'the paradox of the plenty', 'resource abundance curse',

and 'natural resource curse' for describing the (unanticipated) inverse relationship between natural resource endowment and economic development (Badeeb et al. 2017; Leibbrandt & Lynham 2018). An often-proposed causal mechanism underlying the 'paradox of the plenty' is the substitution of taxation for natural resource revenue (Bornhorst et al. 2009; Carnicelli & Postali 2014; Ducoing et al. 2018; Crivelli & Gupta 2014; James 2015).

Revenue from natural resources induces politicians to lower taxes, because this makes them more popular and increases their chances of being re-elected (Vicente 2010). Instead of investing natural resource revenue in assets that advance economic growth in the long term, such as entrepreneurism and human capital, governments decrease their fiscal effort and collect less tax revenue. Knack (2009) reveals that countries that rely heavily on royalty revenue experience a sharp deterioration in their tax administration capacity, implement extensive tax exemptions in an ad hoc manner, and apply their tax laws in a discretionary manner (Thomas & Trevino 2013).Thus, in the longer term, the availability of royalty revenue is likely to crowd in rent seeking, corruption, lower public health expenditures, and weak government institutions, which all negatively impact economic development (Busse & Gröning 2013; Cockx & Francken 2014; Dube & Vargas 2013; Perry & Olivera 2009).

Subnational governments can also be subject to a 'natural resource curse' (Karl 2004). Bradford and Oates (1971) suggest that transferring an unconditional lump sum grant to a subnational jurisdiction will increase the jurisdiction's available revenue and will create an income effect. Locally elected politicians are likely to pass on those grants to their citizens by reducing taxes and fees in an effort to increase their chances of re-election (Mogues & Benin 2012; Vicente 2010). Hence, revenue from natural resources allocated to local governments in the form of unconditional grants are likely to decrease the incentives of those governments to collect local taxes (Bonet-Morón et al. 2018; Bravo 2013; Caldeira & Rota-Graziosi 2014; Masaki 2018; Mogues & Benin 2012; Melgarejo & Rabanal 2006). As a result, local governments become less accountable to their citizens, which leads to deteriorated social and economic performance. Studies that focus on subnational governments indeed find a negative impact of royalty revenue on the supply of education and health and the reduction of poverty and income inequality (Aragón & Rud 2013; Caselli & Michaels 2013; Loayza et al. 2013; Monteiro & Ferraz 2010).

A potentially important modifying factor for the occurrence of a 'paradox of plenty' is the quality of government institutions (Badeeb et al. 2017; Boschini et al. 2013; Cockx and Francken 2014; Mehlum et al. 2006). Based on a meta-analysis of the empirical literature, Dauvin and Guerreiro (2017) point out that the quality of

institutions can explain the mixed findings regarding the question of whether natural resource endowment negatively impacts economic growth[2]. This may also explain why developing countries in particular are found to be subject to a 'paradox of the plenty': most developing countries tend to have relatively weak political institutions. The impact of resource wealth on a country's incentive to mobilise non-resource domestic revenue has also received attention in the literature that explores the 'natural resource curse'. The evidence is mixed and strongly suggests that a substitution effect—i.e. a decrease in a government's fiscal effort in response to increasing royalty revenue—depends on contextual factors such as a country's dependency on natural resource revenue, knowledge accumulation, and tax structure (Crivelli & Gupta 2014; Ducoing et al. 2018; Ossowski & Gonzáles 2012).

Research focusing on the substitution effect for local governments also presents mixed findings. Some studies find an inverse relationship between royalty revenue and fiscal effort and others do not (Badeeb et al.. 2017; Bornhorst et al. 2009; Carnicelli & Postali 2014; Cust & Viale 2016; Crivelli & Gupta 2014; Ossowski & Gonzáles 2012; Postali 2015). The evidence is also mixed for municipalities in Colombia, which is the focus of our empirical analysis. Ramírez and Bedoya (2014) and Bonet et al. (2015) find that municipalities' effort in property tax collection declines when they become more reliant on royalty revenue whereas Bonet-Morón et al. (2018) find that an increase in royalty revenue is positively associated to property tax collection for more-developed municipalities in particular. The argument made in the present chapter is that these contrasting findings can (in part) be explained by differences in administrative efficiency between subnational jurisdictions. Administrative efficiency refers to the extent to which municipal administrations turn inputs such as finances and personnel into policy outputs. The focus here is on administrative efficiency, because while subnational jurisdictions often increase or decrease their tax revenue by adjusting the tax rate, they can also apply exceptions granted in the law, select different collection methods, and alter penalties, for example. The extent to which subnational jurisdictions can implement these alternative options depends not only on how much administrative *capacity* they have, but also on the extent to which these resources associated with that capacity are efficiently and effectively deployed. Administrative capacity focuses on financial, infrastructural, and human resources at the disposal of a government to

[2]Dauvin and Guerreiro (2017) also attribute the mixed results in the literature to differences in the way in which royalty revenue is measured, which natural resources are considered, the employed econometric methods, the countries that are included in the data set, and the control variables that are included in the models (see also Cust and Poelhekke 2015).

achieve its outcomes effectively and efficiently (Christensen & Gazley 2008; de la Riva Agüero 2022).

Another important factor that determines the extent to which *subnational* governments are subject to a 'natural resource curse' is the design of the policy that allocates royalty revenue across municipalities. In most (developing) countries, natural resource revenue accrues to the national government, which subsequently distributes this revenue across subnational jurisdictions in the form of inter-governmental transfers. Ideally, inter-governmental transfers aim to support local governments in their providing of optimal levels of public services. Such transfers thus represent the implementation of policy that reaps scale effects and internalises externalities while subnational governments remain accountable to their citizens (Sharma 2012). However, in practice, and especially in developing countries, royalty revenue is typically distributed to jurisdictions where the natural resources are located and as such is not aimed at reducing inequalities between local jurisdictions or reducing poverty (Perry & Olivera 2009; Postali 2015). Colombia, the focus of our empirical analysis, used to have a policy that returned the bulk of royalty revenue to municipalities where natural resources were produced. However, a recent reform drastically changed the allocation of royalty revenue, which is discussed in detail in the next section.

4.3 Fiscal effort of Colombian municipalities before and after the 2012 policy reform

There are 1,101 municipalities and 32 departments in Colombia[3]. Since a major decentralisation reform in 1991, municipalities have been responsible for the provision of public services in the areas of education, health, sanitation, and drinking water[4]. Municipal councils have been directly elected throughout the 20th century and mayors have been directly elected since 1988. Municipal revenue consists of earmarked transfers, taxes, and royalty revenue which accounted for 58.4, 12.2, and 4.5 percent, respectively, of total municipal revenue before the 2012 policy reform

[3] The data set constructed for the analysis in this chapter includes 1,078 municipalities because data for some years are missing for 23 municipalities. Table 4.4 in the appendix presents robustness analyses conducted by running the models for all 1,101 municipalities.

[4] The 1991 constitutional revision was implemented by a national law adopted in 1993.

and account for 55.8, 13.9, and 7.3 percent after the 2012 policy reform[5]. Hence, a major revenue source for municipalities consists of royalty revenue and some municipalities have been or are heavily reliant on this source of income (the maximum score in the data set is 87 percent of total municipal revenue).

The extent to which municipalities rely on royalty revenue has changed considerably because of a policy reform in 2012. Before the reform, a producer municipality—i.e. a municipality that has an oil field or a coalmine within its jurisdiction—kept 80 percent of the natural resource royalty revenue.[6] After the reform, the central government recentralised 50 percent of the royalty revenue and of the remaining 50 percent, half was allocated to producer municipalities[7]. However, the share of royalty revenue for producer municipalities was gradually reduced from the 25 percent of the annual total it was in 2012 to 17.5 percent in 2013, 12.5 percent in 2014, and finally to 10 percent from 2015 onwards (Legislative Act No. 5, 2011). Consequently, producer municipalities faced significant decreases in royalty revenue and had strong incentives to increase their own tax revenue in order to compensate for the lost funds.

The main tax revenues for municipalities come from a property tax (34 percent), a business tax (17 percent), and a gasoline tax (22 percent) (Martinez 2019). Municipalities must set the rate of the property tax within a lower and an upper limit (between 0.5 and 1.6 percent since 2014) established by the central government (Law No. 1450 2011)[8]. The base and rate of the other municipal taxes are also set by the central government[9]. Municipalities can thus increase or reduce the amount of revenue they collect by adjusting the property tax rate, but they can also do so by applying exceptions granted in the law, updating the cadaster, choosing different collection methods, and altering penalties (Bravo 2013; Law No. 1450 2011; Shapiro

[5] Additional sources of municipal revenue such as non-tax current revenue, current transfers, co-financing resources, and other revenue, amounted to 24 percent of revenue before and after (through 2017) the 2012 policy reform.

