Title
Essays on Fiscal and Monetary Policy

Author
Mier y Teran, Alfredo

Publication Date
2014

Peer reviewed|Thesis/dissertation

UNIVERSITY OF CALIFORNIA
Los Angeles

ESSAYS ON FISCAL AND MONETARY POLICY

A dissertation submitted in partial satisfaction
of the requirements for the degree
Doctor of Philosophy in Management

by

Alfredo Mier y Teran

2014

ABSTRACT OF THE DISSERTATION

ESSAYS ON FISCAL AND MONETARY POLICY

by

Alfredo Mier y Teran

Doctor of Philosophy in Management

University of California, Los Angeles, 2014

Professor Romain Wacziarg, Chair

The three chapters of this dissertation investigate how micro level phenomena affect aggregate outcomes and challenge basic fiscal and monetary principles. In particular, I analyze how these phenomena affect the transmission mechanisms and outcomes of specific fiscal and monetary policies in emerging markets. In Chapter 1, I investigate the transmission of monetary policy to retail interest rates using a novel transaction-level data set that includes all corporate loans of every commercial bank in Mexico from 2005 to 2010. In particular, I analyze the speed and completeness of the pass-through of the monetary policy rate to bank lending rates, and provide evidence on the importance of bank competition to explain heterogeneity in the way banks react to monetary policy impulses along the business cycle. For this purpose, I develop a simple model of the banking firm and test its implications using dynamic panel data methods. I find that: (1) interest rate pass-through is sluggish and incomplete; (2) the degree of bank competition is positively correlated with the completeness of the interest rate pass-through;

and (3) interest rate pass-through is asymmetric: lending rates adjust less in the case of monetary policy easing than in the case of tightening. Chapter 2 draws from a district-level database to investigate the local impact on socioeconomic outcomes of mining-related revenue windfalls in Peru, which have grown almost twentyfold in the last two decades. I find evidence that improvements in average living standards are related to the mining activity but independent from fiscal revenue windfalls at the district level, where inefficiencies in the use of public funds may be accounting for the disconnect between fiscal revenues and socioeconomic outcomes. In Chapter 3, I investigate how the fiscal institutional framework has given rise to deficit and procyclical biases in the case of Mexico, and evaluate how the use of alternative fiscal rules may affect these biases. For the latter, I conduct a series of simulations using an unrestricted VAR model that allows me to evaluate the effect on fiscal outcomes of a constellation of shocks calibrated to match Mexican historical macro-data. I find that Mexico´s fiscal framework allows the conduct of a countercyclical fiscal policy during economic recessions; however, it does not contemplate a mechanism to generate buffers during economic expansions. Thus, fiscal policy is oftentimes procyclical and has a built-in deficit bias. Moreover, I find that a budget balance rule with an expenditure cap is able to mimic the results of a rule based on a cyclically adjusted balance in terms of reducing the procyclical and deficit biases, with the advantage of not having to rely on an autonomous fiscal agency, which is usually absent under weak institutional frameworks.

The dissertation of Alfredo Mier y Teran is approved.

Sebastian Edwards

Hanno Lustig

Aaron Tornell

Romain Wacziarg, Committee Chair

University of California, Los Angeles

2014

To my grandmothers, Maria Elena and Gloria, my parents, Eva and Carlos, and my brothers, Carlos and Andrés.

Table of Contents

List of Figures

List of Tables

Acknowledgements

I am extremely grateful to everyone who has helped me throughout my studies at the Anderson School of Management and at UCLA in general. First, I would like to thank my committee members, Sebastian Edwards, Hanno Lustig, and Aaron Tornell, for all the valuable comments and suggestions on my dissertation.

I am grateful to Christian Dippel, Alvaro Garcia, Dario Luna, Bernardo Morais, Pablo Peña, Ernesto Revilla, Claudia Ruiz, Connan Snyder, Nico Voigtlander, and Juan Marcos Wlasiuk for their comments and guidance. I also want to thank participants at the GEM Seminar at UCLA Anderson and at seminars in the Economics Department at UCLA for valuable comments. Also important to mention is that Chapter 2 of this dissertation is co-authored by Norman Loayza and Jamele Rigolini.

Financial support from CONACYT (Consejo Nacional de Ciencia y Tecnología) and SEP (Secretaria de Educación Publica) is acknowledged.

Finally, a very special thank you to my advisor, Romain Wacziarg, for his guidance and for always providing encouragement and support during my doctoral education.

VITA

2000-2005	*Licenciatura* in Economics, CIDE, México.
2004	Analyst, Bancomext, Buenos Aires, Argentina.
2005-2008	Analyst, Protego Asesores, México.
2010	M.A. Economics, UCLA, Los Angeles, California.
2010	Consultant, World Bank, Washington, D.C.
2013-	Economist, Ministry of Finance and Public Credit, Mexico.

PUBLICATIONS

Loayza, Norman & Mier y Teran, Alfredo & Rigolini, Jamele, 2013. "Poverty, Inequality, and the Local Natural Resource Curse," IZA Discussion Papers 7226, Institute for the Study of Labor (IZA)..

CHAPTER 1

1 Bank Competition and the Transmission of Monetary Policy

1.1 Introduction

In the wake of the Great Recession there is a general consensus that monetary easing is key to stimulating investment and to strengthening economic recovery. However, there is a widespread concern that monetary stimulus is not reaching all markets evenly. For example, the International Monetary Fund (IMF, 2002) argues that monetary easing is allowing large corporations to access capital at record low rates, while small firms are struggling to obtain bank loans. Along the same lines, the president of the Federal Reserve Bank of New York suggests that the recent purchases of mortgage backed securities by the Federal Reserve were not effective in lowering primary mortgage rates, in part, because banks increased their margins (Dudley, 2012).

Motivated by such concerns, in this paper I tackle the idea that bank competition affects the transmission of monetary policy across markets. In particular, I analyze the speed and completeness of the pass-through of the monetary policy rate to bank lending rates, and provide evidence on the importance of bank competition to explain heterogeneity in the way banks react to monetary policy impulses, using a unique transaction-level data set that includes all corporate loans of every commercial bank in Mexico from 2005 to 2010. For this purpose, I develop a simple model of the banking firm and test its implications using dynamic panel data methods.

The analysis of interest rate pass-through is closely related to the literature on the so-called "bank lending view" of monetary transmission. This literature underlines the importance of frictions in the banking system to understanding the transmission of monetary policy, by arguing that central banks shift banks' loan supply by conducting open-market operations (Bernanke and Blinder, 1988). According to this view, cross-sectional differences in the transmission of monetary policy are attributed to differences in banks' capacity to access alternative sources of funding (e.g., Kashyap and Stein, 2000). However, this literature gives little attention to whether banks' reaction to policy impulses is also affected by the elasticity of demand they face on the loan market. My paper aims to shed light on this question by measuring the importance of bank competition to explain differences in the transmission of monetary policy across markets.

Understanding frictions in the transmission of monetary policy associated with bank competition is particularly relevant for emerging markets today. In a number of these economies, the adoption of stability measures in the last two decades (e.g., fiscal discipline, floating exchange rate regimes, financial sector reforms) has led to an increasing importance of bank interest rates as conveyors of monetary policy shocks (Gaytán and González-García, 2006; Sidaoui and Ramos-Francia, 2007; Berstein and Fuentes, 2004). Moreover, the level of bank concentration in these countries is high. For example, in the case of Mexico, the largest six banks controlled 82% of total corporate loans in 2010. In addition, at a regional level, markets with unit banking accounted for one fifth of all markets with bank presence.

To guide the empirical strategy of the paper, I develop a simple model of the banking firm that allows for the presence of variable markups. Such markups are a common outcome of a wide range of theoretical models that incorporate imperfect competition in a dynamic setting (e.g., Rotenberg and Saloner, 1984; Bils, 1989; Rotemberg and Woodford, 1990; Dornbush, 1997; Melitz and Ottaviano, 2008; Atkeson and Burstein, 2008). My model is a dynamic extension of the classical Monti-Klein model of banking. It proposes that banks act as oligopolists and set lending rates based on a markup over the monetary policy rate. Under perfect competition, the model predicts that this markup is constant. However, it suggests countercyclical markups if banks exercise some degree of market power. This in turn implies that the pass-through of policy rate impulses to lending rates will be incomplete in markets with imperfect competition. The idea behind this result is that the availability of alternative sources of financing for borrowers varies along the business cycle and thus banks face a procyclical elasticity of demand. During economic booms, the effect of monetary tightening on lending rates will be buffered by lower markups, while during a recession the effect of monetary easing will be attenuated by higher margins. Under perfect competition, however, markups are constant because the elasticity of demand in this case is always infinite.

To test the predictions of this model, I use three empirical models. The first explores average interest rate pass-through using a simple specification that controls for differences in portfolio characteristics. The aim of this specification is to measure average short- and long-term pass-through of the policy rate to lending rates. The second, my baseline model, explores the link between bank competition and the interest rate pass-through by closely mapping the relationship suggested by the theoretical framework. The third empirical model seeks to capture asymmetry between positive and negative movements of the policy rate. These models are estimated using a fixed-effects estimator, which is shown to be the most consistent and efficient given the large N and large T nature of my data set (Nickel, 1981).

The case of Mexico provides an ideal setting to empirically test the importance of bank competition to explain cross-sectional differences in the transmission of monetary policy. The fact that regional markets in Mexico share the same regulatory framework, legal system, and banking technology significantly reduces the presence of omitted variables. Moreover, the Mexican banking system is formed by a small number of large banks with a nationwide presence. This allows me to trace the behavior of individual banks operating under a wide range of market conditions.

For this study, I compiled a novel and very large data set that contains detailed characteristics of the universe of new and continuing loans made by every regulated bank in Mexico over a period of time beginning in March 2005 and ending in March 2010. The subsample used for this study includes all new corporate loans in the range of US$7,700 to US$770,000, a total of 1,416,412 observations. This information was merged with monthly bank balance sheet reports and a set of geographic and economic performance measures.

The results from the empirical analysis show a consistent pattern. First, there is incomplete and sluggish interest rate pass-through. Specifically, a change of 100 basis points of the interbank interest rate is associated with a change of 32 basis points of the lending rate after one period and a total of 68 basis points in the long run (i.e., a short-term pass-through of 0.32

and a long-term pass-through of 0.68). Second, the degree of bank competition is positively related to the long-term interest rate pass-through: a market with a number of banks in the 10th percentile (low-competition) has a long term pass-through of only 0.60, while a market in the 90th percentile (high-competition) it is 0.90. Third, interest rate pass-through is asymmetric: the long-term pass-through of upward movements of the policy rate is complete, while it is 0.64 in the case of downward movements. This asymmetry is also observed when looking at low- and high-competition markets: long-term pass-through in low competition markets is 0.54 for negative policy shocks and 0.87 for positive shocks, while it is 0.74 and 1.17 for markets with high competition. Note that the long-term pass-through is more incomplete in markets where bank competition is low, irrespective of the direction of the monetary policy shock.

My results seem robust. They withstand the use of alternative measures of bank competition, different estimation methods (i.e., fixed-effects and difference GMM estimators), and various levels of aggregation and truncation of the data set. They cannot be explained by the observed cyclicality of credit risk and economic activity across regions, or differences in the size and level of urbanization of markets. They survive corrections to account for dynamic aggregation problems and the Hurwicz bias.

Incomplete and heterogeneous long-term pass-through is opposite to earlier studies on the interest rate pass-through (see De Bondt (2002) for a review). Most of the existing work supports the idea of complete interest rate pass-through. Asymmetric pass-through, on the other hand, is in line with earlier studies done for the United States (Hannan and Berger, 1991;

Neumark and Sharpe, 1992). However, I do not find evidence that the asymmetry can be explained by market concentration, as these studies suggest.

Cottarelli and Kourelis (1994) document a strong relationship between interest rate stickiness and the structure of the financial system. However, this and other related studies that analyze the determinants of the interest rate pass-through are conducted using country- or bank-level time series that may be subject to substantial biases.[1] Using dynamic panel data methods with transaction level information for a single country improves upon this literature in the following respects: (1) it reduces potential dynamic aggregations bias;[2] (2) it minimizes the presence of cross-sectional-level omitted variables; (3) it avoids problems derived from cross-country measurement differences; and (4) it allows me to control for cross-sectional differences in the dynamics of loan demand and credit risk. To the best of my knowledge, this is the first paper to use loan-level data to analyze the link between bank competition and the transmission of monetary policy.

The rest of this paper is structured as follows. Section 2 presents a simple theoretical model of the lending rate setting behavior of banks. Section 3 describes the data set and the choice of variables used to take the theoretical model to the data. Section 4 derives the empirical specification used to test the predictions of the model. Section 5 presents the results, and Section 6 concludes.

---

[1] Along the same lines, Mojon, 2000; Sander and Kleimeier, 2004; De Graeve et al., 2007; and Gambacorta and Iannotti, 2007 analyze the determinants of the interest rate pass-through. Most of them estimate interest rate pass-through coefficients based on a two-step approach. The first step involves using an Error Correction Model to estimate coefficients for the size, speed, and convergence of the pass-through. These coefficients are then used as dependent variables on cross sectional OLS regressions to investigate the determinants of the pass-through process.

[2] As shown by Imbs et al (2005), failure to allow for heterogeneity in price adjustment dynamics may induce a bias in persistence estimates.

1.2 Model

In this section I develop a model linking bank competition to the interest rate pass-through. The model is a dynamic extension of the classical Monti-Klein model of banking; it proposes that banks act as oligopolists and set lending rates based on a markup over the monetary policy rate. The model relies on the idea that the way banks adjust to monetary policy shocks depends on an optimal steady state markup rule and short-term adjustment costs. In steady state, banks' pricing depends on the perceived elasticity of demand, the risk profile of borrowers, and some branch-specific operational costs. In the short run, however, if the policy rate changes, banks face a tradeoff between adjusting lending rates too slow to the new steady-state equilibrium and a cost of moving too fast.

1.2.1 Equilibrium in the steady state

The banking sector is formed by B banks operating in M markets. In each market m there is imperfect (Cournot) competition between a finite number of banks $B_m \leq B$ that exercise some degree of market power in setting loan prices. A branch, uniquely identified by a combination of bank b and a market m, faces an inverse (residual) demand function $i_{b,m}(L_{b,m} + \sum_{j \neq b} L^*_{j,m})$ where L is the lending volume, and $\sum_{j \neq b} L^*_{j,m}$ is the total supply of competitors. In this market there is no entry (i.e., B_m is fixed over time). This assumption is based on the idea that under the time horizon of my analysis, the fixed costs of entering a new market are too high, and it is in line with the low variation in number of banks over time observed in the data.

Costs, on the other hand, include the costs of funds and operational costs. The costs of funds are equal to the interbank interest rate r, which is assumed to be the opportunity cost of capital for banks Operational costs $OC(L)$ are assumed to be separable between markets and banking products; this means that any strategic behavior across markets and products is ruled out.

An equilibrium of the banking sector is a vector $(L^*_{b,m})_{\ b,m}$ such that $L_{b,m}$ maximizes the profit of every bank $b = 1, \dots, B$ in each market $m = 1, \dots, M$. In other words, for every b and m, $(L^*_{b,m})$ solves:

$$\max_{L_{b,m}}\{\pi_{b,m} = [d_{b,m} \times i_{b,m} - r]\, L_{b,m} - OC_b(L_{b,m})\} \tag{1}$$

where d is the probability of repayment of loans. Solving (1) we get the following optimal lending rule (markup rule):

$$i^*_{b,m} = \underbrace{\frac{B_m \varepsilon_{b,m}}{B_m \varepsilon_{b,m} - 1}}_{M(B,\varepsilon):\, Markup} \underbrace{\frac{1}{d_{b,m}} \left[r + OC'_{L,b}\right]}_{Marginal\ cost} \tag{2}$$

where $\varepsilon = \frac{\partial L(i)}{\partial i} \frac{i}{L(i)}$ is the elasticity of demand and $OC'_{L,b}$ is the marginal operational cost. Equation (2) implies that in steady state the interest rate pass-through is determined by $\frac{\partial i^*}{\partial r}$, which is a function of the markup $M(B, \varepsilon)$, the probability of repayment d, and the correlations between ε and d with r. If changes in the monetary policy rate are systematically associated with the business cycle, these correlations can be thought of as the cyclicalities of the elasticity of demand and probability of repayment. Note that under perfect competition (i.e., $B_m \to \infty$) the markup $M(B, \varepsilon)$ is constant, while under less competitive markets it is only constant if ε is constant. However, I propose that ε is procyclical. A procyclical elasticity of demand captures the notion that during recessions, the availability of alternative sources of financing (e.g., loans from financial intermediaries from other countries) is scarcer than during economic booms. Such characterization is in line with the idea that firms' access to financing from abroad decreases during economic downturns, a pattern observed in Mexico in the period of analysis. Formally, there are several theoretical routes to obtain procyclical elasticity of demand; for simplicity here I use a linear demand function to obtain this result. Using an inverse demand function of the following form $i_{b,m} = a_m - b_m(L_{b,m} + \sum_{j \neq b} L^*_{j,m})$ where a_m and b_m are demand parameters, equation (2) becomes:

$$i^*_{b,m,t} = BC_{b,m} \times a_m + \left(1 - BC_{b,m}\right) \frac{1}{d_{b,m}} [r + OC'_{L,b}] \tag{3}$$

where $BC = \frac{1}{1+B_m}$ is a measure of bank competition, where $BC = 0$ refers to perfect competition and $BC = 0.5$ is the case of monopoly or perfect collusion. Note that $\frac{\partial i^*}{\partial BC} > 0$ and $\frac{\partial i^*}{\partial r \partial BC} < 0$, which means that a market with low degree of bank competition is associated with higher lending rates and a more incomplete pass-through of monetary policy to bank lending rates, as depicted by Figure 1.1.

1.2.2 Monetary policy shocks

According to equation (3) a change in the monetary policy rate r implies a new optimal lending rate $(i^*_{b,m})$. However, the presence of adjustment costs can potentially weaken the incentives for banks to immediately set lending rates equal to the new optimal rate. Thus, banks face a tradeoff between minimizing the cost of suboptimality and adjustment costs. Formally, this tradeoff can be represented as an intertemporal adjustment cost function of the following form:

$$C_t = \sum_{s=0}^{\infty} \beta^s \underbrace{c_{1,t}(i_{t+s} - i_{t+s-1})^2}_{Cost\ of\ adjustment} + \underbrace{c_{2,t}(i_{t+s} - i_{t+s}^*)^2}_{Cost\ of\ suboptimality} \tag{4}$$

where c_1 and c_2 represent the weight that a bank gives to the cost of changing the interest rate and the cost of not achieving the long-run target i_t^*,respectively.

When minimizing (4) we get:

$$i_t = \alpha_t i_{t-1} + (1 - \alpha_t) i_t^* \tag{5}$$

where $\alpha = \frac{c_1}{c_1+c_2}$.By substituting (3) into (5) we obtain an inter-temporal lending rule of the following form:

$$i_{b,m,t} = \alpha_{b,m,t} i_{b,m,t-1} + \left[\frac{(1-\alpha_{b,m,t})}{d_{b,m,t}}(1 - BC_{m,t})\right] r_t + A_{b,m,t} \tag{6}$$

where $A_{b,m,t} = \frac{c_1}{c_1+c_2}[BC_m \times a_b + (1 - BC_m)\frac{1}{d_{b,m,t}} OC'_{L,b}]$.

1.2.3 The Bank Balance Sheet Channel

Until now I have assumed that the costs of funds are determined by r and that a monetary policy shock is equivalent to a change in r. However, the bank lending channel literature proposes that the structure of banks' balance sheet is key to understanding the way banks react to monetary policy impulses (e.g., Kashyap and Stein, 2000; De Graeve et al., 2007; Gambacorta, 2008). According to this view, a drop in reservable funds, caused by a tight monetary policy, shifts loan supply inwards if banks are not able to frictionlessly substitute reservable deposits with other types of funding. In this context, liquid and well-capitalized banks are able to buffer the drop in deposits and maintain a higher loan supply by drawing down cash and securities.

Under the proposed model, I can introduce this notion by replacing r with $i_{F,b} = (1 - BSS_b)r$, where BSS is a measure of balance sheet strength between zero and one. A bank with a lower level of BSS is less creditworthy and thus faces higher costs of lending: Moreover, this formulation of costs implies that a change in r has a smaller impact on the cost of funds of a bank with a higher level of BSS. In other words, banks with a weak balance sheet are more exposed to changes to the monetary policy rate. With this formulation of costs, equation (6) becomes:

$$i_{b,m,t} = \alpha_{b,m,t} i_{b,m,t-1} + \left[\frac{(1-\alpha_{b,m,t})}{d_{b,m,t}}(1 - BC_{m,t})(1 - BSS_b)\right] r_t + A_{b,m,t} \tag{7}$$

where $A_{b,m,t} = \frac{c_1}{c_1+c_2}\left[BC_m \times a_b + (1 - BC_m)\frac{1}{d_{b,m,t}}(1 - BSS_b)OC'_{L,b}\right]$. This lending rule is the basis for the empirical analysis in this paper.

To conclude this section, I discuss several predictions that we can derive from equation (7) regarding the pass-through of monetary policy to lending rates:

1. *The effect of bank competition.* A low degree of competition (i.e., low BC) is associated with higher lending rates and a more incomplete pass-through of monetary policy impulses to lending rates. Note that $\frac{\partial i^*}{\partial BC} > 0$ and $\frac{\partial i^*}{\partial r \partial BC} < 0$.[3]

[3] A low pass-through is also related with variable markups which are not exclusive from the proposed formulation. For example, Rotemberg and Woodford (1991) also obtain variable markups in the absence of perfect competition. Under their framework, the fluctuation of markups is caused by the strategic behavior of firms to maintain an implicit collusive price. Their idea is that markups increase when the marginal cost falls since low costs are associated with pessimistic expectations on the returns of collusion. On the other hand, high interest rates are associated with higher expected returns from collusion and thus require lower markups to sustain the collusive arrangement.

2. Other determinants of the interest rate pass-through. A strong balance sheet (i.e., high BSS) and a low probability of repayment d are also associated with lower interest rate pass-through. Thus, to empirically identify the effect of bank competition on the interest pass-through I need to account for the potential bias of these effects, particularly if it is not possible to rule out that $\frac{\partial BSS}{\partial BC}$, $\frac{\partial d}{\partial BC}$, $\frac{\partial^2 BSS}{\partial r \partial BC}$ and $\frac{\partial^2 d}{\partial r \partial BC}$ are zero.

3. Short vs long term effects. Short-term costs only generate a delay in the interest rate passthrough, but do not affect the long-term (i.e., steady-state) adjustment of lending rates. The steady state relationship between r and i is determined by i^*.

4. Sources of asymmetry. Asymmetries in the delay of interest rates between positive and negative adjustment of the policy rate are a result of asymmetric adjustment costs. However, asymmetries in the long-term pass-through are explained by the correlation between d, ε, and BSS with the direction of the monetary policy shock.

5. The cost of suboptimality (c_2). This cost can be calculated as the difference in total profits associated with moving from $i^*(r_0)$ to $i^*(r_1)$. For the linear case, this cost is $\Delta\pi_t = \frac{1}{4b}(r_1 - r_0)^2$ where b is the slope of the residual demand curve perceived by a branch. This formula suggests that the cost of not moving to $i^*(r_1)$ is a decreasing function of b. This means that, other things being equal, banks that face steeper demand curves (i.e., banks in less competitive markets) will face lower suboptimality costs (c_2).

1.3 Data and Choice of Variables

For this study, I compiled a novel and very large data set on the characteristics of corporate loans in Mexico with the help of the staff of the Mexican Banking and Securities Commission (CNBV). This data comes from the regulatory reports (known as R04-C) sent monthly by every commercial bank to the CNBV. Reports contain detailed characteristics of the universe of new and continuing loans made by every regulated bank in Mexico over a period of time beginning in March 2005 and ending in March 2010. The subsample used for this study includes all new corporate loans in the range of 100 thousand to 10 million pesos (approx. US$7,700-770,000)[4] in the sample period, a total of 1,416,412 observations. This information was merged with monthly bank balance sheet reports, also from CNBV, and a set of geographic and economic performance measures from INEGI (Mexican Institute of Statistics and Geography).

1.3.1 Some facts about the banking system in Mexico

The case of Mexico presents an ideal setting to evaluate the predictions of the model for several reasons. First, the availability of data at the loan level allows me to construct all variables used by the theoretical model, as I will explain in more detail below. Second, the banking system in Mexico is characterized by having few large banks competing under a wide range of market structures across regions. As reported in Table 1.1, the six largest banks

[4] Smaller loans were not considered due to the lack of reliable and complete information. Larger loans, on the other hand, were not included since the segregated market condition is less likely to hold for borrowers of this type of loan.

account for 82.4% of the corporate loan market. Moreover, they operate in single-bank markets as well as in markets where they compete with up to eighteen banks.

As Table 1.2 displays, the number of banks competing in a market is correlated with the level of lending spreads that banks charge. Average lending spreads are higher in markets with a number of banks below the median. This is true for the whole sample and within subsamples of comparable loans. For instance, an average borrower located in a low-competition market will face a lending rate 14% higher than an average borrower in a competitive market. These differences are in line with the idea that markets are geographically segmented and that banks are able to price-discriminate based on the degree of competition they face locally.

Another key characteristic of banks in Mexico is that their funding costs are closely related to the monetary policy rate. From Table 1.5 we can see that the correlation of the cost of funds of the six major banks and the policy rate ranges from 0.80 to 0.98. Interestingly, this Table also shows that the correlation of lending rates with the policy rate is significantly lower than that of the cost of funds. This fact suggests the presence of frictions within banks, other than the cost of funds, that affect the way banks adjust lending rates to movements in the policy rate.

Such frictions appear also when plotting the average lending rate and the monetary policy rate along with the average spread of the lending rate. As can be seen in Figure 1.2, there is a sluggish adjustment of lending rates to movements in the monetary policy rate. The main objective of my paper is to empirically test the importance of bank competition (BC) to explain these frictions.

1.3.2 Branch-level variables

The empirical analysis of this paper is conducted at the branch level. A branch is defined as the set of loans given by bank b to borrowers located in market m.[5] The final sample used is an unbalanced panel of 443 branches located in 106 regions over a 61-month period, a total of 25,901 observations. An alternative approach would be to conduct the analysis at the firm level. This latter approach would allow me to control for firm-level effects. However, the tradeoff is that this approach presents an important selection problem. This is because the analysis of interest rate dynamics requires a firmlevel panel with no gaps, which means that the only firms included in the sample would be those asking for a new loan every month, primarily the largest firms in the sample.

Therefore, the lending rate variable $i_{b,m,t}$ is a branch-level weighted average of lending rates to new loans. Control variables are also at the branch-level; these include average size of loans, weighted average maturity of loans, percentage of loans with explicit collateral, percentage of borrowers with credit rating of A1, and weighted average size of borrowers.[6]

[5] A market is defined as: (1) a group of municipalities in the same metropolitan area, as defined by INEGI; (2) a municipality outside metropolitan areas, with a value of total loans larger than 100 million pesos (approx. US$7.5 million); (3) a pool of municipalities in the same state that are not part of a metropolitan area, with a value of total loans smaller than 100 million pesos, and where more than half of the population lives in urban areas; or (4) a pool of municipalities in the same state that are not included in any of the previous categories.

[6] Size of borrowers is measured by a categorical variable included in the reports that takes values from 1 to 4, based on the number of employees a firm has.

1.3.3 The monetary policy rate

As the monetary policy interest rate (r), I use the one-month interbank equilibrium interest rate. This variable closely follows Banco de Mexico's interest rate target for overnight funding operations between banks, which was not officially used until 2008.[7] This variable is also highly correlated with the total cost of funds of banks as shown in the previous section.

1.3.4 Measures of credit risk and demand

To capture differences in probability of repayment and demand of loans, the use of transactional-level data is crucial. CNBV's monthly reports contain the characteristics of both new and continuing loans. This unique feature is key because it allows me to construct measures of the probability of repayment and demand by branch for every point in time, which in turn allows me to identify the effect of bank competition on the interest rate pass-through.

The probability of repayment is measured as the fraction of loans with a credit rating of A1, with A1 corresponding to the highest credit rating (i.e., a loan with the lowest probability of default). Demand, on the other hand, is measured by two variables that capture loan demand at different levels of aggregation. First, I use industrial production as reported by INEGI to account for monthly movements in the economic activity at the country level. Second, I construct a variable called demand intensity that is based on how much current firms use pre-

[7] The correlation between these two variables was 0.998 for the period 2008-2012.

approved lines of credit.[8] This measure offers two advantages: it is available monthly for all branches and it provides a measure of demand unaffected by supply-side shocks. The idea is that banks have no influence on what percentage of approved lines of credit borrowers use. One potential caveat to this measure is that it only reflects the financing needs of current bank clients of revolving lines of credit, which could be uncorrelated with loan demand. This does not appear to be the case; intensity of demand is highly correlated with changes in industrial production. Their correlation coefficient is 0.76, significant at the 1% level.

1.3.5 Measures of bank competition and balance sheet strength

In terms of the bank competition and balance sheet strength variables, I make the following choices. The main variable used to measure bank competition (BC) is the number of branches per market. This is because it maps exactly the measure BC proposed in the model for the case of Cournot competition. Alternatively, I use (1) a Herfindahl index computed as the sum of squared shares of total loans by market and (2) the market share of the three largest branches. These measures reflect the level of bank competition only if there is some degree of market segmentation. This may not be true for markets that are geographically close to each other. Thus, I also use minimum distance to a highly competitive market (i.e., a market with a number of banks in the top decile) as a proxy for bank competition.

