Effects of a Mortgage Interest Rate Subsidy:
Evidence from Colombia

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EFFECTS OF A MORTGAGE INTEREST RATE SUBSIDY: EVIDENCE FROM COLOMBIA[*]

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Abstract

Government intervention in the construction sector as a way to boost the economy has been a constant in Colombia for the past 90 years. This paper explicitly tests the impact of the most recent of such interventions: a subsidy to the mortgage interest rate. Our results show that the subsidy boosted mortgage loans by around 38 percent. However, we also find that real interest rates went up by 1.09 percent, i.e., there has been an incomplete pass-through of the subsidy to the consumer. We estimate the pass-through of such intervention to be in the range of 65 percent to 74 percent.

Key words: Mortgage loans, mortgage interest rate subsidy, history of mortgage loans in Colombia.

JEL classification: N96, R21, R28.

EFECTOS DE UN SUBSIDIO A LA TASA DE INTERÉS HIPOTECARIA: EL CASO DE COLOMBIA[*]

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Resumen

Este artículo evalúa el efecto de la más reciente estrategia gubernamental para apoyar el sector de la construcción: un subsidio a la tasa de interés hipotecaria. El artículo muestra que el subsidio incrementó los desembolsos hipotecarios en cerca de 38%. Sin embargo, también aumentó la tasa pactada entre bancos y clientes en 1.09 por ciento, es decir, el traspaso del subsidio a los consumidores fue incompleto. Dicho traspaso, estimado en el artículo, se encuentra en un rango de entre 65 y 74 por ciento.

Palabras clave: Créditos hipotecarios, Subsidio a tasa de interés hipotecaria, historia hipotecaria colombiana.

Clasificación JEL: N96, R21, R28.

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1. Introduction

The housing sector and its financing have been at the heart of public policy for decades. The housing sector has traditionally been considered strategic, among other reasons, because its outcome (houses) provides an essential good for the population. Moreover, many governments have considered the sector crucial for employment generation and for its strong linkages with other sectors of the economy. Of course, housing is an expensive asset and households devote a large part of lifetime incomes to acquire it. As such, governments have understood that a healthy housing sector requires an adequate financing scheme, one that will adapt to the fact that mortgage loans are often long-term loans.

In this document, we begin by briefly reviewing the history of housing finance in Colombia over the last 80 years. This historical analysis contextualizes the importance and evolution of government intervention in the housing finance sector. It sets the stage for the main purpose of the document, i.e., the analysis of the latest profound policy intervention of the government in the housing sector: a mortgage interest rate subsidy. Indeed, at the beginning of 2009, when it became evident that Colombia's economy was not immune to the global crisis, the government designed a program to subsidize the mortgage rates of new loans intended to pay for new houses. The subsidy would cover up to 5 percentage points of the agreed interest rate for a seven-year period. This subsidy was originally implemented as a countercyclical policy; the goal was to boost the construction sector during the recession. Nevertheless, given the perceived success, the government has recently announced new resources for the program for 2011. Without much public discussion or impact evaluation, the countercyclical strategy has gone structural. In this paper, we fill part of this gap. We describe the details of the program, take a deep look at the evolution of mortgage loans and interest rates in recent times, and econometrically evaluate the impact of the subsidy on housing finance.

Two major results come out of this analysis. First, the program was effective in terms of its impact on mortgage loans. Controlling for other factors, the subsidy increased

mortgage loans for low-income housing (*vivienda de interés social*, VIS) by 36 percent.[1] For non-VIS housing the results suggest an increase of 38 percent. The latter number should be interpreted as a lower bound because our database, as explained later, does not allow us to estimate this figure with the precision that the VIS model does. Second, the market real interest rates (i.e., the interest rate agreed between the bank and the consumer prior to the government rebate) went up. As textbook micro models tell us, not necessarily all the burden of a tax or the revenues of a subsidy, fall into one side of the market. Depending on the characteristics of demand and supply, consumers and producers (banks in our case) will share the benefits of the subsidy. In this case, our results suggest that after controlling for other relevant determinants, real mortgage interest rates went up by 1.09 percent, i.e., banks are also able to get part of the revenues by charging a higher interest rate. Another way to look at this result is to estimate the pass-through of the subsidy to the consumer. We estimate this figure to be between 65 percent and 74 percent.

The rest of the document is organized as follows. Section 2 is devoted to the history of housing finance in Colombia since the early 1920s. Section 3 describes the regulation of the subsidy on mortgage interest rates and presents a textbook model. The section also takes a first look at recent data on the housing finance market. In Section 4, we describe the methodology to evaluate the impact of the subsidy on loans and interest rates. In Section 5, we describe the datasets used in the empirical exercises. Section 6 reports the main empirical results of this evaluation. Section 7 offers some additional discussion. We summarize the main findings and conclude in Section 8.

2. A Brief History of Mortgage Finance in Colombia[2]

For a long time, the Colombian government has intervened directly and regulated both the market for mortgage loans and the housing sector. Government intervention in the housing and mortgage loan market has been prevalent over time and has received several justifications:

- The persistence of a housing deficit (fewer housing units than households).
- Housing is a basic right according to the Colombian Constitution.

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[1] VIS refers to properties below 135 monthly minimum wages, i.e. US$38.625 for 2010. Non-VIS housing are properties priced above that.
[2] This section is based on a separate appendix entitled "A History of Mortgage Loans in Colombia."

- The quality of the urban environment, especially for low-income sectors, might depend on housing subsidies.
- The housing sector can boost economic growth and employment.
- Promoting housing at the low part of the economic cycle may be an effective countercyclical policy.
- Government housing subsidies are popular during electoral campaigns.

Since the 1930s, access to long-term credit for housing to different groups of the population has been promoted by the creation of various institutions. In the 1930s and 1940s, the main source of mortgage loans was the Central Mortgage Bank (*Banco Central Hipotecario*—BCH). Created in 1932, the BCH had "the purpose of providing mortgage loans with gradual amortization and payable in no more than 10 years" (Patiño, 1981). The National Loans Institute (*Instituto de Credito Territorial*—ICT) was created in the 1940s with the aim of building and financing low income housing. Its resources came from the national budget and from forced investments from bank deposits.[3] It was not until the early 1970s, with the advent of the Savings and Housing Corporations (*Corporaciones de Ahorro y Vivienda*—CAV) and the UPAC system—inflation-adjusted interest rates—that private banks started providing long-term mortgage loans.

In 1991 the government created the National Institute for Low-Income Housing and Urban Reform (*Instituto Nacional de Vivienda de Interés Social y de Reforma Urbana –* INURBE) to subsidize demand for the acquisition of low-income housing by granting buyers a one-time grant. The government's investments through the ICT were replaced by subsidies to low-income families. The subsidies allowed beneficiaries to acquire new housing built by the private sector with funding from the financial sector (Cuervo & Jaramillo, 2009). It was also in 1991 that it was decided that a portion of the Family Compensation Funds' (*Cajas de Compensación Familiar*—CCF) revenue would be devoted to housing. Funding for the CCFs comes from the 4 percent tax that has been charged against the payroll of firms since 1957.

Over time the government has also tried to redirect resources to the sector through forced saving schemes. In 1950, Colombian legislators decreed that workers should receive a redundancy payment (*cesantía*) at the time of dismissal. Each year a month's salary was

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[3] In the 1980s, at the time of the Latin American debt crisis, it started to lend with no down payment. This ended up being an effective anticyclical policy in the depth of the debt crisis, but many of the loans turned bad and the ICT was later liquidated.

put into the worker's *cesantía* account. Although these resources were thought to be a buffer stock in case of dismissal, workers were allowed to use these funds at any time as long as they were used for repairing or buying a house. The *cesantías* were typically used for down payments. In addition, the Lleras Restrepo administration (1966-1970) had public employees deposit their redundancy payments in the recently created National Savings Fund (*Fondo Nacional del Ahorro*—FNA). With these savings, the FNA became another source of mortgage funding.

During the Lleras Restrepo administration, another forced saving scheme was also implemented with the purpose of financing pensions for workers affiliated to the social security system. Half of the savings for pension reserves were to be invested in mortgage loans through BCH. Throughout the 1970s, the government forced the BCH to invest some of its resources in ICT bonds. This and other unfortunate investments caused the BCH to go bankrupt during the economic crisis of 1998-99. As a consequence, the Social Security Institute (*Instituto de Seguros Sociales*—ISS) lost a significant share of its reserves for pensions.

The UPAC System

The most consistent program to finance housing through the private financial sector was designed and implemented by President Misael Pastrana (1970-1974), who made it a cornerstone of his National Development Plan.[4] The main idea was that there was excess demand for housing, which could be solved with an appropriate mortgage loan system. The government created the Savings and Housing Corporations (*Corporaciones de Ahorro y Vivienda*—CAV), whose assets (which could only be mortgage loans) and liabilities would be expressed in an inflation-adjusted unit.[5] This Unit of Constant Purchasing Power (*Unidad de Poder Adquisitivo Constante*—UPAC), was initially a moving index based on the previous twelve months' inflation rate. The number of months of inflation used for the calculation was modified several times.

The CAVs' liquidity reserves were remunerated by the Savings and Housing Fund (*Fondo de Ahorro y Vivienda* – FAVI). This institution was a fund at the Central Bank that

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[4] This strategy was based on a study entitled *The Colombia Operation: a National Program for Economic and Social Development*, whose author was Dr. Lauchlin Currie and which was published in 1961 (DNP, 2009, págs. 55-58).
[5] CAVs were particularly vulnerable because they could only provide loans for one sector: construction.

remunerated the deposits made by CAVs in UPAC. It also awarded loans in UPAC according to liquidity needs. FAVI solved the main problem faced by mortgage funding, namely the maturity mismatch between deposits and mortgage loans.

Accounts denominated in UPAC were a very appealing way of saving when the system was just starting because at the time the financial system paid negative real interest rates on savings. Savings moved quickly to the CAVs. Loans also grew (Figure 1), but with a lag. Nevertheless, over time, the development of the financial sector and the growing proportion of deposits obtained at market interest rates, plus the increase of interest rates above inflation, made funding of mortgages difficult. The CAVs pressed repeatedly for market interest rates to be part of UPAC estimates.[6] The monetary authority gradually made some changes in this direction, trying both to prevent a financial crisis and to keep the building industry afloat.