[6] Before the 2012 reform, municipalities with maritime or river ports that were used to transport natural resources were also considered to be producer municipalities (Bonet et al. 2015).

[7] The other 25 percent was allocated to municipalities and departments based on poverty and population criteria.

[8] The lower limit has risen over time, going from 0.1 percent before 2012 to 0.3 percent in 2012 and to 0.4 percent in 2013.

[9] Municipalities can introduce a new municipal tax, but first the tax has to be approved by the National Congress through a long administrative process. In Colombia during the time period covered in the data set, no municipality introduced a new municipal tax (Procuraduría General de la Nación [PGN] 2011).

et al. 2018)[10]. The extent to which municipalities are able to collect revenue given a certain property tax rate is therefore likely to depend on their administrative efficiency.

The 2012 policy reform, which introduced a dramatic change in the incentive structure especially for producer municipalities, enables the exploration of whether a substitution effect took place and whether municipal fiscal effort increased in response to decreasing royalty revenue. In addition, there is the question of whether municipalities with more-efficient administrations collect more property tax revenue. These considerations lead to two hypotheses:

H1: Municipalities that receive more royalty revenue will collect less property tax revenue.

H2: Municipalities with more-efficient administrations will collect more property tax revenue.

Differences in fiscal effort between producer and non-producer municipalities and before and after the policy change in 2012 are expected. Available royalty revenue increased for non-producer municipalities from 8.2 to 10 percent of total natural resource revenue. This increase in available royalty revenue may have created incentives for non-producer municipalities to decrease their fiscal effort after the policy reform. However, the impact is likely to be limited, because 800 non-producer municipalities compete for the available royalty revenue. In stark contrast, the 278 producer municipalities that were entitled to 80 percent of the total natural resource revenue before the reform of 2012 saw this percentage gradually reduced to 10 percent from 2015 onwards. Therefore, it is expected producer municipalities in particular increased their fiscal effort after the policy reform of 2012.

H3: Producer municipalities will collect more property tax revenue after the policy reform in 2012 compared to non-producer municipalities.

Along with or rather than increasing their fiscal effort, municipalities can try to increase their royalty revenue. Since the reform of 2012, municipalities have had

[10] An example of an exception is that the property tax rate may be increased to a maximum of 3.3 percent in the case of undeveloped land in an urban area (Law No.1450 2011). The cadaster must be updated every five years and a mayor needs to initiate the process. In addition, every year the national geography institute selects municipalities that must update their cadasters (Shapiro et al. 2018). Almost 60 percent of municipalities updated their cadasters between 2006 and 2010 (Martinez 2019).

to develop project plans that must be submitted to and approved by the central government in order to receive royalty revenue.[11] The quality of the plans and the likelihood of approval of the plans by the central government are both likely to depend on the administrative efficiency of municipalities. However, competition for the available royalty revenue also became stiffer among producers, because after the policy they were allotted only 10 percent of total royalty revenue, leading them to compete with each other for these funds. Even though municipalities with more-efficient administrations may compensate for an anticipated revenue loss by developing high-quality plans, it is expected that producer municipalities cannot avoid increasing their fiscal effort and that those with more-efficient administrations will increase their property tax revenue.

H4: Producer municipalities with more-efficient administrations will collect more property tax revenue after the policy reform in 2012 compared to producer municipalities with less-efficient administrations.

4.4 Data

The four hypotheses lead to three key variables of interest: *fiscal effort*, *royalty revenue*, and *administrative efficiency*. Fiscal effort is operationalised as the logarithm (base 10) of property tax revenue in pesos per capita in a given year.[12] Figure 4.1 displays average property tax revenue collected by non-producer and producer municipalities between 2006 and 2017. Both types of municipalities

[11] See Bonet et al. (2015) for further detail on the development and approval of municipal development plans.

[12] We focus on property tax for two main reasons. Firstly, it is the most important tax levied by Colombian municipalities, granting them greater fiscal autonomy to set the tax rates (within a specified range), determine taxable properties, and spend the revenues (Shapiro et. al. 2018; Martinez, 2019). Second, other substantial taxes (business tax and the gasoline surcharge tax) are closely tied to economic dynamics, largely outside municipal control. For example, these municipal taxes can be influenced by companies engaged in hydrocarbon exploitation and related economic activities in the territory, with the majority operating formally and managing their tax responsibilities autonomously, often without significant municipal intervention or effort (Ramírez & Bedoya 2014). Considering total municipal tax revenue, instead of just property tax, might suggest producer municipalities collect more. However, this increase would be likely to stem from wealth generated by natural resource exploitation and related economic activities, rather than improved fiscal effort. Hence, wealth accumulation from such activities (or other concentrated economic activities in different municipalities) may boost tax revenues without necessarily reflecting improved fiscal effort.

increased their fiscal effort over time and producer municipalities raised, on average, more property tax revenue than non-producer municipalities. Importantly, the gap between non-producer and producer municipalities increased over time. The difference in average property tax revenue is 0.06 for 2006–2011 (4.12 compared to 4.18 log10 pesos per capita) and is 0.12 for 2012–2017 (4.29 compared to 4.41 log10 pesos per capita). This is an initial indication that producer municipalities increased their fiscal effort to a greater extent than non-producer municipalities after the policy reform in 2012 (hypothesis 3).

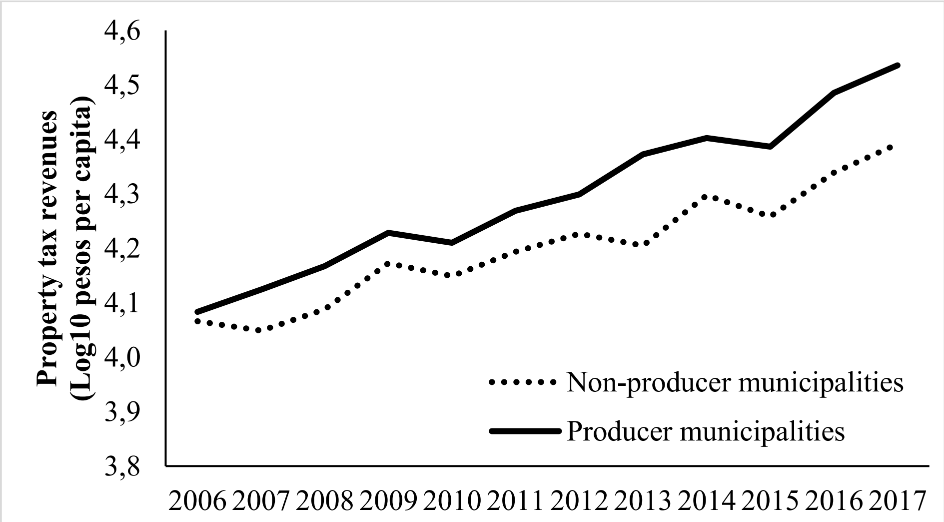

Figure 4.1: Property tax revenue collected by municipalities in Colombia

Royalty revenue is measured as the logarithm (base 10) of royalty revenue (in pesos) per capita received by a municipality in a given year. Figure 4.2 displays average royalty revenue received by non-producer and producer municipalities between 2006 and 2017. Producer municipalities received more royalty revenue over the entire period. This is not surprising, because before the policy reform in 2012 they were entitled to keep 80 percent of royalty revenues generated in the country. After the policy reform, as noted above available royalty revenue for producer municipalities declined from 25 percent of the total royalty revenue collected in Colombia in 2012 to 10 percent from 2015 onwards, the same proportion as was available to non-producer municipalities. Because the number of producer municipalities was much lower than the number of non-producer municipalities (278 versus 800), average received royalty revenue was (still) higher for producer

municipalities. Average royalty revenue increased for both non-producer and producer municipalities, but the increase was higher for the former: 0.93 (log10 pesos per capita) for them (from 1.08 in 2006 to 2.01 in 2017) compared to 0.67 (log10 pesos per capita) for producer municipalities (from 2.87 in 2006 to 3.54 in 2017). As would be expected, the gap between the two types of municipalities decreased especially since the policy reform in 2012. The difference in received royalty revenue increased from 1.8 (log10 pesos per capita) in 2006 to 2.0 in 2011 and subsequently to 1.5 in 2017. This provides face validity to the expectation that producer municipalities in particular received relatively less royalty revenue compared to non-producer municipalities and therefore had to increase their fiscal effort.