For the bank balance sheet variable (BSS), I use two measures: the ratio of securities to total assets and the ratio of capital to total assets. Both measures capture the exposure of banks to

[8] Formally, intensity of demand is calculated as $\frac{\sum_{f=1}^{F} DL_{f,b,m,t-s}}{\sum_{f=1}^{F} DL_{f,b,m,t}}$ where DL is the amount disbursed of a line of credit, $MaxL$ is the maximum amount approved in the corresponding line of credit, and F is the total number of lines of credit approved by a branch.

the monetary policy rate. A high level of securities or capital can serve as a buffer for banks to isolate loan supply from monetary policy impulses. This choice of variables is in line with previous work (e.g., Kashyap and Stein, 2000; Gambacorta, 2009).

1.4 Econometric Specification

The goal is to empirically test the predictions of the model. Specifically, the aim is (1) to measure average short- and long-term pass-through of the policy rate to lending rates; (2) to test the importance of bank competition to explain heterogeneity in the interest rate pass-through; and (3) to test if these measures are asymmetric for positive and negative movements of the monetary policy rate. In terms of the model, this means estimating $\frac{\partial i}{\partial r}$, and $\frac{\partial^2 i}{\partial r \partial BC}$ under different scenarios. For this purpose, I derive three empirical models from equation (7) of my model. The first explores average interest rate pass-through using a simple specification that only controls for differences in the portfolio. The second, my baseline model, closely maps the relationship suggested by equation (7) by including the interaction terms of BC, BSS, and d with r_t. The third model seeks to capture asymmetry by interacting all relevant terms with a dummy variable that takes the value of one if the change of the monetary policy rate is negative and zero otherwise. In contrast to previous work on the interest rate pass-through, I derive an empirical model that uses variables in levels as opposed to an Error Correction Model (ECM) form. ECM requires variables to be nonstationary and cointegrated, which is not the case for my data.

The specification of the first model is:

$$i_{b,m,t} = \sum_{l=1}^{L} \alpha_l i_{b,m,t-l} + \sum_{l=0}^{L} \beta_l r_{t-l} + \delta_X X_{b,m,t} + \mu_{b,m} + \varepsilon_{b,m,t} \tag{8}$$

where $b = 1, \dots, B$ ($B =$ Total number of banks); $m = 1, \dots, M$ ($M =$ Total number of markets), $t = 1, \dots, T$ is a monthly time index for the period 2005:03-2010:03; $l = 1, \dots, L$ ($L =$Total number of lags included); $\mu_{b,m}$ is a bank branch fixed effect; $\varepsilon_{b,m,t}$ is unobserved heterogeneity; and X_t is a vector of level controls that includes: (i) at the branch level, controls of portfolio characteristics such as log of average loan size, log of weighted average loan maturity, percentage of loans with credit rating of A1, and percentage of loans with explicit collateral; and (ii) at the country level, controls for inflation and industrial production. This specification controls for cross-sectional differences in the probability of repayment, demand, and bank characteristics. However, it assumes that the dynamics of these variables are not correlated with the monetary policy rate. My baseline model relaxes this assumption by including a vector of interaction terms Z_t. This vector includesBC, which allows meto estimate the effect of bank competition on the interest rate pass-through. It also includes BSS, d, and a, to control for potential biases in this estimation, associated with differences in the dynamics of these variables.

The specification of the baseline model is:

$$i_{b,m,t} = \sum_{l=1}^{L} [\alpha_l + \alpha_{Z,l} Z_{b,m,t}] i_{b,m,t-l} + \sum_{l=0}^{L} [\beta_l + \beta_{Z,l} Z_{b,m,t}] r_{t-l} + \delta_{Z,l} Z_{b,m,t} + \delta X_{b,m,t} + \mu_{b,m} + \varepsilon_{b,m,t} \tag{9}$$

The vector Z_t is included as an interaction term of both the lagged lending rate and monetary policy rate, to allow heterogeneity in both the short- and long-term coefficients. Moreover, Z_t is also included alone to control for effects in lending rates independent of the policy rate. The measure of bank competition $BC_{m,t}$ is used with a lag to avoid potential endogeneity problems.

The third model seeks to test the existence of asymmetric effects between upward and downward changes. The specification used in this case is:

$$i_{b,m,t} = \sum_{l=1}^{L}[(\alpha_l + \alpha_{Z,l}Z_{b,m,t}) + (\alpha_{A,l} + \alpha_{A,Z,l}Z_{b,m,t})A_t]i_{b,m,t-l} + \sum_{l=0}^{L}[(\beta_l + \beta_{Z,l}Z_{b,m,t}) + (\beta_{A,l} + \beta_{A,Z,l}Z_{b,m,t})A_t]r_{t-l} + \delta_{Z,l}Z_{b,m,t} + \delta X_{b,m,t} + \mu_{b,m} + \varepsilon_{b,m,t} \quad (10)$$

where A_t is a dummy variable that takes the value of one whenever Δr_t is positive, and zero otherwise.

1.5 Empirical Results

All models are estimated using a fixed-effects estimator, which is shown to be the most consistent and efficient given the large N and largeT nature of the dataset.[9] To test the robustness of the baseline results, (1) I use alternative measures of bank competition; (2) I estimate the model using a Difference GMM estimator, and (3) I explore the presence of dynamic aggregation bias problems by estimating the model also at the firm level and by testing the results for different subsamples of loans.

[9] Fixed effects wipe out the unobservable individual specific effect $\mu_{b,m}$, however the remaining disturbance $\varepsilon_{b,m,t}$ biases the estimator. As shown by Nickel (1981), this bias, known as the Hurwitz bias, vanishes as T gets large. The bias comes from the fact that $(i_{b,m,t-1} - \bar{\imath}_{b,m,-1})$, a right hand side regressor, is correlated with the error term $(\varepsilon_{b,m,t-1} - \bar{\varepsilon}_{b,m,-1})$.This is because by construction $i_{b,m,t-1}$ is correlated with $\bar{\varepsilon}_{b,m,-1} = \sum_{t=2}^{T} \varepsilon_{b,m,t-1}/(T-1)$ and $\bar{\imath}_{b,m,-1} = \sum_{t=2}^{T} i_{b,m,-1}/(T-1)$ is correlated with $\varepsilon_{b,m,t-1}$.

1.5.1 Coefficients of interest and tests

The focus of the empirical analysis is based on two statistics that summarize the response of lending rates to monetary policy shocks. These are: (1) short-term pass-through: $\theta_{ST} = \alpha_1\beta_0 + \beta_0 + \beta_1$; and (2) long term pass-through: $\theta_{LT} = \frac{\sum_{l=0}^{L}\beta_l}{1-\sum_{l=1}^{L}\alpha_l}$. Parameter θ_{ST} accounts for the total impact of the policy rate on the lending rate after one period. It provides a measure of the speed of adjustment and thus a test of the importance of adjustment costs. Parameter θ_{LT} measures the long-term (i.e., steady state) relationship between the monetary policy and the lending rate. This parameter measures the completeness of the interest rate pass-through.

The effect of bank competition is estimated similarly: (1) short-term pass-through $\theta_{BC,ST} = (\alpha_1 + \alpha_{BC,1}BC)(\beta_0 + \beta_{BC,0}BC) + (\beta_0 + \beta_{BC,0}BC) + (\beta_1 + \beta_{BC,1}BC)$; and (2) long run pass-through $\theta_{BC,LT} = \frac{\sum_{l=0}^{L}(\beta_l+\beta_{BC,l}BC)}{1-\sum_{l=1}^{L}(\alpha_l+\alpha_{BC,l}BC)}$. Heterogeneity is tested for each parameter by jointly testing that all parameters associated with BC are zero.

To simplify the interpretation of coefficients, I normalize BC and all covariates in Z with respect to its mean. This procedure implies that the interaction term will be zero for the average branch, and therefore θ_{ST} and θ_{LT} can be interpreted as average effects under all three models. Moreover, to provide a measure of the magnitude of the effect of bank competition, all tables report $\theta_{BC,ST}$ and $\theta_{BC,LT}$ for the first and tenth decile of BC.

In the third model, asymmetry is tested by jointly testing that all parameters associated with the dummy variable A are zero.

1.5.2 Main findings

Table 1.6 reports the main coefficients of interest for the first specification along the coefficients of the main controls. We can see that there is sluggish and incomplete pass-through: θ_{ST} is 0.33 and θ_{LT} is 0.68. This means that a change of 100 basis points of the interbank interest rate is associated with a change of 32 basis points of the lending rate after one period, and a total of 68 basis points in the long run.

From Table 1.6, we can also see that the characteristics of the portfolio (i.e., average loan size, probability of repayment, maturity, etc.) explain a significant portion of the variation in lending rates; they are all highly significant; and they have the expected signs. This behavior is maintained practically unchanged in all the specifications. Thus, it will not be reported in the subsequent tables. The focus of my analysis will be only on the dynamic coefficients reported in Panel A.

Table 1.7 reports the results of the baseline model. In columns 1 through 5, I build up to the specification in equation (9), starting from a simpler specification. All results show a consistent pattern. First, there is incomplete and sluggish interest rate pass-through. Second, the degree of bank competition is positively related to long-term pass-through. In Column 1, I report that the average short-term interest rate pass-through in my sample is 0.44, and the average long term pass-through is 0.78. The null hypothesis of no heterogeneity cannot be rejected for short-term pass-through, but it is rejected for the other two coefficients. This means that bank competition is not correlated with short-term adjustment costs. The degree of bank competition however, is relevant in the long run. The long-term pass-through is 0.58 for borrowers in markets where the degree of bank competition (BC) is in the first decile, while it is 0.95 for borrowers in markets with BC in the tenth decile.

In Column 2, we can see that controlling for portfolio characteristics reduces average long term pass-through, mainly due to a reduction of the effect in markets with high competition. In Columns 3 through 5, I sequentially include all the interaction terms suggested by the model to control for BSS, d, and a. Controlling for these terms, increases average short and long term pass-through, but it does not changes the magnitude of the effect of bank competition. The results reported in Column 5 use the specification that most closely map the optimal lending rule of the theoretical model (i.e., Equation (7) in Section 2). Under this specification the long term interest rate pass-through is 0.75 for the average branch, 0.60 for a branch at the first decile of BC, and 0.90 for a branch at the tenth decile of BC. In Table 1.9 I report the results of using this same specification with different measures of BC. Long run heterogeneity remains highly significant in all cases.

1.5.2.1 Potential Biases

Aggregation bias. The use of aggregated data in our specification could lead to a dynamic aggregation bias that results in higher persistence estimates (i.e., lower long term pass-through), as shown by Imbs et al. (2002). Such a bias could arise in my case from the failure to account for cross-sectional heterogeneity in the dynamic behavior of lending rates. Even though the baseline specification accounts for such heterogeneity by introducing the vector of controls Z in interaction with r_t and i_{t-1}, I also explore the existence of this bias by estimating the model at the firm level. Table 1.12 reports the results of this exercise. The importance of bank competition remains strong: long-term pass-through is close to unity under a high degree of bank competition, and it is 0.73 under low competition. However, there is a significant change in the level of θ_{ST} and θ_{LT}. Using firm-level data renders an average short-term pass-through of 0.69 and a long-term pass-through of 0.90. The overall higher level of pass-through can be attributed to a selection bias. As mentioned before, estimating the model at the firm level results in a selection of large firms, which are less likely to be attached to a single market. Thus, banks serving these firms will face more competition. This result is in line with the predictions of the model.

Correlation between BC and the cyclicality of d and loan demand. As detailed in the model, the way banks adjust lending rates to policy rate impulses can also be driven by market-specific changes in the probability of repayment and loan demand. Thus, it could be argued that incomplete pass-through in low-competition markets is explained by unobservable differences in the co-movement of these factors between low- and high-competition markets. In other words, there could be a bias in the estimates of θ_{LT} if there is an endogenous link between BC and the cyclicality of credit risk or loan demand. In principle, this bias could augment or diminish the gap between the estimates of θ_{LT} in high- and low-competition markets. For instance, if markets with few banks are also associated with harsher economic downturns, incomplete pass-through of a negative movement of the policy rate can be explained by a relative increase in the risk profile of credits in these markets. However, by comparing columns 2 and 3 of Table 1.7, the opposite appears to be true. The gap in θ_{LT} between lowand high-competition markets increases after we control for probability of repayment. This suggests that economic activity is relatively more procyclical in high-competition markets. This hypothesis is in line with the reduction in the gap in θ_{LT} observed when we control for intensity of loan demand (columns 4 and 5). The intuition behind the latter is that firms reduce loan demand during recessions.

It is possible that the inclusion of observed probability of repayment and intensity of loan demand in vectors X and Z do not fully control for the potential biases mentioned above. I address this concern in Table 1.8 by estimating the baseline model for different subsamples of observations. First, I explore the possibility of a bias related to different levels of urbanization by restricting the sample to metropolitan areas. Second, I further reduce the sample by excluding Mexico City's metropolitan area, the largest market in the sample, which could have significant differences from the rest of the country. The aim of these subsamples is to diminish the presence of unobservable heterogeneity in lending rate dynamics across regions. Columns 2 and 3 of Table 1.8 present the results. In sum, we can see that the average long-term effect does not vary more than 3%, and that the difference in long term pass-through between markets with high and low bank competition remains significant. The smallest difference in θ_{LT} between these markets is 0.28.

Fixed effect estimator bias. To address the potential presence of the so-called Hurwicz bias, I also estimate the baseline model using a Difference GMM estimator. The drawback of using this estimator under my specification is that the number of interaction terms makes the proliferation of instruments unavoidable. To minimize this problem, I restrict the number of lags of the endogenous variables used as instruments. Table 1.11, compares the coefficients under the GMM and the fixed-effects estimators. Comparing columns 1 and 2 of this table, we can see that the difference between the long-run pass-through in low- and high-competition markets remains practically unchanged, in spite of higher long-term coefficients under GMM.

1.5.2.2 Asymmetry

Lastly, I explore asymmetry in the interest rate pass-through between negative (Δr^{-}) and positive (Δr^{+}) monetary policy shocks. For this purpose I run the model specified in Equation (10). Several findings emerge. Several findings emerge. First, there is no heterogeneity or asymmetry in the short-term coefficient θ_{LT}. Second, there is asymmetry in the average long-term pass-through: coefficient θ_{LT} is 0.64 for negative movements in the policy rate, and it is close to unity in the opposite case. Third, the long-term pass-through is smaller in markets where the degree of bank competition is low, independent of the direction of the monetary policy shock. From Table 1.13 we can see that for low-competition markets, θ_{LT} is 0.54 for Δr^{-}, and it is 0.86 for Δr^{+}. For high-competition markets these coefficients are 0.74 and 1.17, respectively.[10] These results are in line with the previous findings on asymmetry, but do not provide evidence on the link between asymmetry and bank concentration. To test the robustness of these results, I follow a similar approach as for the baseline specification. The results hold in all cases. In the interest of brevity, I only report four cases in Table 1.13.

[10] In the context of my theoretical framework, a pass-through coefficient higher than one signals the presence of decreasing marginal costs or a probability of repayment smaller than the measure of bank competition.

1.6 Conclusions

Previous work has found evidence on the importance of frictions in the banking sector to understanding the effectiveness of monetary policy transmission. Most of this work has focused on analyzing the importance of banks' creditworthiness to explain differences in the way banks react to monetary policy; however, the literature has given little attention to the importance of bank competition. Moreover, the existing studies that analyze the determinants of the interest rate pass-through use broadly aggregated measures that are subject to omitted variable and aggregation biases. The premise in this paper has been to provide a sharp test of the link between bank competition and the interest rate pass-through. For this purpose, I develop a theoretical framework that I take to the data for the case of Mexico, which has a banking market structure that provides an ideal setting for this investigation. Using a unique loan-level data set containing more than 1.4 million observations, I find that banks adjust corporate lending rates sluggishly to monetary policy shocks. I also find that this adjustment is less than proportional to the change in the policy rate (i.e., incomplete pass-through), and that it is more incomplete when the monetary policy rate is reduced compared to when it increases (i.e., asymmetric pass-through).

In addition, I find that differences in the degree of bank competition are important to explain heterogeneity in the transmission of policy rates across markets. A market with a number of banks in the 10th percentile has a pass-through of only 0.6, while a market in the 90th percentile has a passthrough of 0.9. Incomplete and heterogeneous long-term pass-through are opposite to many earlier studies. However, they support the idea that monetary policy shocks do not reach all markets evenly.

These results seem robust. They withstand the use of alternative measures of bank competition, different estimation methods, and various levels of aggregation and truncation of the data set. They cannot be explained by the observed cyclicality of credit risk or economic activity across regions, nor differences in the size or level of urbanization of markets. They survive corrections to account for dynamic aggregation problems and the Hurwicz bias.

However, I am aware that my findings are limited to the case of Mexico. It remains to be investigated to what extent bank competition is important for the transmission of monetary policy in other markets. Moreover, I recognize that bank competition may be an endogenous variable determined by an unobservable characteristic that may also be driving lending rate dynamics. To fully account for this issue, I would need to estimate a general equilibrium model with endogenous market structure. I leave this interesting analysis for future research.

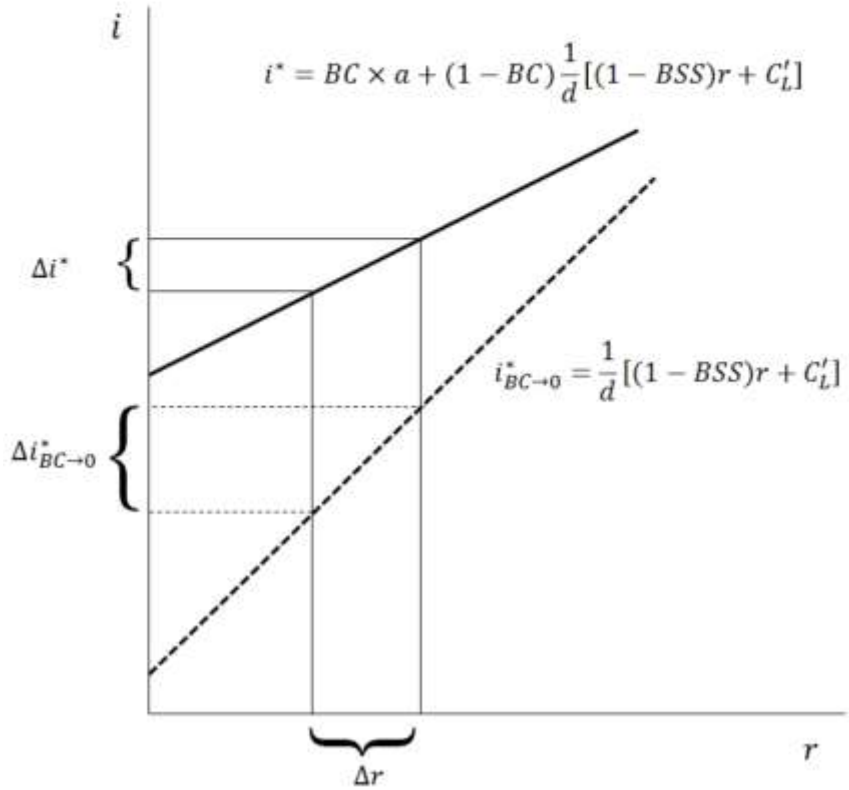
Nonetheless, my findings provide evidence on the importance of microeconomic factors in understanding a crucial macroeconomic issue: they suggest that banks exercise different degrees of market power across regions and that this generates frictions in the transmission of monetary policy. These frictions undermine the effectiveness of central banks to affect retail interest rates through the money market, particularly in the case of monetary policy easing. Interestingly, my results also imply that the conduction of monetary policy has important distributional consequences for the cost of corporate financing across markets.

Monetary stimulus is shown to be less effective in reducing the cost of bank loans for small firms and firms located in markets where bank competition is low. In the absence of alternative sources of finance, this may affect the distribution of investment and economic activity. The next logical question is, how important are these frictions for economic activity? This question is harder to answer with my data set. While my results leave open the possibility that bank competition generates substantial heterogeneity in the cost of funds across regions, an attempt to precisely measure the effect on investment is hampered by the availability of information about the costs of alternative sources of corporate finance. To make progress on this front, I need to be able to measure the elasticity of substitution between bank and non-bank financing.

From a methodological point of view, interesting extensions of my approach may take into account strategic behavior of banks across markets and products, as well as the importance of relationship lending.

Figures and Tables

FIGURE 1.1: EFFECT ON OPTIMAL LENDING RATE OF A MONETARY POLICY SHOCK



Note: The dashed line represents the optimal lending rule of a bank under perfect competition (i.e., $BC \to 0$), while the solid line is the optimal lending rule for a bank in a market with N competitors. A change in the monetary policy rate of Δr, translates into an equal change in the lending rate under perfect competition. However, it is associated with a less than proportional change under a less competitive environment: $\Delta r = \Delta i^*_{BC\to 0} > \Delta i^*$.

FIGURE 1.2: AVERAGE SPREAD ON CORPORATE LENDING INTEREST RATES AND THE MONETARY POLICY RATE

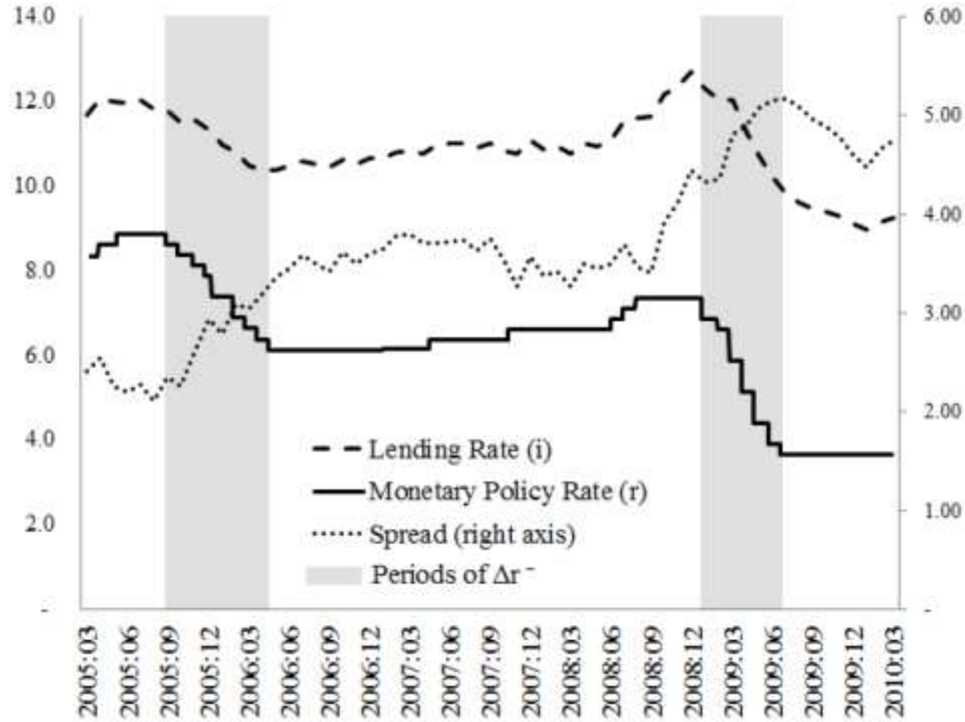


TABLE 1.1: DISTRIBUTION OF LOANS AND BANK COMPETITION

Six largest banks

	Bancomer	Banamex	Santander	Banorte	HSBC	Inbursa	Total
Panel A. Number of loans and markets							
Total number of loans	198,040	293,700	63,369	141,296	395,240	46,225	1,137,870
Number of markets†	87	82	77	94	94	36	111
Panel B. Share of the market							
Total	20.41	16.03	13.98	11.55	11.37	9.10	82.44
Low-competition market	32.39	9.93	12.22	12.45	5.58	12.88	85.45
High-competition market	12.18	20.22	15.20	10.94	11.51	10.33	80.39
Panel C. Measure of bank competition (number of banks operating in the same market)							
Mean	6.6	6.9	6.9	6.4	6.5	8.5	6.8
Standard deviation	2.8	2.7	2.7	2.8	2.8	2.8	2.8
Minimum	1	1	1	1	1	1	1
Maximum	19	19	19	19	19	19	19

Note: The total number of observations is 1,416,412 distributed across 111 markets and 19 banks over a period of 61 months. Low competition refers to observations in markets where the number of banks is below the median; high competition refers to observations above the median.

ƚ Number of markets refers to the average number of markets where a bank had operations in the period 2010:03 to 2010:03.

TABLE 1.2: AVERAGE LENDING SPREADS AND THE DISTRIBUTION OF THE PORTFOLIO

Sample of new loans for the period 2005:03-2010:03

Degree of bank competition (number of banks)	(1) High	(2) Low
	A. Average lending spreads	
Total loans in the sample	2.589	2.969***
	(0.004)	(0.003)
Loans with maturity of less than six months	2.386	2.647***
	(0.004)	(0.003)
Loans with credit rating of A1 (highest category)	2.686	3.149***
	(0.007)	(0.006)
Loans in metropolitan areas †	2.578	2.889***
	(0.005)	(0.004)
Loans in small cities ‡	2.821	2.852***
	(0.014)	(0.007)
Loans to large firms (>500 employees)	2.183	2.472***
	(0.007)	(0.006)
Loans to small firms (<100 employees)	3.769	4.111***
	(0.009)	(0.006)
Loans given by Banamex	2.339	2.775***
	(0.010)	(0.009)
Loans given by Bancomer	2.205	2.367***
	(0.009)	(0.006)
	B. Portfolio distribution	
Share of total loans in sample	59.3	40.7
	C. Portfolio distribution within bank competition categories	
Loans with maturity of less than six months	81.9	75.9
Loans with credit rating of A1 (highest category)	47.7	41.2
Loans in metropolitan areas †	96.5	67.2
Loans in small cities ‡	3.4	23.2
Loans to large firms (>500 employees)	57.8	42.9
Loans to small firms (<100 employees)	19.2	23.5
Loans given by Banamex	20.2	9.9
Loans given by Bancomer	12.2	32.4

Note: The total number of observations is 1,416,412. Low competition refers to observations in markets where the number of banks is below the median; high competition refers to observations above the median. Standard errors are reported in parentheses. Stars denote if the difference between means is significant, *** p<0.01, ** p<0.05, * p<0.1.

† There are 56 metropolitan areas in Mexico, defined by INEGI (Statistics and Geography Institute of Mexico). The median value of total loans in these markets is 1.18 billion pesos (approx. US$88 million).

‡ Small cities correspond to municipalities outside metropolitan areas with a value of total loans larger than 100 million pesos (approx. US$7.5 million). The median value of total loans in these markets is 0.36 billion pesos (approx. US$27 million).

TABLE 1.3: SUMMARY STATISTICS AND CORRELATIONS

	i	*BC*	*a*	*d*	*BSS*	
	Lending rate	Bank competition	Use of line of credit	Credit rating	Capital / total assets	Securities / total assets
			Panel A. Summary statistics			
Mean	11.88	7.61	0.34	1.98	0.09	0.32
Standard deviation	3.32	2.95	0.15	0.69	0.03	0.11
Between banks	1.99	3.33	0.12	0.47	0.05	0.15
Within banks	2.28	2.50	0.10	0.55	0.00	0.00
Minimum	5.80	0.04	0.02	0.93	0.04	0.06
Maximum	23.89	16.14	0.83	4.98	0.19	0.58
			*Panel B. Correlation coefficients**			
Lending rate	1.00	-0.37	-0.06	-0.29	-0.32	0.03
Bank competition		1.00	-0.07	0.19	0.22	-0.09
Use of line of credit			1.00	0.12	0.15	0.35
Credit rating				1.00	0.26	-0.17
Capital / total assets					1.00	-0.52

Note: Statistics are computed using branch-level means for the subsample of new loans. The sample is an unbalanced panel that comprises 443 branches over a maximum of 61 periods, a total of 25,901.
*All correlations in Panel B are significant at a 5% level. The sample period is 2005:03-2010:03.

TABLE 1.4: BANK MEAN REGRESSIONS

Dependent variable: Mean lending rate	(1)	(2)	(3)
Mean number of branches	-3.33***		
	(0.38)		
Mean Herfindahl index		5.41***	
		(1.12)	
Mean share of 3 largest branches			9.60***
			(1.40)
R-squared	0.15	0.05	0.10
Observations	25,901	25,901	25,901

Note: Regressions of mean lending rates on mean values of bank competition measures. Standard errors are reported in parentheses, *** p□ 0.01, ** p□ 0.05, * p□ 0.1. The sample period is 2005:03-2010:03.

TABLE 1.5: BANK CHARACTERISTICS AND THE MONETARY POLICY RATE

	(1) Bancomer	(2) Banamex	(3) Santander	(4) Banorte	(5) HSBC	(6) Inbursa	(7) Policy rate (r)
			Bank competition (number of branches per market)				
			Cost of funds				
Mean	3.57	2.90	4.91	3.51	3.19	7.06	7.61
Standard deviation	0.67	0.77	1.22	0.70	0.52	1.36	1.47
Minimum	2.40	1.60	2.60	2.30	2.30	4.60	4.89
Maximum	4.80	4.40	7.10	4.90	4.00	9.40	10.12
Correlation with policy rate (r)	0.93*	0.83*	0.96*	0.92*	0.80*	0.98*	1.00*
			Lending rate				
Mean	10.27	11.86	10.98	13.80	18.01	11.09	
Standard deviation	3.77	4.32	5.67	4.08	7.62	3.80	
Autocorrelation	0.44	0.64	0.59	0.52	0.74	0.69	
Correlation with policy rate (r)	0.19	0.22	0.22	0.32	-0.08	-0.15	
			Key Balance sheet indicators (% of total assets)				
Corporate loans	14.17	11.05	14.08	16.51	16.66	50.27	
Securities	27.91	42.30	37.31	44.17	27.85	7.00	
Capital	8.14	11.76	9.32	5.84	7.12	19.32	
Demand deposits	28.15	24.65	16.37	20.65	33.54	22.22	

Note: There are a total number of nineteen banks in the final subsample used; six of them account for 82.4 percent of the total assets. The table above reports summary statistics of the policy rate and key financial indicators for these six banks. The sample period is 2005:03-2010:03.