Figure 1
Mortgage Loans of CAVs as a
Share of Total Loans (1972-1999)
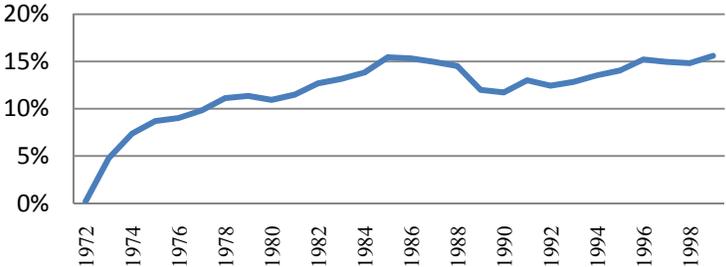
Note: Most housing credits were provided by CAVs. There were a small number of mortgage credits provided by banks and CAVs made some credits to manufactures of inputs to housing construction. However the CAV credit is a very good indicator of total housing credits.
Source: Asobancaria - Plot done by authors

Figure 2 and Figure 3 show clearly that the loan portfolio quality worsened during the financial crises of 1983-1985 and 1998-2002. During the former, however, mortgages were not the primary cause of the deterioration of the loan portfolio. The graphs also show that it was at the end of the 20th century crisis that CAVs did much worse: non-performing loans grew from 5.6 percent in December 1996 to 21.6 percent in November 1999.

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[6] Between September 28, 1992 and October 28, 1993 Enrique Peñalosa, President of ICAVI, sent 11 petitions to the Board of the Central Bank. (Board Archives)

Figure 2
Non–performing Loans as Share of Total
Loans. All Lending Establishments (1965-2004)
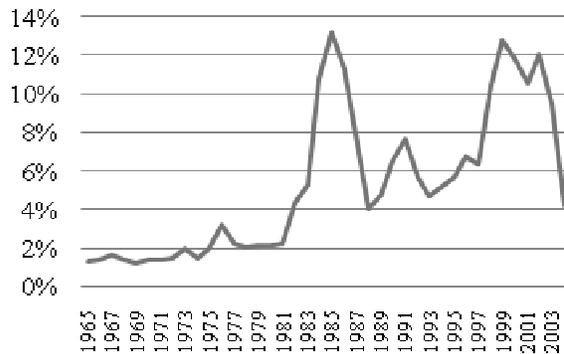
Figure 3
Non-performing Loans as Share of
Total Loans by Mortgage Banks (1974-2004)

Source: Asobancaria
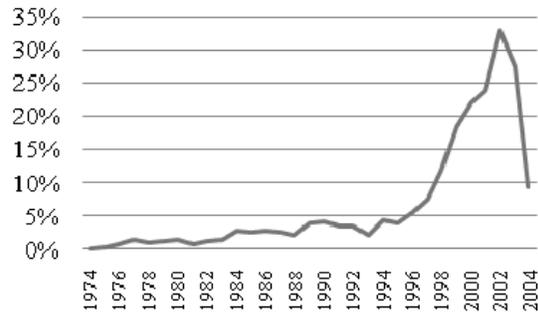
Source: Asobancaria
Note: from 1974 to 1990 mortgage loans belong to CAVs.
The subsequent data belongs to mortgage banks.
Plot done by authors

The Asian and Russian crises of the late 1990s and the reversal in capital flows that followed caused an increase in Colombian interest rates as liquidity in the economy was reduced and the country risk increased. Expectations of depreciation gave way to speculative episodes against the peso and the sale of foreign reserves by the Central Bank, making an anticyclical monetary policy harder to follow. As the interest rate rose during the crisis, the inclusion of DTF (an average market rate on CDs) in the calculation of UPAC caused an increase in monthly mortgage payments and in the value of mortgage loans at the same time as real estate prices were falling.

Deposits in CAVs decreased while their subprime portfolio increased. While several mortgage banks turned insolvent and were intervened by the government, others received liquidity support from FOGAFIN (the institution providing insurance on deposits) for capitalization, plus credit from the Central Bank. The CAVs that survived eventually became banks and diversified their assets.

Amid the crisis, the Constitutional Court ruled that the UPAC system was unconstitutional. The Court asked for a return to a unit tied exclusively to annual inflation. Complying with the ruling, the Unit of Real Value (*Unidad de Valor Real—*UVR) was created. Given the high interest rates on CDs at the time, eliminating that component from the UPAC calculation automatically implied a decrease in mortgage payments in the short run. Banks incurred major losses. With the Court's rule changes, mortgage loans did not recover until 2005 (Fogafin, 2009, p. 205).

The UPAC system worked for two decades thanks to financial repression. The segmentation of the market, the attraction of inflation-adjusted interest rates, and regulations on other financial products mobilized resources towards housing finance. By the late 1990s, a more developed capital market, less financial regulation and lower inflation made the UPAC unsustainable. The time had come for a new system of housing policies, and new instruments such as the interest rate subsidy instituted in April 2009, which will be described and evaluated in this paper.

3. The Interest Rate Subsidy

By the last quarter of 2008, it became clear that what seemed initially to be a domestic crisis in the United States was to become a major global financial crisis. Colombia, like many other countries around the world, implemented countercyclical monetary and fiscal policies. The Central Bank reduced interest rates. The government, with little fiscal and political space to implement countercyclical policies, tried to speed up its investments and designed, during the first half of 2009, a program to boost the construction sector. The program consisted of an interest rate subsidy for mortgage loans for new houses. Depending on the price of the property, up to 5 percentage points of the agreed interest rate were to be covered by the government during the first seven years of the loan.

Initially, the government used the resources available at the Mortgage Portfolio Stabilization Reserve Fund (*Fondo de reserva para la estabilizacion de la cartera hipotecaria—FRECH*), created during the 1999 crisis.[7] The FRECH was originally created to offer interest rate coverage in order to protect mortgage consumers from potential inflationary pressures. As such pressure never materialized, the fund, managed by the Central Bank, remained unused for almost a decade. The size of the original fund was considerable: ca 500 billion pesos, i.e., close to US$278 million. To put the figure in

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[7] The sources of the FRECH fund were: i) a 50 percent tax on the monthly remuneration of cash position of the banks between January 2002 and December 2002; ii) $150 billion pesos of the Central Bank's revenues; iii) the payment by the mortgage banks of the difference between the deposits' interest rate and the real unit value (UVR), if the latter is bigger; iv) the capital gains of the FRECH, and v) the resources from credits awarded to the *Banco de la República* as the fiscal agent of the national government (see Article 48 Law 546 (December 23, 1999)).

perspective, during 2008, new mortgage loans granted by the financial sector represented 5,637 billion pesos, that is, US$3.1 billion.

At the beginning of 2010, the government added 350 billion pesos to the program. This time, most of the resources came from the government's budget. In October 2010, the government announced new resources in the amount of 100 billion pesos for 2010-11. With this, the sum of resources channeled by the government to the program reaches 950 billion pesos, an amount equivalent to 17 percent of all the mortgage loans granted during 2008.[8]

The Subsidy: Policy Details

Decree 1143 (April 1, 2009) authorized the Central Bank to offer the subsidy using the 500 billion pesos of the FRECH. The coverage, granted for the first seven years of the credit, consists of a direct subsidy of the interest rate on new mortgages, offered by existing financial institutions to new loan debtors. The Decree established that the grant should continue for up to seven years as long as the debt is honored. If the debt is overdue for more than three consecutive months, the grant is cancelled.

As shown in Table 1, the subsidy depends on the price of the house. The prices shown are valid for 2009. For 2010, the range of prices covered by the subsidy went up by 3.64 percent i.e., the percentage increase of monthly minimum legal wages (SMMLV). Moreover, the government established quotas, that is, it determined how many loans in each category of the subsidy could benefit from the program. These quotas changed over time as new information on the demand for the loans arrived. Details are summarized in Table 1A in the Appendix.

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[8] During April 2011, the government announced that fresh 137 billion pesos would be added to the program.

Table 1: Coverage as a Function of the House Price in 2009

Price (SMMLV)[*]	Price (COP), in millions	Price (US dollars[**])	Interest rate subsidy
Up to 135	Up to $67.1	37,267	5%
135-235	$67.1-$116.8	37,267 – 64,873	4%
235 – 335	$116.8- $166.5	64,873 – 92,478	3%

Notes: [*] The first category includes two types of housing: low-income housing (VIS) with a top price of 135 SMMLV (legal monthly minimum wages) and priority interest housing (VIP) with a maximum price of 70 SMMLV. SMMLV: Monthly legal minimum wages, $496.900 in 2009 approximately US$276.05. [**] Exchange rate: $1,800 COP per US dollar.

The Interest Subsidy: a Simple Textbook Model

Consider a simple linear supply and demand model for the mortgage loan market.

$$L^d = a - br \ \text{(Demand)}$$
$$L^s = c + dr \ \text{(Supply)}$$

where L = Loan (value) and r = real interest rate. $b, d \geq 0$ are constant parameters. In a and c we include all factors affecting demand and supply of loans other than the mortgage real interest rate. The equilibrium of the model is given by

$$r^* = \frac{a-c}{d+b} \qquad \text{and} \qquad L^* = \frac{ad+bc}{d+b}$$

Suppose now that the government grants a subsidy to the interest rate. How much of the interest rate subsidy will actually reach consumers and how much will stay in the banks depends on the characteristics of supply and demand. Figure 4 depicts the situation.