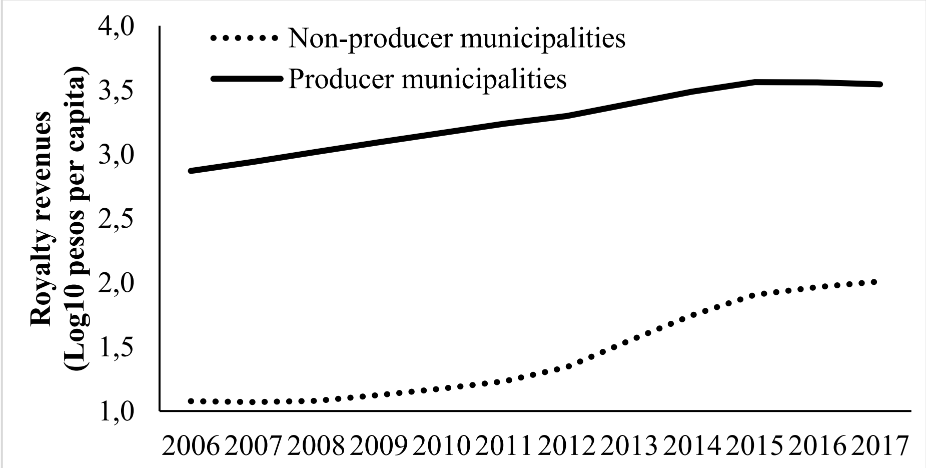

Figure 4.2: Royalty revenue received by municipalities in Colombia

Administrative efficiency refers to the extent to which municipal administrations turn inputs such as finances and personnel into policy outputs. The Departamento Nacional de Planeación (DNP) provides an indicator of administrative efficiency that is measured annually for each municipality. A data envelopment analysis lies at the core of this indicator, whereby output performance indicators in education, health, and drinking water are related to inputs in terms of human resources (quality and quantity of personnel) and capital investments in these three policy sectors (DNP 2005). For example, in education the number of students enrolled in preschools and middle schools and their exam scores (output) are evaluated against the total number of employed teachers, the experience of those teachers, investment in education (not including payroll expenses), and classroom

space (inputs). The best performing municipalities, i.e. the municipalities that are most efficient in providing a good or service, receive a score of 100 percent and other municipalities receive a score below 100 percent depending on how they compare to the best-performing municipalities. The final score is an average across three policy sectors: education, health, and drinking water (DNP 2005). Table 4.3 in the appendix provides further detail.

The models used to test the hypotheses include eight control variables that are commonly used in research on fiscal effort of subnational jurisdictions (Bonet et al. 2018; Crivelli & Gupta 2014; Mogues & Benin 2012; Valés Giménez & Zárate Marco 2017). First, *transfers* from the central government—not including royalty revenue—and *total spending* by a municipality, which may either decrease or increase the incentives for a municipality to increase their tax revenue, are included. Both transfers and total spending are measured as the logarithm (base 10) of pesos per capita in a given year.

Next, municipal *population size* and the sizes of *rural population* and of *population with age 65 or higher* within a municipality (the logarithms (base 10) of the population variables are taken) are included. Municipalities with larger total population sizes and smaller rural populations and smaller populations of 65 years and older may have more opportunities to increase their fiscal effort. In addition, one dummy traces whether the *mayor and president* are from the same party and another dummy indicates whether the *mayor and governor* are of the same party. Party congruence may increase the probability that a municipality receives royalty revenue (Avellaneda 2012). Finally, the vote share won by the party of the mayor in the last municipal election is included. Mayors who can rely on the support of the municipal council may find it easier to increase the rate of the property tax.

Table 4.1 presents the descriptive statistics for the dependent and independent variables for non-producer and producer municipalities. The data set includes yearly data from 2006 to 2017 for 800 non-producer and 278 producer municipalities, yielding a total of 12,936 yearly observations clustered by 1,078 municipalities. In Table 4.4 in the appendix the results for the full sample, which includes 13,164 yearly observations for 1,101 municipalities are presented. The data come from four sources: The National Administrative Department of Statistics (DANE), the National Department of Planning (DNP), the National Registrar Office (NRO), and the Center for Economic Development Studies (CEDE)[13].

[13]The data were retrieved from www.dane.gov.co (DANE) and www.terridata.dnp.gov.co (DNP).

Table 4.1: Descriptive statistics

Variables	All municipalities (N=1,078)				Non-producer (N=800)				Producer (N=278)			
	Mean	Std.dev.	Min	Max	Mean	Std.dev.	Min	Max	Mean	Std.dev.	Min	Max
Property tax revenues (log10 pesos per capita)	4,23	0,74	0	6,15	4,20	0,80	0	6,15	4,30	0,57	0	5,85
Royalty revenues (log10 pesos per capita)	2,83	2,28	0	7,14	2,46	2,24	0	6,79	3,91	2,03	0	7,14
Administrative efficiency	53,46	15,84	0	100	53,98	15,88	0	100	51,99	15,63	0	100
Dummy producer since 2012	0,13	0,34	0	0	0	0	0	0	0,50	0,50	0	1
Administrative efficiency producer since 2012	7,19	19,44	0	98,88	0	0	0	0	29,80	29,80	0	98,88
Transfers (log10 pesos per capita)	5,62	0,23	4,79	6,78	5,62	0,23	4,79	6,78	5,61	0,23	4,87	6,52
Total spending (log10 pesos per capita)	5,93	0,35	0	7,79	5,91	0,35	0	7,10	5,99	0,36	0	7,79
Population size (log10)	4,16	0,48	2,96	6,91	4,13	0,46	2,96	6,91	4,26	0,53	3,03	6,38
Rural population (log10)	3,84	0,38	2,49	5,24	3,81	0,37	2,49	4,87	3,92	0,41	2,83	5,24
Population over 65 years (log10)	3,06	0,45	1,67	5,77	3,03	0,44	1,67	5,77	3,15	0,48	1,96	5,35
Congruence mayor-president	0,45	0,50	0	1	0,45	0,50	0	1	0,45	0,50	0	1
Congruence mayor-governor	0,10	0,30	0	1	0,09	0,28	0	1	0,12	0,32	0	1
Proportion of votes for mayor's party	0,48	0,12	0	1	0,48	0,12	0	1	0,47	0,12	0	1

Notes: Total number of observations is 12,936 (12 years * 1,078 municipalities); 9,600 observations for non-producer municipalities (12 years * 800 municipalities), and 3,336 obsevations for producer municipalities (12 years * 278 municipalities) .

4.5 Method

The data set is a balanced panel that includes 12 years (t) from 2006 to 2017 for 1,078 municipalities (i). The first model is a fixed effects regression model that includes royalty revenues, administrative efficiency, eight control variables, municipal fixed effects to account for differences between municipal characteristics, and year fixed effects to account for exogenous shocks such as increases or decreases in oil prices.

$$(4.1)\ PRT_{it} = RR_{it} + AE_{it} + \Psi_{it} + \alpha + \varsigma_i + \lambda_t + \epsilon_{it},$$

where PRT_{it} is the property tax revenue raised by municipality i (= 1, …., 1078) in year t (= 2006, …., 2017), RR_{it} is the royalty revenue received by municipality i in year t, and AE_{it} is the administrative efficiency of municipality i in year t. Ψ_{it} is a set of eight control variables: central government transfers, total spending, population size, rural population, population age 65 years and higher, congruence between the parties of the mayor and president, congruence between the parties of the mayor and governor, and proportion of votes for the party of the mayor. The model includes a constant term (α), fixed effects for municipalities (ς_i), and fixed effects for years (λ_t), and ε_{it} represents the error term. Standard errors in model 4.1 and in models 4.2–4.4 (see below) are adjusted for the clustering of observations by municipalities.