TABLE 1.6: INTEREST RATE PASS-THROUGH AND THE DETEMINANTS OF LENDING RATES

Branch-level fixed effects (Branch FE)

	(1) No Controls	(2) Portfolio controls
Panel A. Dynamic coefficients		
Short-term pass-through (after one month)	0.415	0.327
	(0.136)	(0.117)
Long-term pass-through (steady-state)	0.774	0.679
	(0.056)	(0.034)
Panel B. Level coefficients		
Average loan size		-0.850***
		(0.012)
Percentage of loans with rating A1		-0.259***
		(0.016)
Log of months to maturity		0.500***
		(0.018)
Percentage of loans with collateral		-0.989***
		(0.055)
Inflation		7.506
		(4.743)
Industrial production		0.0117**
		(0.005)
Constant	1.177***	13.55***
	(0.272)	(0.569)
Observations	20,397	20,397
R-squared	0.254	0.468
Number of branches	443	443

Note: The model used for the results reported in this table has the following specification:

$$i_{b,m,t} = \sum_{l=1}^{L} \alpha_l i_{b,m,t-l} + \sum_{l=0}^{L} \beta_l r_{t-l} + \gamma_{b,m} + \delta X_{b,m,t} + \varepsilon_{b,m,t}$$

where $b = 1, \dots, B$ ($B =$ Total number of banks); $m = 1, \dots, M$ ($M =$ Total number of markets), $t = 1, \dots, T$ is a monthly time index for the period 2005:03-2010:03; $l = 1, \dots, L$ ($L = 6$; Total number of lags included). The model is estimated using a fixed effects estimator. The interaction term $BC_{m,t-l}$ is measured as the log of number of banks. These results do not change significantly for lags larger than 6. Standard errors, reported in parentheses, are clustered at the market level and are calculated using the delta method. *** p<0.01, ** p<0.05, * p<0.1.

TABLE 1.7: INTEREST RATE PASS-THROUGH AND THE EFFECT OF BANK COMPETITION

Branch-level fixed effects (Branch FE)

	(1)	(2)	(3)	(4)	(5)
A. Short-term pass-through (one period):					
Average bank branch	0.444	0.369	0.366	0.435	0.442
	(0.136)	(0.118)	(0.268)	(0.224)	(0.239)
Low-competition markets (1st decile)	0.394	0.346	0.341	0.412	0.420
	(0.141)	(0.122)	(0.284)	(0.249)	(0.260)
High-competition markets (10th decile)	0.490	0.391	0.389	0.457	0.463
	(0.137)	(0.118)	(0.257)	(0.204)	(0.221)
Ho: No heterogeneity (*p*-value)	0.104	0.093	0.797	0.857	0.614
B. Long-term pass-through (steady-state):					
Average bank branch	0.780	0.708	0.719	0.751	0.754
	(0.057)	(0.034)	(0.054)	(0.044)	(0.045)
Low-competition markets (1st decile)	0.578	0.571	0.571	0.597	0.604
	(0.080)	(0.048)	(0.096)	(0.106)	(0.112)
High-competition markets (10th decile)	0.996	0.856	0.877	0.902	0.901
	(0.083)	(0.049)	(0.126)	(0.085)	(0.071)
Ho: No heterogeneity (*p*-value)	0.000	0.000	0.000	0.000	0.000
Observations	20,397	20,397	20,397	20,397	20,397
R-squared	0.255	0.470	0.473	0.481	0.482
Number of branches	443	443	443	443	443
Level controls (X)					
Branch FE	Yes	Yes	Yes	Yes	Yes
Inflation and industrial production	Yes	Yes	Yes	Yes	Yes
Portfolio (loan size, maturity, rating, collateral)		Yes	Yes	Yes	Yes
Interaction terms (Z)					
$BC \times r$	Yes	Yes	Yes	Yes	Yes
$Credit\ risk \times r$			Yes	Yes	Yes
$BSS \times r$				Yes	Yes
$Demand\ intensity \times r$					Yes

Note: The model used for the results reported in this table includes interactions of r_t with a vector of explanatory variables Z. The specification is the following:

$$i_{b,m,t} = \sum_{l=1}^{L}[\alpha_l + \alpha_{Z,l}Z_{b,m,t}]i_{b,m,t-l} + \sum_{l=0}^{L}[\beta_l + \beta_{Z,l}Z_{b,m,t}]r_{t-l} + \gamma_{b,m} + \delta_{Z,l}Z_{b,m,t} + \delta X_{b,m,t} + \varepsilon_{b,m,t}$$

where $b = 1, \dots, B$ ($B =$ Total number of banks); $m = 1, \dots, M$ ($M =$ Total number of markets), $t = 1, \dots, T$ is a monthly time index for the period 2005:03-2010:03; $l = 1, \dots, L$ ($L = 6$; Total number of lags included). The model is estimated using a fixed effects estimator. The interaction term $BC_{m,t-l}$ is measured as the log of number of banks. A "low competition market" refers to markets in the first decile of BC. A "high competition market" refers to markets in the tenth decile. "Ho: No heterogeneity" reports the p-value of jointly testing that all the corresponding heterogeneity coefficients are zero. These results do not change significantly for lags larger than 6. Standard errors, reported in parentheses, are clustered at the market level and are calculated using the delta method. *** p<0.01, ** p<0.05, * p<0.1.

TABLE 1.8: INTEREST RATE PASS-THROUGH AND THE EFFECT OF BANK COMPETITION

Branch-level fixed effects, different samples

	(1) Full sample	(2) Metropolitan areas	(3) Metropolitan areas without Mexico City
A. Short-term pass-through (one period):			
Average effect	0.442	0.439	0.391
	(0.239)	(0.284)	(0.293)
Effect for low-competition markets (1st decile)	0.413	0.435	0.383
	(0.267)	(0.306)	(0.321)
Effect for high-competition markets (10th decile)	0.469	0.444	0.400
	(0.216)	(0.263)	(0.268)
Ho: No heterogeneity (p-value)	0.6141	0.0063	0.0107
B. Long-term pass-through (steady-state):			
Average effect	0.754	0.720	0.719
	(0.045)	(0.043)	(0.048)
Effect for low-competition markets (1st decile)	0.559	0.563	0.582
	(0.133)	(0.088)	(0.103)
Effect for high-competition markets (10th decile)	0.951	0.908	0.864
	(0.100)	(0.121)	(0.079)
Ho: No heterogeneity (p-value)	0.0000	0.0000	0.0000
Observations	19,889	12,217	11,480
R-squared	0.488	0.465	0.492
Number of branches	431	255	240
Level controls (X)	Yes	Yes	Yes
Interaction terms (Z)	Yes	Yes	Yes
Double interaction control ($r \times BC \times Rating$)	Yes	Yes	Yes

Note: The model used for the results reported in this table includes interactions of r_t with a vector of explanatory variables Z. The specification is the following:

$$i_{b,m,t} = \sum_{l=1}^{L}[\alpha_l + \alpha_{Z,l}Z_{b,m,t}]i_{b,m,t-l} + \sum_{l=0}^{L}[\beta_l + \beta_{Z,l}Z_{b,m,t}]r_{t-l} + \gamma_{b,m} + \delta_{Z,l}Z_{b,m,t} + \delta X_{b,m,t} + \varepsilon_{b,m,t}$$

where $b = 1, \dots, B$ ($B =$ Total number of banks); $m = 1, \dots, M$ ($M =$ Total number of markets), $t = 1, \dots, T$ is a monthly time index for the period 2005:03-2010:03; $l = 1, \dots, L$ ($L = 6$; Total number of lags included). The model is estimated using a fixed effects estimator. The interaction term $BC_{m,t-l}$ is measured as the log of number of banks. A "low competition market" refers to markets in the first decile of BC. A "high-competition market" refers to markets in the tenth decile. "Ho: No heterogeneity" reports the p-value of jointly testing that all the corresponding heterogeneity coefficients are zero. These results do not change significantly for lags larger than 6. Standard errors, reported in parentheses, are clustered at the market level and are calculated using the delta method. *** p<0.01, ** p<0.05, * p<0.1.

TABLE 1.9: INTEREST RATE PASS-THROUGH AND THE EFFECT OF BANK COMPETITION

Branch-level fixed effects, different measures of bank competition

	(1) Log of number of banks	(2) Herfindahl index	(3) Share of 3 largest banks	(4) Market size	(5) Distance to compet-itive market
A. Short-term pass-through (one period):					
Average effect	0.442	0.429	0.439	0.449	0.454
	(0.239)	(0.240)	(0.237)	(0.227)	(0.223)
Effect for low-competition markets (1st decile)	0.413	0.311	0.414	0.461	0.825
	(0.267)	(0.287)	(0.243)	(0.227)	(0.324)
Effect for high-competition markets (10th decile)	0.469	0.486	0.476	0.356	0.328
	(0.216)	(0.218)	(0.232)	(0.241)	(0.267)
Ho: No heterogeneity (*p*-value)	0.6141	0.0763	0.3865	0.0185	0.3088
B. Long-term pass-through (steady-state):					
Average effect	0.754	0.716	0.717	0.713	0.713
	(0.045)	(0.060)	(0.057)	(0.064)	(0.062)
Effect for low-competition markets (1st decile)	0.559	0.575	0.640	0.709	0.612
	(0.133)	(0.133)	(0.081)	(0.070)	(0.085)
Effect for high-competition markets (10th decile)	0.951	0.804	0.839	0.749	0.753
	(0.100)	(0.049)	(0.072)	(0.070)	(0.109)
Ho: No heterogeneity (*p*-value)	0.0000	0.0000	0.0000	0.0020	0.0000
Observations	20,397	20,397	20,397	20,397	20,397
R-squared	0.488	0.487	0.487	0.487	0.486
Number of branches	431	431	431	431	431
Level controls (X)	Yes	Yes	Yes	Yes	Yes
Interaction terms (Z)	Yes	Yes	Yes	Yes	Yes
Double interaction control ($r \times BC \times Rating$)	Yes	Yes	Yes	Yes	Yes

Note: The model used for the results reported in this table includes interactions of r_t with a vector of explanatory variables Z. The specification is the following:

$$i_{b,m,t} = \sum_{l=1}^{L}[\alpha_l + \alpha_{Z,l} Z_{b,m,t}] i_{b,m,t-l} + \sum_{l=0}^{L}[\beta_l + \beta_{Z,l} Z_{b,m,t}] r_{t-l} + \gamma_{b,m} + \delta_{Z,l} Z_{b,m,t} + \delta X_{b,m,t} + \varepsilon_{b,m,t}$$

where $b = 1, \dots, B$ ($B =$ Total number of banks); $m = 1, \dots, M$ ($M =$ Total number of markets), $t = 1, \dots, T$ is a monthly time index for the period 2005:03-2010:03; and $l = 1, \dots, L$ ($L = 6$; Total number of lags included). The model is estimated using a fixed effects estimator. The interaction term $BC_{m,t-l}$ is measured by different measures as indicated in the first row of each column. A "low-competition market" refers to markets in the first decile of BC. A "high-competition market" refers to markets in the tenth decile. "Ho: No heterogeneity" reports the p-value of jointly testing that all the corresponding heterogeneity coefficients are zero. These results do not change significantly for lags larger than 6. Standard errors, reported in parentheses, are clustered at the market level and are calculated using the delta method. *** p<0.01, ** p<0.05, * p<0.1.

TABLE 1.10: INTEREST RATE PASS-THROUGH AND THE EFFECT OF BANK COMPETITION

Branch-level fixed effects (four lags)

	(1) Log of number of banks	(2) Herfindahl index	(3) Share of 3 largest banks	(4) Market size	(5) Distance to competitive market
A. Short-term pass-through (one period):					
Average effect	0.283	0.240	0.252	0.244	0.247
	(0.217)	(0.228)	(0.223)	(0.227)	(0.225)
Effect for low-competition markets (1st decile)	0.237	0.153	0.204	0.255	0.360
	(0.252)	(0.260)	(0.240)	(0.226)	(0.229)
Effect for high-competition markets (10th decile)	0.326	0.301	0.308	0.238	0.181
	(0.185)	(0.207)	(0.204)	(0.227)	(0.277)
Ho: No heterogeneity (p-value)	0.4460	0.1414	0.2022	0.0061	0.4197
B. Long-term pass-through (steady-state):					
Average effect	0.634	0.597	0.604	0.594	0.598
	(0.062)	(0.078)	(0.076)	(0.083)	(0.081)
Effect for low-competition markets (1st decile)	0.466	0.477	0.511	0.590	0.549
	(0.132)	(0.134)	(0.105)	(0.088)	(0.033)
Effect for high-competition markets (10th decile)	0.797	0.690	0.722	0.596	0.631
	(0.037)	(0.043)	(0.048)	(0.080)	(0.122)
Ho: No heterogeneity (p-value)	0.0000	0.0000	0.0000	0.0002	0.0000
Observations	21,078	21,078	21,078	21,078	21,078
R-squared	0.471	0.471	0.470	0.471	0.472
Number of branches	431	431	431	431	431
Level controls (X)	Yes	Yes	Yes	Yes	Yes
Interaction terms (Z)	Yes	Yes	Yes	Yes	Yes
Double interaction control ($r \times BC \times Rating$)	Yes	Yes	Yes	Yes	Yes

Note: The model used for the results reported in this table includes interactions of r_t with a vector of explanatory variables Z. The specification is the following:

$$i_{b,m,t} = \sum_{l=1}^{L} [\alpha_l + \alpha_{Z,l} Z_{b,m,t}] i_{b,m,t-l} + \sum_{l=0}^{L} [\beta_l + \beta_{Z,l} Z_{b,m,t}] r_{t-l} + \gamma_{b,m} + \delta_{Z,l} Z_{b,m,t} + \delta X_{b,m,t} + \varepsilon_{b,m,t}$$

where $b = 1, \dots, B$ ($B =$ Total number of banks); $m = 1, \dots, M$ ($M =$ Total number of markets), $t = 1, \dots, T$ is a monthly time index for the period 2005:03-2010:03; and $l = 1, \dots, L$ ($L = 4$; Total number of lags included). The model is estimated using a fixed effects estimator. The interaction term $BC_{m,t-l}$ is measured by different measures as indicated in the first row of each column. A "low-competition market" refers to markets in the first decile of BC. A "high-competition market" refers to markets in the tenth decile. "Ho: No heterogeneity" reports the p-value of jointly testing that all the corresponding heterogeneity coefficients are zero. Standard errors, reported in parentheses, are clustered at the market level and are calculated using the delta method. *** p<0.01, ** p<0.05, * p<0.1.

TABLE 1.11: INTEREST RATE PASS-THROUGH AND THE EFFECT OF BANK COMPETITION

Difference GMM estimator at the branch level

	(1) Fixed effects	(2) GMM
A. Short-term pass-through (one period):		
Average effect	0.442	0.452
	(0.239)	(0.110)
Effect for low-competition markets (1st decile)	0.420	0.476
	(0.260)	(0.135)
Effect for high-competition markets (10th decile)	0.463	0.430
	(0.221)	(0.124)
Ho: No heterogeneity (*p*-value)	0.614	0.734
B. Long-term pass-through (steady-state):		
Average effect	0.754	0.805
	(0.045)	(0.084)
Effect for low-competition markets (1st decile)	0.604	0.658
	(0.112)	(0.154)
Effect for high-competition markets (10th decile)	0.901	0.973
	(0.071)	(0.172)
Ho: No heterogeneity (*p*-value)	0.000	0.001
AR(1) (*p*-value)		0.000
AR(2) (*p*-value)		0.065
Hansen test of overidentification (*p*-value)		0.242
Number of instruments		432
Number of branches	443	459
Observations	20,397	15,338
Level controls (X)	Yes	Yes
Interaction controls (Z)		
$BC \times r$	Yes	Yes
$Rating \times r$	Yes	Yes
$BSS \times r$	Yes	Yes

Note: The model used for the results reported in this table includes interactions of r_t with a vector of explanatory variables Z. The specification is the following:

$$i_{b,m,t} = \sum_{l=1}^{L}[\alpha_l + \alpha_{Z,l}Z_{b,m,t}]i_{b,m,t-l} + \sum_{l=0}^{L}[\beta_l + \beta_{Z,l}Z_{b,m,t}]r_{t-l} + \gamma_{b,m} + \delta_{Z,l}Z_{b,m,t} + \delta X_{b,m,t} + \varepsilon_{b,m,t}$$

where $b = 1, \dots, B$ ($B =$ Total number of banks); $m = 1, \dots, M$ ($M =$ Total number of markets), $t = 1, \dots, T$ is a monthly time index for the period 2005:03-2010:03; and $l = 1, \dots, L$ ($L = 6$; Total number of lags included). The model is estimated using the GMM estimator suggested by Arellano and Bond (1991).The interaction term $BC_{m,t-l}$ is measured as the log of number of banks. A “low-competition market” refers to markets in the first decile of BC. A “high-competition market” refers to markets in the tenth decile. “Ho: No heterogeneity” reports the p-value of jointly testing that all the corresponding heterogeneity coefficients are zero. These results do not change significantly for lags larger than 6. Standard errors, reported in parentheses, are clustered at the market level and are calculated using the delta method. *** p<0.01, ** p<0.05, * p<0.1.

TABLE 1.12: INTEREST RATE PASS-THROUGH AND THE EFFECT OF BANK COMPETITION

Firm-level fixed effects (Firm FE)

	(1)	(2)	(3)	(4)	(5)
A. Short-term pass-through (one period):					
Average effect	0.740	0.691	0.692	0.693	0.694
	(0.061)	(0.062)	(0.062)	(0.062)	(0.062)
Effect for low-competition markets (1st decile)	0.719	0.661	0.663	0.671	0.671
	(0.064)	(0.065)	(0.065)	(0.065)	(0.065)
Effect for high-competition markets (10th decile)	0.755	0.711	0.712	0.708	0.710
	(0.062)	(0.063)	(0.062)	(0.063)	(0.063)
Ho: No heterogeneity (p-value)	0.399	0.333	0.397	0.589	0.521
B. Long-term pass-through (steady-state):					
Average effect	0.905	0.881	0.885	0.897	0.897
	(0.041)	(0.039)	(0.040)	(0.041)	(0.040)
Effect for low-competition markets (1st decile)	0.730	0.699	0.702	0.733	0.734
	(0.069)	(0.063)	(0.063)	(0.065)	(0.065)
Effect for high-competition markets (10th decile)	1.010	0.999	1.004	1.002	1.002
	(0.052)	(0.050)	(0.051)	(0.051)	(0.051)
Ho: No heterogeneity (p-value)	0.001	0.000	0.000	0.000	0.000
Observations	12,598	12,598	12,598	12,598	12,598
R-squared	0.579	0.587	0.590	0.590	0.590
Number of firms	352	352	352	352	352
Level controls (X)					
Branch FE	Yes	Yes	Yes	Yes	Yes
Inflation and industrial production	Yes	Yes	Yes	Yes	Yes
Portfolio (loan size, maturity, rating, collateral)		Yes	Yes	Yes	Yes
Interaction terms (Z)					
$BC \times r$	Yes	Yes	Yes	Yes	Yes
$Rating \times r$			Yes	Yes	Yes
$BSS \times r$				Yes	Yes
$Demand \times r$					Yes

Note: The model used for the results reported in this table includes interactions of r_t with a vector of explanatory variables Z. The specification is the following:

$$i_{b,m,t} = \sum_{l=1}^{L}[\alpha_l + \alpha_{Z,l}Z_{b,m,t}]i_{f,m,t-l} + \sum_{l=0}^{L}[\beta_l + \beta_{Z,l}Z_{f,m,t}]r_{t-l} + \gamma_{b,m} + \delta_{Z,l}Z_{b,m,t} + \delta X_{b,m,t} + \varepsilon_{b,m,t}$$

where $b = 1, \dots, B$ ($B =$ Total number of banks); $m = 1, \dots, M$ ($M =$ Total number of markets), $t = 1, \dots, T$ is a monthly time index for the period 2005:03-2010:03; and $l = 1, \dots, L$ ($L = 6$; Total number of lags included). The model is estimated using a fixed effects estimator. The interaction term $BC_{m,t-l}$ is measured as the log of number of banks. A "low-competition market" refers to markets in the first decile of BC. A "high-competition market" refers to markets in the tenth decile. "Ho: No heterogeneity" reports the p-value of jointly testing that all the corresponding heterogeneity coefficients are zero. These results do not change significantly for lags larger than 6. Standard errors, reported in parentheses, are clustered at the market level and are calculated using the delta method. ***p<0.01, **p<0.05, *p<0.1.

TABLE 1.13: INTEREST RATE PASS-THROUGH AND THE EFFECT OF BANK COMPETITION

Asymmetric effects between negative and positive changes of r

	Log of number of branches		Herfindahl index	
	Δr^-	Δr^+	Δr^-	Δr^+
Panel A. Long-term pass-through (steady state): full sample				
Average effect	0.640	1.021	0.617	1.028
	(0.057)	(0.050)	(0.054)	(0.049)
Effect for low-competition markets (1st decile)	0.536	0.865	0.574	0.896
	(0.101)	(0.082)	(0.091)	(0.070)
Effect for high-competition markets (10th decile)	0.743	1.171	0.654	1.132
	(0.094)	(0.073)	(0.088)	(0.064)
Ho: No heterogeneity (*p*-value)	0.002	0.079	0.000	0.000
Panel B. Long-term pass-through (steady state): Metropolitan areas excluding Mexico City				
Average effect	0.657	0.966	0.593	0.978
	(0.071)	(0.064)	(0.068)	(0.062)
Effect for low-competition markets (1st decile)	0.633	0.745	0.551	0.823
	(0.110)	(0.091)	(0.099)	(0.085)
Effect for high-competition markets (10th decile)	0.683	1.189	0.639	1.105
	(0.114)	(0.088)	(0.127)	(0.082)
Ho: No heterogeneity (*p*-value)	0.000	0.004	0.000	0.000

Note: The model used for the results reported in this table includes interactions of r_t with a vector of explanatory variables Z, and the double interaction of all variables affecting i_{t-1} and r_t with a dummy variable that A_t takes the value of one when the change in the monetary policy rate is positive.. The specification is the following:

$$i_{b,m,t} = \sum_{l=1}^{L}[\alpha_l^* + \alpha_{A,l}^* A_t] i_{f,m,t-l} + \sum_{l=0}^{L}[\beta_l^* + \beta_{A,l}^* A_t] r_{t-l} + \gamma_{b,m} + \delta_{Z,l} Z_{b,m,t} + \delta X_{b,m,t} + \mu A_t + \varepsilon_{b,m,t}$$

where $b = 1, \dots, B$ ($B =$ Total number of banks); $m = 1, \dots, M$ ($M =$ Total number of markets), $t = 1, \dots, T$ is a monthly time index for the period 2005:03-2010:03; and $l = 1, \dots, L$ ($L = 6$; Total number of lags included). The model is estimated using a fixed effects estimator. The interaction term $BC_{m,t-l}$ is measured as the log of number of banks. A "low-competition market" refers to markets in the first decile of BC. A "high-competition market" refers to markets in the tenth decile. "Ho: No heterogeneity" reports the p-value of jointly testing that all the corresponding heterogeneity coefficients are zero. These results do not change significantly for lags larger than 6. Standard errors, reported in parentheses, are clustered at the market level and are calculated using the delta method. ***p<0.01, **p<0.05, *p<0.1.

CHAPTER 2

2 Fiscal Policy and the Local Natural Resource Curse

2.1 Introduction

To which extent do local communities benefit from commodity booms? The question, of high policy relevance given rising commodity prices, has been subject to wide but inconclusive investigations. This paper utilizes new data on mining activity and government transfers in Peru to investigate the effect of mining and resource windfalls on socioeconomic outcomes at the district level, the lowest administrative unit in the country.[11]

Peru is entering its second decade of an impressive mining boom. After decades of relative stability, the value of mining exports more than doubled between 1993 to 2000, to 3.2 billion US dollars, and by 2010 exports rose again sevenfold to 21.7 billion US dollars, or 14 percent of the country's GDP. Local Governments are benefitting generously from mining activities: the central Government transfers to local authorities in mining departments a large share of the taxes levied on mining companies, in the context of an agreement that is commonly referred to as the *Canon Minero*. In 2007, the year of our analysis, the overall budget envelope of the *Canon* amounted to 5.1 billion Soles (approximately 1.6 billion US dollars).

Yet, despite these generous transfers, the dramatic expansion of mining activities has been accompanied by raising societal tensions, which have grown to become a major concern for

[11] In Peru, sub-national administrative units are called departments, provinces, and districts, in decreasing order of size.

policy makers. In 2009, the *Defensoría del Pueblo* (Ombudsman's office) reported 268 social conflicts in Peru, of which 38 percent were related to mining activities. Major confrontations involved violence and the use of firearms, leading to death and injuries among both protesters and police (Taylor, 2011). While many protesters cite environmental concerns, case studies suggest that the underlying reasons are often more complex, involving revenue sharing disputes between mining companies, local authorities, and local populations (Arellano-Yanguas, 2011). Poor management of the *Canon* also appears to add to the discontent (Hinojosa, 2011).

In this paper we use variation in mining across Peruvian districts to investigate the impact of mining activity and government transfers on local socioeconomic outcomes. The analysis uses a unique, district level dataset that merges administrative data on local mining production, transfers from central to local government, and census and survey-based measures of households' average consumption, poverty, and inequality.

Our empirical approach improves upon the existing literature in two related aspects. First, since we are able to identify the location where the mineral is extracted down to the lowest administrative level, we can estimate mining effects on socio-economic outcomes with greater local accuracy and specificity. Second, the precise identification of the location of mines allows us to conduct a thorough study of how far geographically the impacts of mining activity can be observed. This represents an improvement with respect to related studies, which have focused mainly on the aggregate impact over large regions of revenue windfalls derived from oil extraction. In contrast with mines, oil fields and oil wells tend to be spread over several local administrations, making necessary to conduct impact analyses at higher levels of aggregation

(Michaels, 2010). This runs the risk of missing some of the specific local effects and suffers from aggregation bias and greater measurement error (Caselli and Michaels, 2009).

Our identification strategy is based on comparing socioeconomic outcomes in districts where mines are located, with outcomes in neighboring or nearby districts of similar characteristics. Our premise is that, while economic and political factors may influence broad geographical patterns of mining activity, at lower administrative and geographic levels the location of a mine is primarily dictated by geological factors. By comparing neighboring or nearby districts we can therefore minimize omitted variables biases related to endogenous location decisions. Figure 2.1 reports the location of mining districts and provinces across the Peruvian territory. It shows that mining is concentrated in the Andean region and in the Amazon basin. To reduce potential omitted variable biases, we restrict therefore the analysis to departments that report mining activity and, given how much the capital differs from the rest of the country, we exclude the department of Lima from the sample. Our base sample consists, therefore, of 87 producing districts and 1195 non-producing districts spread over 142 provinces and 16 departments, with an average of 9 districts per province.

Several findings emerge. In 2007, the year of our analysis, average per capita expenditure in producing districts was around ten percent higher than in non-producing districts of the same province. Producing districts also faced around 2.5 percentage points lower rates of extreme poverty, and had 2.5 percentage points fewer households with basic needs uncovered. Illiteracy was also lower. When compared to non-producing districts in *other* provinces, impacts are larger: per capita expenditure in producing districts is 14 percent higher, and poverty rate is between three and four percentage points lower. We concentrate our analysis on 2007 because this is when the most recent census was conducted. The previous census had been done in 1993, that is, prior to the mining boom. When we use data corresponding to 1993, we find that mining districts did not exhibit any statistically significant difference with respect to otherwise similar districts, which reinforces the causal interpretation of the impacts of mining activity.

The benefits of mining activity, however, appear to be unevenly distributed. Consumption inequality, as captured by the Gini coefficient, increases in all districts of mining provinces and particularly in those where mining takes place. Moreover, benefits from mining appear to lead to higher inequality *across* districts, as its benefits are substantially higher in producing than in non producing districts, even those located in the same province.

Next, we conduct a series of alternative analyses to check robustness and enrich the interpretation of our basic results. First, to fully correct for differences in time invariant and 1993 characteristics between districts, we match samples of producing and non-producing districts by means of a propensity score, and test for differences in socioeconomic outcomes using a kernel matching estimator. The results are almost the same as in the benchmark specification. Second, we test the extent to which the magnitude (and not only the presence) of mining activity, measured by the log of the value of mineral production, affects socioeconomic outcomes. We find that larger mines have a stronger impact, both on welfare and inequalities.

Third, to investigate further the geographic impact of mining activity, we refine the spatial analysis and consider the *geographic* proximity of districts, as an alternative to the *administrative* (provincial) proximity in the benchmark specification. We use mapping software to identify direct neighbors of mining districts, as well as their second neighbors. Our findings remain basically unaffected: the positive impacts of mining activity decrease rapidly with (geographic) distance, while income inequality increases in both producing and non-producing districts.

Fourth, the localized impact of mining activity calls for an investigation of the impacts of mining revenues (i.e. the *Canon Minero*) that, to varying degrees, are distributed to all districts in mining departments (the highest subnational administrative level). Because producing districts also receive a higher share of the *Canon*, the specifications described up so far do not distinguish between the impacts from direct mining activity and the effects associated with higher local government revenues through the *Canon*. To overcome this issue, we exploit exogenous variation in the allocation rule of the *Canon* between producing districts, districts in producing provinces, and in non-producing provinces. Then, we control for socioeconomic characteristics that may affect the allocation of the *Canon* by instrumenting each district's mining revenues with the value of mining production at the district, province, and department levels. Once department fixed effects are accounted for, we do not find any significant impact from the *Canon*. This lack of impact is in line with some of the findings from oil extraction studies (Caselli and Michaels, 2009), and calls into question the usefulness of local revenue sharing agreements without accompanying them with strong monitoring and capacity building efforts (Bardhan and Mookherjee, 2006; Loayza, Rigolini and Calvo-Gonzalez, 2011).