Figure 4
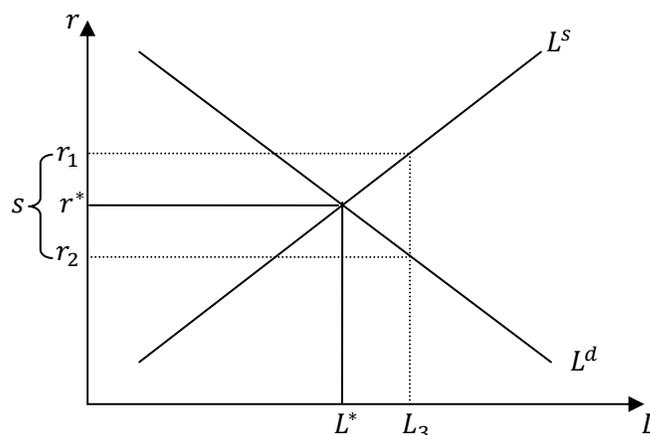
r^* and L^* represents the equilibrium prior to the subsidy. Suppose that the government introduces a subsidy to the interest rate of size s. Now the banks receive an interest rate of r_1 and consumers pay r_2; s is obviously r_1-r_2. The subsidy also increases the value of loans to L_3. As long as the demand and supply equations are not totally elastic or inelastic the plot shows that part of the subsidy will favor consumers in the form of lower interest rates and part will favor banks in the form of higher interest rates. It is trivial to show that the amount of the subsidy that favors banks and consumers depends on the relative magnitudes of supply and demand elasticities. In particular, note that the model can now be summarized by the following equations:

$$L^d = a - br_2 \ (demand)$$
$$L^s = c + dr_1 \ (supply)$$
$$r_1 - r_2 = s \ (subsidy)$$

The model can be solved for the equilibrium values of r_1, r_2 and L_3:

$$r_1 = \frac{a - c + bs}{b + d}$$
$$r_2 = \frac{a - c - ds}{b + d}$$
$$L_3 = \frac{cb + da + dbs}{b + d}$$

Let's focus on the pass-through of the subsidy to consumers and to banks. Consider first the pass-through to consumers (PTC). Define the pass-through as the proportion of the subsidy that goes to the interest rate actually paid by the consumer. In particular,

$$PTC = \frac{r^* - r_2}{s} = \frac{r^* - r_2}{r_1 - r_2}$$

Using the equilibrium described above, the pass-though can be expressed in terms of the slope parameters of demand and supply for loans:

$$PTC = \frac{d}{b + d}$$

Moreover, the pass-through can be expressed in terms of the elasticities of demand and supply. In particular, define ε_s as the elasticity of supply and ε_d the elasticity of demand (both in the equilibrium prior to the subsidy).

Then, $\varepsilon_s = \frac{\partial L^S}{\partial r} \cdot \frac{1}{L} = d \cdot \frac{1}{L}$, and $\varepsilon_d = \frac{\partial L^d}{\partial r} \cdot \frac{1}{L} = -b \cdot \frac{1}{L}$. Then the PTC can be expressed as

(1) $$PTC = \frac{\varepsilon_s}{\varepsilon_s - \varepsilon_d}$$

Analogously, the pass-through to banks (PTB) can be written as

(2) $$PTB = \frac{r_1 - r^*}{s} = \frac{b}{b+d} = \frac{\varepsilon_d}{\varepsilon_d - \varepsilon_s}$$

The PTC grows with the size of ε_s and falls with the size of ε_d. Moreover, the PTC would be complete, i.e., all of the subsidy would end up in the hands of consumers, if either the elasticity of demand is zero or the elasticity of supply goes to infinity. The PTB falls with the size of ε_s and grows with the size of ε_d. In particular, note that the PTB would be complete if either the elasticity of supply is zero or the elasticity of demand goes to infinity.

To sum up, the model predicts that the subsidy should have a positive impact on the amount of loans. Moreover, although consumers should benefit from lower interest rates, under supply and demand equations with non extreme slopes, the pass-through will not be complete. Indeed, banks facing higher marginal costs will charge higher interest rates. The challenge in the next sections is to quantify the impac*t* of the subsidy on both the quantities and the real rates and estimate the pass-through of the policy.

4. Data

Description of databases

This paper uses two main two datasets. The first one, provided by the Financial Superintendency (*Superintendencia Financiera de Colombia—Superfinanciera*), is a bank-level monthly dataset, between January 2006 and June 2010, covering observations for 12 banks involved with the mortgage sector (not all banks in Colombia offer mortgage loans). Among other variables, it includes—for each bank and each month—average mortgage interest rates and mortgage loans. The information is disaggregated according to the type of housing, VIS and non-VIS. Moreover, whenever an individual requests a mortgage loan, whether VIS or non-VIS, it can be denominated either in pesos (COP, a fixed nominal interest rate) or UVR (inflation-indexed nominal interest rate). The *Superfinanciera* also

has monthly data per bank on deposits, assets, liabilities, quality of the portfolio, total wages, and indirect costs.[9] Finally, we also have information on the number of workers and number of offices per bank, although these two variables are available at a quarterly frequency.

The second dataset, publicly unavailable, is the FRECH dataset provided by the Central Bank. It has information on each mortgage loan that has received the subsidy since the program started in April 2009. This implies that for VIS housing it essentially represents the universe of mortgage loans since April 2009. For each credit, the FRECH has the transaction date, its denomination (whether in COP or UVR), the gross interest rate (i.e. not net of the subsidy), the value of the property and, consequently interest rate net of subsidy (5 percent, 4 percent or 3 percent as stated by Decree 1143 of 2009). The dataset has a daily frequency and as of June 30 2010, we have data on 59,101 transactions for a total amount of $ 2,453.8 billion pesos.

The latter dataset has some limitations. On the one hand, due to confidentiality issues, we are unable to identify either the individuals or the banks providing the loan. Thus, we cannot cross these data with other datasets. Secondly, for econometric purposes, we have no control group to evaluate the impact of the policy. Similarly, there is no demographic information on the buyers, nor do we know the city where the properties are located. Consequently, we will only use the FRECH dataset to describe the evolution of loans receiving the subsidy; we will not use it in the econometric models described below.

Recent Evolution of the Mortgage Market

We start by analyzing the evolution of mortgage loans relative to total loans and total deposits, based on the *Superfinanciera* dataset. Specifically, Figure 5 reports the recent evolution of mortgage loans as a percentage of total loans and total deposits in the banking sector. Vertical lines are added in April 2009, when the subsidy was implemented. The plot shows both the decline of the sector prior to the policy and its reaction coinciding with the subsidy. This preliminary evidence suggests that the subsidy was effective in terms of boosting the market for mortgage loans.

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[9] Indirect costs refer to all non-operating costs. Examples are personnel incentives, office equipment, transportation, and other services.

As explained in Section 2, in the aftermath of the 1998-99 crisis, mortgage credits based on the UPAC system were ruled to be unconstitutional. A new system with mortgage credits indexed to the inflation rate was created. These are loans denominated in UVR, a measure that mimics the lagged CPI. As inflation fell to single digits, banks started offering fixed interest rate mortgage credits. They have become increasingly popular and, as Figure 6 shows, nowadays most of the credits are not UVR-based.

Figure 5. Recent Evolution of Mortgage Loans

Note: Vertical line on April 2009 (date of the Decree)
*Only includes banks with mortgage loans
Source: Superintendencia Financiera - own calculations
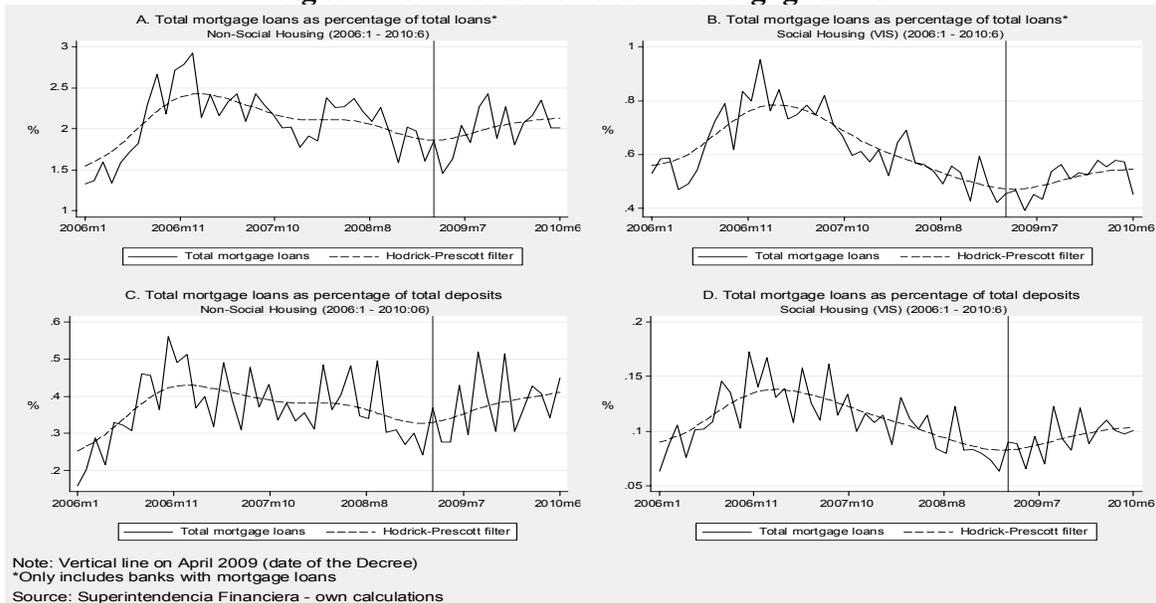
Figure 6: Share of UVR and Fixed Interest Rate Credits

Note: 2010 data is available until June
*UVR is the Spanish abbreviation of real value unit
Source: Superintendencia Financiera - own calculations
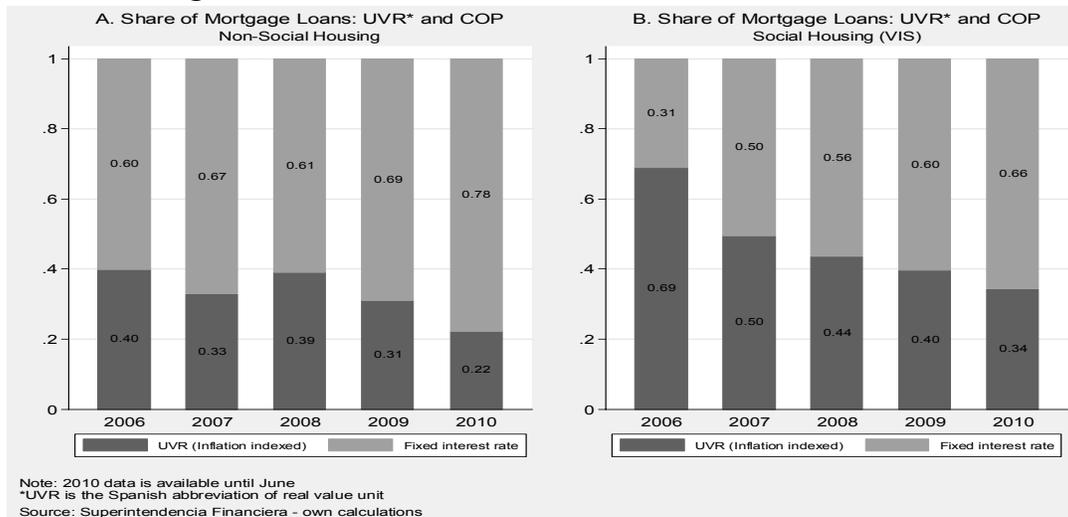
The recent evolution of average real interest rates charged by the banks for mortgage credits is depicted in Figure 7. The plots at the top of the figure show that real mortgage interest rates have gone up since the subsidy was implemented. Of course, a simple explanation of the trend could be that other interest rates of the economy have gone up during that time. Nevertheless, this interpretation is not supported by the data. In general, this has been a time of falling interest rates. Indeed, the Central Bank has reduced interest rates by more than 6 percent over the last two years. The plots at the bottom of Figure 7 show the gap between interest rates on mortgage and consumer loans. It is quite evident that, according to this metric, mortgage interest rates have gone up relative to other interest rates charged by the banks. The econometric model will shed light on the determinants of the apparent mortgage interest rate increase.