Year fixed effects control for possible exogenous shocks occurring in a particular year that may impact some or most of the observations. For example, royalty revenue is highly dependent on the price of oil, which is marked by volatility over time. Year dummies will absorb these differences between the years. A time trend variable does not assume effects specific to any given year; instead it assumes a monotonic process of growth or decline that extends across years and that may be associated with the trends in the dependent and independent variables. Figures 4.1 and 4.2 clearly reveal a trend of growth in property tax and royalty revenues for both producer and non-producer municipalities. Therefore, model 4.2 below is run, which is the same as model 4.1 but, rather than including fixed effects for years (λ_t), model 4.2 includes a trend variable that has a value of 1 for 2006, 2 for 2007, up to 12 for 2017.

$$(4.2)\ PRT_{it} = RR_{it} + AE_{it} + \Psi_{it} + \alpha + \varsigma_i + trend_t + \epsilon_{it}$$

Models 4.3 and 4.4 return to the model specification of model 4.1, which includes fixed effects for years rather than a trend variable. Hypothesis three expects that producer municipalities in particular increased their fiscal effort after the policy reform in 2012. This hypothesis is assessed by including the variable *dummy producer since 2012* (*DP2012*) in model 4.3, which takes the value of 1 for producer municipalities for 2012 and later years and 0 for non-producers and years before 2012.

$$(4.3)\ PRT_{it} = RR_{it} + AE_{it} + DP2012_{it} + \Psi_{it} + \alpha + \varsigma_i + \lambda_t + \epsilon_{it}$$

Hypothesis four expects that producer municipalities with more-efficient administrations will collect more property tax revenue after the policy reform in 2012. This hypothesis is assessed by including the variable *administrative efficiency for producers since 2012* (*AEP2012*) in model 4.4. This variable traces the administrative efficiency scores for producers for 2012 and later years; administrative efficiency scores are 0 for non-producers and years before 2012.

$$(4.4)\ PRT_{it} = RR_{it} + AE_{it} + AEP2012_{it} + \Psi_{it} + \alpha + \varsigma_i + \lambda_t + \epsilon_{it}$$

Models 4.3 and 4.4 apply a difference-in-difference model approach, whereby it is assumed that in the absence of the treatment (the 2012 policy reform), the difference between the comparison group (producer municipalities) and the control group (non-producer municipalities) is constant over time. The parallel trend assumption can be tested for the period before the 2012 policy reform and the null-hypothesis of parallel linear trends is not rejected for this period ($F(1, 1077) = 0.06$, $p = 0.8080$). It is important to note that this statistical test cannot be performed for model 4.4, because AEP2012 (i.e. the treatment) is a continuous variable. Visual inspection of Figure 4.3 reveals that prior to the 2012 policy reform, producer and non-producer municipalities followed a parallel trend in property tax revenue, which seems to indicate that the parallel-trends assumption is satisfied.

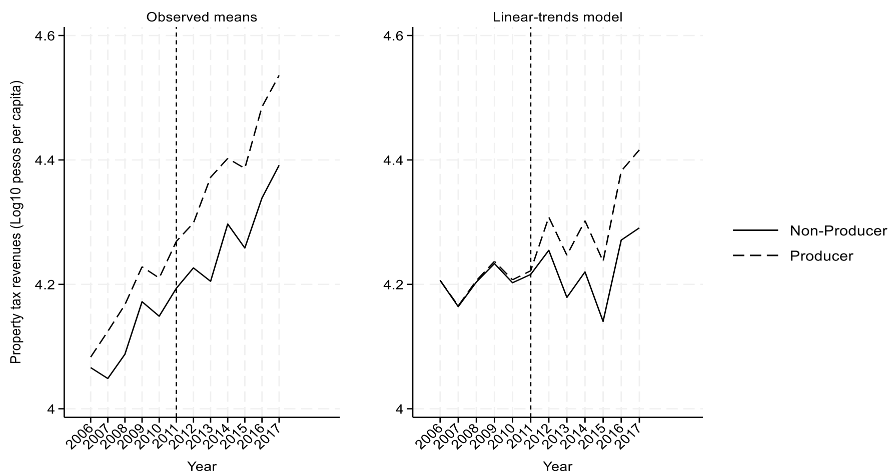

Figure 4.3. Trends in property tax revenues collected in producer and non-producer municipalities in Colombia, 2006–2017

Note: The left panel in Figure 4.3 shows average tax revenues over time for producer and non-producer municipalities. The right panel in Figure 4.3 shows the predicted values for producer and non-producer municipalities based on the augmented model 4.3, which excludes the variable DP2012 but includes interactions between the year dummies and a dummy with a value of 1 for producer municipalities and 0 otherwise.

4.6 Results: The impact of royalty revenue and administrative efficiency on property tax revenue

Table 4.2 presents the results of the four regression models. Royalty revenue does not reach statistical significance ($p < 0.05$) in model 1, but does in model 2, which includes a trend variable instead of fixed effects for years. Administrative efficiency reaches statistical significance at the 10 percent level in model 2, but its impact is not statistically significant in model 1. Both royalty revenue and administrative efficiency reach statistical significance in model 2, when the model is run for the full data set of 13,164 yearly observations for 1,101 municipalities (Table 4.4). These results do not provide strong empirical support for hypothesis 1, which expects that municipalities that receive more royalty revenue raise less property tax revenue or for hypothesis 2, which expects that municipalities that are more

administratively efficient raise more property tax revenue. The difference between the results of model 1 and of model 2 may suggest that changing levels over time of royalty revenue and administrative efficiency can explain different degrees of fiscal efforts between municipalities.

Based on the results of model 2, a one unit increase in royalty revenue decreases property tax revenue by 0.009 units. When the means are taken as starting points (2.83 and 4.23 log10 pesos per capita, respectively, for royalty and property tax revenue; Table 4.1), then an increase of one unit corresponds to a 6,085 pesos per capita increase in royalty revenue (from 2.83 to 3.83 log10 pesos per capita), which leads to a 354 pesos per capita decline in property tax revenue (from 4.23 to 4.2179 log10 pesos per capita). The results are consistent with those of Ramírez and Bedoya (2014), who find a 1 percent increase in royalty revenue (as a share of total income) decreases short-term and long-term fiscal effort (measured as per capita property tax) by 0.65 and 0.30 percent, respectively, for Colombian municipalities.

Based on the results of model 2, a 10 percent increase in administrative efficiency increases property tax revenue by 0.01 units. When the mean property tax revenue is taken as a starting point, this impact corresponds to a 230 pesos per capita increase in property tax revenue (from 4.23 to 4.2330 log10 pesos per capita). This result is in line with Postali (2015), who finds fiscal capacity (measured by GDP per capita) contributes to an increase in the efficiency of tax revenue collection in Brazilian municipalities.

Models 3 and 4 in Table 4.2 return to the robust model specification that includes year fixed effects. The variable DP2012 reveals that producer municipalities in particular increased their fiscal effort after the 2012 policy reform (model 3), a finding that provides strong support for hypothesis 3. Since 2012, producer municipalities raised 0.086 (log10 pesos per capita) more property tax revenue than did non-producer municipalities. This difference is statistically significant ($p < 0.01$) and, when the mean property tax revenue is taken as a reference, this difference corresponds to a 3,690 pesos per capita difference in property tax revenue (from 4.23 to 4.31 log10 pesos per capita). As indicated, it is plausible that producers increased their property tax revenue in response to the reduction in their entitlement to natural resource revenue. This concurs with Bonet et al. (2015), who establish that in 2012, municipalities more reliant on resource revenue (i.e. those with allocated royalties constituting over 20 percent of total municipal revenue, primarily corresponding to the previous regime's beneficiaries) actually increased their property tax revenue. The results also align, albeit to a lesser degree, with those of James (2015), who shows that when faced with a \$1.00 decline in resource revenue (as a share of income), US states raised non-resource revenue (income tax as a share of income)

by $0.35. The deviations of the results presented here from those of James (2015) could be attributed to variations in the unit of analysis (all states), sample size (over 51 years of data), and the country's developed status.

Table 4.2: Impact of royalty revenues and administrative efficiency on municipal fiscal effort (property tax revenues)

	Model 1	Model 2	Model 3	Model 4
Royalty revenues	-0.004	-0.009***	-0.002	-0.002
	(0.003)	(0.003)	(0.003)	(0.003)
Administrative efficiency	0.000	0.001*	0.000	0.000
	(0.000)	(0.000)	(0.000)	(0.000)
Dummy producer since 2012			0.086***	
			(0.018)	
Administrative efficiency producer since 2012				0.002***
				(0.000)
Transfers	-0.182**	-0.182**	-0.195**	-0.195**
	(0.081)	(0.079)	(0.080)	(0.080)
Total spending	0.526***	0.507***	0.526***	0.527***
	(0.039)	(0.039)	(0.039)	(0.039)
Population size	0.161	0.072	0.060	0.031
	(0.413)	(0.411)	(0.411)	(0.412)
Rural population	-0.688***	-0.658**	-0.680***	-0.656***
	(0.258)	(0.256)	(0.255)	(0.253)
Population over 65 years	0.180	0.204	0.227	0.226
	(0.233)	(0.233)	(0.230)	(0.230)
Congruence mayor-president	-0.001	-0.003	-0.002	-0.002
	(0.010)	(0.009)	(0.010)	(0.010)
Congruence mayor-governor	0.014	0.016	0.016	0.016
	(0.014)	(0.014)	(0.014)	(0.014)
Proportion of votes for mayor's party	-0.006	0.003	-0.005	-0.003
	(0.039)	(0.039)	(0.039)	(0.039)
Trend		0.010***		
		(0.004)		
Constant	3.523***	3.777***	3.838***	3.875***
	(1.247)	(1.235)	(1.247)	(1.250)
Municipal fixed effects	YES	YES	YES	YES
Year fixed effects	YES	NO	YES	YES
Clustered standard errors	YES	YES	YES	YES

Notes: * $p < 0.10$; ** $p < 0.05$; *** $p < 0.01$. Shown are the results (beta coefficients and their standard errors in between parantheses) of fixed effects models with 12,936 observations, 12 years * 1,078 municipalities. Standard errors are adjusted for the clustering of observations by municipality.