Our findings add to an emerging literature that investigates the local impacts of commodities' extraction. How natural resources affect living standards has been subject to wide but inconclusive investigations. Early cross-country studies based on cross-sectional analyses (Sachs and Warner, 1995 and 2001) tend to find a negative association between natural resource abundance and economic growth, but studies exploiting both cross-sectional and times series variation find no effect, or even a positive one (Manzano and Rigobon, 2006; Raddatz, 2007). Institutional differences and the time span of the investigations (short vs. longer term) may explain in part these differences (Mehlum, Moene and Torvik, 2006; Collier and Goderis, 2007; van der Ploeg, 2011). Notwithstanding their contribution, cross-country studies have suffered from uneven data quality and limited treatment of omitted variables that may correlate with resource abundance.

More recent studies have attempted to solve some of these pitfalls by exploiting variation of commodity production within national boundaries. These studies have mostly focused on oil extraction. A pattern partly consistent with cross-country evidence is beginning to emerge. Michaels (2010) studies the impact of oil abundance in Southern US counties on long term development. He finds oil abundance to increase local employment, population growth, per capita income and quality of infrastructure.[12] In developing countries with inferior institutional settings, however, the picture seems to reverse. Caselli and Michaels (2009) look at the impact of backward linkages and revenue windfalls from oil production across municipalities of similar characteristics in Brazil. They find no impact on GDP, and despite higher reported municipal spending on a range of budgetary items, they find little impact on social transfers, public good provision, infrastructure, and household income. Moreover, Dube and Vargas (2006) find that higher oil prices in Colombia boost conflict over the ownership of resource production. Thanks to a greater ability to determine the location of mining activity and the use of different socioeconomic outcomes, our analysis considers the nuanced ability of commodity extraction to benefit local communities at large.

[12] At a higher level of aggregation, however, Papyrakis and Gerlagh (2007) find a negative US state-level correlation between resource extraction and growth.

Our findings also put in perspective the analysis of Aragon and Rud (2011), who observe a geographically widespread positive impact of the Yanacocha gold mine in Peru, the second largest in the world. The Yanacocha mine may represent a best case scenario for two reasons. First, its sheer size may extend its impact. Second, as Aragon and Rud (2011) observe, local living standards improved only after international shareholders put pressure on the mine to expand local procurement of its inputs, which calls again for accompanying revenue sharing agreements with institutional building.

Our analysis is also consistent with an emerging literature finding that local officials may handle revenues from commodity extraction differently than other transfers from the central Government, which do seem to positively affect human capital and reduce poverty (Litschig, 2008), even if they may foster corruption (Brollo et al., 2010). These differences may stem from a greater ability of local officials to capture commodity-related revenues, which may be particularly pronounced when citizens have little knowledge about their magnitude (Monteiro and Ferraz, 2009).

In conclusion, we find that mining activity has a positive effect on the average living standards of producing districts. Against this positive effect, however, we also find that the beneficial impact is accompanied by rising inequality both within and across districts, and that government transfers associated to mining revenues (i.e., the *Canon*) have little effect on poverty alleviation. This nuanced impact may well be at the center of the current social discontent regarding mining activities in the country. Solving this discontent may require a broader discussion and overarching institutional reforms that reach to the current decentralization structure, of which mining revenues are only one component (Loayza, Rigolini and Calvo-Gonzalez, 2011). We leave this discussion to further research.

The paper is organized as follows. Section 2 discusses in greater details the Peruvian mining panorama and the structure of the *Canon Minero*. Section 3 presents the data and empirical methodology. Section 4 presents the results, and Section 5 concludes.

2.2 Context

The Peruvian mining sector is experiencing a prolonged boom, with the value of mining-related exports having grown sevenfold in the period between 2001 and 2010, from 3,205 to 21,723 million US dollars. As of 2010, Peru was among the five largest producers of silver, zinc, tin, lead, copper, gold, and mercury in the world. In the same year, mineral exports accounted for 61 percent of total exports.

Mining has become an important source of government income. In an effort to decentralize these windfalls, Peru implemented a sharing scheme called the *Canon Minero*, by which the central Government shares fifty percent of all mining companies' corporate tax revenues with local governments in producing departments. This sharing agreement has been developed in the context of a broader decentralization process, which began in 2002 with the Constitutional reform. To avoid the fiscal crises that had plagued earlier episodes of decentralization in Latin America, decentralization in Peru was heavily anchored around fiscal neutrality (World Bank, 2003). The ability to borrow of sub-national Governments (which include department, province and district governments) was strictly limited by law, and the central Government imposed strong fiduciary requirements for spending (such as the need to submit proposals and receive clearance from the central Government for large capital investments). For districts, a law on participatory budgeting was also passed requiring local authorities, who are elected every four years, to consult each year with their constituency and civil society in planning the budget.

All districts in mining regions have limited ability to raise their own taxes. Thus, their investments in infrastructure and poverty alleviation programs depend on revenues transferred from the central Government. The main ones are the *Fondo de Compensación Municipal (FONCOMUN)*, and, since 2002, the *Canon Minero*. While the allocation rule of *FONCOMUN* favors remote and poor districts, the *Canon* is mainly allocated on the basis of mining production value. The *Canon*'s rule is as follows: 50 percent of mining tax revenues are distributed back to subnational governments; of this amount,10 percent goes directly to the corresponding producing district; 25 percent is distributed among all districts in a producing province; 40 percent is distributed among all districts in a producing department; and the remaining 25 percent is transferred to departmental Governments and universities.[13] Apart from the 10 percent transferred directly to producing districts, the allocation of the Canon across all (producing and non-producing districts) also depends on district characteristics that include socioeconomic conditions.

Before the implementation of the *Canon*, *FONCOMUN* represented the main sources of revenues for most districts. However, as a result of Peru's mining boom, the *Canon* has grown substantially, particularly for districts in producing regions. In 2007, the year of our analysis, *FONCOMUN* represented 32.9 percent of districts' budget and the *Canon* 21.4 percent

[13] Districts are the smallest administrative entity in Peru. A group of districts forms a province and a group of provinces forms a Department. Peru is divided in 25 Departments, 195 Provinces, and 1841 districts.

(excluding the Department of Lima). The correlation between the amount of FONCOMUN received from the start of decentralization until the years of our analysis (2002-2006), and being a mining district, is statistically insignificant, hence there may be little crowding out of other Government transfers from the *Canon*. Accordingly, we shall find that controlling for additional transfers from the central Government does not affect the results.

2.3 Data and Methodology

Our outcome variables are a set of district-level living standards measurements for 2007: average per capita expenditure, the poverty and extreme poverty headcount indexes, a measure of uncovered basic necessities, the illiteracy rate, and the Gini coefficient of consumption inequality.

We collect living standard measurements that are representative at the district level by drawing directly from the 1993 and 2007 Censuses and from a poverty map developed by the Peruvian Statistical Institute that combines data from the 2007 Census with 2007 household survey data from the *Encuesta Nacional de Hogares sobre Condiciones de Vida* (INEI, 2009). The advantage of using districts as our unit of analysis is that they are also the smallest administrative unit where the location of a mine can be identified.

In the analysis, we introduce two sets of explanatory variables: variables related to the location and magnitude of mining activity, and control variables. In line with the distribution formula of the *Canon*, and using plant-level mining data from the Peruvian Ministry of Energy and Mining, we distinguish between three types of districts within mining departments:[14] *producing districts*, which hosted a mining facility during 2004-2006; *non-producing districts in producing provinces*, which, despite not hosting any mining activity, receive a larger share of the *Canon* than districts in provinces where there is no mining production; and *non-producing districts in non-producing provinces*, which still receive a share, albeit the smallest, of the *Canon* because they are located in a producing department. Our final sample consists of 87 producing districts, 453 non-producing districts in producing provinces, and 742 non-producing districts in non-producing provinces (Table 2.2).

For all districts, we use information about the amount of *Canon* they received during 2002-2006; the amount of other Government transfers during 2002-06; and the value of mineral production at the district and province level during the same period.[15] In addition, we also use in the analysis time invariant district characteristics such as altitude, area, and the location of provincial capitals, and district socioeconomic characteristics from the 1993 Census, prior to the mining boom (for more details, see Table 2.1).

Table 2.2 presents summary statistics of these three groups of districts. Of interest are the two socioeconomic outcomes for which we have information in both 1993 and 2007: illiteracy and basic necessities uncovered. Overall, in 1993, producing districts seemed to display a slightly higher literacy rate than non producing districts; however this difference disappears once we control for basic district characteristics (Table 2.3). And there are no significant

---

[14] We exclude from the analysis the department of Lima, and departments where no mining activity has taken place during 2002-06.

[15] The value of production at the district level is the log of (one plus the) accumulated dollar value of mineral production by all mining facilities within the district, as reported by the Ministry of Energy and Mining (MINEM) for the period 2002-2006. The mineral prices used are the average annual prices per mineral reported by MINEM for the same period.

differences regarding the index of basic necessities uncovered between producing and non producing districts. Of the control variables, the only major difference between producing and non-producing districts is regarding geographic area: on average, producing districts have twice the square kilometers than their non-producing counterparts. While at first sight the difference can appear surprising, the selection of larger districts is consistent with random location of mineral abundance across the provincial territory, as larger districts have a higher probability of including a mine. Nevertheless, since size may correlate with potential unobserved district characteristics, in the analysis we control for it.

2.3.1 Methodology

Our identification relies upon comparing producing and non-producing districts that are spatially close and institutionally similar. We do so by means of several exercises. Our baseline case considers all districts from departments with mining activity (excluding the department of Lima), and compares socioeconomic outcomes of producing districts with, in turn, outcomes of non-producing districts in non-producing provinces and outcomes of non-producing districts in the same province of each mining district. We use information from the 1993 Census to control for district characteristics in 1993, prior to the mining boom, so that our baseline regression is as follows:

$$y_{pd} = \alpha + \beta_0 \mathbb{I}_{pd}[PD] + \beta_1 \mathbb{I}_{pd}[NPDPP] + \beta_2 X_{pd} + \nu_d + \nu_p + \varepsilon_{pd} \qquad (1)$$

where p denotes the province, d the district, $\mathbb{I}_{pd}[PD]$ a binary variable that takes a value of one if the district is producing, $\mathbb{I}_{pd}[NPDPP]$ a binary variable that takes a value of one if the district is non-producing in a producing province, X_{pd} a set of time invariant and 1993 district characteristics, and $\nu_d, \nu_p, \varepsilon_{pd}$ department, province, and district error terms.

Under this specification, we consider two types of "treatment" districts: producing districts and non-producing districts in producing provinces; and one type of "control districts": non-producing districts in non-producing provinces. Therefore, without province fixed effects, the estimates of β_0 and β_1 refer to the respective impacts on the two types of treatment districts with respect to control districts. When we introduce province fixed effects, however, the dummy $\mathbb{I}_{pd}[NPDPP]$ (associated with β_1) drops out, and the estimate of β_0 refers to the additional impact on producing districts with respect to non producing districts in the same province.

Using the specification in (1), we first perform a diagnostic analysis to check the possibility of pre-treatment differences. Drawing from the 1993 Census, we use the 1993 district averages of illiteracy rate and index of basic necessities uncovered (the two dependent variables for which information is available for 1993) and test whether, everything else being equal, the two treatment and one control sets of districts had statistically different levels before the mining boom. Then, we perform a set of exercises to evaluate the impact of the treatment. In the benchmark exercise, we estimate regression (1) by Ordinary Least Squares (OLS) using outcome variables corresponding to 2007.

Next, as an alternative to correct for differences in observed characteristics between mining and non mining districts, we use a matching procedure based on time invariant and 1993 characteristics (which precede the mining boom). Specifically, we match producing districts with various subsamples of non-producing districts of similar characteristics using a propensity score built upon a probit regression (Table 2.5). The matching variables are, at the district level, the percentage of households without electricity in 1993; the illiteracy rate in 1993; the log of population in 1993; the percentage of urban population in 1993; the log of the area in square kilometers; and department dummies. We then estimate the Average effect of Treatment on the Treated (ATT) using an Epanechnikov Kernel with a bandwidth of 0.2. We obtain standard errors through bootstrapping, using 100 repetitions.

We then extend the analysis along three important dimensions. First, we go beyond average effects by exploring whether varying magnitudes of mining activity affect socioeconomic indicators differently. We do so by substituting $\mathbb{I}_{pd}[PD]$ in Equation (1) with the log of (one plus) the cumulated value of mineral production in each district between 2002 and 2006. Similarly, we substitute $\mathbb{I}_{pd}[NPDPP]$ with the log of (one plus) the value of mineral production in other districts of the corresponding province between 2002 and 2006.

Second, we refine the spatial analysis by considering the *geographic* proximity between districts, instead of *administrative* proximity (determined by whether districts belong to the same province). Specifically, we use mapping software to identify direct neighbors of mining districts, as well as their second and higher order neighbors. We then run the following regression specification:

$$y_{pd} = \alpha + \beta_0 \mathbb{I}_{pd}[PD] + \beta_1 \mathbb{I}_{pd}[First\ Neighbor] + \beta_2 X_{pd} + \nu_d + \nu_p + \varepsilon_{pd} \qquad (2)$$

where $\mathbb{I}_{pd}[First\ Neighbor]$ is a dummy variable that takes the value of one if a non producing district shares a border with a producing district. Under this specification, the omitted districts (the control group) are the second and higher order neighbors (i.e., non-producing districts that are not first neighbors). This approach can be useful in two aspects.

One, by focusing attention on districts that share borders and are thus more likely to be similar, it helps addressing further potential omitted variable biases. Two, it allows exploring how much geographic proximity, as opposed to administrative proximity, matters for reaping the benefits of a mine. Specifically, while under specification (1) all non-producing districts in producing provinces are treated as equals, specification (2) distinguishes between first and higher order neighbors, treating them differently even when province fixed effects are introduced.

Finally, we conclude the analysis by attempting to isolate the impact of the *Canon* from the direct effect of the mining activity. For that purpose, we run the following specification:

$$y_{pd} = \alpha + \beta_0 \mathbb{I}_{pd}[PD] + \beta_1 \mathbb{I}_{pd}[NPDPP] + \beta_2 \text{Log}(Canon_{pd}) + \beta_3 X_{pd} + \nu_d + \nu_p + \varepsilon_{pd} \quad (3)$$

where $Canon_{pd}$ represents the government transfers related to mining revenue received by each district during 2002-2006. Because the Canon's attribution rule does factor in socioeconomic indicators for the provincial and departmental allocations, we instrument the amount of Canon received by each district with three variables: the log of (one plus) the value of the mineral extracted in each district, province and department between 2002 and 2006.

2.4 Results

We begin the analysis by considering the possibility of preexisting differences between producing and non-producing districts. In particular, we test whether socioeconomic outcomes in 1993 differ between districts where a mine was active during 2002-2006 and districts with no mining activity. The socioeconomic outcomes under consideration are the illiteracy rate and the index of basic necessities uncovered, the two variables for which we have information for 1993.

Results are shown in Table 2.3. The results corresponding to each outcome variable are organized by rows, with columns assigned to different regression specifications and comparison groups. The comparison groups are defined according to whether or not we include in the regressions department and province dummies. In regression (1), the comparison group consists of all non-producing districts in non-producing provinces. In regression (2), the comparison group is restricted to non-producing districts in non-producing provinces within the same producing department. Finally, in regression (3), we compare producing and non-producing districts in the same province. In all cases, we control for time-invariant district characteristics (provincial capital, log of area, and log of altitude), and district characteristics obtained from the 1993 Census (log of total population, share of rural population, and share of households without electricity).[16] Results are encouraging. While there are differences in the 1993 raw means between producing and non-producing districts, once we introduce department fixed effects, all differences disappear except one. The only statistically significant difference that remains is among non-producing districts, where the ones located in producing provinces seem to display lower levels of basic necessities uncovered than those in non producing provinces. However, once we add province fixed effects, comparing producing and non-producing districts in the same province, all differences disappear. Overall, results in Table 2.3 suggest that in 1993, prior to the mining boom,

[16] Observe that, when we look at 1993 outcomes, the analysis may suffer from reverse causality biases. We shall however not devote efforts to attempt to correct for these biases since the core of our analysis deals with outcomes in 2007, where a clear causal relation can be asserted. Moreover, to correct for such biases we would need to use data on district characteristics prior to 1993, which are unavailable.

producing and non-producing districts did not differ in a statistically significant manner (conditional on the same controls used for the 2007 analysis).

With these results in hand, we move to analyzing whether the mining boom had any impact on mining districts, and how that impact may have trickled down to neighboring districts. In Table 2.4 we repeat the analysis of Table 2.3 except that now we use 2007 outcome variables and control for all 1993 variables (including district averages of the illiteracy rate and the index of basic necessities uncovered). In some specifications we also control for the amount of government transfers other than the *Canon* (in logs, accumulated during 2002-06). This is to account for potential transfers aimed at compensating districts that are not favored by the distribution formula of the *Canon*. It turns out that in all regressions the inclusion of other government transfers makes virtually no difference on the outcome variables, and therefore we will devote little time to discussing it.

Regression (1) in Table 2.4 suggests that in 2007 all districts in producing provinces had better socioeconomic outcomes than their counterparts in non-producing provinces: β_0 is always significantly different from zero, and β_1 in all but two cases. The signs of these coefficients indicate that districts in mining provinces show higher average per capita expenditures; lower rates of poverty and extreme poverty (the latter for producing districts only); fewer households with basic necessities uncovered; and lower illiteracy rates (producing districts only). At the same time, districts in producing provinces exhibit higher consumption inequality, as measured by a higher Gini coefficient.

When we refine the control group and introduce department fixed effects (regression (2)), the differences between producing districts and districts in non producing provinces (β_0)

remain large and significant: on average, households in producing districts display 14 percent higher per capita expenditures, poverty rates are between 3 and 4 percentage points lower, there are 4 percentage points fewer households with basic necessities uncovered, and illiteracy rates are 1.6 percentage points lower.[17] These beneficial impacts contrast with those regarding consumption inequality: the Gini coefficient in producing districts is higher by 1 percentage point than in districts of non producing provinces. Note that controlling for other Government transfers, in regression (3), has almost no effect on the coefficients.

Controlling for department fixed effects does change however the results regarding the comparison between non-producing districts (β_1). Non-producing districts in producing provinces do not exhibit anymore a difference with respect to districts in non producing provinces of the same department. The only difference that remains significant is regarding consumption inequality, which is higher by 0.7 percentage points of the Gini. Again, controlling for other Government transfers, in regression (3), does not change the picture.

In regressions (4) and (5) we compare producing districts with non-producing districts *in the same province* by introducing province fixed effects. While such a comparison minimizes omitted variables biases, it also changes the nature of the comparison because, by introducing province fixed effects, we drop the control group and evaluate the differential impact of mining activity between the two treatment groups. The results show marked differences in the impact of mining activity even within producing provinces: producing districts display better socioeconomic outcomes along all the dimensions we explore, but also higher consumption

[17] Observe that the last two estimates show the net impact after controlling for their 1993 levels.

inequality (differences in the Gini coefficient, however, are now significant only at the 10 percent level).

The results tell a clear and consistent story. First, mining activity has a positive and statistically significant impact on socioeconomic outcomes. The impacts are substantially larger in producing districts than in their neighbors, however. Spillovers beyond the producing districts may occur but not enough to equalize the impact; in fact, socioeconomic outcomes between non-producing districts in producing and non-producing provinces differ only slightly. Second, mining activity, while improving welfare and reducing poverty, also brings higher inequality, both within districts *and* across districts in the same province and department. Finally, considering Government transfers other than the *Canon* (i.e., *Foncomun*) does not seem to affect the impact of mining and related transfers, which suggests that these other transfers do not compensate for the advantaged condition of producing districts.

The remainder of the paper deals with the robustness of these results, and expands the analysis along some important dimensions. In Table 2.5, we adopt an alternative approach to fixed effects to cope with omitted variables biases and test if our results hold under propensity score matching techniques.[18] With small differences, all our findings hold through: when we use the full sample of 1282 districts (comparison 3), producing districts display higher socioeconomic outcomes than non-producing districts, but also display higher inequality. However, when we only select sub-samples of these districts for the comparison, small differences emerge. In columns (1) and (2), we compare producers with non-producers in non-

[18] We use department dummies as one of the variables on which we base the propensity score – see Table 2.5. To avoid sample selection biases, we estimate differences in means using the full sample of districts, but the results are almost identical if we restrict the analysis to the common support.

producing provinces and in the same province, respectively. In both cases results weaken for poverty and extreme poverty. Moreover, when we compare producers with non-producers in the same province (comparison 2), the inequality differences are no longer significant. Finally, in column (4) we restrict the analysis to non-producing districts only. In accordance with the OLS results, no differences subsist between districts in producing and those in non-producing provinces *except* for higher inequality.

In Table 2.6, we go beyond average mining effects and study whether the *magnitude* of mining activity affects socioeconomic outcomes. We measure the magnitude of mining activity in a given district as (the log of one plus) the value of mining production in the district between 2002 and 2006; similarly, we measure mining activity in a province as (the log of one plus) the value of mining production in the province between 2002 and 2006.[19] We then replace the dummies in Equation (1) with these two variables.

Results in Table 2.6 look almost identical than under average effects. However, their interpretation remains more nuanced, since the *magnitude* of mining activity now matters. In regressions (2) and (3), with department dummies, an increase in district-level mining activity leads to better socioeconomic outcomes, even when correcting for other Government transfers per capita. At the same time, higher mining activity also leads to higher inequality. On the other hand, similarly to the results reported in Table 2.4, for a non-producing district the value of production in other districts in the province does *not* affect any socioeconomic outcome apart from raising inequality. Such a result may come as a surprise since higher production in a province is associated with higher *Canon* transferred to all districts in that

[19] To avoid double counting, for each district we subtract from this last variable the value of production in the district itself.

province, and suggests a rather weak effect of the *Canon* – something that we explore below in greater details. In regressions (4) and (5) we compare districts within provinces. The results are similar but somewhat weaker than in the regressions with average effects of Table 2.4. While higher values of production affect positively socioeconomic outcomes (and, again, also lead to higher inequality), the estimates for poverty and extreme poverty, while keeping the correct sign, are now statistically insignificant.

In Tables 2.7 to 2.9 we refine the analysis along the geographical dimension, following Equation (2). Using mapping software, we identify direct (i.e. first) neighbors of producing districts, as well as higher-order neighbors (i.e., districts that are not direct neighbors of producing districts). We then study the extent to which socioeconomic outcomes vary with geographic distance, as opposed to administrative location. This approach allows us to compare, among other things, producing districts with their first and higher-order neighbors *within producing provinces*, reducing further the possibility of omitted variable biases.

Table 2.7 reports differences in socioeconomic outcomes between producing districts and their higher-order neighbors. The picture that emerges, as well as the magnitude of the estimates, remains very similar to the analysis in Table 2.4. Along all the dimensions we analyze, producing districts show better socioeconomic outcomes but display also higher consumption inequality. When we introduce province fixed effects, the estimate of extreme poverty loses significance, but all other estimates remain significant.

Table 2.8 reports differences between first and higher-order neighbors of producing districts. Here as well, in full similarity with the administrative analysis, there are no significant differences in socioeconomic outcomes. First neighbors seem to display a lower proportion of people with basic necessities uncovered, but the difference becomes insignificant once we add province fixed effects. The main difference with the administrative analysis of Table 2.4 is that we do not observe differences in inequality between first and higher-order neighbors.

Finally, Table 2.9 compares, by means of a Wald test on $(\beta_0 - \beta_1)$, differences in socioeconomic outcomes between producing districts and their first neighbors. Because of its novelty with respect to the analysis in Table 2.4, we focus the description on regressions (4) and (5), where we introduce province fixed effects. Even within provinces, producing districts display higher average per capita expenditures, lower rates of extreme poverty, lower illiteracy rates, and higher inequality than their first neighbors. The geographic analysis confirms therefore that the benefits of mining activity accrue substantially more in producing districts, and that mining tends to increase inequalities within and across districts.

To conclude, in Table 2.10 we attempt to isolate the impact of the *Canon* from the direct effect of mining activities. We correct for direct effects unrelated to the *Canon* by introducing dummies for producing districts and non-producing districts in producing provinces. We then add separately the (log of) the *Canon*, as per Equation (3). To account with the fact that part of the *Canon* is allocated based on socioeconomic outcomes, we instrument it using (the log of one plus) the value of production at the district, province, and department levels. Once we introduce department dummies, we find that the *Canon* raises average per capita expenditure but has no significant impact on other socioeconomic outcomes. The limited impact of the *Canon* is consistent with the observed challenges districts are facing to manage large transfers from the central Government, which have been scaled up in the context of the 2002 decentralization process (Loayza, Rigolini and Calvo-Gonzalez, 2011). This apparent shortcoming calls for reforming the way in which producing regions should share the benefits from mining activity.

2.5 Conclusions

Mining activity has had a positive impact on local communities. Mining has brought higher levels of average income, lower poverty, fewer households with basic necessities uncovered, and lower illiteracy rates. The high level of disaggregation of our analysis, and the various checks we perform, indicate that these effects can be interpreted causally. Why, then, is mining creating so much discontent and conflict?

Our analysis highlights several aspects of mining that may counteract its benefits, and which may be at the source of the observed societal tensions. First, the positive impact of mining activity appears to differ between producing districts, and their neighbors. Our analysis consistently points out that districts where the mines are located have substantially better socioeconomic outcomes than their neighbors do. This is the case even with respect to districts located in the same province, which in principle should also strongly benefit from mining through positive spillovers and generous transfers through the *Canon*. Second, mining is not only generating higher inequalities across districts (with producing districts benefitting the most), but is also generating an increase in district-level inequality that extends beyond producing districts, and reaches their non producing neighbors. Not everybody is thus benefitting as much from mining. Finally, despite their generosity, and reflecting a trend that is emerging in many countries (Caselli and Michaels, 2009), the redistributive arrangements that have been put in place to share the revenues from mining with local communities have had only a limited impact on social outcomes, increasing average expenditures but having a weaker impact on poverty alleviation.