Figure 7: Average Real Mortgage Interest Rates

Note: Vertical line on April 2009 (date of the Decree)
*ic= consumption loans' interest rate
**im=mortgage interest rate
Source: Superintendencia Financiera - own calculations
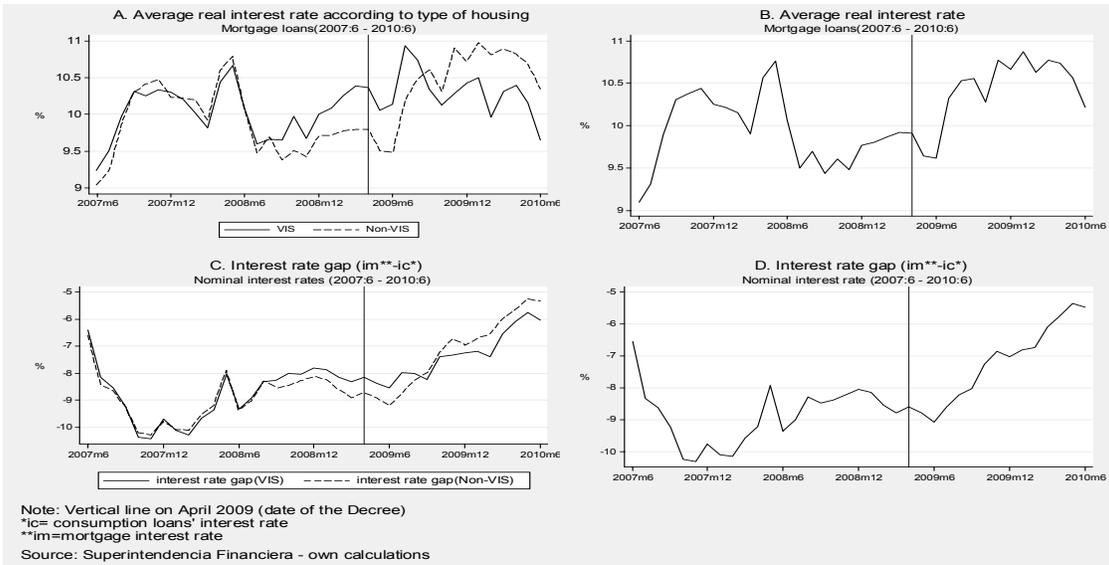
Figure 8 gives an idea of the performance of the construction sector in recent years. The left chart shows that construction licenses begun to fall in late 2007 until mid-2009. Likewise, the right chart illustrates that the area of projects started follows that of licenses with a short gap, and to that extent, experience a crash in mid-2008.

The housing finance trends described so far include all mortgage loans granted by the banking sector. That is, they mix credits that received the subsidy with others that might not have been blessed with it (in the non-VIS segment). The following figures focus exclusively on information for the credits that did receive the subsidy as reported by

FRECH. As noted above, the FRECH data set is available only for those loans that have benefited from the subsidy. As a consequence, its use for statistical inferences is limited because it lacks a control group. Assuming that the state of the housing and mortgage markets in April 2009 is very similar to what we would have observed without the subsidy, we describe general trends.

Figure 8: Housing Construction
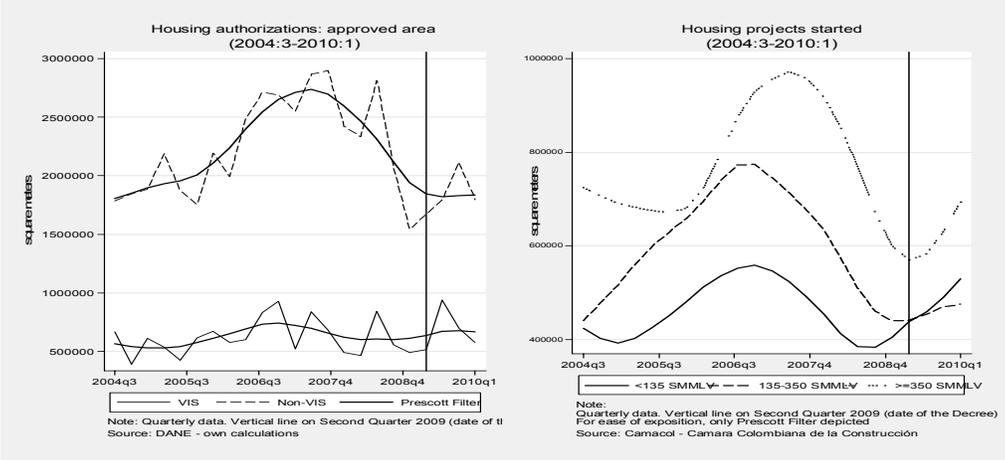
Figure 9 reports the evolution over time of loans that have benefited from the subsidy. Compared with the numbers of April of 2009, the number and value of loans increased rapidly particularly for fixed interest rates loans in pesos. The value of loans in COP, is by June 2010 almost twice as large as the figure in April 2009.

Figure 9: Loans with Subsidy
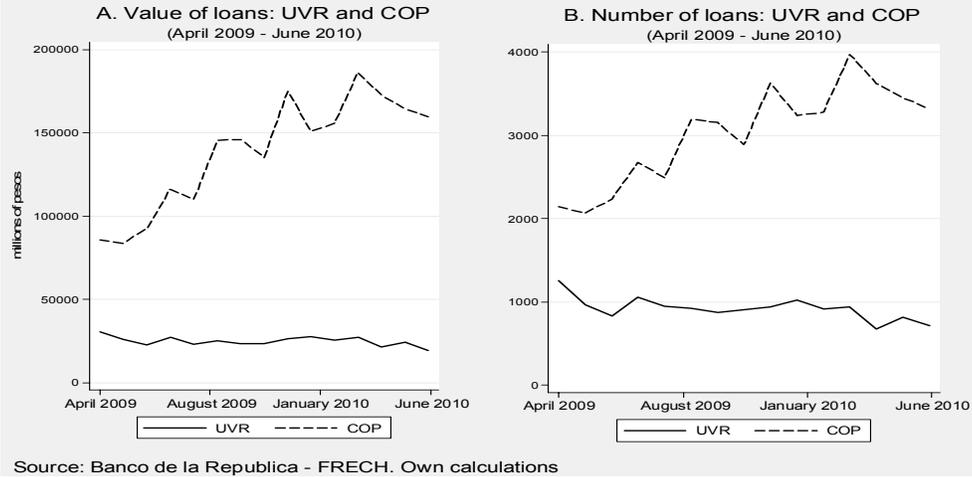
Figure 10 10 takes a closer look by discriminating the value of the mortgage loans and the number of such loans by the price of the property and thus by the size of the subsidy. A couple of facts are worth mentioning. On the one hand, the number of loans receiving the 5 percent subsidy is larger. A second interesting finding is that within the UVR-based loans, most resources (not just the number of loans) also go to purchase low-priced properties. One reason for this is that with UVR-based loans, monthly installments are lower at the early stages of the credit. More often than not, for low-income families, this is the only available option the financial sector will accept to offer them the loan.

Figure 10: Loans per Subsidy Segment

Source: Banco de la Republica - FRECH. Own calculations
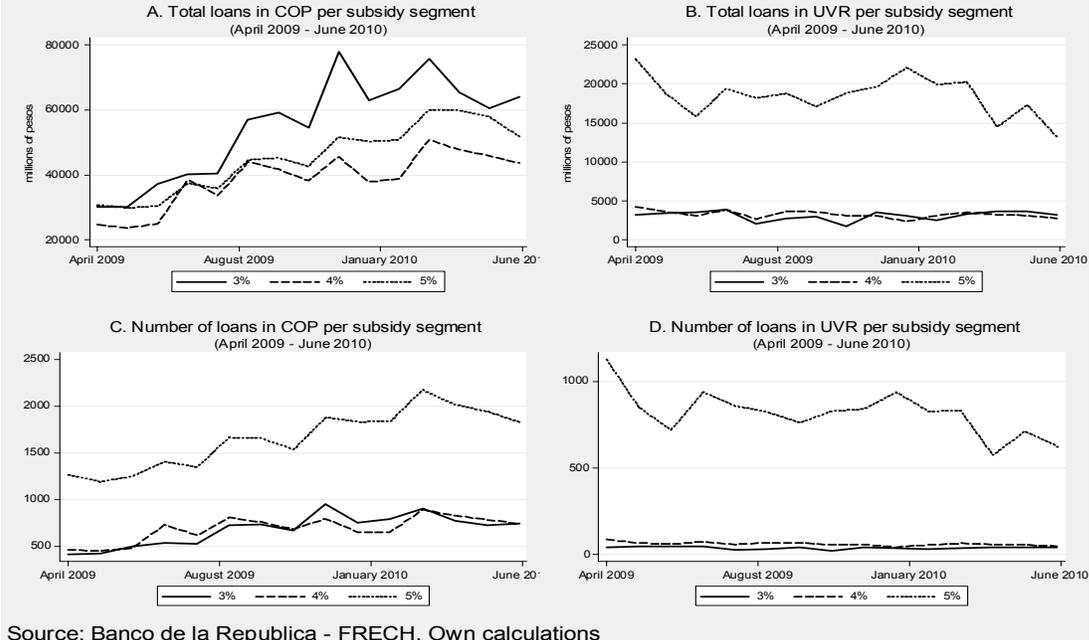
Figure 11 once again reports real interest rates, this time per type of subsidy. Consistent with the trends exhibited by the data for the whole mortgage sector reported earlier, real interest rates have gone up, at least compared with those prevailing in April 2009. Two other things stand out from Figure 11. First, for all types of subsidies, interest rates rose rather strongly during the first four to six months of the program. Second, interest rates went up by more in the 3 and 4 percent range of subsidies.