Model 4 in Table 4.2 provides strong evidence for hypothesis 4, which expects that producer municipalities with more-efficient administrations will collect more property tax revenue after the policy reform in 2012. The variable AEP2012 is statistically significant ($p < 0.01$) and producer municipalities that increased their administrative efficiency by 10 percent after 2012 raise 0,02 (log10 pesos per capita) more property tax revenue. When the mean property tax revenue is taken as a reference, this difference corresponds to a 609 pesos per capita increase in property tax revenue (from 4.23 to 4.2425 log10 pesos per capita).

4.7 Conclusion and discussion

In conclusion, the results provide strong evidence for two out of the four hypotheses presented in this chapter. There is not conclusive evidence that municipal fiscal effort depends on the amount of received royalty revenue and the level of administrative efficiency of municipalities. However, when a trend variable instead of year fixed effects is included in the regression model municipalities that receive less royalty revenue have a higher fiscal effort and collect more property tax revenue (hypothesis 1). Specifically, a 1 percent reduction in royalty revenue results in a 0.9 percent increase in property tax revenues, aligning with the findings of Ramírez and Bedoya (2014). In addition, in the same model municipalities with more-efficient administrations raise more property tax revenue (hypothesis 2). Specifically, a 10 percent increase in administrative efficiency leads to a 0.01 percent rise in property tax revenue, consistent with the findings of Postali (2015). The policy reform of 2012 produced clear incentives for producer municipalities to increase their fiscal effort by sharply reducing the amount of royalty revenue available to them. The analysis in this chapter finds that producer municipalities increased their property tax revenue since 2012 (hypothesis 3) by 8,6 percent more than did non-producers, which is consistent with the findings of Bonet et al. (2015) and James (2015). In particular, producer municipalities with efficient administrations were able to increase their fiscal effort (hypothesis 4), with a 10 percent rise in administrative efficiency leading to a 0.02 percent increase in property tax revenue for producers after the policy.

Taken together, the results provide for an important insight regarding an assumption underlying the ‘paradox of the plenty’. Scholars often take for granted that local governments can increase their own revenue if they want to do so (Masaki 2018). However, the extent to which subnational jurisdictions can and will increase their fiscal effort in response to a decline in royalty revenue depends on their

administrative efficiency. This finding has important implications especially for developing countries, where administrative efficiency tends to vary widely between local governments. These results also underline the importance of institutional quality to explain the extent to which subnational jurisdictions are subject to a 'natural resource curse' (Badeeb et al.. 2017; Bulte et al. 2005; Leibbrandt and Lynham 2018; Libman 2013; Mehlum et al. 2006; Sachs & Warner 1995).

Another important insight has to do with the role of the design of the policy used for the allocation of royalty revenue and for (un)conditional grants and inter-governmental fiscal transfers in general (Caldeira & Rota-Graziosi 2014; Cust & Viale 2016). An often-upheld assumption is that inter-governmental fiscal transfers from the central government decrease the incentives of subnational governments to increase their own-source revenue (Jaimes 2020). However, the results presented here point out that producer municipalities with high administrative efficiency in particular increased their fiscal effort in response to a decrease in available royalty revenue. Given that more than two-thirds of Colombian municipalities are non-producing municipalities (812 versus 289 producer municipalities), this may explain why the results regarding the direct impacts of royalty revenues and administrative efficiency were inconclusive. This may also explain why Bonet-Morón et al. (2018) and Cadena (2002) find that increases in inter-governmental transfers do not decrease the fiscal effort of Colombian municipalities. The results presented here point out that producer municipalities with high administrative efficiency in particular increased their fiscal effort, which may provide for an explanation for Colombia's 'exceptionalism'. Administrative efficiency might also help to explain why inter-governmental fiscal transfers are not invariably associated with decreased fiscal efforts on the part of subnational governments in other countries such as Brazil (Monteiro & Ferraz 2010), Indonesia (Lewis & Smoke 2017), and Tanzania (Masaki 2018).

Overall, the results point out that the ability of municipalities to increase their fiscal effort is dependent on their administrative efficiency. This means that a country's ability to avoid a substitution effect in response to inter-governmental grants is dependent on the administrative efficiency of its municipalities. Thus, central governments are well advised to have policies in place that help to increase the administrative efficiency of municipalities that have low institutional quality.

One of the main limitations of the analysis in this chapter is its focus on Colombia, which implemented a specific policy reform in 2012. This may limit the external validity of the findings and thus a useful avenue for future research would be the investigation of to what extent administrative efficiency impacts fiscal effort of subnational jurisdictions in developed countries where administrative efficiency

tends to be relatively high for all governments. In addition, future research should not only consider other developing countries to replicate the findings presented in this chapter, but also explore which characteristics of a policy design may impact the extent to which administrative efficiency moderates fiscal effort.

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Appendix

Table 4.3: Outputs and inputs used to calculate the administrative efficiency of municipalities.

Sector	Outputs	Inputs
Education	Number of students enrolled in preschools and middle public schools	Total number of employed teachers
		Investment in education (without payroll)
		Classroom space (square meters)
	Number of students from public schools who had a medium, superior and very superior score in the exit exam (SABER 11)	Number of teachers with a score higher than six on the promotion ladder or two on the latest promotion ladder
		Investment in education (without payroll)
Health	Number of affiliates to the subsidized health regime	Total resources allocated to the health subsidized regime (except administrative expenses)
		Personnel expenses intended for targeting, assurance and auditing of Subsidized Regime contracts
	One-year-olds who have received three doses of the pentavalent (DPT) vaccine	Total investment on the Immunization Program (PAI)
Drinking water	Cubic meters of water produced for the urban area and populated centers	Average monthly number of hours of water service provision (urban area and populated centers)
		Total investment in drinking water
	Water Quality Risk Index	Total investment in drinking water
		The share of tests carried out relative to the number of legally required tests

Source: DNP (2017).

Table 4.4: Impact of royalty revenues and administrative efficiency on municipal fiscal effort (property tax revenues): Full sample

	Model 1	Model 2	Model 3	Model 4
Royalty revenues	-0.005*	-0.010***	-0.002	-0.002
	(0.003)	(0.003)	(0.003)	(0.003)
Administrative efficiency	0.001	0.001**	0.001	0.000
	(0.000)	(0.000)	(0.000)	(0.000)
Dummy producer since 2012			0.088***	
			(0.018)	
Administrative efficiency				0.002***
producer since 2012				(0.000)
Transfers	-0.186**	-0.195**	-0.201**	-0.201**
	(0.082)	(0.080)	(0.081)	(0.081)
Total spending	0.527***	0.514***	0.527***	0.528***
	(0.029)	(0.029)	(0.029)	(0.029)
Population size	0.047	-0.035	-0.044	-0.071
	(0.417)	(0.416)	(0.416)	(0.417)
Rural population	-0.695***	-0.667***	-0.695***	-0.671***
	(0.259)	(0.257)	(0.255)	(0.255)
Population over 65 years	0.305	0.330	0.348	0.348
	(0.244)	(0.244)	(0.242)	(0.242)
Congruence mayor-president	0.002	-0.001	0.002	0.001
	(0.010)	(0.009)	(0.010)	(0.010)
Congruence mayor-governor	0.017	0.019	0.019	0.020
	(0.014)	(0.014)	(0.014)	(0.014)
Proportion of votes for mayor's party	0.006	0.015	0.007	0.009
	(0.039)	(0.039)	(0.039)	(0.039)
Trend		0.009**		
		(0.004)		
Constant	3.634***	3.879***	3.960***	3.992***
	(1.243)	(1.237)	(1.247)	(1.250)
Municipal fixed effects	YES	YES	YES	YES
Year fixed effects	YES	NO	YES	YES
Clustered standard errors	YES	YES	YES	YES

Notes: * $p < 0.10$; ** $p < 0.05$; *** $p < 0.01$. Shown are the results (beta coefficients and their standard errors in between parantheses) of fixed effects models with the full dataset of 13,164 observations. Standard errors are adjusted for the clustering of observations by municipality. The full sample includes 12 years * 1,078 municipalities plus 23 municipalities which are included for 11 years or less because there is missing data on one or more on the independent variables for one or more years.