While our analysis provides a comprehensive picture of the local social effects of mining activity, it remains however incomplete regarding their mechanisms. One aspect that deserves further attention is the extent to which migration of people in and out of mining areas is affecting socioeconomic outcomes. Our findings, for instance, are consistent with mining attracting more skilled workers, who may help improving socioeconomic outcomes, but at the same time may also raise inequality. General equilibrium price effects could also drive the poorest households out of mining districts, thus leading to the same measured result. We leave the exploration of these issues for future research

Figures and Tables

FIGURE 2.1: MINERAL PRODUCTION IN PERU (EXCLUDING LIMA), 2007

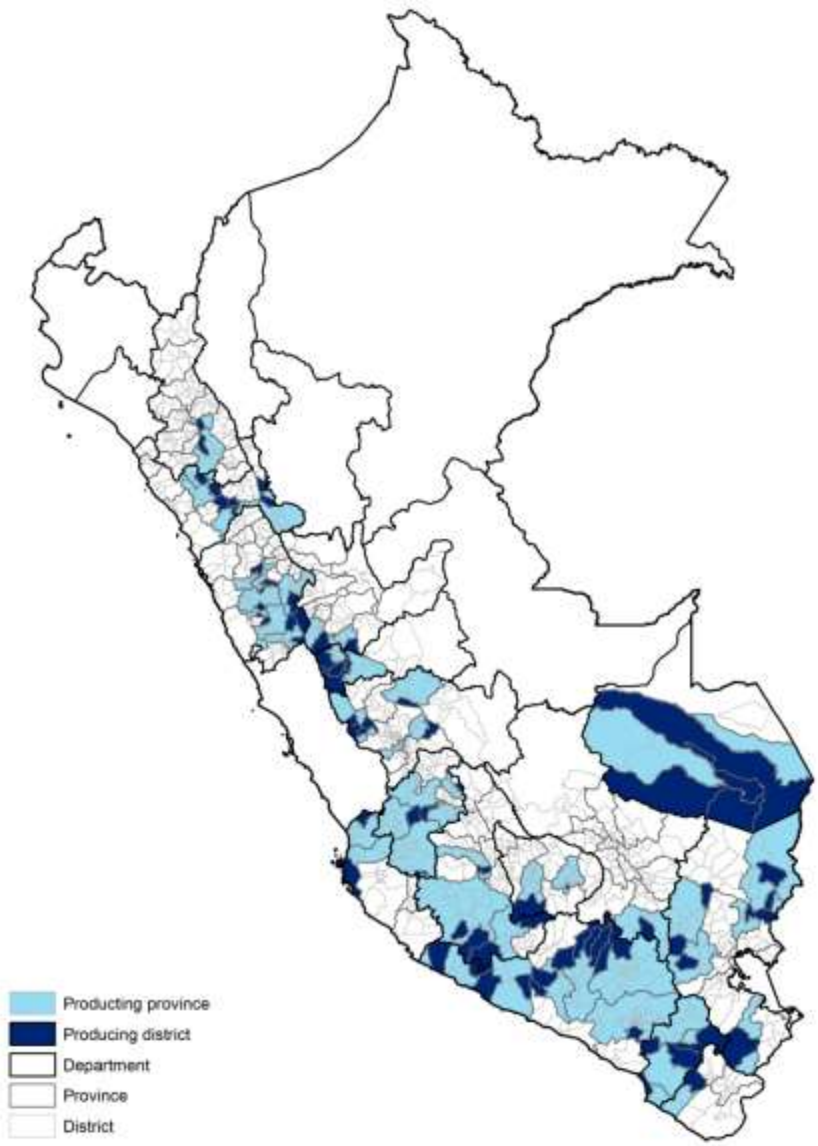


TABLE 2.1. VARIABLES DEFINITIONS AND SOURCES

	Origin	*Source*
Outcome Variables		
Average Per Capita Monthly Expenditures in 2007 (Soles)	*2007 Poverty Map*	INEI (2009)
% Population under Poverty Line in 2007 The poverty line is the minimal amount of money needed by an individual to buy goods and services to satisfy basic needs The poverty line varies by Department and urban/rural geographic areas.	*2007 Poverty Map*	INEI (2009)
% Population under Extreme Poverty Line in 2007 The extreme poverty line is the minimal amount of money needed by an individual to satisfy basic food needs The extreme poverty line varies by Department and urban/rural geographic areas.	*2007 Poverty Map*	INEI (2009)
% Population with Basic Needs Uncovered in 2007 A household is deemed to have basic needs uncovered if at least one of the following holds: inadequate or excessively crowded housing, lack of sewage, at least one school aged child does not attend school, unskilled household head with high dependency ratio.	*2007 Census*	National Statistical Institute (INEI)
Illiteracy in 2007 (% of population older than 15 years old)	*2007 Census*	INEI
Expenditure Gini Coefficient in 2007	*2007 Poverty Map*	INEI (2009)
Population in 2007	*2007 Census*	INEI
Control Variables		
1993 Control Variables	*2003 Census*	INEI
Producing Districts Dummy variable that takes the value of one for all districts where there was production of any tax paying mineral (mainly copper, gold, and silver) between 2002 and 2006	*Administrative Data*	Peruvian Ministry of Energy and Mining (MINEM)
Non-Producers in Producing Provinces Dummy variable that takes the value of one for Non-Producing Districts in a province where there is at least one Producing District.	*Administrative Data*	MINEM
Non-Producers in Non-Producing Provinces Dummy variable that takes the value of one for Non-Producing Districts in a Non-Producing Province in a Department where there is at least one Producing District.	*Administrative Data*	MINEM
Value of Mineral Production in a Producing District Accumulated dollar value of mineral production by all mining facilities within a district as reported by the Ministry of Energy and Mining (MINEM) for the period 2002-2006. The mineral prices used are the average annual prices per mineral reported by MINEM for the same period.	*Administrative Data*	MINEM
Value of Mineral Production in Producing Provinces For each district it is the sum of the value of production between 2002-2006 at the province level, excluding (if applicable) the value of mineral production realized within a district's own boundaries.	*Administrative Data*	MINEM
Canon Minero Accumulated per capita revenues from the *Canon Minero* between 2002-2006 in soles.	*Administrative Data*	Peruvian Ministry of Economy and Finance (MEF)

TABLE 2.2. SUMMARY STATISTICS
MEAN COMPARISON OF OUTCOME AND CONTROL VARIABLES BY GROUPS

	(1) Producers	(2) Non-Producers in Producing Provinces	(3) Non-Producers in Non-Producing Provinces
Outcome Variables			
Average Per Capita Monthly Expenditures in 2007 (Soles)	346.32	285.36	213.6
	(504.49)	(1228.86)	(111.00)
% Pop. under Poverty Line in 2007	54.22	62.3	63.9
	(23.09)	(21.48)	(21.93)
% Pop under Extreme Poverty Line in 2007	24.50	31.3	31.4
	(19.49)	(21.03)	(19.73)
% Pop with Basic Necessities Uncovered in 2007	25.33	29.0	31.2
	(9.55)	(13.18)	(12.09)
Illiteracy in 2007 (% of population older than 15 years old)	11.66	15.4	16.5
	(8.43)	(8.68)	(8.85)
Gini in 2007	0.30	0.3	0.3
	(0.04)	(0.04)	(0.04)
Control Variables			
Altitude (meters)	2868.13	2902.90	2,600.0
	(1185.08)	(930.15)	(1210.33)
Area(square kilometers)	1039.42	422.7	437.5
	(2697.44)	(769.39)	(1147.47)
Provincial Capital Dummy	0.11	0.09	0.13
	(0.32)	(0.28)	(0.33)
Population Density in 1993(population per square kilometer)	98.74	86.74	122.05
	(513.37)	(540.85)	(845.21)
% of Rural Population in 1993	57.93	60.00	63.03
	(31.09)	(30.69)	(37.24)
% Pop with Basic Necessities Uncovered in 1993	79.88	82.73	81.48
	(19.45)	(18.32)	(18.48)
% of Households without Electricity in 1993	67.24	76.6	75.1
	(30.26)	(28.03)	(29.02)
Illiteracy in 1993 (% of population older than 15 years old)	21.56	25.3	26.4
	(12.45)	(13.20)	(13.60)
Accumulated Other Gov. Transfers per capita in soles (2002-2006)	1146.45	1337.79	1092.78
	(1084.13)	(1271.60)	(859.17)
Accumulated Canon Minero per capita in soles (2002-2006)	715.60	434.9	182.2
	(1976.69)	(1345.44)	(320.72)
Observations	87	453	742

Note: the sample consists of all districts in producing departments excluding districts of the department of Lima. Standard deviations are reported in parentheses below each mean.

TABLE 2.3. OLS: SAMPLE OF ALL DISTRICTS IN PRODUCING DEPARTMENTS EXCLUDING LIMA

IMPACT OF PRODUCING DISTRICTS AND NON-PRODUCING DISTRICTS IN PRODUCING PROVINCES

	Producers vs Non-Producers in Non-Producing Provinces (β_0)		*Non-Producers in Producing Provinces vs Non-Producers in Non-Producing Provinces (β_1)*		*Producers vs Non-Producers in the same Province(β_0)*
	(1)	(2)	(1)	(2)	(3)
Dependent Variable					
A) % Pop with Basic Necessities Uncovered in 1993	-1.81	-0.63	-2.19***	-1.31*	-0.86
	(1.37)	(1.33)	(0.78)	(0.76)	(1.24)
B) Illiteracy (% of Population) in 1993	-3.76***	-1.90	-1.91***	-1.02	-0.79
	(1.31)	(1.33)	(0.69)	(0.70)	(1.23)
Controls					
Provincial Capital Dummies, Log of Area, and Log of Altitude	YES	YES	YES	YES	YES
Log of Population in 1993	YES	YES	YES	YES	YES
% of Rural Population in 1993	YES	YES	YES	YES	YES
% of Households without Electricity in 1993	YES	YES	YES	YES	YES
Department Dummies	-	YES	-	YES	-
Provincial Dummies	-	-	-	-	YES
Observations	1282	1282	1282	1282	1282

Note: Each row in the table reports the coefficients β_0 and β_1 of Equation (1) for different dependent variables. The numbers above each column characterize a specific regression that varies in the set of controls included. In this model β_0 reports the impact of producing districts against the omitted category, and β_1 reports the impact of non-producing districts in producing provinces. The omitted category is non-producing districts in non-producing provinces for regressions (1) and (2), and non-producing districts in producing provinces for regression (3). Robust Standard Errors are reported in parentheses below each coefficient. *** p<0.01, ** p<0.05, * p<0.1.

TABLE 2.4. OLS: SAMPLE OF ALL DISTRICTS IN PRODUCING DEPARTMENTS EXCLUDING LIMA

IMPACT OF PRODUCING DISTRICTS AND NON-PRODUCING DISTRICTS IN PRODUCING PROVINCES

	Producers vs Non-Producers in Non-Producing Provinces (β_0)			*Non-Producers in Producing Provinces vs Non-Producers in Non-Producing Provinces (β_1)*			*Producers vs Non-Producers in the same Province(β_0)*	
	(1)	(2)	(3)	(1)	(2)	(3)	(4)	(5)
Dependent Variable								
A) Log of Average Per Capita Expenditures in 2007	0.199***	0.140***	0.138***	0.055***	0.009	0.008	0.108***	0.109***
	(0.046)	(0.043)	(0.042)	(0.020)	(0.014)	(0.014)	(0.041)	(0.041)
B) % Pop. under Poverty Line in 2007	-6.406***	-3.993***	-3.808***	-2.282***	-0.547	-0.483	-2.529*	-2.685*
	(1.778)	(1.516)	(1.511)	(0.861)	(0.738)	(0.731)	(1.478)	(1.454)
C) % Pop under Extreme Poverty Line in 2007	-3.748**	-3.252***	-3.108***	-0.388	-0.382	-0.332	-2.318*	-2.450*
	(1.779)	(1.374)	(1.384)	(0.925)	(0.790)	(0.784)	(1.344)	(1.330)
D) % Pop with Basic Necessities Uncovered in 2007	-4.972***	-4.193***	-4.267***	-2.092***	-0.98	-1.005	-2.422*	-2.371*
	(1.199)	(1.302)	(1.308)	(0.771)	(0.823)	(0.826)	(1.362)	(1.360)
E) Illiteracy in 2007 (% of population older than 15 years old)	-2.05***	-1.584***	-1.556***	-0.349	0.1580	0.168	-1.588***	-1.615***
	(0.475)	(0.492)	(0.499)	(0.282)	(0.300)	(0.300)	(0.549)	(0.550)
F) Gini in 2007	0.017***	0.009***	0.009***	0.01***	0.007***	0.007***	0.006*	0.006*
	(0.004)	(0.003)	(0.003)	(0.002)	(0.001)	(0.001)	(0.003)	(0.003)
Controls								
Provincial Capital Dummies, Log of Area, and Log of Altitude	YES	YES	YES	YES	YES	YES	YES	YES
Log of Population in 1993	YES	YES	YES	YES	YES	YES	YES	YES
% of Rural Population in 1993	YES	YES	YES	YES	YES	YES	YES	YES
% Pop with Basic Necessities Uncovered in 1993	YES	YES	YES	YES	YES	YES	YES	YES
% of Households without Electricity in 1993	YES	YES	YES	YES	YES	YES	YES	YES
Illiteracy (% of Population) in 1993	YES	YES	YES	YES	YES	YES	YES	YES
Department Dummies	-	YES	YES	-	YES	YES	-	-
Provincial Dummies	-	-	-	-	-	-	YES	YES
Log of Accumulated Other Gov. Transfers per capita in soles (2002-2006)	-	-	YES	-	-	YES	-	YES
Observations	1282	1282	1282	1282	1282	1282	1282	1282

Note: Each row in the table reports the coefficients β_0 and β_1 of Equation (1) for different dependent variables. The numbers above each column characterize a specific regression that varies in the set of controls included. In this model β_0 reports the impact of producing districts against the omitted category, and β_1 reports the impact of non-producing districts in producing provinces. The omitted category is non-producing districts in non-producing provinces for regressions (1), (2) and (3), and non-producing districts in producing provinces for regressions (4) and (5). Robust Standard Errors are reported in parentheses below each coefficient. *** p<0.01, ** p<0.05, * p<0.1.

TABLE 2.5. PROPENSITY SCORE MATCHING: SUBSAMPLE OF ALL DISTRICTS IN PRODUCING DEPARTMENTS EXLUDING LIMA

IMPACT OF PRODUCING DISTRICTS AND NON-PRODUCING DISTRICTS IN PRODUCING PROVINCES

	Producers vs Non-Producers in Non-Producing Provinces	*Producers vs Non-Producers in the same Province*	*Producers vs All Non-Producers*	*Non-Producers in Producing Provinces vs Non-Producers in Non-Producing Provinces*
	(1)	(2)	(3)	(4)
Dependent Variable				
A) Log of Average Per Capita Expenditures in 2007	0.108***	0.153**	0.200***	0.010
	(0.044)	(0.073)	(0.064)	(0.030)
B) % Pop. under Poverty Line in 2007	-2.701	-4.704*	-6.209***	-0.788
	(2.631)	(2.761)	(2.359)	(1.703)
C) % Pop under Extreme Poverty Line in 2007	-2.655	-3.817*	-4.906***	-0.675
	(2.248)	(2.274)	(2.110)	(1.551)
D) % Pop with Basic Necessities Uncovered in 2007	-4.033***	-3.103***	-4.451***	-1.080
	(1.039)	(1.192)	(1.039)	(0.853)
E) Illiteracy (% of population) in 2007	-2.302**	-2.770***	-3.327***	-0.429
	(1.140)	(0.889)	(0.912)	(0.600)
F) Gini in 2007	0.009**	0.006	0.010***	0.006***
	(0.004)	(0.005)	(0.004)	(0.002)
Observations	829	540	1282	1195

Note: Results are divided in four columns each containing the estimates of the Average effect of Treatment on the Treated (ATT) for a different set of treatment and control groups. The propensity score is built via a probit where we regress each treatment group on the percentage of households with Basic Necessities Uncovered in 1993, percentage of households with electricity in 1993, illiteracy in 1993, log of population in 1993, percentage of urban population in 1993, log of area, and department dummies. The ATT is estimated using the full sample. Matching is done using an Epanechnikov Kernel with a bandwidth of 0.2. Balancing: Observations are divided in six blocks where all covariates are balanced, except for one department dummy for one block in column 2, and percentage of urban population and three department dummies for one block in column 4. Standard Errors are obtained by bootstrapping (100 repetitions), and are reported in parentheses below each coefficient*** p<0.01, ** p<0.05, * p<0.1.

TABLE 2.6. CONTINOUS TREATMENT: SAMPLE OF ALL DISTRICTS IN PRODUCING DEPARTMENTS EXLUDING LIMA

IMPACT OF ACCUMULATED VALUE OF MINERAL PRODUCTION, 2002-2006

	Log(1+value of production in the district) No province fixed effects			*Log(1+value of production in the province - value of production in the district) No province fixed effects*			*Log(1+value of production in the district) With province fixed effects*	
	(1)	(2)	(3)	(1)	(2)	(3)	(4)	(5)
Dependent Variable								
A) Log of Average Per Capita Expenditures in 2007	0.0049***	0.0041***	0.0041***	0.0010	0.0005	0.0006	0.0037***	0.0037***
	(0.0017)	(0.0014)	(0.0014)	(0.0007)	(0.0005)	(0.0005)	(0.0013)	(0.0013)
B) % Pop. under Poverty Line in 2007	-0.1705***	-0.0984*	-0.0928*	-0.0370	-0.0126	-0.0149	-0.0647	-0.0656
	(0.0681)	(0.0523)	(0.0524)	(0.0319)	(0.0253)	(0.0250)	(0.0524)	(0.0513)
C) % Pop under Extreme Poverty Line in 2007	-0.1457**	-0.1069**	-0.1030**	0.03094	0.00977	0.00821	-0.0791	-0.0798
	(0.0699)	(0.0493)	(0.0496)	(0.0342)	(0.0278)	(0.0277)	(0.0506)	(0.0500)
D) % Pop with Basic Necessities Uncovered in 2007	-0.1520***	-0.1290***	-0.1287***	-0.0614**	-0.0282	-0.0283	-0.0860*	-0.0859*
	(0.0470)	(0.0472)	(0.0472)	(0.0276)	(0.0285)	(0.0284)	(0.0519)	(0.0519)
E) Illiteracy in 2007 (% of population older than 15 years old)	-0.0594***	-0.0655***	-0.0647***	0.0022	0.0032	0.0029	-0.0609***	-0.0610***
	(0.0193)	(0.0187)	(0.0188)	(0.0090)	(0.0090)	(0.0090)	(0.0203)	(0.0203)
F) Gini in 2007	0.0004***	0.0002***	0.0002***	0.0003***	0.0001***	0.0001***	0.0002***	0.0002***
	(0.0002)	(0.0001)	(0.0001)	(0.0001)	(0.0001)	(0.0001)	(0.0001)	(0.0001)
Controls								
Provincial Capital Dummies, Log of Area, and Log of Altitude	YES	YES	YES	YES	YES	YES	YES	YES
Log of Population in 1993	YES	YES	YES	YES	YES	YES	YES	YES
% of Rural Population in 1993	YES	YES	YES	YES	YES	YES	YES	YES
% Pop with Basic Necessities Uncovered in 1993	YES	YES	YES	YES	YES	YES	YES	YES
% of Households without Electricity in 1993	YES	YES	YES	YES	YES	YES	YES	YES
Illiteracy (% of Population) in 1993	YES	YES	YES	YES	YES	YES	YES	YES
Department Dummies	-	YES	YES	-	YES	YES	-	-
Provincial Dummies	-	-	-	-	-	-	YES	YES
Log of Accumulated Other Gov. Transfers per capita in soles (2002-2006)	-	-	YES	-	-	YES	-	YES
Observations	1282	1282	1282	1282	1282	1282	1282	1282

Note: Each row in the table reports the coefficients of Equation (1) for different dependent variables. The numbers above each column characterize a specific regression that varies in the set of controls included. Average effects in Equation (1) have been substituted with the log of value of production. Robust Standard Errors are reported in parentheses below each coefficient. *** p<0.01, ** p<0.05, * p<0.1.

TABLE 2.7. OLS WITH NEIGHBORS: SAMPLE OF ALL DISTRICTS IN PRODUCING DEPARTMENTS EXCLUDING LIMA

IMPACT OF PRODUCING DISTRICTS ON SECOND NEIGHBORS

	Producers vs Second Neighbors Non-Producers (β_0)				
	(1)	(2)	(3)	(4)	(5)
Dependent Variable					
A) Log of Average Per Capita Expenditures in 2007	0.188***	0.135***	0.133***	0.097***	0.099***
	(0.047)	(0.043)	(0.042)	(0.043)	(0.043)
B) % Pop. under Poverty Line in 2007	-6.000***	-3.698***	-3.535***	-2.467*	-2.793*
	(1.779)	(1.405)	(1.401)	(1.467)	(1.435)
C) % Pop under Extreme Poverty Line in 2007	-3.604**	-2.999***	-2.868***	-1.858	-2.141
	(1.771)	(1.246)	(1.254)	(1.355)	(1.334)
D) % Pop with Basic Necessities Uncovered in 2007	-4.877***	-4.236***	-4.310***	-2.596*	-2.485*
	(1.174)	(1.199)	(1.201)	(1.440)	(1.437)
E) Illiteracy in 2007 (% of population older than 15 years old)	-1.999***	-1.857***	-1.825***	-1.847***	-1.91***
	(0.467)	(0.470)	(0.478)	(0.563)	(0.563)
F) Gini in 2007	0.014***	0.006**	0.006**	0.006**	0.006**
	(0.004)	(0.003)	(0.003)	(0.003)	(0.003)
Controls					
Provincial Capital Dummies, Log of Area, and Log of Altitude	YES	YES	YES	YES	YES
Log of Population in 1993	YES	YES	YES	YES	YES
% of Rural Population in 1993	YES	YES	YES	YES	YES
% Pop with Basic Necessities Uncovered in 1993	YES	YES	YES	YES	YES
% of Households without Electricity in 1993	YES	YES	YES	YES	YES
Illiteracy (% of Population) in 1993	YES	YES	YES	YES	YES
Department Dummies	-	YES	YES	-	-
Provincial Dummies	-	-	-	YES	YES
Log of Accumulated Other Gov. Transfers per capita in soles (2002-2006)	-	-	YES	-	YES
Observations	1282	1282	1282	1282	1282

Note: Each row in the table reports the coefficient β_0 of Equation (2) for different dependent variables. The numbers above each column characterize a specific regression that varies in the set of controls included. Robust Standard Errors are reported in parenthesis below each coefficient. *** p<0.01, ** p<0.05, * p<0.1.

TABLE 2.8. OLS WITH NEIGHBORS: SAMPLE OF ALL DISTRICTS IN PRODUCING DEPARTMENTS EXCLUDING LIMA

IMPACT OF FIRST NEIGHBORS OF PRODUCING DISTRICTS ON SECOND NEIGHBORS

	First Neighbors Non-Producers vs Second Neighbors Non-Producers (β_1)				
	(1)	(2)	(3)	(4)	(5)
Dependent Variable					
A) Log of Average Per Capita Expenditures in 2007	0.047**	0.010	0.010	-0.016	-0.015
	(0.023)	(0.023)	(0.023)	(0.024)	(0.024)
B) % Pop. under Poverty Line in 2007	-2.035**	-0.555	-0.481	-0.386	-0.608
	(1.028)	(0.779)	(0.769)	(0.799)	(0.787)
C) % Pop under Extreme Poverty Line in 2007	-0.060	0.300	0.359	0.405	0.213
	(1.111)	(0.843)	(0.840)	(0.873)	(0.868)
D) % Pop with Basic Necessities Uncovered in 2007	-2.926***	-2.276***	-2.309***	-0.7400	-0.665
	(0.837)	(0.858)	(0.860)	(1.014)	(1.018)
E) Illiteracy in 2007 (% of population older than 15 years old)	-0.355	-0.100	-0.085	-0.324	-0.367
	(0.278)	(0.267)	(0.267)	(0.290)	(0.288)
F) Gini in 2007	0.006**	0.002	0.002	0.001	0.001
	(0.003)	(0.002)	(0.002)	(0.002)	(0.002)
Controls					
Provincial Capital Dummies, Log of Area, and Log of Altitude	YES	YES	YES	YES	YES
Log of Population in 1993	YES	YES	YES	YES	YES
% of Rural Population in 1993	YES	YES	YES	YES	YES
% Pop with Basic Necessities Uncovered in 1993	YES	YES	YES	YES	YES
% of Households without Electricity in 1993	YES	YES	YES	YES	YES
Illiteracy (% of Population) in 1993	YES	YES	YES	YES	YES
Department Dummies	-	YES	YES	-	-
Provincial Dummies	-	-	-	YES	YES
Log of Accumulated Other Gov. Transfers per capita in soles (2002-2006)	-	-	YES	-	YES
Observations	1282	1282	1282	1282	1282

Note: Each row in the table reports the coefficient β_1 of Equation (2) for different dependent variables. The numbers above each column characterize a specific regression that varies in the set of controls included. Robust Standard Errors are reported in parenthesis below each coefficient. *** p<0.01, ** p<0.05, * p<0.1.

TABLE 2.9. OLS WITH NEIGHBORS: SAMPLE OF ALL DISTRICTS IN PRODUCING DEPARTMENTS EXCLUDING LIMA

IMPACT OF PRODUCING DISTRICTS ON FIRST NEIGHBORS (WALD TEST $\beta_0 - \beta_1$)

	Producers vs First Neighbors Non-Producers (Wald test β_0- β_1)				
	(1)	(2)	(3)	(4)	(5)
Dependent Variable					
A) Log of Average Per Capita Expenditures in 2007	0.142***	0.124***	0.123***	0.114***	0.114***
B) % Pop. under Poverty Line in 2007	-3.964**	-3.143**	-3.054**	-2.081	-2.185
C) % Pop under Extreme Poverty Line in 2007	-3.544*	-3.299**	-3.228**	-2.263*	-2.353*
D) % Pop with Basic Necessities Uncovered in 2007	-1.951	-1.960	-2.000	-1.856	-1.820
E) Illiteracy in 2007 (% of population older than 15 years old)	-1.644***	-1.757***	-1.740***	-1.523***	-1.543***
F) Gini in 2007	0.008*	0.004	0.004	0.005*	0.005*
Controls					
Provincial Capital Dummies, Log of Area, and Log of Altitude	YES	YES	YES	YES	YES
Log of Population in 1993	YES	YES	YES	YES	YES
% of Rural Population in 1993	YES	YES	YES	YES	YES
% Pop with Basic Necessities Uncovered in 1993	YES	YES	YES	YES	YES
% of Households without Electricity in 1993	YES	YES	YES	YES	YES
Illiteracy (% of Population) in 1993	YES	YES	YES	YES	YES
Department Dummies	-	YES	YES	-	-
Provincial Dummies	-	-	-	YES	YES
Log of Accumulated Other Gov. Transfers per capita in soles (2002-2006)	-	-	YES	-	YES
Observations	1282	1282	1282	1282	1282

Note: Each row in the table reports the coefficient $(\beta_0 - \beta_1)$ of Equation (2) for different dependent variables, where significance has been estimated by means of a Wald test. The numbers above each column characterize a specific regression that varies in the set of controls included. Robust Standard Errors are reported in parenthesis below each coefficient. *** p<0.01, ** p<0.05, * p<0.1.

TABLE 2.10. INSTRUMENTAL VARIABLES: SAMPLE OF ALL DISTRICTS IN PRODUCING DEPARTMENTS EXCLUDING LIMA

IMPACT OF ACCUMULATED CANON MINERO, 2002-2006

		Log(1+Canon minero)		
		(1)	(2)	(3)
Dependent Variable				
A)	*Log of Average Per Capita Expenditures in 2007*	0.0186***	0.0975**	0.0948*
		(0.0080)	(0.0482)	(0.0485)
B)	*% Pop. under Poverty Line in 2007*	-2.1073***	-0.4141	-0.2287
		(0.4393)	(1.9461)	(1.9793)
C)	*% Pop under Extreme Poverty Line in 2007*	-0.7837**	1.752	1.9814
		(0.4008)	(2.0306)	(2.0696)
D)	*% Pop with Basic Necessities Uncovered in 2007*	0.5315	-1.0074	-1.0549
		(0.3312)	(1.8702)	(1.8936)
E)	*Illiteracy (% of population) in 2007*	0.3343***	0.0575	0.1094
		(0.1458)	(0.8652)	(0.8863)
F)	*Gini in 2007*	0.0156***	-0.0027	-0.0025
		(0.0015)	(0.0036)	(0.0037)
Controls				
Producing District Dummies		YES	YES	YES
Non Producing District in Producing Province Dummies		YES	YES	YES
Provincial Capital Dummies, Log of Area, and Log of Altitude		YES	YES	YES
Log of Population in 1993		YES	YES	YES
% of Urban Population in 1993		YES	YES	YES
% Pop with Basic Necessities Uncovered in 1993				
% of Households without Electricity in 1993		YES	YES	YES
Illiteracy (% of Population) in 1993		YES	YES	YES
Department Dummies		-	YES	YES
Log of Accumulated Other Gov. Transfers per capita in soles (2002-2006)		-	-	YES
Observations		1282	1282	1282

Note: Each row in the table reports the coefficient β_2 of Equation (3) for different dependent variables. The numbers above each column characterize a specific regression that varies in the set of controls included. The *Canon* is instrumented with the log of (one plus) the accumulated value of mineral production at the district, province and department levels for the same period. Robust Standard Errors are reported in parentheses below each coefficient. *** p<0.01, ** p<0.05, * p<0.1.

CHAPTER 3

3 Fiscal Policy Cyclicality, the Deficit Bias, and Fiscal Rules: the Case of Mexico

3.1 Introduction

The European sovereign debt crisis is a reminder that no country can ignore the intertemporal budget constraint. Governments can run budget deficits for years, but sooner or later they will need to balance public finances and run surpluses to guarantee fiscal sustainability in the long term. However, there is wide evidence of a deficit bias (Persson, Roland and Tabellini, 2000) that contradicts the so-called *tax smoothing hypothesis* of government budgetary policy championed by Barro (1979, 1983, 1985). This approach argues that fiscal policies are a reflection of an intertemporal optimization over a long time horizon by the budgetary authorities, who choose their policies to reduce the excess burden of taxation for a given path of government spending. Roubini and Sachs (1989), Tornell and Lane (1999), and Alesina and Tabellini (2005), among others, have developed political economy models to account for constant tax hikes, increasing deficits, and unsustainable public debt path experiences.

Roubini and Sachs (1989) develop a model of government behavior that considers a society divided into several influential interest groups, each of which benefits from a particular type of government spending. Under their model, the government is assumed to be weak in the sense that each of the interest groups can influence the budgetary process to set transfers on the group´s desired items, resulting in what they call fragmented fiscal policymaking. This model suggests that the strength of the budgetary authorities (i.e., weak finance ministers, most parliamentary amendments, etc.) is negatively related to deficit levels. Von Hagen (1992) finds evidence to support this view. They conclude that budgeting procedures that lend the finance minister strategic dominance over spending ministers and limit the amendment powers of parliament are conductive to fiscal discipline, while an opposite arrangement often leads to sizeable deficits and debts. Alesina, Hausman, Hommes, and Stein (1996) report similar results in a study of twenty Latin American and Caribbean countries.

Tornell and Lane (1999) use a similar setup to account for slower growth in countries that lack a strong legal-political institutional framework and are characterized by social fragmentation. They develop a model that explains why such countries frequently respond in a counterintuitive fashion to favorable shocks (i.e., terms of trade or commodity windfalls), by increasing fiscal redistribution more than proportionally and by investing in inefficient capital projects. They focus on the budgetary process as an important arena in which powerful groups (i.e., industrial conglomerates, strong unions, etc.) interact in a society with a weak institutional framework, and they emphasize discretionary fiscal redistribution as a key mechanism by which such groups appropriate national resources for themselves.

Alesina and Tabellini (2005) link fiscal myopia and procyclicality to a political agency problem to explain why many countries follow suboptimal, procyclical fiscal policies, namely that spending goes up (taxes go down) in economic expansions and spending goes down (taxes go up) during downturns. They argue that in countries where corruption is high, voters do not trust government with resources and demand tax cuts, increase in productive government spending, or transfers when positive shocks hit the economy, fearing that otherwise the available resources will be wasted in rents. Alesina and Tabellini argue that, for the same reason, voters do not allow government to accumulate reserves of assets; on the contrary, they demand a level of government debt that forces the government to use resources to pay interest rather than steal them. They conclude that this behavior leads to a higher-than-first-best accumulation of debt and procyclical fiscal policy.

The intra- and intertemporal common pool phenomena described by Roubini and Sachs (1989), Lane and Tornell (1999), and Alesina and Tabellini (2005), among others, may explain the deficit bias observed in several countries. To address it, several countries have tried to implement measures to internalize the externality created by recipients of public spending that fail to fully internalize the costs that taxpayers must assume. This calls for adequate fiscal institutions or fiscal rules, or both.

As suggested by Von Hagen and Harden (1994), such fiscal discipline is achieved either when the Finance Minister is given enough authority to control the process, or when the political forces that support the government agree to adequate contracts. Such scenarios have been achieved by the introduction of various types of fiscal rules and with institutional changes. According to Wyplosz (2012), there are basically three possibilities to correct for the common pool problem: (i) delegation to an independent agent; (ii) binding numerical fiscal rules; and (iii) improvements in the budgetary process.

As argued by Kydland and Prescott (1977), fiscal rules are sometimes suboptimal and can generate serious time-inconsistent problems, given that they are fundamentally arbitrary and noncontingent. Thus, theoretically, a first best is to delegate some aspects of fiscal policy to an unelected agent. It is widely accepted that the creation of independent fiscal institutions is an optimal solution, mainly due to its flexibility to optimally act to respond to unforeseen contingencies. Unfortunately, the conditions required for fiscal institutions to be effective are rarely met in practice (Wyplosz, 2012). For instance, taking power out of the hands of elected officials in the budgetary process in favor of bureaucrats may seem excessive.