Figure 11: Real Interest Rate per Subsidy Segment

Real interest rate per subsidy segment
(April 2009 - June 2010)

3% —— 4% ------ 5% ··········

Interest rate not net of the subsidy
Source: Banco de la Republica - FRECH. Own calculations
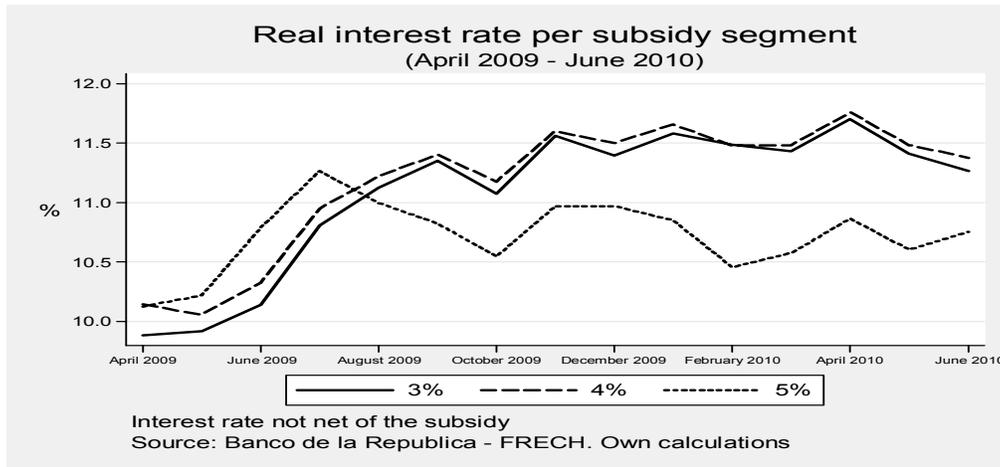
Finally, Figure 12 reports other stylized facts of the program. Panel A presents the loan-to-value ratio. This ratio averages 57 percent for 5 percent subsidized properties, 58 percent for 4 percent and 55 percent for 3 percent. The ratio has remained relatively constant for all segments, except for the more expensive property, which has increased its loan-to-value ratio by around 4 percent. Panel B shows that the average loan has increased particularly for fixed interest rate loans. Finally, the price of the properties benefiting from the loan has timidly moved closer to the subsidy's upper limits.

Figure 12: Other Stylized Facts

A. Loan to value ratio per subsidy segment
(April 2009 - June 2010)

B. Average mortgage loan: UVR and COP
(April 2009 - June 2010)

C. Median house value*
(April 2009 - June 2010)

*Notes:
Shaded bars indicate the range of the subsidy
minimum salary changes every year

Source: Banco de la Republica - FRECH. Own calculations

19
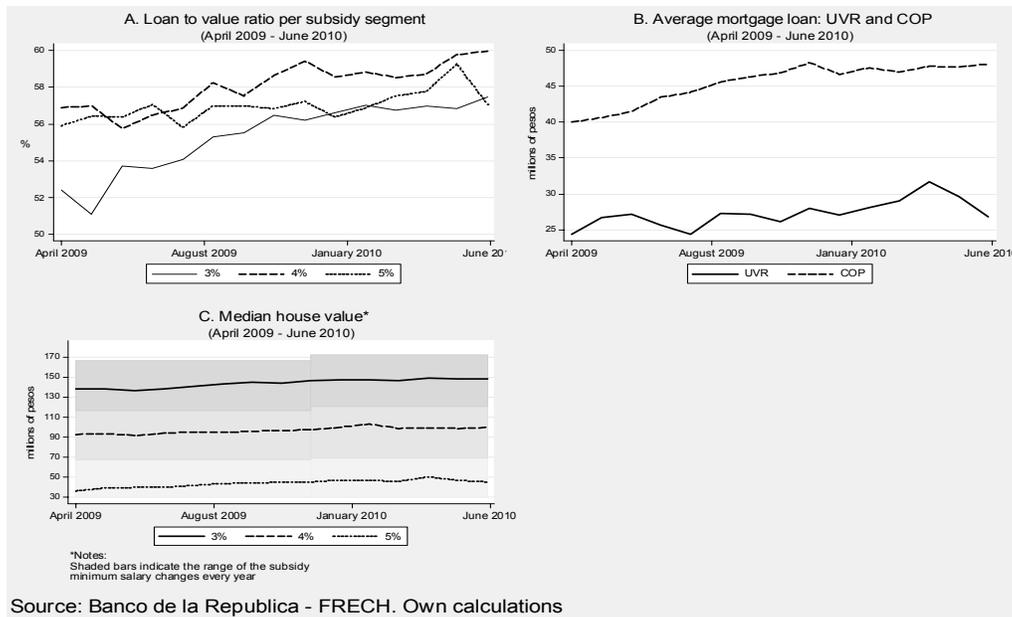
Table 2 summarizes the total number of credits and the total loans granted by the financial sector under the interest rate subsidy program.

Table 2: Loans with Subsidy (basic points)
(April 2009- June 2010)

		300	**400**	**500**	**Total***
COP{	**No. loans**	10158	10342	24837	45337
	Value	$ 822	$ 580	$ 679	$ 2.081
UVR{	**No. loans**	587	933	12244	13764
	Value	$ 47	$ 49	$ 277	$ 373
Total{	**No. loans**	10745	11275	37081	59101
	Value	$ 869	$ 629	$ 956	$ 2.454

*Amount in billions of pesos. Source: Banco de la República – FRECH. Own calculations.

Another interesting dimension of the program is its potential impact on the proportion of overdue loans. Indeed, as specified before, subsidy beneficiaries with more than three installments overdue are expelled from the program. This conditionality might be reflected in better quality indices of the banks' mortgage assets. A simple look at the data suggests that this seems to be the case. Indeed, the subsidy granted by the government stops if consumers have three or more consecutive monthly installments overdue. As of June 2010, only 0.33 percent of VIS loans and 0.16 percent of non-VIS loans lost the benefits. These figures are very small. For instance, the percentage of mortgage loans with at least three installments overdue as of June 2008 (prior to the crisis and the subsidy) was 1.9 percent for VIS loans and 1 percent for non-VIS.[10]

5. Methodology

The main objective of the paper is to understand the effects of the interest rate subsidy on the credit market. In order to do so, we focus on the potential effect of the subsidy on both "quantities" and "interest rates." In this context, the former is measured as the value of mortgage loans. We expect a positive effect on the value of mortgage loans. The latter, "interest rates," refers to the effect of the subsidy on mortgage real interest rates. In this case, under standard supply and demand equations, we should also observe higher

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[10] To make the comparison fair, we restricted the pre-subsidy data to 15 (or less) month-old loans, i.e., loans granted between April 2007 and June 2008. This makes the figures comparable to those in the FRECH dataset which focuses on loans with the subsidy between April 2009 and June 2010.

real interest rate (before the subsidy rebate). Both issues are tested econometrically. In all estimates reported, we use monthly data for the period January 2006-June 2010. Recall that the subsidy was implemented in April 2009.

Quantity

Our first exercise measures the effect of the subsidy on the value of mortgage loans. Using the aggregate data from *Superfinanciera* described in the previous section, we run three sets of regressions, one for the whole market, one for VIS and one for non-VIS. The exercise is represented by equation (3):

(3) $$L_{ijt} = \beta D + \alpha_0 + \alpha_i + \alpha_1 r_{ijt} + \gamma X_{it} + \theta M_t + \varepsilon_{ijt}$$

j = whole market, VIS, non-VIS

where L_{ijt} refers to the value of mortgage loans of type *j* given by bank *i* at time (month) *t*. *D* is a dummy variable taking the value of 1 starting April 2009, when the subsidy policy was introduced. r_{ijt} refers to the real interest rate for bank *i* on mortgage loans, prior to the rebate.

X_{it} stands for observable bank characteristics, where we include total assets as a measure of bank size and a proxy for labor productivity defined as the number of workers employed per branch. As the frequency of the latter is quarterly, we interpolate the missing values.[11] We expect that larger and more productive banks lend more. Macro controls and other relevant variables are also included in equation (3) within the vector of variables M_t. In particular, we use two macro measures, the monthly index for the manufacturing industry and the unemployment rate. Potential cyclical factors are captured in the model with these macro variables. The proper identification required that *D* exclusively captures the effect of the subsidy. In order to guarantee this we include two exogenous (to the banks) interest rate measures, the Emerging Markets Bond Index (EMBI) and the Colombia Central Bank Reference Interest Rate. The former measures the gap between comparable

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[11] Other variables, such as the ratio of non-performing loans, as a measure of risk exposure were tested but they were not significant and their inclusion had no major effect on the results. The interpolation done is linear as implemented in STATA's ipolate ado-file: The missing value *y* at a given *x* is found "by finding the closest point (x_0, y_0) and (x_1, y_1), such that $x_0 < x$ and $x_1 > x$ where y_0 and y_1 are observed."

Colombia and U.S. government bonds interest rates. The latter corresponds to the intervention interest rate set by the Central Bank. Time invariant unobservable bank characteristics are captured by using bank fixed effects (α_i).

Finally, our parameter of interest is *β*. It measures the effect of the subsidy on the amount of mortgage loans after controlling for other determinants such as the mortgage interest rate. A positive *β* implies that in terms of the value of mortgage loans, the subsidy has had a positive impact. In order to facilitate the interpretation, we will also report the estimated elasticities.