Chapter 5

Conclusions

5.1 Synthesis

Government in its role as a social planner, entrusted with the responsibility of addressing externalities, market failures, and inefficiencies, confronts significant challenges arising from the presence of utility-maximizing agents within its structure. The interests of these agents can hinder the adoption and implementation of welfare-enhancing approaches, potentially compromising the achievement of desired or planned outcomes.

This political economy argument has been integrated into the fiscal federalism literature, which was originally centered on the allocation of revenues and expenses among various government levels, with the objectives of attaining efficiency and optimising welfare. Nevertheless, in its subsequent development (i.e. its second generation), the fiscal federalism literature has been compelled to acknowledge the possible adverse repercussions arising from self-interested social planners, their authority, and their decision-making, which have, in certain instances, led regions and even entire nations into dire circumstances.

Recognising the dynamic responses of institutions, both formal and informal, in addressing these potential negative consequences of fiscal federalism thus becomes imperative. At the same time, problem-solving institutional changes provide additional incentives for self-interested political agents while reflecting the

complex environment within which governmental structures operate. Therefore, comprehending how decision-makers, who are utility-maximising agents, respond to incentives arising from institutional changes is essential for understanding the actual outcomes of government intervention, including those implemented under fiscal federalism, and their broader implications for societal performance and developmental goals.

Each chapter of this thesis significantly contributes to the academic discourse surrounding the intricate dynamics of fiscal federalism resulting from institutional changes. Chapter 2 delves into the regulatory framework's significance in mitigating the tendency of political party alignment to foster inefficient resource allocation to subnational governments. It reveals how institutional changes can be levered by agents to increase the influence of party alignment on resource distribution, turning resources into bargaining chips for political support. Chapter 3 investigates how resource rents invested in visible sectors can fuel political budget cycles (PBCs). It thoroughly analyses and demonstrates how institutional changes that restrict resource access for subnational governments can hinder their investments in human capital. Finally, chapter 4 highlights how institutional changes can jeopardise the financial autonomy of subnational governments by recentralising decision-making power over resource distribution. In response, subnational governments may adapt their behaviour and increase revenue collection, provided they possess sufficient administrative efficiency.

All these responses illustrate utility-maximising political agents' responses to incentives brought about by policy changes or resource availability. Understanding those responses helps bridge the gap between theory and evidence frequently found in the fiscal federalism literature. These findings emphasise the need to continuously support theoretical predictions with empirical evidence. This realisation not only serves as a confirmatory tool, but also enables the examination of off-path behaviours in fiscally decentralised countries and supranational entities worldwide.

This thesis assesses how subnational governments' exposure to an institutional change in the inter-governmental grants regulatory framework driven by the center can affect those governments' fiscal responses and outcomes, as well as influence previously established relationships between variables in the theory, uncovering and clarifying causal effects (Pepinsky 2019). As a result, its chapters make substantial and collective contributions to the political economy literature on fiscal federalism (i.e. the second generation) in four main ways.

First, the chapters' findings demonstrate the significance of institutional crafting in inter-governmental grants distribution in order to ensure proper fiscal

decentralisation in a developing country, aligning with the recognition of Smoke (2015) of decentralisation as an ongoing adjustable process. Through the case of Colombia it is shown that the effectiveness of fiscal federalism in a developing and decentralised context is contingent upon specific conditions and circumstances that govern fiscal federalism's operation, particularly the design of the regulatory framework governing transfer distribution. The findings reveal that stringent rules in the allocation and distribution of resources result in inequalities, which in turn give rise to inefficiencies and the potential emergence of the resource curse. Conversely, they demonstrate how efforts to address these issues through institutional redesigning by adopting more-equitable and fair criteria, reducing horizontal fiscal imbalances, and incorporating local knowledge into resource access and utilisation can foster more-responsible fiscal behaviour at the subnational level and reduce dependence on volatile revenue sources. However, these improvements may introduce new inefficiencies stemming from the inclusion of political objectives in resource distribution or constraints on essential public investments, thereby potentially having long-term implications for development. Consequently, the crafting and design of institutions are essential in determining whether fiscal federalism compromises the intended outcomes or contributes to overall development.

Second, by examining a policy reform on resource redistribution in Colombia, this thesis informs about the mechanisms that lead to inefficient resource distribution and suboptimal local management. Understanding how political agents interfere with the design of the reform and how different levels of government respond heterogeneously to incentives arising from these institutional changes is essential for assessing the effectiveness and actual outcomes of government interventions. The findings suggest that political considerations, including party alignment and PBCs, have the potential to permeate all levels of government and undermine the efficiency objectives associated with institutional changes in fiscal decentralisation. These political factors act as influential mechanisms throughout the entire process of institutional change, spanning from the design phase to the implementation stage, irrespective of the origin of resources (e.g. resource rents, transfers, grants, aid), and have the potential to impact crucial subnational fiscal outcomes, including human capital investment. The findings emphasise that the reform of institutions can either enhance mechanisms that prioritise political aims at the expense of efficient resource allocation and utilisation or expose the means under which the political misuse of resources can be countered or prevented, such as through enhanced local administrative efficiency. This research underscores the

significance of these mechanisms as key responses to incentives generated by institutional changes, shaping the impact of fiscal decentralisation.

Third, the thesis underscores the consequential and sometimes unintended repercussions of institutional change and crafting on subnational autonomy. When driven by the central government, institutional changes, though aimed at enhancing equality and efficiency, are more likely to be designed or utilised with political objectives in mind, rather than with consideration of the challenges they can pose to assumptions about subnational autonomy, particularly in relation to subnational governments' ability to generate revenue (Masaki 2018) or to access resources, along with the subsequent ramifications. Institutional crafting, if permitted, can undermine agreements regarding the principles that govern the allocation of responsibilities and resources between upper and lower levels of government. When such crafting touches upon resource access, it risks compromising the four key elements of the fiscal decentralisation framework stated by Sorens (2011): the autonomy and authority of subnational governments in determining the provision of public goods or in externalising or not the costs of providing them, those governments' participation in a common market, and even their institutional stability, particularly when the change interferes with or impacts their competencies. Hence, the crafting of institutions that minimise political influence and safeguard subnational autonomy is essential for promoting efficient resource distribution and ensuring responsible fiscal management. Ultimately, this has long-term implications for fiscal federalism as a tool for development.

Fourth, by focusing on a developing country with natural resources that render it susceptible to the resource curse phenomenon, this research highlights the decentralisation of resource rents as an essential aspect of fiscal federalism. This thesis reveals how the distribution of these rents (through inter-governmental transfers funded by royalties) adds to the challenges in fiscal federalism and further exacerbates the spread of the resource curse within a developing context. Its chapters collectively and significantly advance the understanding of the underlying mechanisms of the resource curse by providing a comprehensive analysis of how the decentralisation of resource rents often leads to inefficient (re)distribution and utilisation, thereby perpetuating the curse phenomenon. First, the results presented point to policy design as a key political determinant influencing the distribution of resource rents, as it will potentially include goals of higher government levels. Second, the findings that are discussed inform of the significant impact of inter-governmental redistribution on public investment when resource rents are present, as well as the relationship between PBCs and those rents at the subnational level, adding to the quite limited literature, a literature that moreover has only undertaken

cross-country comparisons (Vergne 2009; Klomp & de Haan 2016; Aaskoven 2020). Third, the thesis assesses the potential impact of fiscal institutions on mitigating PBCs induced by resource rents and highlights local administrative efficiency as a crucial factor in understanding the susceptibility of subnational jurisdictions to the 'natural resource curse'. This aligns and complements existing literature on the significance of institutional quality in explaining and countering the occurrence and extent of the curse for subnational governments (Badeeb et al. 2017; Boschini et al. 2013; Bulte et al. 2005; Sachs & Warner 1995). These findings effectively address significant gaps in the existing literature on fiscal federalism, particularly pertaining to the decentralisation of resource rents. Furthermore, they enhance the resource curse literature by moving beyond the conventional focus on resource rent effects to delve into the political determinants that govern the distribution of those rents, providing crucial insights into the intricate transmission mechanisms of the curse.