Numerical fiscal rules, on the other hand, are politically more acceptable since they are designed and self-imposed by the same officials they seek to bind. Since laws can be amended or even repudiated, the challenge is not just to have such limits adopted, but that they remain in place when they become binding. Fiscal rules come in a large variety of forms but they share the characteristic of imposing numeric norms to guide fiscal policy. These norms can address the budget balance, public debt, public spending, or government revenues, and all of them seek to correct the institutional or political failure that gives rise to deficit and procyclical biases. They usually stipulate upper limits on the budget balance, on public debt, or on spending, or they set a lower limit on tax revenues. Most countries have adopted a combination of these limits. Some rules are determined on a yearly basis and others define guidelines over several years (i.e., the entire business cycle).

In theory, a well-designed fiscal rule should eliminate common pool problems when implemented correctly. However, in practice, rules have shown several problems, given that there is always a tradeoff between the strength of a rule and time consistency. Therefore, rules should be designed to be binding most of the time but foresee escape clauses to accommodate unforeseeable contingencies.

The third solution to the common pool problem is the improvement of the budgetary process. This solution involves arrangements that encourage policymakers to internalize among themselves the externalities associated with the deficit bias. As shown by Hallerberg et al. (2009), the success of such arrangements depends on whether they are compatible with the political backstage.

In this paper I contribute to understanding the common pool problem in the budgetary process for the case of Mexico. I first analyze the recent evolution of the institutional framework in Mexico, as well as the determinants of revenue volatility using historical data. I then assess the implications of different fiscal rules. To do so I simulate the path of the main fiscal variables under shock configurations. Following Celasun, Debrun, and Ostry (2006), I use a stochastic debt sustainability analysis algorithm based on three building blocks. First, I calibrate the joint distribution of shocks to fit the statistical properties of historical data using an unrestricted VAR model. This model serves to describe comovements among the main exogenous determinants of debt dynamics (i.e., GDP growth, interest rates, and exchange rates). Moreover, it provides estimates of the conditional variance and covariance of shocks, and allows me to generate a consistent set of projections for these debt dynamic determinants. The second building block aims at characterizing fiscal behavior using annual fiscal data for the period 1990-2013 to calibrate the plausible policy response of the balance to economic shocks. The third building block estimates a constellation of annual debt paths based on the economic scenarios simulated using the results from the VAR model, and on the fiscal reaction function. Through repeated simulations of random shocks I construct a large sample of debt projections from which I then extract probabilistic assessment of the dynamics of various fiscal variables.

I find that Mexico´s current framework has a built-in deficit bias over the business cycle and it allows the government to conduct a countercyclical fiscal policy during downturns, but it incentivizes procyclical behavior during economic expansions. Moreover, I find that a budget balance rule with an expenditure cap is able to mimic the results of a rule based on a cyclically adjusted balance in terms of reducing the procyclical and deficit biases, with the advantage of not having to rely on an autonomous fiscal agency, which is usually absent under weak institutional frameworks.

This paper is organized as follows. Section 2 characterizes different types of fiscal rules. Section 3 gives an overview of fiscal policy for the case of Mexico, analyzing the determinants of fiscal revenues and evaluating the presence of deficit and procyclical biases. Section 4 presents the methodological framework behind the simulations, describes the data, and presents the results from the simulations of alternative fiscal policy designs. Section 5 concludes.

3.2 Fiscal Rules

In the widest sense, fiscal rules refer to a set of rules and regulations that guide the budgetary process. In a more narrow sense, as defined by Kopits and Symansky (1998), a fiscal rule is a permanent constraint on fiscal policy expressed as a numerical ceiling or target on budgetary aggregates. A fiscal rule delineates long-lasting guidelines to promote macroeconomic stability, enhance the credibility of a government´s commitment to fiscal sustainability, minimize negative externalities within a federation or an international arrangement, and foster countercyclical fiscal policies.

The design of fiscal rules entails a conflict between flexibility and credibility. Less flexibility increases the credibility of a rule; however, the lack of flexibility may become nonviable if it is perceived as unsustainable. In other words, there is a conflict between the objective of avoiding the deficit bias and allowing the conduct of a countercyclical fiscal policy. The former requires a level of rigidity that may ignore potential effects of the business cycle and might accentuate the procyclicality of fiscal policies. The latter requires a degree of flexibility to support countercyclical fiscal policies but might jeopardize long-term debt sustainability (Perry, 2002). Thus, an optimal fiscal rule should be designed to avoid the deficit bias and permit a limited degree of countercyclical fiscal policy. This can be attained by establishing a fiscal anchor (i.e., a numeric target on a fiscal aggregate compatible with long-term sustainability) and a mechanism to limit the level of discretionary fiscal policy across the business cycle.

Such a fiscal policy can be achieved by the use of one or more fiscal rules. Fiscal rules can be grouped in four categories: (1) budget balance rules; (2) debt rules; (3) expenditure rules; and (4) revenue rules (IMF, 2009). Budget balance rules can be based on a fixed or a flexible target. Those based on a fixed target are the most effective rules to set public debt on a decreasing path; however, they induce a procyclical fiscal policy.

Balance rules based on a flexible target set a numeric target to be attained on average over a cycle (i.e., cyclically adjusted balance), allowing for short-term flexibility in the yearly budget balance. These types of rules allow the operation of automatic stabilizers to counter the effects of the economic cycle or short-term trend deviations in commodity prices so that governments can smooth consumption and investment, and they contribute to countering the negative effects of volatility. A fiscal policy based on a cyclically adjusted balance (CAB), also known as a structural balance, relies on a definition of balance, B, constructed as the sum of a structural, B^s, and a cyclical component, B^c, which are tied to potential GDP and the output gap, respectively. A sound fiscal policy entails estimating a sustainable level for the B^s based on potential GDP to set as a fiscal anchor, and determining an adequate level of the B^c given the output and commodity gaps at each moment of time.

Conceptually, a well-calibrated CAB rule is the most effective way to instill fiscal confidence. However, unlike actual balance, B^s and B^c are not observable and may prove difficult to calculate, rendering the budgetary process potentially obscure. Estimating CAB requires the use of economic variables that may be difficult to define under uncertain macroeconomic conditions or while undergoing structural changes. In practice, ex post revisions of the output gap have shown to be of the same order of magnitude as the gap itself (Orphanides and van Norden, 2002). Moreover, CAB estimates are generally based on the assumption that revenue and expenditure elasticities are constant over time. However, there is widespread evidence that these elasticities are sensitive to the business cycle (e.g. Mills and Quinet, 2001).

In general, budget balance rules with both fixed and flexible targets aim at controlling the path of debt-to-GDP ratio so that it converges to a finite level when based on a broad measure of the budget balance. Rules based on the primary balance or on the overall balance net of capital expenditure (i.e., Golden Rule) control the quality of spending and allow for discretionary fiscal stimulus, but they are not necessarily linked to debt sustainability.

Debt rules establish an explicit limit or target on public debt as a ratio of public income or GDP. These rules are by definition the most effective in terms of ensuring a convergence to a debt target. However, they fail to provide enough guidance when debt is well below its target, and they do not allow for discretionary fiscal stimulus when debt is close to its target.

Expenditure rules usually set numerical limits on expenditure growth rates, which allow controlling the size of governments, for instance, when revenues are above their trend. As such, these rules can be used to guide the implementation of countercyclical fiscal policy during economic expansions. These types of rules do not depend on projections of future economic conditions nor on the estimation of the output gap and revenue elasticities. The effectiveness of expenditure rules relies on how comprehensive they are, since leaving out important expenditure items can lead to reclassification of spending items (i.e., creative accounting). However, it has proven desirable to exclude the most volatile items, such as interest payments, public investment, and contingent social security expenses, to keep the rule stable and avoid ad hoc budgetary adjustments (World Bank, 2011).

Finally, revenue rules set a ceiling, a floor, or a target on revenues, or specify an ex ante use of revenue windfalls. The latter can prevent procyclicality, ensuring that revenues above forecast are not used to finance discretionary spending, raise structural spending, and weaken a country´s fiscal position in the medium term. Revenue rules usually require that excess revenue be used to reduce deficit or be placed in a rainy-day fund.

As mentioned in the previous section, fiscal rules aim at correcting distorted incentives in policymaking. They seek to correct for shortsightedness that arises from concerns about electoral prospects that fail to take into account longer-term costs. They also aim at solving the common pool problem that occurs when special interest groups do not internalize the overall budgetary impact of their competing demands. However, the implementation of fiscal rules raises several concerns: (1) fiscal rules that lack sufficient political commitment undermine policy credibility; (2) inflexible debt or deficit ceilings translate into procyclical fiscal measures in bad times or divert political capital from other policies such as long-term structural reforms; and (3) rules can undermine transparency since they may encourage off-balance operations and creative accounting (IMF, 2009).

Empirical evidence suggests that fiscal rules are associated with improved fiscal performance (e.g. Debrun et al., 2008; Deroose, Moulin, and Wierts, 2006; Debrun and Kumar, 2007; Kopits, 2004; and Corbacho and Schwarts, 2007). In general, evidence suggests that while fiscal rules might serve as a useful commitment technology to counter time-inconsistency and political distortions, they do not automatically lead to fiscal restraint. Their effectiveness depends on the proper design, the presence of a supportive institutional framework, and the existence of a broad consensus on the fiscal objectives.

3.3 Fiscal Policy in Mexico

Since the 1995 Mexican crisis, fiscal consolidation and active debt management have been at the center of Mexico´s fiscal policy. Efforts to contain expenditures and raise recurrent public-sector revenues have been a constant goal. However, public finances in Mexico remain vulnerable to oil shocks, and fiscal policy is often procyclical.

Mexico´s public finances are characterized by its reliance on volatile revenues associated with non-renewable sources (i.e., oil revenues) and, until the late nineties, by highly volatile nonprogrammable spending (i.e., interest payments). Under that scenario, authorities launched a series of reforms to reduce the potential impact of public revenue volatility on the economy.

Since 2002, there have been several reform attempts that have sought to reduce government´s dependence on oil revenues. However, they have been, for the most part, unsuccessful due to a lack of support for repealing preferential value-added tax treatments, and to the difficulty of expanding taxpayers' base. As a result, non-oil tax revenues have converged to around 10 percent of GDP in the last decade.

Moreover, the incentives to undertake more comprehensive fiscal reforms have been weakened by increasing oil prices. Oil revenue windfalls have been, in some sense, a curse for public finances since they have allowed the Mexican government to postpone structural reforms without facing the tradeoff of having to cut expenditures to maintain sound public finances. On the contrary, current expenditures have increased in the same period, and the country´s fiscal position has only marginally improved.

Even though oil prices remained relatively high, the 2009 Global financial crisis significantly affected public finances in Mexico. Expenditures maintained a steep growth path between 2009 and 2012, while income growth experienced a break in 2009, resulting in a structural deficit of close to 4% of GDP that has not been closed (see Table 3.1). A yearly deficit of this magnitude is associated with an increasing debt level, thus unsustainable in the long run. Given the growth rate of potential GDP and the long-term real interest rate of Mexico, to maintain debt at its current level in terms of GDP, fiscal policy must aim at an annual primary surplus of 0.4% of GDP (i.e., Public Sector Borrowing Requirements [PSBR][20] of 2.6% of GDP).[21]

[20] PSBR is the most accurate measure of fiscal balance in Mexico.

[21] This level of primary surplus is derived from a solvency constraint: $d_{t-1} = \sum_{j=0}^{\infty} \left(\frac{(1+g)(1+\rho)}{1+i}\right)^{j} s_{t+j}$, where d_t is public debt at the end of period t as a proportion of GDP; i is the nominal interest rate on public debt; g_t is the growth rate of real GDP; ρ_t is the growth rate of GDP deflactor; and s_t is the primary surplus. Fixing the

3.3.1 Determinants of fiscal revenue fluctuations

To analyze Mexico´s fiscal policy it is crucial to understand the main components of fiscal revenue and the factors that guide their behavior. In particular, I want to estimate the determinants of revenue deviations from their trend to assess how the fiscal framework and expenditure dynamics interact with these deviations. Moreover, understanding the determinants of revenue deviations is the basis for evaluating and designing the optimal investment strategy for stabilization funds.

In the case of Mexico, we can separate fiscal income into oil revenues (R_t^O) and non-oil revenues(R_t^{NO}); $R_t = R_t^O + R_t^{NO}$.

Figure 3.1, Panel A shows the evolution of these two income components in the period 1990-2012. In general, we can observe that they follow a similar trend, but that the short-term deviations are driven by different forces. Non-oil revenues are composed primarily of tax revenues, income from government-owned companies (excluding Pemex), and nontax revenues. Deviations from revenues coming from government-owned companies and from nontax revenues are excluded from the analysis given that the former type of revenues has shown not to be affected by short-term fluctuations, while the latter is determined endogenously and oftentimes includes nonrecurring revenues. On the other hand, the relevant component of oil revenues is the revenue coming from oil royalties (i.e., revenues from all royalties established in Mexico´s *Ley Federal de Derechos*). Deviations on other oil-related revenues, mainly revenues from Pemex and excise tax on gasoline, are excluded from the

desired level $d_t = \bar{d}$ and assuming the inflation is equal to the GDP deflator, we obtain that the level of primary surplus that maintains a fixed debt is: $s_t = \frac{r-g}{1+g}\bar{d}$, where r is the real interest rate on public debt.

analysis, to avoid changes in accounting practices that occurred in the time period, and to avoid accounting gasoline subsidies as revenues deviations.

A simple regression analysis of oil revenues from royalties on the average price of Mexican crude oil points to an almost one-to-one relationship between these two variables (see Table 3.2), while a regression of tax revenues on GDP shows a high correlation between the latter two variables. Thus, to calculate total revenue deviations I use:

$$D_t = \frac{R_t^r}{R_t} D_t^r + \frac{R_t^t}{R_t} D_t^t$$

where D_t^r and D_t^t are deviations of royalties and tax revenues, respectively, which depend on the deviations of realized oil prices and GDP to trend oil prices and potential GDP. Figure 3.6, Panel A depicts estimations of D_t over the period 1990-2012, where we can see that deviations of total revenues due to cyclical factors ranged from -8.6% to 13.4%. (i.e., approximately -2.0% to 3.2% of GDP). This level of deviations contrasts with the level of precautionary savings accumulated in stabilization funds, as I will show below.

3.3.2 Fiscal policy framework

Fiscal policy management in Mexico has been guided by yearly congressional authorizations that establish net borrowing limits. Under the Constitution, the federal government is mandated to follow a "Golden Rule": borrowing is permitted only to finance public investment. Starting in 1998, contingent procedural fiscal rules have been introduced to contain unexpected shocks. These rules have been introduced yearly in the Federal Expenditure Budget (PEF) and have evolved over time. The main purpose of this set of rules has been to establish ex ante procedures to absorb unanticipated revenue shortfalls through stabilization funds created with excess revenues when available, as well as through spending cuts. This framework was properly institutionalized in 2006 in the Fiscal Responsibility Law.

At the same time, Mexico has made progress toward fiscal transparency. Starting in 1999, all information in the Federal Public Account (Cuenta de la Hacienda Pública Federal) and the PEF has been made accessible electronically. Whereas off-budget disbursements had already been eliminated from the PEF, in 2001 the government submitted a constitutional amendment to formally abolish all such disbursements. Overall, since 2001 more detailed and timely information has been released in monthly reports on fiscal developments with considerable detail on revenue, expenditure, and indebtedness. Also in 2001, a new measure of the overall financing needs of the government, the Public Sector Borrowing Requirements (PSBR), was introduced. Although not tied to a fiscal rule, the PSBR was put forth as an analytically more meaningful and comprehensive indicator of fiscal balance than the official, so-called traditional balance.

Contingent rules have helped promote sound public finances even at times of economic slowdown and uncertainty. This has allowed the economy to withstand the effects of slowdown and uncertainty in world markets in an orderly fashion. However, fiscal policy has often been procyclical, there are no binding mechanisms to save revenue windfalls, and the institutional framework entails a deficit bias. For instance, procyclicality was present in 1998 when the Mexican economy was shaken by the fall in international oil prices, and public spending was cut to reach the fiscal deficit target. Moreover, in 2000, when oil prices were relatively high and economic growth increased, spending in social programs also increased.

Similarly, in the period 2006-2008, higher-than-expected oil prices allowed a steady increase in spending. Only after the 2009 crisis was the government able to conduct a countercyclical fiscal policy to counter the effects of the economic recession; however, the legal framework did not oblige the federal government to compensate these deficits with surpluses whenever the economy operated above potential, thus allowing for a deficit bias over the cycle (i.e., deficit during downturns and no surplus during economic expansion).

To systematically test the cyclicality of the fiscal policy, I compare changes in the budgetary balance with changes in the output gap over a period of seventeen years starting in 1996.[22] A positive (negative) number in the output gap indicates an increase (decrease) of GDP with respect to potential GDP, and a change in the budgetary balance is associated with a fiscal impulse. A fiscal impulse refers to changes in government's cyclically adjusted fiscal balance as a percentage of potential GDP. A positive (negative) number indicates a fiscal stimulus (withdrawal of fiscal stimulus). Thus, we can say that fiscal policy is countercyclical (procyclical) whenever the change in output gap and the fiscal impulse have opposite (equal) signs. As Figure 3.2, Panel A suggests, fiscal policy in the period 1996-2012 was procyclical six times, neutral five times, and countercyclical six times. However, if we test the cyclicality of the fiscal policy, adjusting for the effect of the economic cycle on the balance, fiscal policy appears to be procyclical ten times, neutral four times, and countercyclical only three times (i.e., in the years 2000, 2009, and 2010) as shown in Figure 3.2, Panel B. In this latter case, the cyclically adjusted fiscal balance is calculated by adjusting PSBR by nonrecurrent revenues and by the economic cycle using a revenue elasticity of one.

[22] To estimate potential GDP I use a standard HP filter (lambda 100) using observed GDP data from 1980 to 2013 and GDP estimations based on consensus forecasts for the period 2013-2015.

In terms of the savings and rainy-day funds, the framework has not proven to be effective. In the period 2006-2008, savings in these funds only accumulated up to 0.7% of GDP, which fell significantly short of absorbing an estimated drop in revenues due to cyclical factors in 2009 of 2.0% of GDP, even though accumulated revenues above trend between 2005 and 2008 amounted to close to 18% of GDP (see Figure 3.6, Panel B).

3.3.3 The 2013 Fiscal Reform

In this context, the Mexican government proposed amendments to the Fiscal Responsibility Law (FRL) to move towards an implicit structural balance rule. This rule builds upon the current balance rule to improve the fiscal position whenever economic activity grows beyond its potential. As I will explain in detail in the next section, this implicit rule mimics the benefits associated with a standard structural balance rule *à la Chile*, with the additional benefit of being easier to implement.

As part of the recently approved fiscal reform, Congress approved a series of amendments to the FRL that aim at strengthening Mexico´s fiscal rule, establish a medium-term fiscal anchor based on the PSBR, and increase the rate of savings of excess income across the business cycle. The government proposed to move to an implicit structural balance rule, by adding an expenditure cap to the current budget balance rule. This seeks to generate more savings in the upper part of the business cycle that serve as fiscal buffers during economic downturns. To implement this rule, the government established a growth limit to an ad hoc measure of current expenditure: the Structural Current Expenditure (SCE). This measure of current expenditure excludes pensions, fuel costs, and nonprogrammable spending (i.e., interest payments and non-earmarked transfers).[23]

In terms of capital expenditure, the limit on SCE leaves direct capital spending unrestricted. However, it limits the growth of transfers for capital expenditure to local governments (approximately 20 percent of total capital expenditure). Direct capital spending is not capped by the SCE; however, its growth will be anchored by the traditional budget balance rule, as well as by PSBR goals.

The expenditure cap will not only be binding for the budgeting process; the amended Fiscal Responsibility Law also requires the government to obey the growth limit in realized fiscal accounts at the end of the year. This helps prevent under-budgeting practices, where irreducible expenditure (e.g., pensions) is underestimated in the budget to make room for other spending items, thus satisfying the balance rule at the moment of authorizing the budget, knowing that at the end of the year the irreducible expenditure would be covered regardless (usually with excess revenue or assets).

The goal of this expenditure cap is to establish a legally binding constraint that can set current expenditure on a slower growth path than the GDP. In the period 2007-2013, SCE averaged an annual growth of 4.9 percent, and the amended law requires it to grow at an annual rate of less than 2% until 2016, and to a rate equal to potential GDP growth thereafter.

Moreover, the fiscal reform elevates the importance of the PSBR, establishing this measure as a medium-term fiscal anchor. The current fiscal target (i.e., traditional balance) had been gradually losing its relevance to follow the fiscal position or as an effective fiscal anchor (see

[23] This measure would ideally include all expenditure concepts; however, the government opted to allow certain exclusions to avoid under-budgeting practices that could undermine the enforceability of the rule.

Figure 3.4, Panel D), given that there were several important concepts that remained below the line (i.e., investment from Pemex, Mexico´s state-owned oil company). The fiscal reform also proposed amendments to the FRL to set PSBR at the same legal level as the traditional balance. Thus, the FRL now requires the government to set annual goals for PSBR that have to be met by the end of the fiscal year. The law also requires five-year projections of the PSBR, consistent with a sustainable public debt path. The determinants to calculate a sustainable path will be established in the by-laws, as well as in an annual methodological note published by the Ministry of Finance. These measures will anchor the path of the PSBR, and establish a public commitment to a medium-term fiscal policy from which it will be politically costlier to deviate.

In addition, the fiscal reform proposed several measures to upgrade the stabilization and rainy-day fund framework. The objective was to limit the purpose of the current stabilization funds to intra-annual cash management, and to separate savings for longer-term purposes in a different vehicle (i.e., a newly created sovereign wealth fund). The goal was to amend the scheme used to manage excess income to increase savings across the business cycle, relative to the existing framework. Stylized projections of excess revenues and savings funds show that, under the amended FRL, savings would be up to three times higher than under the current framework. However, these changes are yet to be approved. They were postponed by Congress to be discussed as part of the energy reform, which also contemplated changes to the excess income management scheme and the creation of a sovereign wealth fund (i.e., The Mexican Oil Fund for Stabilization and Development). The creation of this fund is in line with the proposal of the fiscal reform to separate short- and longer-term precautionary savings. The underlying logic behind the Mexican Oil Fund is to transform wealth associated with nonrenewable sources into wealth invested in a portfolio of diversified assets. The fund will thus enable the creation of a financial vehicle to mitigate the exposure of public finances to oil shocks.

3.4 Assessment of Alternative Fiscal Policy Designs

In this section I evaluate the implications of the proposed amendments to Mexico´s Fiscal Responsibility Law, as well as other fiscal policy rules, in terms of debt sustainability. I thus simulate public debt dynamics under a constellation of shocks for the following fiscal rules: (1) a budget balance; (2) an expenditure rule; (3) a cyclically adjusted balance rule; and (4) a budget balance rule with an escape clause and an expenditure rule.

To generate the constellation of shocks, I use an unrestricted VAR model of the nonfiscal determinants of public debt. The VAR estimates the relationship between Mexico´s output gap, real interest rates, and real effective exchange rates using quarterly data from 1990 to 2012 (92 observations); it produces a one-period-ahead forecast of $Y_t = (y_t, r_t, z_t)$, a vector of endogenous variables where y_t is the output gap, r_t is the real interest rate, and z_t is the log of the real effective exchange rate. I estimate a vector of coefficients γ_k based on historic data from 1990 to 2012, using the following specification:

$$Y_t = \gamma_0 + \sum_k \gamma_k Y_{t-k} + \xi_t$$

where $\xi \sim N(0, \Omega)$ is a vector of well-behaved error terms. The variance-covariance matrix of residuals Ω describes the joint statistical properties of the contemporaneous shocks affecting debt dynamics.[24] Moreover, the variance-covariance matrix allows me to calibrate the distribution of shocks during the last twenty years. This distribution is used to conduct repeated simulations of random shocks that enable me to construct conditional forecasts. Then I estimate paths for public revenue, expenditure, the fiscal balance, and public debt using annualized projections from the VAR as a basis. I report graphically the path of these variables for a period of fifteen years, using "fan charts" that show the median, as well as 50-, 90-, and 98-percent confidence bands. To evaluate the different fiscal rules I will focus on two elements: (1) sustainability, measured by the median path for public debt, and (2) flexibility, measured by the average correlation between the simulated output gap and the budget balance.

The debt sustainability analysis under the budget balance rule is done assuming a constant deficit target of 2.5% of GDP. As explained in the previous section, this level of deficit (i.e., PSBRs) implies, other things being equal, a constant ratio of debt to GDP. Thus, deviations from the median forecast are small, and dependent only on nonfiscal variables, as can be seen in Figure 3.7. By construction this rule is not flexible; fiscal balance is fixed. However, it is sustainable; public debt remains constant over the simulation period with a low range of variation between the worst and best case scenarios of 8.6% of GDP.

The estimations under the expenditure rule are determined by $b_t = R_t - min\{E_t; \bar{E}_t\}$, where R_t and E_t stand for total revenue and expenditure, and $\bar{E}_t$ is the limit for expenditure in time *t*, which is capped to an annual growth of 3% in real terms. Under this rule expenditure and debt are set on decreasing paths in the long run. Thus, it guarantees sustainability in the

---

[24] Specifically, the simulations use a sequence of random vectors $\hat{\xi}_{t+1} \dots \hat{\xi}_T$, such that $\forall\, \tau \in [t+1, T]$, $\hat{\xi}_\tau = W v_\tau$, where $v_\tau \sim N(0,1)$, W is such that $\Omega = W'W$ (Celasun et al., 2006).

long run. However, the rule´s flexibility allows large variations of the balance, as well as paths that lead to a substantial increase in debt in the medium term. As can be seen in Figure 3.8, debt fluctuates in a range between 61% and 30% of GDP.

The fiscal rule based on the cyclically adjusted balance (CAB) can be spelled out as:

$$b_t = b_0 + \varepsilon^{GDP} \frac{GDP_t - \overline{GDP}_t}{\overline{GDP}_t} + \varepsilon^{Oil} \frac{P_t^{Oil} - \bar{P}_t^{Oil}}{\bar{P}_t^{Oil}}$$

where ε^{GDP} is the balance elasticity to the output gap, ε^{Oil} is the balance elasticity to the commodity gap, and b_0 is the long-term fiscal balance target, which is assumed to be -2.5% of GDP. The output gap is calculated based on deviations from the realized GDP from a potential output (i.e., $\overline{GDP}_t$) estimated using an HP filter for the period 1990-2016. Similarly, the commodity gap is calculated based on deviations from realized oil prices to a long-term trend price estimated using a five-year moving average.[25] By construction, a fiscal rule based on a cyclically adjusted balance renders the optimal fiscal policy by allowing sufficient flexibility to conduct a countercyclical policy, while maintaining a sustainable debt path. As can be seen in Figure 3.9, debt remains under 50% of GDP with a confidence of 95%. Moreover, the correlation between the output gap and the public balance is 0.98.

Finally, I conduct simulations for an implicit structural balance rule that combines a CAB rule with an expenditure rule. I simulate the debt path under a balance rule at -2.5% of GDP that allows triggering an escape clause during economic downturns and where expenditure growth is capped (i.e., a fiscal rule that mimics the fiscal framework approved for the Mexican federal government under the 2013 fiscal reform). This rule spells out as:

[25] Simulations under alternative assumptions render similar results (i.e., using different time periods to estimate the output gap, and using an HP or a different time range for the moving average used as the long-term oil price).

$$b_t = R_t - min\{R_t - b_s; \bar{E}_t\}$$

where $b_s = b_0 + I_t \varepsilon^{GDP} \frac{GDP_t - \overline{GDP}_t}{\overline{GDP}_t}$, I_t is an indicator variable that takes the value of 1 when GDP_t is smaller than $\overline{GDP}_t$ and 0 otherwise, and $\bar{E}_t$ stands for an upper bound of expenditure that limits expenditure to a growth rate of 3.0% in real terms. Figure 3.10 shows that this rule sets debt on a decreasing path with a 95% confidence. This is the result of capping expenditure growth at a rate lower than the growth rate of potential GDP (3.5%).[26] In terms of flexibility, this rule also contrasts with a simple balance rule, given that it allows for conducting a countercyclical fiscal policy along the whole business cycle. It shows an average correlation between the output gap and public balance of 0.82.

3.5 Conclusions

There is a wide literature that analyzes how taxes, government expenditures, and government balance should be set over the business cycle for fiscal policy to be optimal and sustainable. However, international experience also shows ample evidence that such policies have not always been pursued. This has been reflected in unsustainable public debt growth paths and in the conduct of procyclical policies that have accentuated the negative effects of the business cycle in the economy. Such outcomes have drawn attention from policy analysts and academics, who have been exploring the drivers of these so-called deficit and procyclical biases.

[26] To obtain a debt path similar to the one implied by the structural balance rule, the rule would have to be recalibrated so that the expenditure cap growth rate is set at potential GDP growth.

In this paper I contribute to understanding the reasons behind these biases by providing a comprehensive analysis of the case of Mexico. I present the determinants of public revenue deviations and a historical analysis of the evolution of the institutional framework driving fiscal policy. I find that Mexico´s current framework has a built-in deficit bias over the business cycle and allows the government to conduct a countercyclical fiscal policy during downturns, but incentivizes procyclical behavior during economic expansions. Moreover, I use an unrestricted VAR model to simulate the implications of different fiscal rules, and show the dichotomy in objectives between fiscal policies that exclusively focus on avoiding the deficit bias and those that exclusively focus on reducing the procyclicality bias. I find that rules based on a cyclically adjusted balance (CAB) are a first best. I also find that a fiscal rule that combines a budget balance rule with an expenditure cap is able to mimic the results of a CAB rule in terms of reducing the procyclical and deficit biases, with the advantage that it is simpler to implement.