Some estimation issues are worth discussing. Equation (3) resembles a demand equation. As such, there is a potential endogeneity issue between the mortgage loan interest rate and the value of mortgage loans because they might be simultaneously determined. As a first step we check for the endogeneity of the interest rate using a Durbin–Wu–Hausman test. If the test suggests an endogeneity problem, we deal with it with an instrumental variable approach. Specifically, we use the one month lagged real interest rate of the 10 years treasury bonds, the one month lagged Central Bank reference real interest rate, and the one month lagged wages and indirect costs, as instruments. These variables are related to the current real mortgage interest rate, but they do not directly determine the value of mortgage loans in the current month. We also check for the potential existence of serial correlation using the test proposed by (Wooldridge, 2002, pp. 282-283). All standard errors are Huber/White robust in order to control for the potential existence of heteroskedasticity and, hence, take into account the existence of large banks vis-à-vis smaller banks.

Interest rates

Another question to ask is the effect that the subsidy may have had on the market mortgage interest rates. As argued in the simple model above, the whole subsidy does not necessarily go into the consumers' pockets. The government probably hoped that all of subsidies would fall into the consumers' hands (people taking mortgage loans for new houses) but part of the subsidy may end up in the producers' hands (banks giving mortgage loans). Which effect actually occurred is an open empirical question. In equation (4) below,

we test for the incidence of the subsidy on the mortgage interest rate. Formally, we estimate the following reduced form equation:

(4) $$r_{ijt} = \alpha_0 + \alpha_i + \delta D + t + X_{it} + \varepsilon_{it}$$

j = whole market, VIS (pesos and UVR), non-VIS (pesos and UVR)

where all variables are defined as before (recall that the interest rate is the one prior to the rebate). X_{it} now includes a cost measure, the interest rate of certificate of deposits, the ratio of non-performing loans as a measure of risk, the 10 year government bond real interest rate (TES10) and a macro variable–the growth rate of the manufacturing production index (which varies per month, not across banks). The TES10 captures a long term interest rate, which has been shown to be related to mortgage interest rates (e.g., Galindo and Hofstetter, 2008). This exercise also includes a trend to control for the evolution of the interest rate over time. Our coefficient of interest is δ, the link between the subsidy and the mortgage interest rate. δ will be positive, unless the pass-through to consumers is complete.

As noted earlier, banks can lend either in UVR or pesos. Given that recent trends in both variables seemed different (e.g., Figure 6), we estimate various specifications of equation (4). First, we estimate an aggregate exercise, i.e., we calculate the weighted (by the value of loans) average interest rate. We then run VIS and non-VIS loans separately and finally, we disaggregate VIS and non-VIS into pesos and UVR type of loans. Equation (4) includes in those regressions separating UVR from pesos an alternative interest rate. In particular, it seems that a natural alternative for a VIS loan in pesos is a VIS loan in UVR. Similarly, for non-VIS loans in pesos, the natural alternative would be non-VIS loans in UVR.

On the technical side, we estimate equation (4) using feasible generalized least squares with standard errors robust to heteroskedasticity across panels and serial correlation, the latter when required.

6. Results

This section presents the results for equations (3) and (4). In order ease the interpretation of the results, Table 3 reports the summary statistics for the exact data used in estimating equation (3), and Table 4 reports the summary statistics of additional variables

used in the estimation of equation (4). As expected most variables do not differ substantially when considering VIS loans relative to non-VIS loans. Two things, however, stand out from Table 3. There are slightly more observations when considering VIS loans. Ten banks report information for both VIS and non-VIS loans but the frequency varies. Second, as non-VIS loans are for more expensive properties, the value of such loans is 3.6 times higher than VIS loans. As for Table 4, means tend to be similar, but non-VIS interest rates have higher dispersion.

Table 3. Summary Statistics

Summary Statistics (2006:01 - 2010:06)								
	VIS loans				**Non Vis loans**			
	Mean	Std. Dev	Min	Max	Mean	Std. Dev	Min	Max
Value of mortgage loans[1]	12803	13206	10	68084	45855	39984	10	177104
Subsidy dummy[2]	0.25	0.43	0	1	0.29	0.45	0	1
Interest Rate (%)	10.09	1.13	6.60	12.90	10.13	1.51	5.03	14.07
Number of workers per branch	17.7	7.4	4.8	84.6	18.9	5.5	6.6	41.6
Assets[3]	13798	9742	3711	43534	13845	10557	3711	43534
Manufacturing production index[4]	103.42	7.93	81.33	119.60	103.53	7.63	81.33	119.60
Unemployment (%)	11.71	1.04	9.41	14.61	11.70	1.03	9.41	14.61
Embi	2.382	1.061	1.084	5.511	2.430	1.094	1.084	5.511
Central Bank Reference Int. Rate (%)	2.340	0.903	0.755	4.245	2.295	0.913	0.755	4.245
Number of observations	429				421			

[1] Million of constant Colombian pesos
[2] Subsidy dummy 1 starting April 2009
[3] Billions of constant Colombian pesos
[4] 2009 = 100

Source:Superfinanciera. Own Calculations

Table 4. Interest Rate Summary Statistics

Interest Rates Summary Statistics (2006:01 - 2010:06)					
Data in %	Mean	Std. Dev	Min	Max	Observations
Aggregate mortgage interest rate	10.16	1.32	5.03	13.78	503
Aggregate VIS mortagage interest rate	10.09	1.13	6.60	12.90	429
Aggregate Non - VIS mortagage interest rate	10.15	1.50	5.03	14.07	421
VIS mortgage interest rate in pesos	10.02	1.31	3.21	12.87	305
VIS mortgage interest rate in UVR	9.99	1.40	5.32	13.01	305
Non - VIS mortgage interest rate in pesos	10.73	1.67	6.48	14.55	323
Non - VIS mortgage interest rate in UVR	9.44	1.61	5.46	14.74	323
10 yr. government bond real interest rate[*]	5.09	1.11	2.99	7.50	503

[*] The mean varies slightly on each specification due to the difference in the number of observations. The reported figure corresponds to the aggregate model.

Source:Superfinanciera. Own Calculations

Quantity

Table 5 presents the results for equation (3). We ran five specifications. Model 1 runs an aggregate regression, grouping VIS and non-VIS housing. In Models 2 and 3 the dependent variable is the value of VIS mortgage loans, while for Models 4 and 5 the dependent variable is the value of non-VIS mortgage loans. The main difference within housing category is the inclusion of an extra macro variable as a control.

The econometric tests suggest that endogeneity is present in Models (1)-(3). Therefore, for these three cases, we run Equation (3) using two-stage least squares for the aggregate and VIS specifications.[12] However, for non-VIS housing, we do not find evidence of endogeneity. Thus we report OLS results for the last two models.[13][14] Finally, in the quantity regressions, we found no evidence of serial correlation. Thus we proceed with fixed effects (2sls when needed) panel data estimation.

We begin the discussion of the results by looking at the interest rate coefficient. The elasticity estimates at the bottom of the table show that a 1 percent increase in the real interest rate for VIS housing will reduce the value of mortgage loans by around 17 percent. The result for non-VIS housing interest rate is 9 percent. This captures the difference in the potential consumers in each segment. VIS buyers are typically low-income families more sensitive to the interest rate.

Turning to the macro controls, Table 5 also shows that our manufacturing index relates positively, as expected, to the demand of loans. The relationship is statistically significant in all specifications. With unemployment the significance varies across models and when significant we find the only unexpected sign in our model. However, none of the main results are affected by this.

Table 5 shows that as the number of workers per branch increase, the value of the loan falls, while as expected, the size of the bank is significant. While the EMBI is

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[12] The validity of the instruments are tested using the Sargan over-identification test. As reported in the results, they are statistically valid. We also tested with additional lags and the results were consistent.

[13] Essentially we find that for these particular specifications the estimates are consistent whether using OLS or 2SLS. However, since the statistical tests suggest that there is no endogeneity, we report OLS results.

[14] Anecdotal evidence with VIS constructors makes it clear that VIS and non-VIS housing are very different markets. For a new VIS project to be profitable, its scale has to be relatively large and it has to be finished in a schedule of less than a year. Thus, in the short run the supply of new housing is different for non-VIS and VIS maybe explaining the non-exogeneity of the interest rate found in the former.

statistically irrelevant, the Central Bank interest rate appears statistically significant in several specifications with a positive sign.

Table 5. Determinants for VIS and non-VIS Mortgage Loans

	AGGREGATE	VIS HOUSING		NON - VIS HOUSING	
Determinants for VIS and Non VIS Mortgage Loans[+] (2006:01 - 2010:06)					
	Model 1	Model 2	Model 3	Model 4	Model 5
Dependent Variable: Vis/Non-VIS mortgage loans (millions of pesos)					
Interest Rate[1]	-6799	-2278	-2056	-4240	-4104
	[3225]**	[807]***	[815]**	[863]***	[845]***
Subsidy dummy[2]	19178	4712	4468	17659	17511
	[6387]***	[1573]***	[1563]***	[3785]***	[3752]***
Workers per branch	-575	-191	-190	-727	-733
	[268]**	[104]*	[104]*	[213]***	[212.6]***
Assets[3]	2,04	0,45	0,44	2,12	2,10
	[0.49]***	[0.17]***	[0.17]***	[0.38]***	[0.38]***
Manufacturing production index	749	99	149	780	950
	[221]***	[58.6]*	[64.6]**	[140.5]***	[139]***
Unemployment	1769		561		2063
	[1192]		[362]		[968]**
Embi	390	21	42	799	1063
	[950]	[372]	[373]	[779]	[796]
Central Bank Reference Interest Rate	3502	1361	1366	2547	2746
	[1996]*	[619]**	[611]**	[1580]	[1597]*
Constant	-36300	11104	-3075	-39800	-83800
	[54442]	[12175]	[15322]	[17155]**	[23061]***
Bank fix effects	YES	YES	YES	YES	YES
R^2	0,86	0,8	0,81	0,84	0,84
Observations	503	429	429	421	421
Instruments: One month lag 10 year treasury real interest rate and one month lag central bank real reference rate					
Sargan Test p-value	0,126	0,201	0,244	.	.
First Stage R^2	0,48	0,46	0,47	.	.
First Stage. F-test p-value	0,00	0,00	0,00	.	.
Elasticities					
Interest rate elasticity	-0,138	-0,178	-0,161	-0,092	-0,089
	[0.065]**	[0.063]***	[0.064]**	[0.018]***	[0.018]***
Subsidy elasticity	0,389	0,368	0,349	0,385	0,382
	[0.129]***	[0.122]***	[0.122]***	[0.081]***	[0.08]***

Notes:
[+] Models 1,2 and 3 are intrumented regressions. Models 4 and 5 are OLS. See text for explanation.
[1] Aggregate interest rate for Model 1. VIS interest rate for models 2&3, Non-VIS interest rate for models 4&5.
[2] Subsidy dummy equal to 1 starting April 2009
[3] Assets measured in billions of pesos
* p<0.1, ** p<0.05, *** p<0.01
Source:Superfinanciera. Own Calculations

Finally, our variable of interest, the subsidy dummy, is positive and statistically significant in all specifications. This implies that the subsidy has been able to boost demand as was expected when it was implemented. According to our estimates, VIS housing loans increased by 36 percent, while non-VIS housing increased by 38 percent. However, for

non-VIS housing our dataset does not allow us to separate credits that did not receive the subsidy and so, the effect on non-VIS housing loans eligible for the subsidy might even be stronger. The results suggest that the subsidy boosted the mortgage market by a significant amount, as expected by policy makers.