5.2 Policy implications

The findings of chapters 2, 3 and 4 provide policymakers with valuable guidance on the potential benefits and drawbacks of institutional redesign and help them make informed decisions about whether and how to pursue changes that help to deal appropriately with the complexities involved in managing fiscal federalism. Chapter 2 focuses on how institutional redesign allows for party congruence effects to emerge, thus leading to the distribution of more resources to subnational governments politically aligned with the center. Chapter 3 examines how these additional redistributed resources alter subnational investment in human capital following political aims, while chapter 4 explores how administrative efficiency is key to counteracting the impact of these extra resources on jurisdictions' revenue generation. The results presented in this thesis indicate that the redesign of inter-governmental transfer policy is likely to challenge and impact the efficiency goals of fiscal federalism. Consequently, the collective findings from the chapters yield four policy implications that further the understanding of the conditions under which fiscal decentralisation operates effectively and of how to prevent potential undesirable outcomes.

Designing effective inter-governmental transfers policies: The (re)design of inter-governmental transfers policies aimed at ensuring equal resource access faces practical challenges, particularly in unitary developing and decentralised countries where the central government holds significant power. Recentralisation of

resources should be avoided to prevent political biases, while objective and unalterable formula indicators can strengthen decision-making mechanisms for resource distribution and thus mitigate the influence of political factors driven by the center. However, striking a balance is essential to avoid implementing rigid rules that may benefit only a select few, resulting in resource misallocation and misuse, and to prevent excessive decision-making power for the central government, which could lead to political interference in resource distribution. The primary focus should be on promoting efficient resource utilisation rather than restricting subnational access.

Ensuring Subnational Autonomy and Acknowledging Heterogeneity: Institutional designs in inter-governmental transfers must safeguard subnational autonomy by minimising political interference from higher levels of government and ensuring compliance with previous agreements concerning subnational government competencies. The violation of these agreements could eventually jeopardise essential public investment for development. Subnational autonomy serves as the foundation for responsible fiscal management and enables effective responses to challenges arising from future institutional redesigns. Similarly, the diverse responses of heterogeneous subnational governments to institutional changes may stem from their exposure to prior legal arrangements, geographical location, resource accessibility, or administrative efficiency. Considering this heterogeneity and the specific context of subnational governments when formulating policies for resource revenue allocation and inter-governmental fiscal transfers can significantly enhance the effectiveness of future changes.

Promoting Administrative Efficiency: Administrative efficiency (i.e. the ability to turn inputs like financial resources and personnel into policy outputs) significantly shapes the fiscal response of subnational governments to institutional changes. By mitigating the substitution effect between tax and inter-governmental grants, including royalty revenue, administrative efficiency becomes instrumental in determining how subnational jurisdictions adapt to fluctuations in resources. Targeted interventions should be designed to account for existing variations in administrative efficiencies among subnational jurisdictions with a focus on fostering their development in areas where it is lacking. This is particularly relevant for developing countries as a strategy to mitigate the potential adverse consequences of resource dependency and to promote autonomous and responsible fiscal management at the subnational level.

Mitigating the Negative Effects of Resource Dependency: To mitigate the potential negative consequences of resource dependency and the natural resource curse, policymakers should prioritise certain approaches. Rather than recentralising

resource rents, policies should focus on preventing biased distribution resulting from policy design and the influence of political actors. By deviating from efficiency-based criteria, biased distribution perpetuates the curse and undermines the desired outcomes. Policies must also emphasise sustainable and stable investment in critical sectors like health and education. On the one hand, it is essential to discourage resource-dependent behaviour among subnational governments lacking experience in managing windfalls from volatile resource revenue. Similarly, facilitating a gradual transition away from historical reliance on resource dependency is crucial, because drastic institutional changes may impose limitations on public investment, hindering human capital accumulation and long-term development. These measures contribute to the reducing of the vulnerability and the strengthening of the capacity of subnational governments in addressing the challenges posed by the resource curse, because the curse might not result from the resources per se but rather from how governments manage them (Hilmawan & Clark 2019; Shahbaz et al. 2019). Moreover, safeguarding subnational autonomy and addressing administrative disparities are key considerations; these factors significantly influence the extent to which subnational governments are susceptible to the natural resource curse. By implementing these strategies, policymakers can effectively mitigate the adverse effects of resource dependency while promoting sustainable development through the improved capacity of subnational governments.

5.3 Directions for future research

This thesis delves into the realm and intricacies of fiscal federalism and inter-governmental grant distribution within the context of a developing country with resource rents. Through a comprehensive analysis of the far-reaching implications of institutional redesign in shaping fiscal behaviour and outcomes at the subnational level, the findings of the thesis uncover complexities and challenges involved in managing fiscal decentralisation. While providing a solid foundation for making informed decisions and promoting sustainable development in resource-rich regions through more-effective fiscal decentralisation, the thesis also suggests potential research avenues to further advance understanding in this field.

Analysis of Different Levels of Government: Examining additional levels of government, including states and supranational entities, would enhance external validity, provide additional and valuable insights into the dynamics of fiscal federalism, and offer a comprehensive understanding of the applicability and

implications of this research's findings. In the case of Colombia, a natural continuation of this research would involve testing the impact of the redesign of the inter-governmental transfer regulatory framework on states' fiscal responses and outcomes. States in a unitary decentralised and developing country like Colombia may have historically been marginalised by the central government in terms of their authority to collect and manage resources for lower levels of government within their jurisdiction. Moreover, states often bear distinct responsibilities and possess alternative sources of revenue compared to lower levels of government. They face the ongoing challenge of balancing the interests of both the central government and lower levels while effectively implementing policies. Hence, it is essential to explore how institutional changes in resource redistribution impact the fiscal responses and outcomes of states, particularly when they assume a more prominent role in resource management, as well as to analyse the divergences in fiscal responses compared to lower levels of government, such as municipalities. Moreover, conducting research on additional levels of government, specifically states, will advance the understanding of the effects of inter-governmental redistribution of natural resource rents on crucial domains such as public investment, PBCs, fiscal effort, and those rents' significant role in aiding the propagation of the resource curse from the subnational to the national level. Finally, supranational studies can contribute to our understanding of the dynamism of fiscal federalism by considering the implications and challenges posed by institutional changes within individual countries and across different levels of government for the implementation of supranational policies.

Further External Validity: Broadening the scope of studies to include other developing countries would enhance external validity, enabling the replication of findings and further exploration and validation of the inter-governmental transfer regulatory framework's design characteristics that influence the fiscal response and outcomes of subnational governments.[1] Examining the potential heterogeneous effects of these factors across different subnational jurisdictions within the same level of government in developing countries would contribute to a comprehensive understanding of the persistence of the conditional role of administrative efficiency on fiscal effort, the emergence of party congruence effects, and the influence of resource rents on the propagation of PBCs and human capital investment at the subnational level. Additionally, comparing the findings with those from developed

[1] Despite Colombia's extended civil conflict, its impact on the study's external validity remains limited. The analysis covers 2002 to 2017, a period marked by a substantial decline in conflict intensity and scope following its peak from 1996 to 2002 (Restrepo et. al. 2006). Additionally, even in its most severe phases, the conflict did not fundamentally disrupt the nation's short-term economic and macroeconomic functions, with guerrilla actions posing limited threat to the established order (Segovia 2017).

countries is essential to explore the extent to which similar institutional changes yield comparable fiscal responses and moderating roles, considering the expected presence of stronger institutions and more equally capable and efficient subnational jurisdictions in such countries. This type of comprehensive analysis would provide further insights into the dynamics of fiscal federalism in diverse contexts.

Additional Sectors, Outcomes, and Methods: Further research should expand the examination of the impact of inter-governmental redistribution reforms to encompass additional fiscal outcomes, such as investment in infrastructure, widely acknowledged as a crucial driver of growth and development (Van der Ploeg 2011), and environmental conservation, vital for implementing comprehensive sustainable development strategies. Additionally, extending the analyses to explore how the redesign of the regulatory framework, in the presence of resource rents, affects both capital and current investment in key developmental sectors, would help clarify potential trade-offs between these fiscal outcomes while also revealing impacts on PBC dynamics and the allocation of public investment. Furthermore, assessing the actual outcomes achieved within key development sectors, such as the provision of public goods, would offer valuable insights into the broader implications of inter-governmental redistribution of public investment in the presence of resource rents for development. To validate this research's findings, it is also recommended to explore scenarios where policies and data allow for alternative methodological approaches. For example, analysing jurisdictions with narrow electoral margins can provide a robust framework for assessing the impact of institutional changes and offer valuable insights into the effects of political factors on fiscal outcomes. Lastly, incorporating qualitative research approaches, such as interviews or in-depth case studies, would further validate and enrich the findings obtained here. These qualitative approaches would provide nuanced insights into the experiences, perceptions, and decision-making processes involved in resource redistribution and fiscal outcomes, contributing to a comprehensive analysis of the complex dynamics of fiscal federalism.