Such a hybrid rule appears to be a more politically viable, second-best option for the case of Mexico, since it does not require the creation of an autonomous government agency to estimate a cyclically adjusted balance. Its implementation only requires adding an expenditure cap to its existing legal framework. Ideally this expenditure cap should limit the growth of total public expenditure to a rate of growth equal to (smaller than) the rate of growth of potential GDP to obtain a stable (decreasing) debt-to-GDP ratio. The approved amendments to the Fiscal Responsibility Law, together with the creation of the Mexican Oil Fund, are aligned with this objective, and if they are implemented correctly in the following years they will allow the Mexican government to self-insure against macroeconomic risks at the national level. The new fiscal framework allows the federal government to adjust its fiscal policy for the business cycle and for cyclical fluctuations in oil prices, thus transferring resources from good to bad states. By following this rule and establishing a credible enforcement mechanism in by-laws to assure fiscal consolidation in the medium term, the new fiscal framework should protect Mexico against fiscal crisis and help lower the risks associated with increasing interest rates at the international level in the years to come.

Figures and Tables

TABLE 3.1. PUBLIC SECTOR REVENUES AND EXPENDITURES, 2001-2013
(PERCENTAGE OF GDP)

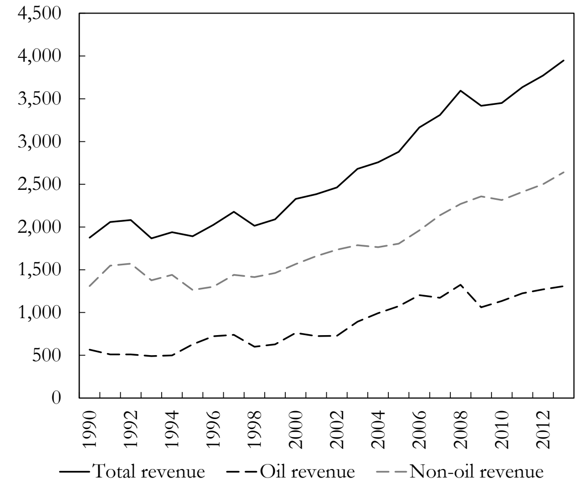
Public Sector Expenditure
(percent of GDP)

	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013 Budget	2013 Estimated	2014 Budget
Traditional Balance	**-0.6**	**-1.0**	**-0.6**	**-0.2**	**-0.1**	**0.1**	**0.0**	**-0.1**	**-2.2**	**-2.8**	**-2.5**	**-2.6**	**-2.0**	**-2.3**	**-3.5**
Traditional balance w/o Pemex investment	-0.2	-0.6	-0.1	0.3	0.2	0.3	0.4	0.5	-0.2	-0.8	-0.6	-0.6	0.0	-0.3	-1.5
Total revenue	**18.6**	**19.1**	**20.5**	**20.3**	**20.5**	**21.5**	**21.8**	**23.3**	**23.3**	**22.4**	**22.7**	**22.7**	**21.6**	**23.6**	**21.7**
Non-tax revenue	1.3	1.6	1.2	1.2	0.8	0.8	1.4	1.2	3.2	1.3	1.2	1.4	0.6	1.7	0.9
Oil revenue	5.6	5.7	6.8	7.3	7.7	8.2	7.7	8.6	7.2	7.4	7.6	7.6	7.4	7.8	7.2
Tax revenue	8.3	8.5	8.7	8.2	8.4	8.8	9.2	9.9	9.3	9.9	10.0	9.8	9.7	10.2	10.0
Government-owned companies	3.3	3.4	3.7	3.5	3.7	3.7	3.5	3.7	3.6	3.7	3.9	3.9	3.7	3.8	3.7
Total expenditure	**19.1**	**20.2**	**21.2**	**20.5**	**20.6**	**21.4**	**21.8**	**23.4**	**25.5**	**25.2**	**25.2**	**25.3**	**23.5**	**25.9**	**25.2**
Current expenditure	11.4	12.3	13.3	12.3	12.6	12.8	13.2	13.8	15.3	14.9	15.1	15.3	14.0	N.A.	15.0
Capital expenditure	2.3	2.6	2.6	2.9	2.9	3.1	3.6	4.4	5.1	5.0	4.9	4.8	4.3	N.A.	4.8
Interest payments	2.7	2.5	2.4	2.4	2.2	2.4	2.1	1.9	2.2	1.9	1.9	2.0	2.1	1.9	2.2
Transfers to states	2.9	3.0	2.9	2.7	2.9	3.1	2.9	3.5	3.1	3.3	3.3	3.2	3.2	3.3	3.3
Other	-0.1	-0.2	-0.1	0.2	-0.1	0.0	0.0	-0.1	-0.1	0.0	0.0	0.0	-0.1	N.A.	-0.1
Memorandum Items															
PSBR	-2.7	-2.4	-1.8	-0.5	-1.3	-1.2	-1.0	-1.6	-2.6	-3.4	-2.7	-3.2	-2.9	-3.8	-4.1
PSBR adjusted for nonrecurring income	-3.3	-3.1	-2.4	-1.8	-1.5	-1.5	-1.7	-2.3	-5.2	-4.1	-3.4	-3.8	-3.2	-4.0	-4.3
Public debt, net	31.9	34.1	35.1	32.6	31.4	29.8	29.1	33.2	36.2	36.4	37.8	38.0	n.a.	38.3	n.a.

PSBR: Public Sector Borrowing Requirements.
Source: Ministry of Finance and Public Credit, Mexico.

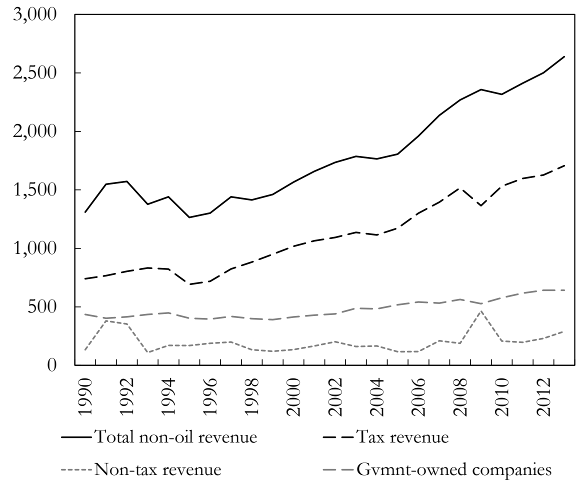
FIGURE 3.1. GOVERNMENT REVENUES

Panel A. Total Revenue and Components
(Billion Pesos)



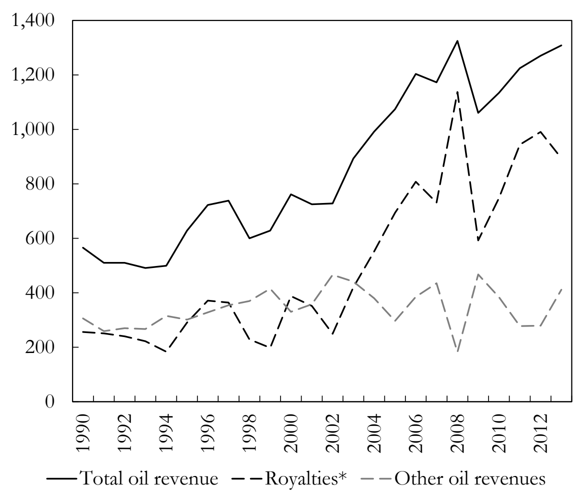
Source: Ministry of Finance and Public Credit, Mexico.

Panel B. Total Non-Oil and Revenue Components
(Billion Pesos)



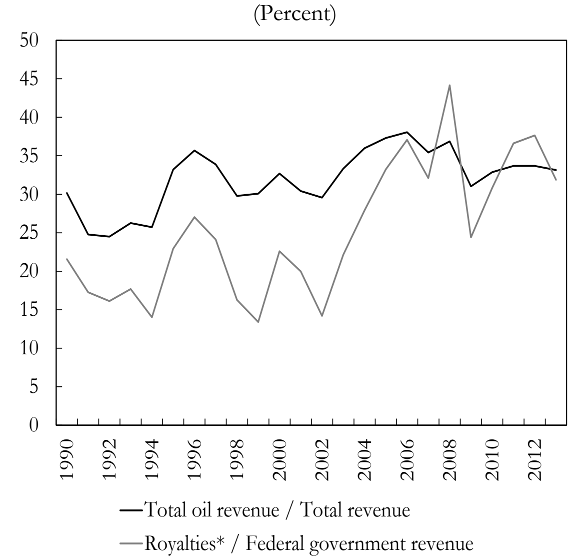
Source: Ministry of Finance and Public Credit, Mexico.

Panel C. Total Oil Revenue and Components
(Billion Pesos)



*Refers to revenues corresponding to the so-called "Derechos sobre Hidrocarburos."
Source: Ministry of Finance and Public Credit, Mexico.

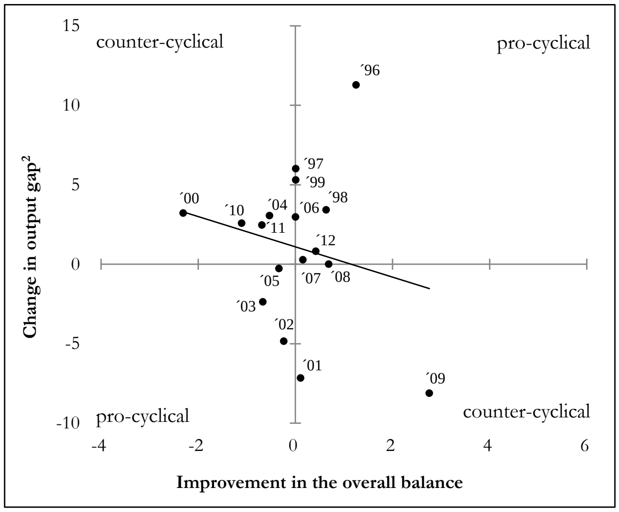
Panel D. Oil Revenue Ratios
(Percent)



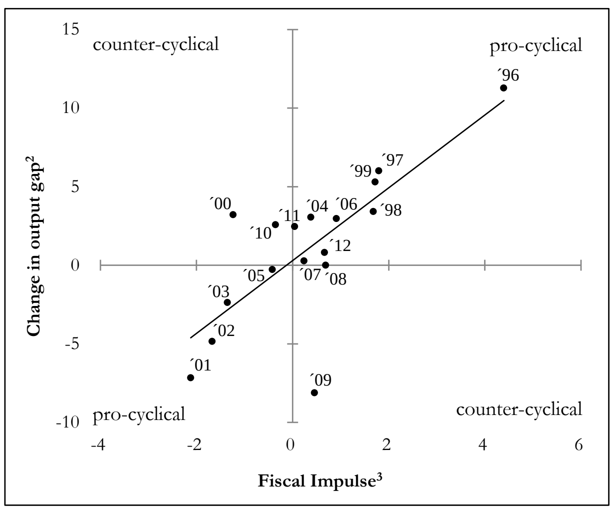
Source: Ministry of Finance and Public Credit, Mexico.

FIGURE 3.2. FISCAL POLICY CYCLICALITY[1]

Panel A. Fiscal Policy Cyclicality



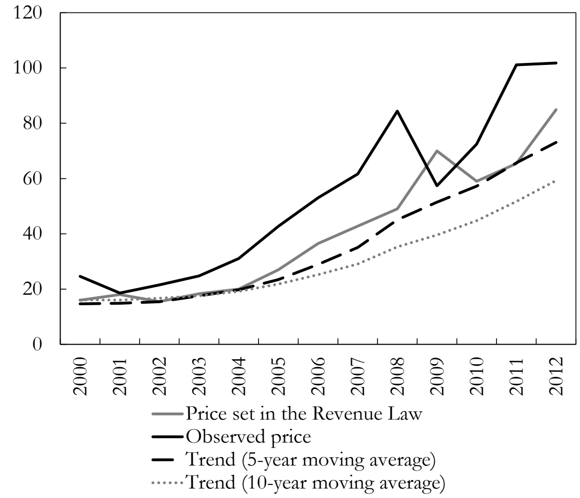
Panel B. Fiscal Policy Cyclicality



1. Fiscal policy is countercyclical (procyclical) when the change in output gap and the fiscal impulse or the change in overall balance have opposite (equal) signs.
2. A positive (negative) number in the output gap indicates an increase (decrease) of GDP with respect to potential GDP. To estimate potential GDP, I use a standard HP filter (lambda 100) using observed GDP data form 1980 to 2013 and GDP estimations based on consensus forecasts for the period 2013-2015.
3. Fiscal impulse refers to changes in government-cyclically-adjusted fiscal balance in percent of potential GDP. A positive (negative) number indicates a fiscal stimulus (withdrawal of fiscal stimulus). The cyclically adjusted fiscal balance is calculated by adjusting PSBR by nonrecurrent revenues and by the economic cycle using a revenue-to-GDP elasticity of 1.

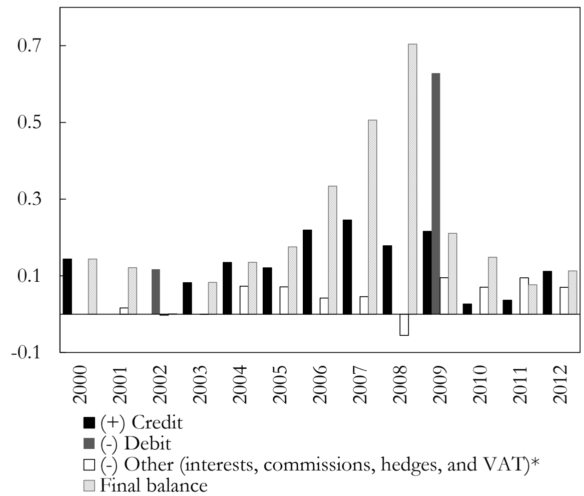
FIGURE 3.3. OIL REVENUE WINDFALLS

Panel A. Price of Mexican Oil
(Dollars per barrel)



Source: Ministry of Finance and Public Credit, Mexico.

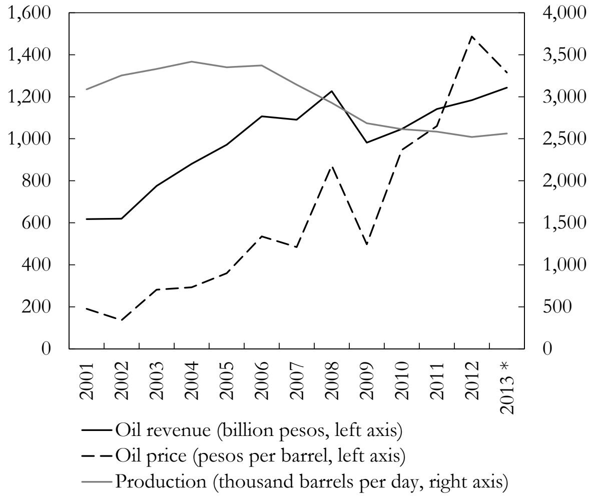
Panel B. Oil Revenue Stabilization Fund Balance
(Percent of GDP)



*The negative value in 2008 is due to interests being larger than costs.
Source: Ministry of Finance and Public Credit, Mexico.

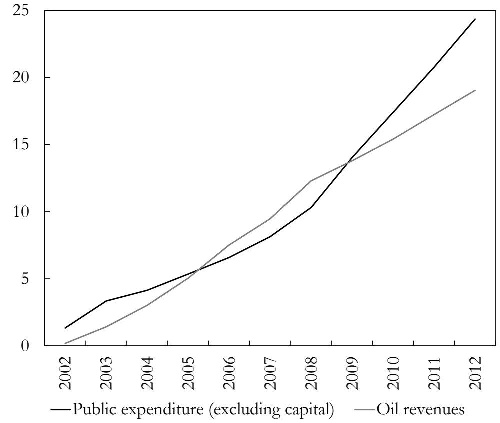
FIGURE 3.4. MEXICAN PUBLIC FINANCE INDICATORS

Panel A. Oil Revenue
(Billion pesos; thousand barrels per day)



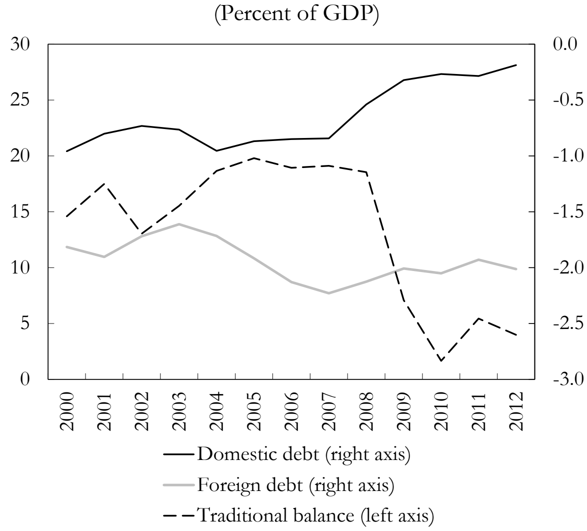
*According to budget.
Source: Ministry of Finance and Public Credit, Mexico.

Panel B. Increase in Oil Revenue and Public Expenditure*
(Percent of GDP)



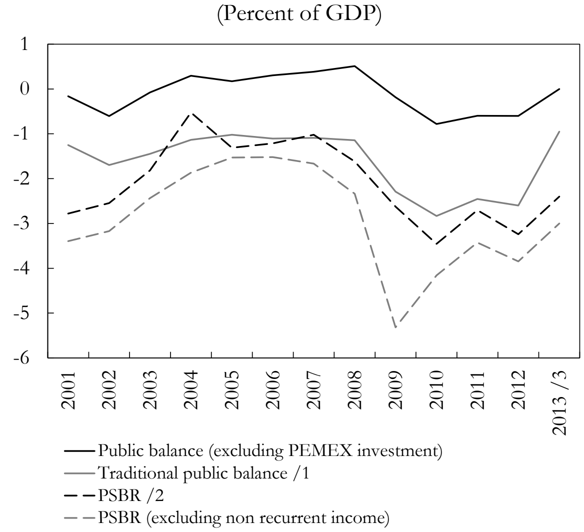
*Percent accumulated increase with respect to year 2001.
Source: Ministry of Finance and Public Credit, Mexico.

Panel C. Mexican Public Debt
(Percent of GDP)



Source: Ministry of Finance and Public Credit, Mexico.

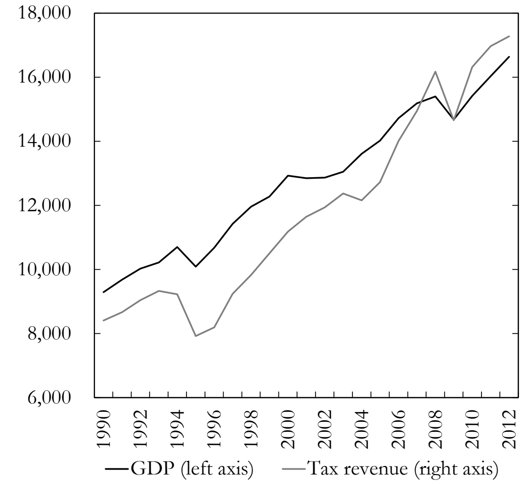
Panel D. Fiscal Balance Measures
(Percent of GDP)



1/ Excludes Pemex public investments financed by the private sector.
2/ Public Sector Borrowing Requirements (PSBR) is a measure that includes all expenditure components of the public sector, providing a more transparent picture of revenues and expenditure.
3/ Projected.
Source: Ministry of Finance and Public Credit, Mexico.

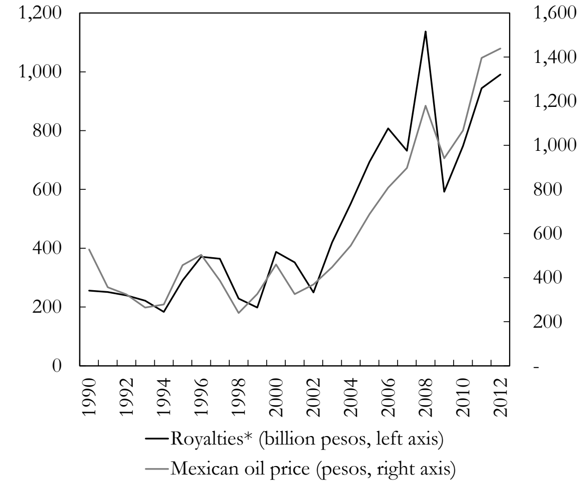
FIGURE 3.5. TREND AND CYCLE COMPONENTS OF TAX REVENUES AND ROYALTIES

Panel A. GDP and Tax Revenue
(Billion Pesos)



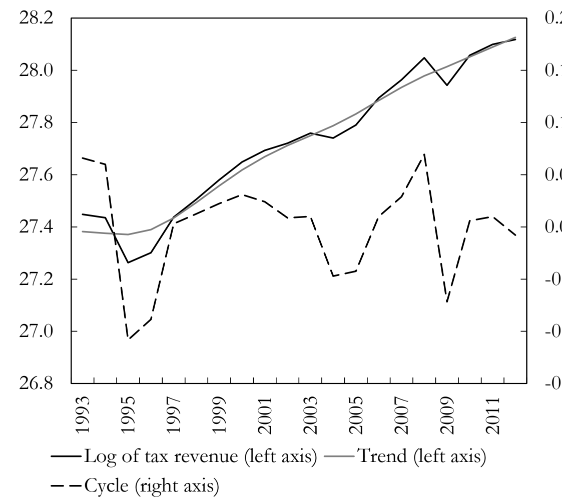
Source: Ministry of Finance and Public Credit, Mexico.

Panel B. Royalties and Oil Price
(Billion Pesos; Pesos)



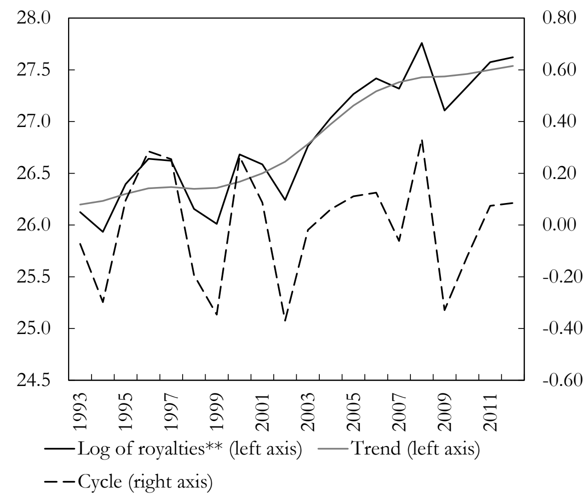
*Refers to revenues corresponding to the so-called "derechos sobre hidrocarburos."
Source: Ministry of Finance and Public Credit, Mexico.

Panel C. Tax revenue, Trend, and Cycle Components*
(Logarithms)



*The trend component of tax revenues is obtained with a Hodrick-Prescott Filter (lambda = 6.25) in period 1990-2013. The cycle component is obtained by subtracting the trend component from the observed series.
Source: Ministry of Finance and Public Credit, Mexico.

Panel D. Royalties, Trend, and Cycle Components*
(Logarithms)



*The trend component of royalties is obtained with a Hodrick-Prescott Filter (lambda = 6.25) in period 1990-2013. The cycle component is obtained by subtracting the trend component from the observed series.
**Refers to revenues corresponding to the so-called "derechos sobre hidrocarburos."
Source: Ministry of Finance and Public Credit, Mexico.

FIGURE 3.6. CYCLICAL COMPONENT OF REVENUE

Cycle Component of Revenue*
(Logarithms)

*The cycle component of revenues is a weighted sum of the cycle component of tax revenues and the cycle component of royalties.
Source: Ministry of Finance and Public Credit, Mexico.

TABLE 3.2. OLS REGRESSIONS

	Log of tax revenue			Royalties (billion pesos)		
	1990-2012	1996-2012	2000-2012	1990-2012	1996-2012	2000-2012
	(1)	(2)	(3)	(4)	(5)	(6)
Log of GDP	1.5109***	1.9066***	1.8070***			
	(0.0842)	(0.0713)	(0.1277)			
Mexican oil price				1.2042***	1.2606***	1.2447**
				(0.3094)	(0.3590)	(0.4977)
Mexican oil price squared				-0.0003	-0.0003	-0.0003
				(0.0002)	(0.0002)	(0.0003)
Constant	-17.8967***	-29.8827***	-26.8612***	-106.5527	-94.3363	-72.8605
	(2.5396)	(2.1565)	(3.8682)	(100.3986)	(124.7919)	(191.4735)
R-squared	0.9388	0.9795	0.9479	0.8844	0.8829	0.8419
Observations	23	17	13	23	17	13

Note: Standard errors in parenthesis; $^{***}p < 0.01$, $^{**}p < 0.05$, $^{*}p < 0.1$.

TABLE 3.3. FISCAL POLICY FRAMEWORK

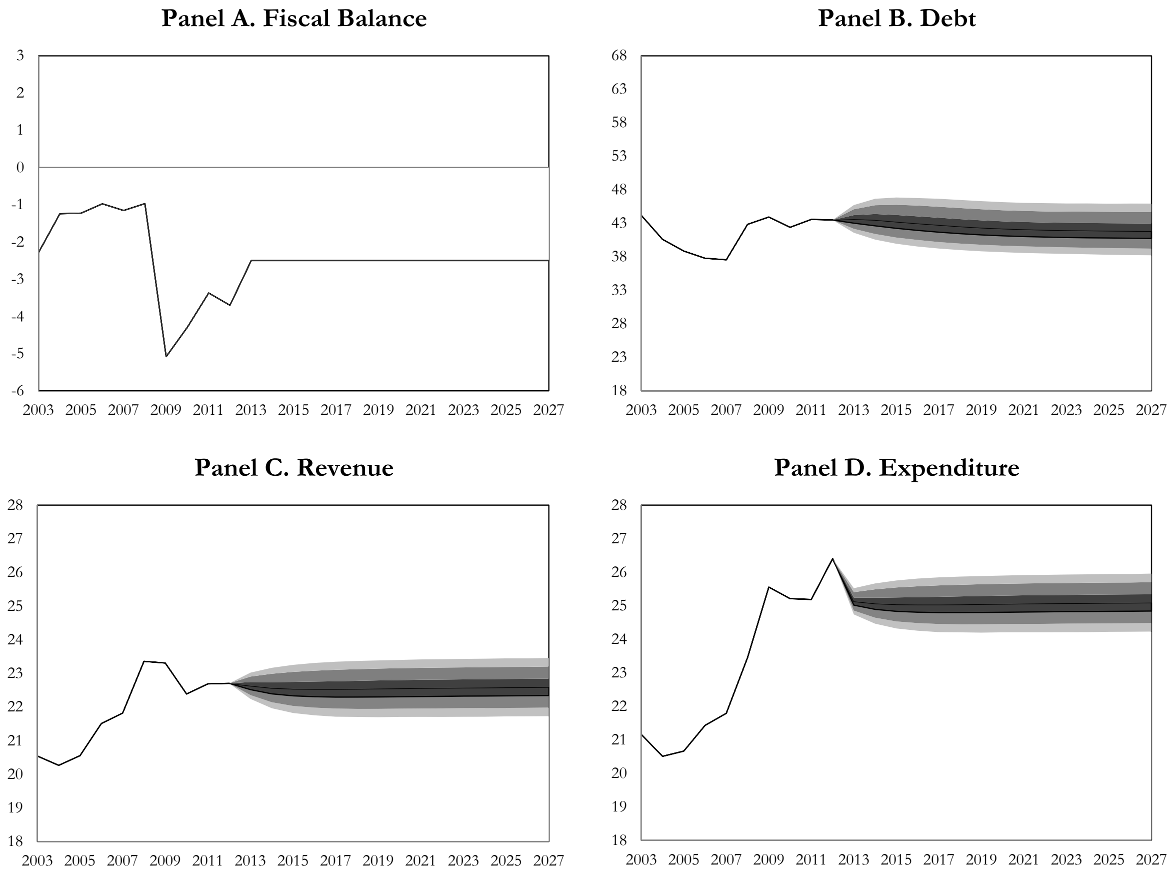
Rule	Year of Introduction	Definition
Golden Rule	1946	Congress can only approve debt if it is used for capital investment.
Contingent fiscal rules	1998-2006	Development of a set of contingent procedural fiscal rules, included yearly in the Federal Expenditure Budget to contain the effect of negative shocks.
Balanced Budget Rule	2006	General government budget must be balanced yearly with an escape clause to be triggered during economic downturns.
Stabilization funds	2006	The Fiscal Responsibility Law created stabilization funds to be used during economic downturns, and to be built with revenue windfalls.
Modified Balanced Budget Rule	2008	The Fiscal Responsibility Law was modified to exclude investment from Pemex from the definition of budgetary balance.
Medium-term balance objectives	2013	Through an amendment to the FRL, Public Sector Borrowing Requirements (PSBR, the widest measure of balance in Mexcio) are established as an additional fiscal anchor.
Expenditure growth ceiling	2013	The FRL also established an expenditure ceiling that caps its rate of growth to 2% in real terms for 2015 and 2016, and a rate equal to the growth of potential GDP thereafter.
Sovereign wealth fund	2013	The Energy Reform contemplates at the Constitutional level the creation of a Mexican Oil Fund to receive all government proceeds from the oil sector and create a long-term savings fund.