Interest rates

We now focus on the potential effects of the subsidy on interest rates. As explained earlier, textbook microeconomics suggest that pass-through to consumers might be incomplete. In order to explore this possibility we run equation (4) and present the results of seven alternative specifications in Table 6.

Model 1 reports results for the whole mortgage market. As argued enough, VIS and non-VIS markets seem to behave differently. We capture these differences in Model 2 and Model 3. Additionally, Figure 6 above shows that loans in pesos are predominant relative to loans in UVR. Consequently, it seems natural to further disaggregate the exercise by checking the impact of the subsidy on pesos and UVR loans. These latter results are reported in Models 4 through 7.

Evidence of serial correlation was found only in the VIS specifications. This suggests that a random shock affecting a given bank may have an effect on other banks because of their close economic ties in such markets. In other words, it statistically reinforces our findings of a strong segmentation between VIS and non–VIS markets due, probably, to the stronger regulation tied to VIS housing. Equation (4) is estimated using FGLS with standard errors robust to heteroskedasticity across panels and serial correlation (the latter in VIS models).

As for the results, the coefficients for the alternative interest rates are all positive and statistical significant. This suggests that banks tend to increase (or decrease) UVR and COP mortgage rates simultaneously. The control measures included in equation (4), X_{it}, report expected results in most cases, with the TES10 being the only exception; there, the sign and significance of the coefficient behaves erratically.

As expected, an increase in the cost of certificates (CD) is positively translated to the mortgage interest rate. The ratio of non-performing loans is positively related to the

mortgage interest rate, with the effect having statistical relevance in most specifications. Finally, as the economy improves the interest rate falls, a result also consistent with that found in Galindo & Hofstetter (2008).

Table 6. Subsidy Incidence on the Mortgage Interest Rate

	Model 1	Model 2	Model 3	Model 4	Model 5	Model 6	Model 7
	Subsidy incidence on the mortgage interest rate (2006:01 - 2010:06)						
Dependent Variable: **interest rate**	Total mortgage	VIS	Non-VIS	VIS in pesos	VIS in UVR	Non-VIS in pesos	Non-VIS in UVR
Subsidy dummy[1]	1,09	0,50	1,48	0,57	-0,38	2,20	-0,55
	[0.19]***	[0.19]***	[0.24]***	[0.18]***	[0.26]	[0.23]***	[0.33]*
Alternative Interest rate[2]				0,16	0,18	0,21	0,40
				[0.04]***	[0.07]**	[0.04]***	[0.06]***
Interest rate on term deposits (CD)	0,27	0,28	0,51	0,35	0,35	0,55	0,51
	[0.04]***	[0.04]***	[0.07]***	[0.05]***	[0.08]***	[0.08]***	[0.10]***
% Non - Performing loans	0,40	0,29	0,31	0,09	0,21	0,20	0,06
	[0.06]***	[0.06]***	[0.07]***	[0.07]	[0.09]**	[0.06]***	[0.10]
Manufacturing production index	-0,02	-0,01	-0,03	0,00	0,00	-0,03	-0,02
	[0.01]***	[0.00]	[0.01]***	[0.00]	[0.01]	[0.01]***	[0.01]**
10 Year Treasury Bonds	-0,04	-0,04	-0,07	0,19	-0,16	0,11	-0,48
	[0.05]	[0.05]	[0.06]	[0.04]***	[0.07]**	[0.06]*	[0.08]***
Trend	-0,01	0,00	-0,01	0,02	0,03	-0,04	0,04
	[0.00]**	[0.01]	[0.01]	[0.01]***	[0.01]***	[0.01]***	[0.01]***
Constant	11,19	9,52	12,05	6,14	7,53	11,05	7,12
	[0.68]***	[0.60]***	[0.80]***	[0.67]***	[0.99]***	[0.90]***	[1.34]***
Bank fix effects	YES	YES	YES	YES	YES	YES	YES
Observations	503	429	421	305	305	323	323

[1] Subsidy dummy 1 starting April 2009

[2] For VIS (loans in pesos) refers to VIS UVR interest rate. For VIS (loans in UVR) refers to the VIS pesos interest rate. Similar with Non - VIS. Standard errors: robust and clustered by bank/year in Brackets. Models 2, 4 and 5 corrected for serial correlation

* p<0.1, ** p<0.05, *** p<0.01

Standard errors: robust and clustered by bank/year

Source:Superfinanciera. Own Calculations

Regarding the variable of interest, Model 1 suggests that, in the aggregate, the subsidy has pushed the real interest rate upwards by 1.09 percentage points. When disaggregating by type of loan (VIS vs. non-VIS), we find that VIS loans increase by 0.5 percentage points while non-VIS have increased by 1.48 percentage points. Further disaggregation is reported in Models 4-7. The results for Models 4 and 6, loans in pesos, are consistent with the aggregate findings. The subsidy has pushed the real interest rate for mortgage loans upward. The figures are larger in the non-VIS case. In the VIS case, the mortgage interest rate rose 0.57 in pesos, while in non-VIS it rose by 2.20.

The results for UVR loans are different than those for COP loans. In the former, the subsidy did not trigger a change in real rates in UVR.[15] Why that might be the case is an open question that the regression itself does not answer. One possible reason for such a finding might be related to the falling demand in UVR loans (Figure 6). For the period April 2009 to June 2010, loans in UVR for non-VIS represent 22 percent of total mortgage loans, while UVR for VIS housing represent just 7 percent. Another possible reason is that because nominal rates were falling at that time, it was easier for the financial sector to raise real rates for loans in pesos by simply letting the falling inflation rate take care of the real change. Of course, the same strategy would not work with UVR loans; in order to increase real rates in UVR loans, banks have to increase nominal rates.

7. Discussion

The subsidy, like much of the historical support to the housing sector, was motivated by the economic cycle. Despite the initial denial of the potential negative effects that the 2008-09 world recession would have on Colombia, by the first quarter of 2009, it was clear enough that the Colombian economy was not immune to the downward trend in world economic growth.

The countercyclical measure based on a subsidy to mortgage loan interest rates had a novel component from a historical perspective: it was not directly aimed at the demand or supply for housing, but rather at the financial (mortgage) sector, i.e., the intermediaries. Ultimately, the direct impact was expected to be on consumers via a reduction in their monthly installments and on the construction sector, via an increase in demand. The increase in demand should boost the economy, according to ideas first proposed in Colombia in the 1970s by Lauchlin Currie, who argued that Colombia's development should be based on the generation of employment in the construction sector and its backward linkages to the real sector.

The banking sector, according to this line of thinking, would benefit from the increase in the demand for credit. It is conceivable, though, that policy makers expected a lower transaction cost than the one now apparent. The likely implicit assumption was that the impact of the subsidy on mortgage loans interest rates should be neutral. Consumers

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[15] In Model 7 the coefficient is borderline significant. Given that there is no reason to expect that the subsidy will reduce the gross interest rate, we disregard this result.

would benefit from the interest rate reduction, builders and bankers from the increase in demand. In other words, the pass-through from the subsidy to consumers would be complete.

This paper reports that the subsidy did meet expectations in terms of the value of mortgage loans: they increased by 38 percent due to the subsidy. Whether this had the projected macroeconomic effect remains an open question which is beyond the scope of this paper to answer. However, there is evidence that the subsidy increased mortgage interest rates. The aggregate results indicate that because of the subsidy the average real interest rate rose by 1.09 percent, with some variation depending on the type of loan (pesos or UVR, and VIS or non-VIS).

Our simple model suggests a natural way to estimate the pass-through to consumers (PTC) and banks (PTB). We showed that the PTC could be written as $[s - (r_1 - r^*)]/s$. Our price regressions give us an estimate of $r_1 - r^*$. For instance, the coefficient on the subsidy in model 1, Table 6, is our aggregate estimate of $r_1 - r^*$ of Figure 4. So for the model 1, Table 6, the PTC would be 74 percent (1-1.25/4.23).[16] In this case, 4.23 corresponds to the average subsidy granted, weighted according to the rebates paid as of June 2010. For the VIS case, the PTC would be 90 percent ($1 - 0.5/5$); for the non-VIS it would reach 58 percent given that the average weighted subsidy for non-VIS is exactly 3.5 percent.

In Panel A, Table 7, we report the rebates paid by FRECH as of June 2010, separated according to the subsidy category and by type of loan (UVR or COP). For instance, the first cell under UVR, reports that the rebates for credits receiving 3 percent interest rate subsidies are, as of June 2010, worth 815 million pesos.

Using the results from Models 4-7 in Table 6, we can estimate further disaggregated PTCs. Table 6, in the previous section, suggests that interest rates rose due to the subsidy but only for the loans in pesos. For those regressions, the point estimates show that interest rates rose 0.57 for VIS loans and 2.20 for non-VIS loans. Given the nature of the *Superfinanciera* dataset, VIS includes exclusively loans benefited with a 5 percent subsidy, while the non–VIS includes loans that incorporate both 4 percent and 3 percent subsidies.