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Impact Statement

This thesis enhances the understanding of fiscal federalism dynamics, including the conditions under which fiscal federalism functions effectively and its implications for societal performance and development. In terms of the scientific impact, the research analyses the impact of institutional changes on revenue distribution and the subsequent responses of utility-maximising political agents within government structures. It examines how these responses influence political alignment effects, investment in human capital, and fiscal effort at the subnational level. By uncovering the complex and heterogeneous responses of these agents to incentives resulting from ongoing institutional changes, the present research reveals why welfare-enhancing and efficiency-oriented fiscal federalism strategies may not always yield the anticipated outcomes. This contributes to a better understanding of the actual results achievable through fiscal federalism interventions, particularly in relation to resource distribution.

Regarding the potential policy impact, the findings of this research address key policy challenges encountered by governments in resource management, such as achieving efficient resource allocation, unbiased transfer distribution, responsible fiscal management, and eventually long-term development. By emphasising the importance of institutional design, the findings of this research underscore specific policy guidelines. Policies should strike a balance between granting excessive decision-making power to the central government, which can lead to political interference in resource distribution, and implementing rigid rules that benefit a select few, resulting in resource misallocation and misuse. Instead of recentralising resources, policies should prioritise sustainable investment in critical sectors such as education, emphasising efficient resource use while discouraging subnational governments' resource dependency. Preserving subnational autonomy is crucial in policy design; doing so entails respecting prior competency agreements and considering the heterogeneity among subnational governments in effectively responding to the challenges posed by institutional redesign. Targeted policy interventions can mitigate the negative consequences of resource dependency and

promote autonomous and responsible fiscal management at the subnational level by increasing administrative efficiency where it is below par. This will empower and equip subnational jurisdictions to adeptly navigate resource fluctuations and counteract tax-grant substitution, strengthening those jurisdictions' fiscal resilience. Overcoming these policy-related challenges is essential for subsequently addressing economic and societal issues at both the subnational and national levels, thus creating an enabling environment for development to thrive.

The findings from this research should enhance the management of fiscal federalism by providing guidelines for the designing of regulatory frameworks that promote efficient distribution of inter-governmental revenue and ensure responsible fiscal autonomy at the subnational level. These guidelines are invaluable for policymakers, government officials, and public administrators involved in policy decisions, institutional reforms, inter-governmental fiscal transfers, and natural resource rents distribution. They aim to inform and support the opportune formulation and implementation of policies that ensure unbiased and equitable resource distribution, enhance limited resources utilisation, foster sustainable investment, and achieve welfare objectives and long-term development while preventing irresponsible fiscal management and negative socio-economic consequences for nations and regions.

The research results of this thesis can be translated into academic publications that disseminate knowledge and lead to further research on the responses of dynamic fiscal federalism to institutional reforms and their subsequent impacts on political budget cycles, fiscal management, and the resource curse at the subnational level.

Chapter 2 brings to the forefront of the fiscal decentralisation discourse the pivotal role of the regulatory framework of inter-governmental transfers. It underscores how framework design significantly impacts effective revenue decentralisation, especially resource rents, thus clarifying empirical disparities and outcomes in the literature. Essentially, the chapter highlights intentional policy design by the central government, wherein party alignment shapes resource distribution among subnational governments. The findings stress the importance of balanced framework design to achieve unbiased transfer distribution, thus averting inequality and inefficiencies caused by strict rules and alignment-driven inefficiencies caused by universal access rules influenced by the central government. Leveraging institutional change, the findings unveil mechanisms behind the resource curse, highlighting how biased resource rent distribution perpetuates the curse by straying from efficiency-based criteria. The chapter is expected to be submitted to a journal specialising in public administration and development in October.

Chapter 3 reveals that subnational investment in health and education relies on resource rents, which also drive political budget cycles (PBCs) at this level. In essence, fiscal transfers funded by royalties become a mechanism for spreading PBCs and the resource curse. Interestingly, by fostering human capital investment beyond election years, PBCs may counteract the curse. The chapter also unveils how institutional changes might curtail PBC effects and reduce reliance on resource rents as a source for human capital investment, thereby enhancing fiscal stability. However, constraining public investment could hinder human capital accumulation, hampering long-term development. Chapter 3 was presented at the 62nd European Regional Science Association Congress, signifying its potential academic and policy impact. Given its focus on prevalent regional developmental concerns, the congress offered the paper an ideal platform for adding to knowledge exchange among academia and policymakers. Furthermore, the chapter is under review at *Resources Policy*, aligning seamlessly with the ongoing discourse concerning sustainable resource exploitation[1].

Chapter 4 exposes the central importance of administrative efficiency—the ability to convert inputs into policy outcomes—in shaping subnational governments' fiscal efforts. Fundamentally, subnational governments' ability to counter the substitution effect between tax and royalty revenue hinges on those governments' administrative efficiency, challenging the notion that local government capacity to easily raise tax revenue is inherent. This chapter emphasises the role of institutional quality in understanding the occurrence and extent of the natural resource curse among subnational governments. Chapter 4 has been revised and accepted for publication in *Local Government Studies*, as it delves into the crucial local characteristics needed to overcome the potential misuse of resource windfalls and achieve subnational autonomy.

Through its three chapters, this thesis offers significant outputs and makes substantial contributions to the intellectual discourse and knowledge creation in diverse yet interconnected domains: public administration, resource rent management, and local government development, all within the realm of fiscal federalism. Moreover, the results presented in the thesis provide the valuable policy guidelines already stated to further enhance its impact, because they can inform the design of inter-governmental transfer policies, resource revenue allocation, and fiscal management strategies. Additionally, the research can inform the development of training programs and capacity-building initiatives for public administrators

[1] The authors would like to thank the anonymous referees from *Regional Studies* for providing their constructive comments to improve the quality of the paper.

engaged in fiscal federalism at both the national and subnational levels, especially in developing countries.

The innovative nature of this research lies in its use of empirical analysis, theoretical contributions, and policy implications that expand the existing knowledge base in the field of fiscal federalism studies. By analysing the impact of institutional changes on established relationships between variables and clarifying the conditions under which those relationships occur, the research addresses gaps in the fiscal federalism literature. It does so by delving into the subnational fiscal responses of political agents to institutional changes in revenue availability. These responses encompass changes in investment decisions, revenue collection and political interference by upper levels of government, all of which manage to traverse subnational governments' autonomy. Furthermore, the results uncover political determinants of resource rents distribution and shed light on the development of the resource curse, which originates from inefficient resource allocation and distribution at the local level and extends to the national level. Overall, these findings offer novel and valuable insights into the intricate dynamics of fiscal federalism, enhancing the understanding of how political factors, resource revenue distribution, and policy design interact to shape fiscal federalism outcomes in developing countries.

About the Author

Maria Antonieta Collazos-Ortiz serves as an Assistant Professor of Finance in the Department of Management at Pontificia Universidad Javeriana in Bogotá, Colombia. Her research interests encompass public finance, public administration, as well as corporate and personal finance. Her research has been published in esteemed journals such as *Research in International Business and Finance* and *Problemas del Desarrollo*.

Maria Antonieta's recent research focuses on testing solutions aimed at enhancing the financial performance and position of individuals, local governments, and companies. She delves into their dynamic responses to these solutions, discerning their role in fostering their respective development trajectories. Maria Antonieta is fervent about leveraging her expertise to bridge the realms of public and private finance—whether corporate or personal—ultimately shaping impactful public policies that address societal disparities by reducing developmental gaps among people, regions, and nations.

She has integrated research with practical experience, previously serving as an advisor to the Directorate of Investments and Public Finances at the National Department of Planning in Colombia. In this capacity, she played a pivotal role in designing the program budgeting initiative for the national investment budget and developed and evaluated various methodologies for planning and assessing public investment projects. Today, she finds great fulfillment in delivering inspirational lectures to her students, consistently earning close-to-perfect scores on students' evaluations.

Maria Antonieta holds a B.A. in Business from Javeriana University (2004), a Master of Public Administration from New York University (2009) and subsequently pursued a Ph.D. in Governance and Policy Analysis at Maastricht University (2017-2024). Currently, Maria Antonieta resides and works in Bogotá, Colombia, where she lives with her beloved husband, David Andrés, and their charming daughter, Maria Adelaida (8).

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