TABLE 3.4. VAR MODEL COEFFICIENTS

	Output gap	Log of REER	Domestic real interest rate
Output gap (*t-1*)	1.0156	0.7243	-0.0115
	(0.1022)	(0.3012)	(0.0054)
Output gap (*t-2*)	-0.2217	-0.2984	0.0091
	(0.1078)	(0.3177)	(0.0057)
Log of real effective exchange rate (REER) (*t-1*)	0.0776	0.5405	0.0050
	(0.0471)	(0.1388)	(0.0025)
Log of real effective exchange rate (REER) (*t-2*)	-0.0784	-0.0598	-0.0053
	(0.0356)	(0.1049)	(0.0019)
Domestic real interest rate (*t-1*)	12.2842	-8.1006	1.1830
	(2.6407)	(7.7816)	(0.1406)
Domestic real interest rate (*t-2*)	-12.2633	16.2757	-0.3435
	(2.6976)	(7.9495)	(0.1436)
Commodity gap	1.8692	-0.3863	0.0817
	(0.6837)	(2.0149)	(0.0364)
Commodity gap (*t-1*)	-1.2898	-0.3210	-0.0555
	(0.7175)	(2.1145)	(0.0382)
U.S. real interest rate	0.0305	-0.2265	0.0062
	(0.2298)	(0.6772)	(0.0122)
U.S. real interest rate (*t-1*)	-0.0062	0.8941	-0.0078
	(0.2336)	(0.6884)	(0.0124)
Constant	-0.2424	-37.6117	0.7327
	(5.4151)	(15.9573)	(0.2883)
R-squared	0.8371	0.5921	0.7787

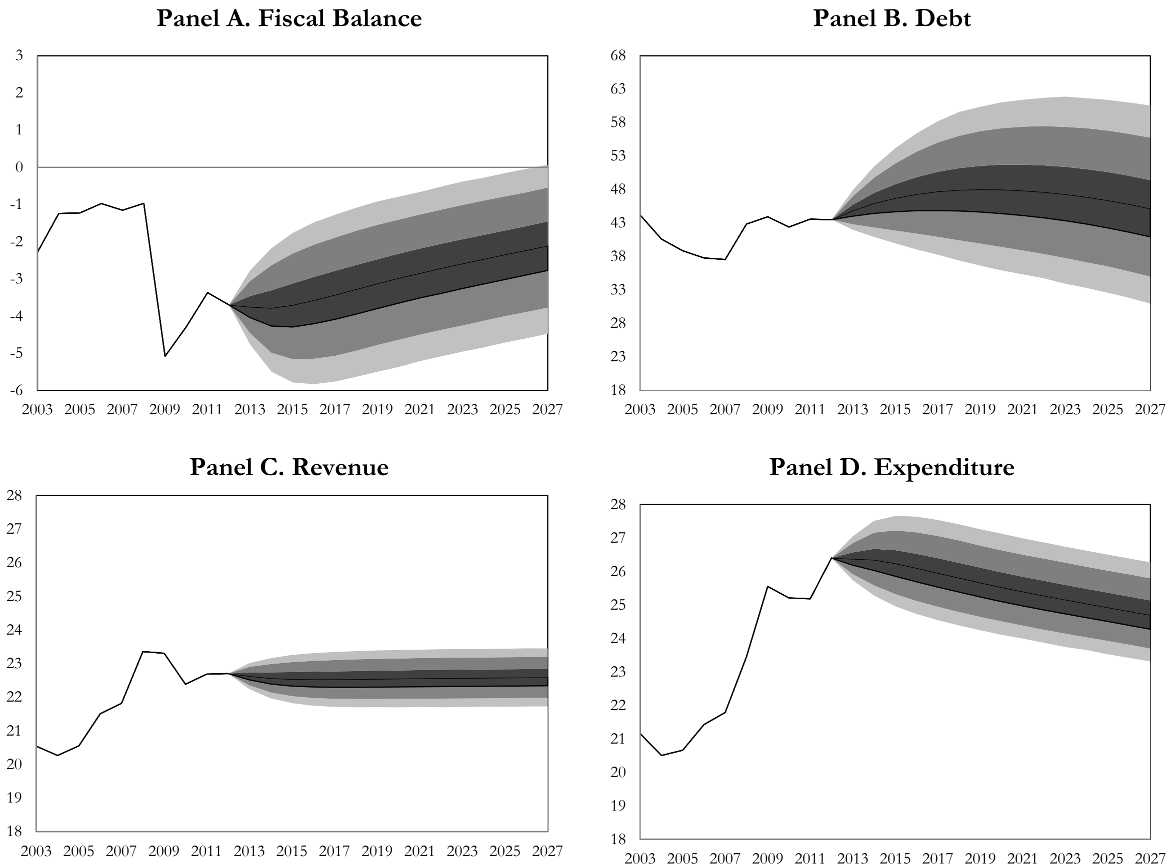
Note: Following Celasun et. al. (2006), I estimate the following VAR model that includes nonfiscal determinants of public debt: $Y_t = \gamma_0 + \gamma Y_{t-1} + \alpha X_{t-1} + \xi_t$, where Y_t is a vector of endogenous variables (the output gap, the log of the real effective exchange rate and the domestic real interest rate), X is a vector of exogenous variables (the commodity gap and the U.S. real interest rate) and $\xi \sim N(0, \Omega)$ is the error term. To estimate the VAR, I use the period 1990-2012. The output gap is calculated using a Hodrick-Prescott filter over the period 1990-2016. For the domestic real interest rate, I use the one-year CETES rate adjusted by CPI. The commodity gap is the six-year moving-average of the price of the Mexican oil mix. The real US interest rate is the ten-year Treasury bond adjusted by CPI.

FIGURE 3.7. SIMULATION RESULTS: BUDGET BALANCE



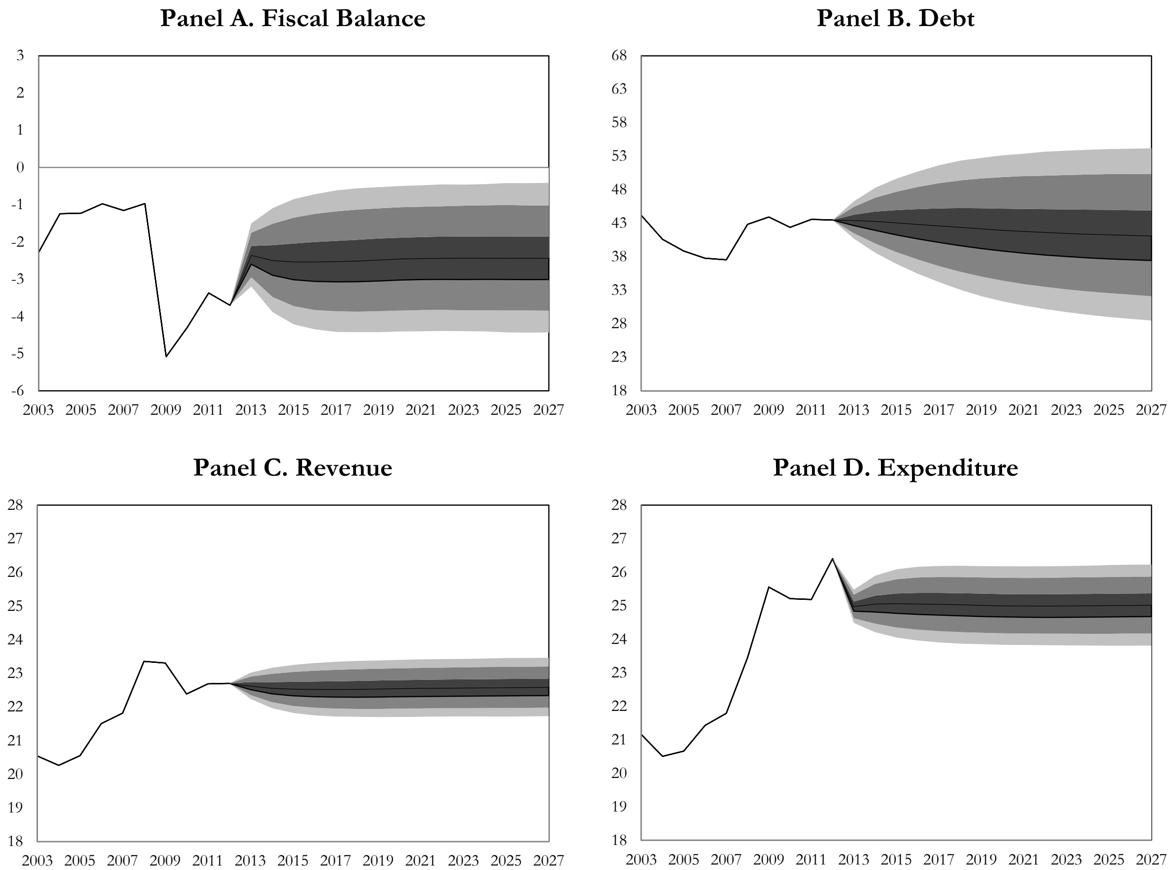
Note: Following Celasun et. al. (2006), I use the variance-covariance matrix of the residuals of the VAR model and a sequence of random shocks to generate projections consistent with the simulated shocks. The VAR model is based on the following specification: $Y_t = \gamma_0 + \sum_k \gamma_k Y_{t-k} + \xi_t$, where $\xi \sim N(0, \Omega)$, is a vector of well-behaved error terms. The variance-covariance matrix of residuals Ω describes the joint statistical properties of the contemporaneous shocks affecting debt dynamics. I estimate path projections for the fiscal balance (Panel A), public debt (Panel B), government revenue (Panel C) and government expenditure (Panel D). The "fan charts" show the median, as well as 50-percent (dark grey area), 90-percent (intermediate grey area), and 98-percent (light grey area) confidence bands. For projections under a budget balance rule, I assume an implicit budget balance of -2.5% of GDP.

FIGURE 3.8. SIMULATION RESULTS: EXPENDITURE CAP



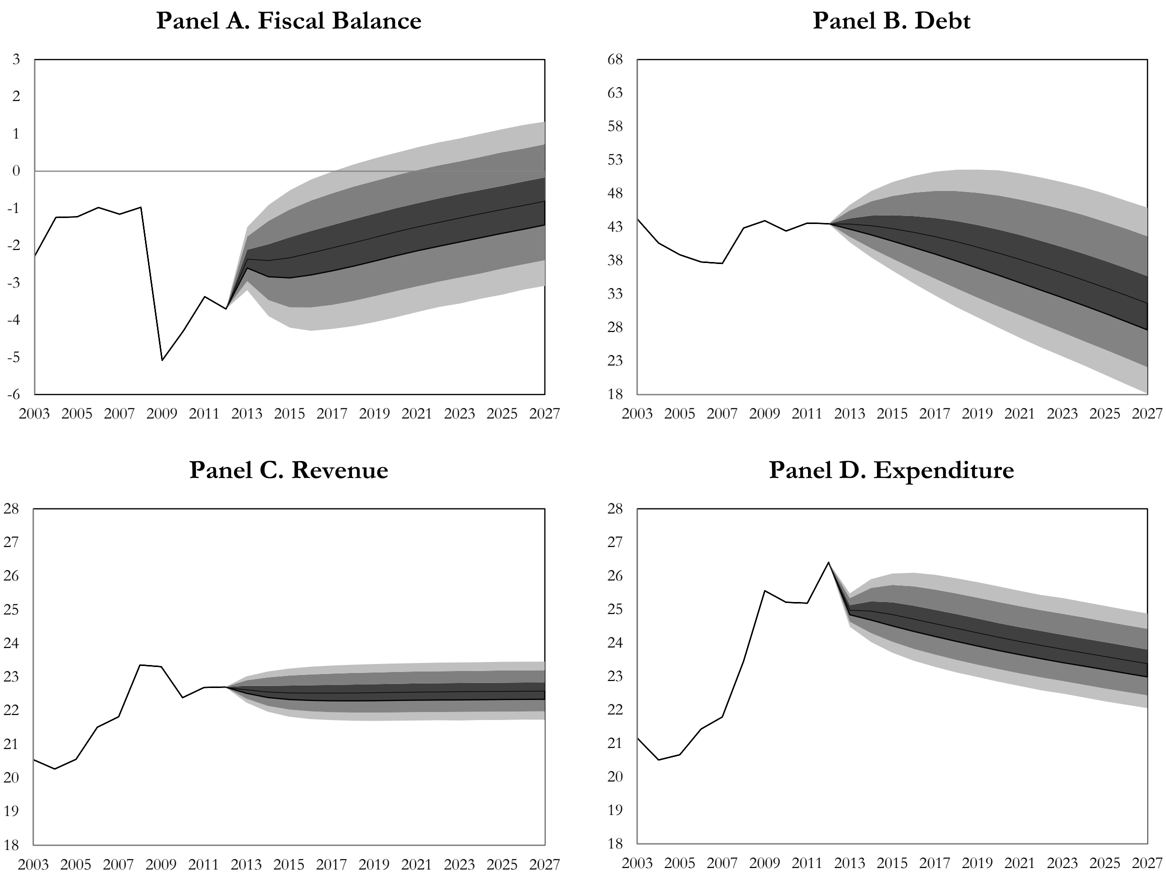
Note: Following Celasun et. al. (2006), I use the variance-covariance matrix of the residuals of the VAR model and a sequence of random shocks to generate projections consistent with the simulated shocks. The VAR model is based on the following specification: $Y_t = \gamma_0 + \sum_k \gamma_k Y_{t-k} + \xi_t$, where $\xi \sim N(0, \Omega)$, is a vector of well-behaved error terms. The variance-covariance matrix of residuals Ω describes the joint statistical properties of the contemporaneous shocks affecting debt dynamics. I estimate path projections for the fiscal balance (Panel A), public debt (Panel B), government revenue (Panel C) and government expenditure (Panel D). The "fan charts" show the median, as well as 50-percent (dark grey area), 90-percent (intermediate grey area), and 98-percent (light grey area) confidence bands. The estimations under the expenditure rule are determined by $b_t = R_t - min\{E_t; \bar{E}_t\}$, where R_t and E_t stand for total revenue and expenditure, and $\bar{E}_t$ is the limit for expenditure in time *t*, which is capped to an annual growth of 3% in real terms.

FIGURE 3.9. SIMULATION RESULTS: CYCLICALLY ADJUSTED BALANCE RULE



Note: Following Celasun et. al. (2006), I use the variance-covariance matrix of the residuals of the VAR model and a sequence of random shocks to generate projections consistent with the simulated shocks. The VAR model is based on the following specification: $Y_t = \gamma_0 + \sum_k \gamma_k Y_{t-k} + \xi_t$, where $\xi \sim N(0, \Omega)$, is a vector of well-behaved error terms. The variance-covariance matrix of residuals Ω describes the joint statistical properties of the contemporaneous shocks affecting debt dynamics. I estimate path projections for the fiscal balance (Panel A), public debt (Panel B), government revenue (Panel C) and government expenditure (Panel D). The "fan charts" show the median, as well as 50-percent (dark grey area), 90-percent (intermediate grey area), and 98-percent (light grey area) confidence bands. The fiscal rule based on the cyclically adjusted balance (CAB) can be spelled out as: $b_t = b_0 + \varepsilon^{GDP} \frac{GDP_t - \overline{GDP}_t}{\overline{GDP}_t} + \varepsilon^{Oil} \frac{P_t^{Oil} - \bar{P}_t^{Oil}}{\bar{P}_t^{Oil}}$, where ε^{GDP} is the balance elasticity to the output gap, ε^{Oil} is the balance elasticity to the commodity gap, and b_0 is the long-term fiscal balance target, which is assumed to be -2.5% of GDP. The output gap is calculated based on deviations from the realized GDP from a potential output (i.e., $\overline{GDP}_t$) estimated using an HP filter (lambda 100) for the period 1990-2016. Similarly, the commodity gap is calculated based on deviations from realized oil prices to a long-term trend price estimated using a five-year moving average.

FIGURE 3.10. SIMULATION RESULTS: BUDGET BALANCE WITH ESCAPE CLAUSE AND EXPENDITURE CAP



Note: Following Celasun et. al. (2006), I use the variance-covariance matrix of the residuals of the VAR model and a sequence of random shocks to generate projections consistent with the simulated shocks. The VAR model is based on the following specification: $Y_t = \gamma_0 + \sum_k \gamma_k Y_{t-k} + \xi_t$, where $\xi \sim \mathrm{N}(0, \Omega)$, is a vector of well-behaved error terms. The variance-covariance matrix of residuals Ω describes the joint statistical properties of the contemporaneous shocks affecting debt dynamics. I estimate path projections for the fiscal balance (Panel A), public debt (Panel B), government revenue (Panel C) and government expenditure (Panel D). The "fan charts" show the median, as well as 50-percent (dark grey area), 90-percent (intermediate grey area), and 98-percent (light grey area) confidence bands. The budget balance rule with escape clause and expenditure cap spells as: $b_t = R_t - min\{R_t - b_s; \bar{E}_t\}$; where $b_s = b_0 + I_t \varepsilon^{GDP} \frac{GDP_t - \overline{GDP}_t}{\overline{GDP}_t}$; I_t is an indicator variable that takes the value of 1 when GDP is smaller than $\overline{\mathrm{GDP}}_\mathrm{t}$ and 0 otherwise; and $\bar{E}_t$ stands for an upper bound of expenditure that limits expenditure to a rate growth of 3.0% in real terms.

References

[1] Alesina, A., Hausmann, R., Hommes, R., & Stein, E. (1996). Budget Institutions and Fiscal Performance in Latin America. Unpublished manuscript.

[2] Alesina, A., & Tabellini, G. (2005). Why do Politicians Delegate?. Unpublished manuscript.

[3] Aragon, F. M. & Rud, J. P. (2011). Natural Resources and Local Communities: Evidence from a Peruvian Gold Mine. Mimeo. Simon Fraser University.

[4] Arellano Yanguas, J. (2011). Aggravating the Resource Curse: Decentralization, Mining and Conflict in Peru. *Journal of Development Studies*. 47(4). 617-38.

[5] Atkeson, A., & Burstein, A. (2008). Pricing-to-Market, Trade Costs, and International Relative Prices. *American Economic Review, 98*(5), 1998-2031.

[6] Barro, R. J. (1985). Government spending, interest rates, prices, and budget deficits in the United Kingdom, 1730–1918. Rochester, NY. *Rochester Center of Economic Research, Working Paper no. 1*.

[7] Barro, R. J. (1979). On the Determination of the Public Debt. *Journal of Political Economy, 87*(5), 940-971.

[8] Bardhan P., and Mookherjee, D. (2006). Decentralization and Local Governance in Developing Countries. The MIT Press.

[9] Berger, A. N., & Hannan, T. H. (1989). The Price-Concentration Relationship in Banking. *Review of Economics and Statistics*, 71(2), 291-299.

[10] Bernanke, B. S., & Blinder, A. S. (1988). Credit, Money, and Aggregate Demand. *American Economic Review*, 78(2), 435-439.

[11] Berstein, S., & Fuentes, R. (2004). Is There Lending Rate Stickiness in the Chilean Banking Industry? Central Banking, Analysis, and Economic Policies Book Series in L. A. Ahumada, R. Fuentes & N. Loayza (Series Eds.), Banking Market Structure and Monetary Policy, edition 1, vol 7, chapter 6, 183-210.

[12] Bils, M. (1987). The Cyclical Behavior of Marginal Cost And Price. *American Economic Review*, 77(5), 838-855.

[13] Brollo, F., Nannicini, T., Perotti, R. & Tabellini, G. (2010). The Political Resource Curse. *NBER Working Paper*. No 15705.

[14] Celasun, O., Debrun, X., & Ostry, J.D. (2006). Primary Surplus Behavior and Risks to Fiscal Sustainability in Emerging Market Countries: A "Fan-Chart" Approach. *IMF Working Paper* No. WP/06/67.

[15] Caselli, F. & Michaels, G. (2009). Do Oil Windfalls Improve Living Standards? Evidence from Brazil. *NBER Working Paper*. No 15550.

[16] Collier, P. & Goderis, B. (2007). Commodity Prices, Growth, and the Natural Resource Curse: Reconciling a Conundrum. *Centre for the Study of African Economies Working Paper*. No 2007-15.

[17] Copelman, M., & Werner, A. M. (1995). The Monetary Transmission Mechanism in Mexico. *International Finance Discussion Papers*, no 521, Board of Governors of the Federal Reserve System.

[18] Corbacho, A., & Schwartz, G. (2007). Fiscal responsibility laws. In M. Kumar, & T. Ter-Minassian (Eds.), *Promoting fiscal discipline*. Washington, DC.: International Monetary Fund.

[19] Cottarelli, C., Ferri, G., & Generale, A. (1995). Bank Lending Rates and Financial Structure in Italy: a Case Study. *IMF Working Paper* no. 95/38.

[20] Cottarelli, C., & Kourelis, A. (1994). Financial Structure, Bank Lending Rates, and The Transmission Mechanism of Monetary Policy. *International Monetary Fund Staff Papers*, 41(4), 587-623.

[21] De Bondt, G., (2002). Retail Bank Interest Rate Pass-Through: New Evidence at the Euro Area Level. *European Central Bank Working Paper Series* 136.

[22] De Graeve, F., De Jonghe, O., & Vennet, R. V. (2007). Competition, Transmission and Bank Pricing Policies: Evidence From Belgian Loan and Deposit Markets. *Journal of Banking and Finance*, 31(1), 259-278.

[23] Debrun, X., & Kumar, M. (2007). Fiscal Rules, Fiscal Councils and all that: Commitment Devices, Signaling Tools or Smokescreens? *IMF Working Papers Series*. Washington, DC.: International Monetary Fund.

[24] Debrun, X., Moulin, L., Turrini, A., Ayuso-i-Casals, J., & Kumar, M. S. (2008). Tied to the mast? National fiscal rules in the European Union. *Economic Policy,* (54), 297.

[25] Deroose, S., Moulin, L., & Wierts, P. (2006). National Expenditure Rules and Expenditure Outcomes: Evidence for EU Member States. *Wirtschaftspolitische Blätter, 1*, 27-42.

[26] Dornbusch, R. (1987). Exchange Rates and Prices. American Economic Review, 77(1), 93-106.

[27] Dube, O. & Vargas, J. F. (2006). Commodity Price Shocks and Civil Conflict: Evidence from Colombia. *Centro de Recursos para el Análisis de Conflictos. Documentos de CERAC*. No 2.

[28] Dudley, W. C. (2012). The Recovery and Monetary Policy. Federal Reserve Bank of New York Speech, (Oct 15)

[29] Gambacorta, L. (2008). How Do Banks Set Interest Rates?. *European Economic Review*, 52(5), 792-819.

[30] Gambacorta, L., & Iannotti, S. (2007). Are There Asymmetries in the Response of Bank Interest Rates To Monetary Shocks?. *Applied Economics*, 39(19-21), 2503-2517.

[31] Gaytán, A & González-García, J. (2006). Structural Changes in the Transmission Mechanism of Monetary Policy In Mexico: A Non-Linear VAR Approach. *Dirección General de Investigación Económica, Banco de México*. Documento de Investigación 2006–06,

[32] Gil. F. (1998). Monetary Policy and its Transmission Channels in Mexico. *BIS Policy Papers*, (8), 155-180.

[33] Hallerberg, M., Scartascini, C., & Stein, E. (2009). The Budget Process as a Political Arena. In M. Hallerberg, C. Scartascini & E. Stein (Eds.), (pp. 295-320) Washington, D.C.: Inter-American Development Bank; Cambridge: Harvard University, David Rockefeller Center for Latin American Studies.

[34] Hinojosa, L. (2011). Riqueza Mineral y Pobreza en Los Andes. *European Journal of Development Research*. 23(3). 488-504.

[35] Imbs, J., Mumtaz, H., Ravn, M. O., & Rey, H. (2005). PPP Strikes Back: Aggregation and the Real Exchange Rate. *Quarterly Journal of Economics*, 120(1), 1-43.

[36] IMF Fiscal Affairs Department. (2009). Fiscal Rules: Anchoring Expectations for Sustainable Public Finances. Washington, DC.: International Monetary Fund.

[37] Instituto Nacional de Estadística e Informática (2009). Mapa de Pobreza Provincial y Distrital 2007: El Enfoque de la Pobreza Monetaria. http://www.inei.gob.pe

[38] International Monetary Fund. (2012). World Economic Outlook October 2012, Coping With High Debt and Sluggish Growth.

[39] Kashyap, A. K., & Stein, J. C. (2000). What Do A Million Observations on Banks Say About the Transmission Of Monetary Policy?. *American Economic Review*, 90(3), 407-428.

[40] Kopits, G. (2004). Fiscal Policy and High Capital Mobility. in Kopits, G. (ed.) Rules-Based Fiscal Policy in Emerging Markets: Background, Analysis and Prospects. London: Macmillan.

[41] Kopits, G., & Symansky, S. A. (1998). Fiscal Policy Rules. *IMF, Occasional Paper, 162*. Washington, DC.: International Monetary Fund.

[42] Kydland, F. E., & Prescott, E. C. (1977). Rules Rather Than Discretion: The Inconsistency of Optimal Plans. *Journal of Political Economy, 85*(3), 473-491.

[43] Litschig, S. (2008). Financing Local Development: Quasi-Experimental Evidence from Municipalities in Brazil, 1980-1991. *Department of Economics and Business, Universitat Pompeu Fabra*. Economics Working Papers. 1142. Revised Oct 2010.

[44] Loayza, N., Rigolini, J. & Calvo-Gonzalez, O. (2011). More Than You Can Handle : Decentralization and Spending Ability of Peruvian Municipalities. *Policy Research Working Paper Series*. 5763. The World Bank.

[45] Manzano, O. & Rigobon, R. (2006). Resource Curse or Debt Overhang? in Lederman, D. and Maloney, W. F. (Eds.). Natural Resources, Neither Curse Nor Destiny. Stanford University Press and World Bank.

[46] Martínez, L., Sánchez, O., & Werner, A. (2001). Consideraciones Sobre la Conducción de la Política Monetaria y el Mecanismo de Transmisión en México. *Dirección General de Investigación Económica, Banco de México*. Documento De Investigación 2.

[47] Mehlum, H., Moene, K. & Torvik, R. (2006). Institutions and the Resource Curse. *Economic Journal*. 116. 1-20.

[48] Melitz, M. J., & Ottaviano, G. I. P. (2008). Market Size, Trade, and Productivity. *Review of Economic Studies*, 75(1), 295-316.

[49] Michaels, G. (2010). The Long Term Consequences of Resource-Based Specialization. *Economic Journal*. 121. 31-57.

[50] Mills, P., & Quinet, A. (2001) The Case for Spending Rules. Fiscal Rules Conference, p. 320.

[51] Mojon, B. (2000). Financial Structure and the Interest Rate Channel of EBC Monetary Policy. *European Central Bank Working Paper Series*, Working Paper No. 40

[52] Monteiro, J. & Ferraz, C. (2009). Does Oil Make Leaders Unaccountable?. Mimeo. Pontificia Universidade Catolica do Rio de Janeiro.

[53] Neumark, D., & Sharpe, S. A. (1992). Market Structure and the Nature of Price Rigidity: Evidence From the Market for Consumer Deposits. *Quarterly Journal of Economics*, 107(2), 657-680.

[54] Nickell, S. (1981). Biases in Dynamic Models With Fixed Effects. *Econometrica*, 49(6), 1417-1426.

[55] Papyrakis, E. & Gerlagh, R. (2007). Resource Abundance and Economic Growth in the United States. *European Economic Review* 51. 1011-39.

[56] Persson, T. (2000). Political Economics: Explaining Economic Policy. Cambridge, MA. MIT Press.

[57] Raddatz, C. (2007). Are External Shocks Responsible for The Instability of Output in Low-Income Countries?. *Journal of Development Economics*. 84(1). 155-87.

[58] Romer, C. D., & Romer, D. H. (1990). New Evidence on the Monetary Transmission Mechanism. *Brookings Papers on Economic Activity*, (1), 149-198.

[59] Rotemberg, J. J., & Saloner, G. (1987). The Relative Rigidity of Monopoly Pricing. *American Economic Review*, 77(5), 917-926.

[60] Rotemberg, J. J., & Woodford, M. (1990). Cyclical Markups: Theories and Evidence. *NBER Working Papers* 3534.

[61] Roubini, N., & Sachs, J. D. (1989). Political and Economic Determinants of Budget Deficits in the Industrial Democracies. *European Economic Review, 33*(5), 903-933.

[62] Sachs, J. D. & Warner, A. M. (1995). Natural Resource Abundance and Economic Growth. *NBER Working Papers*. 5398.

[63] Sachs, J. D. and Warner, A. M. (2001). The Curse of Natural Resources. *European Economic Review*. 45. 827-38.

a. Sander, H., & Kleimeier, S. (2004). Interest Rate Pass-Through in an Enlarged Europe: the Role of Banking Market Structure for Monetary Policy Transmission in Transition Countries. METEOR, Maastricht research school of Economics of TEchnology and ORganizations.

[64] Sidaoui, J. J., & Ramos-Francia, M. (2008). The Monetary Transmission Mechanism in Mexico: Recent Developments. In Bank for International Settlements (Ed.), (pp. 363-394) BIS Papers, no. 35. Basel: Bank for International Settlements.

[65] Taylor, L. (2011). Environmentalism and Social Protest: The Contemporary Anti-Mining Mobilization in the Province of San Marcos and the Condebamba Valley, Peru. *Journal of Agrarian Change*. 11(3). 420-39.

[66] Tornell, A., & Lane, P. R. (1999). The Voracity Effect. *American Economic Review, 89*(1), 22-46.

[67] Torsten P. & Gerard R. & Guido. (2000). Comparative Politics and Public Finance. *Working Papers 114, IGIER (Innocenzo Gasparini Institute for Economic Research)*, Bocconi University.

[68] Van der Ploeg, F. (2011). Natural Resources: Curse or Blessing?. *Journal of Economic Literature*. 49(2). 366-420.

[69] Von Hagen, J. (1992). Fiscal Arrangements in a Monetary Union: Evidence from the U.S. Springer.

[70] Von Hagen, J., & Harden, I. (1994). National Budget Processes and Fiscal Performance. *European Economy Reports and Studies, 3*, 311-418.

[71] World Bank (2003). Restoring Fiscal Discipline for Poverty Reduction in Peru: A Public Expenditure Review.

[72] Wyplosz, C. (2012). Fiscal Rules: Theoretical Issues and Historical Experiences. Unpublished manuscript.