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[16] We can infer the implied supply elasticity with this information; we have the pass-through and the demand elasticity. For the aggregate model, the supply elasticity would be 0.39.

With this information, we calculate the PTC as we did above but now for each type of credit and subsidy category. Results are reported in Panel B, Table 7. Note that for loans in UVR, given that the point estimates are not statistically different from zero, we cannot reject the possibility that the pass-through is complete, i.e., equal to 1. The "Totals" in Panel B are calculated as averages weighted according to the rebates in Panel A.

Table 7

A. Rebates. April 2009-June 2010. Millions of pesos

Subsidy	UVR	COP	Total
3%	815	14.676	15.492
4%	1.211	14.273	15.484
5%	8.993	20.721	29.714
total	11.020	49.670	60.690

B. PTC

Subsidy	UVR	COP	Total
3%	1	0,27	0,31
4%	1	0,45	0,49
5%	1	0,89	0,92
total	1	0,58	0,65

C. Rebates for Banks (PTB*Rebates): Millions of Pesos, April 2009-June 2010

Subsidy	UVR	COP	Total
3%	0	10.763	10.763
4%	0	7.850	7.850
5%	0	2.362	2.362
total	0	20.975	20.975

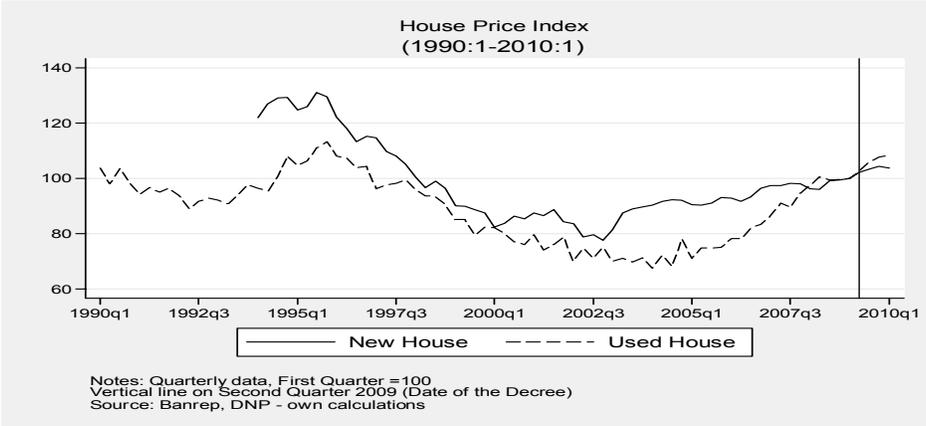Source: Banco de la República – FRECH and Table 6. Own calculations

Several interesting results emerge. First, the PTC for VIS housing is large—0.92. Nevertheless, the PTC for houses receiving the 3 percent subsidy is only 31 percent, i.e., most of the resources accrue to the banks. Note that the average weighted PTC for the whole market is 0.65. This figure is close to the 0.74 that we estimate if we simply use the results from Model 1.

Combining the pass-through of Panel B and the rebates in Panel A reveals how much of the resources of the program reached consumers' pockets and how much went to banks. In particular, in Panel C, we report how much of the rebates granted so far went to banks via higher real interest rates. For instance, out of the 60.690 millions in rebates, we estimate that 39.715 million reached consumers and 20.975 million went to banks. If the trends continue steadily until the entire program' resources are used, out of 950 billion pesos, 622 billion would go to buyers and 328 to the banks.

Of course, the program implied some investments from the banks. That certainly will explain part of these numbers. Nevertheless, it seems to us that such investments and other operational costs related to the subsidy program are negligible compared with the estimations reported above. In the end, the issue boils down to textbook economics; the characteristics of supply and demand determine the distribution of the subsidy between consumers and producers (banks). In this case, the outcome is probably less satisfactory from the perspective of the initial goals of the subsidy.

A dimension that has not been explored in this paper, but one that policy makers should monitor, is the potential effect of the program on real estate prices. Indeed, our study reveals that mortgage loans increased by 38 percent, a considerable amount. Such a boost in demand for housing could have an impact on the price. In Figure 13, we report real housing price indices (that is, housing price indices deflated by the CPI). The series show that relative prices are at the highest levels in over a decade, though still below those prevailing at the peak prior to the burst of the real estate bubble of the late 1990s.

Figure 13: House Price Index

Notes: Quarterly data, First Quarter =100
Vertical line on Second Quarter 2009 (Date of the Decree)
Source: Banrep, DNP - own calculations

Finally, another source of concern for the future is the impact of the seven-year deadline of the program on monthly installments. In principle this will mean that at that time, consumers will start paying higher real interest rates—between 3 and 5 percent points higher, depending on the subsidy category. The good news is that some banks—for instance *Bancolombia* and *Davivienda*, two of the main institutions granting mortgage loans and representing 42 percent of the mortgage market—offered to extend the subsidy beyond the seventh year. While we do not have estimates of the proportion of credits receiving the subsidy that were covered by the banks' extension, the fact that two of the

main players in the market are offering such a program suggests that the aggregate effects of the deadline might be a minor problem. Of course, an emphatic conclusion regarding this concern could only be reached if we had access to the banks' information to disentangle how many loans received the extension. We do not have such information.

8. Concluding Remarks

The main focus of this paper has been to quantify the impact a subsidy for mortgage interest rates. This indirect promotion of the construction sector was put in context by analyzing the evolution of mortgage finance in Colombia since 1923. Backing up the construction sector has been a central goal for every government since that time as a means to provide housing to the population, particularly the lower and middle class, and as an instrument to boost employment and promote economic growth.

The impact of the latest of such measures in Colombia—a subsidy on mortgage interest rates—is mixed. We find that the subsidy did increase the value of mortgage loans, as the government had hoped. In this sense, the policy seems to have been an effective countercyclical tool. Nevertheless, the resources are not being completely passed on to consumers; the subsidy has increased real mortgage interest rates. Our estimates imply that, over the seven years of the program, the banks would receive between one third and one quarter of the resources of the program. This seems like an inefficient use of public resources. It appears to us to be a very high transaction cost, hard to justify beyond situations requiring emergency countercyclical policies.

We should note that, due to time constraints, our analysis covers just over the first year of the program. It is possible that the associated costs of implementing the subsidy have been significant for financial institutions. It is tempting to claim that in the long run, once the transaction costs of the program will have been covered, real rates will revert to the initial levels, and thus we will observe a complete pass-through. Nevertheless, it could also be that the incomplete pass-through is a natural consequence of the shapes of demand and supply. If that were the case, we should not expect a complete pass-through in the future. As the government extends the program in time and resources, these considerations become crucial in the assessment of whether this is a good investment of public funds.

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Legislation Reviewed

Decreto 1143 (April 1, 2009); *Decreto 1176* (April 14, 2010); *Decreto 1729* (May 15, 2009); *Decreto 4996* (December 24, 2009); *Decreto 984* (March 25, 2010); *Ley 1365* (December 21, 2009); *Ley 546* (December 23, 1999); *Resolución 1139* (April 22, 2010); *Resolución 1278* (May 5, 2010); *Resolución 1291* (May 7, 2010); *Resolución 1707* (June 26, 2009); *Resolución 2610* (September 7, 2010); *Resolución 2968* (October 6, 2010); *Resolución 3177* (November 12, 2009); *Resolución 954* (April 17, 2009).

Appendix

Through Resolution 954 (April 17, 2009), the government established the distribution of the number of credits subject to coverage by segment (see column 4 on Table A1). Later, because of market conditions, Decree 1729 (May 15, 2009) extended the term of the loans covered by six months, applying this extension to the loans disbursed by 31 December 2010. In addition, Resolution 1707 (June 26, 2009) changed the distribution of loans by segment (see column 5 on Table A1). Afterward, Resolution 3177 (November 12, 2009) increased the number of credits in the segment corresponding to low-income housing (VIS) and priority interest housing (VIP) (see column 6 on Table A1).

By the first quarter of 2010, through Decree 984 (March 25, 2010), the government authorized to the use of 50 billion pesos from a special sub-account of the FRECH (administered by *Fogafín*) to extend the program. In addition, it included 100 billion pesos from the 2010 budget (see Table A2).

With more resources, the government decided through Decree 1176 (April 14, 2010) that the coverage for loans not yet paid by April 2010 or that would be approved after that date, would have the benefit until December 2011 or until the end of the quota available. At the same time, by Resolution 1139 (April 22, 2010), the government increased the number of credits eligible for coverage for all types of housing (see column 7 on Table A1).

Then, the government took out a line of credit of 200 billion pesos with the *Banco Agrario de Colombia* to finance the FRECH (see Table A2). With this addition of resources, the government, by Resolution 1291 (May 7, 2010) decided to expand the number of eligible loans, reaching a total of 95,000 loans subject to coverage (see column 8 on Table A1)

The latest government move was to add 100 billion pesos from the budget to continue offering the subsidy (Resolución 2610, September 7, 2010). With this addition, the government increased the number of available quota for each segment (Resolución 2968, October 6, 2010). See column 9 on Table A1.

Table A1: Quota with Coverage by Segment

Price* (SMMLV**)	Price (COP)	Price (US dollars***)	April 2009 (i)	June 2009 (ii)	November 2009 (iii)	April 2010 (iv)	May 2010 (v)	Oct 2010 (vi)
Up to 70	36'050.000	20027.77	4000	9500	12700	14800	24500	27324
70-135	36'050.000-69'525.000	20027.77 – 38625	10000	13000	19200	30700	39000	45368
135-235	69'525.000-121'025.000	38625 – 67236.1	9000	12500		13500	18000	21620
235 – 335	121'025.000-172'525.000	67236.11-95847.2	9000	12000		12800	13500	17166
			32000	47000		71800	95000	111478

Notes: * The first category includes two types of housing: low-income housing (VIS) with a top price of 135 SMMLV (legal monthly minimum wages) and priority interest housing (VIP) with a maximum price of 70 SMMLV. ** SMMLV: Monthly legal minimum wages, $ 515.000 in 2010 (approximately US$286.11). *** Exchange rate: $1800 COP. Sources: (i)(Resolución 954, April 17, 2009), (ii)(Resolución 1707, June 26, 2009), (iii)(Resolución 3177, November 12, 2009), (iv)(Resolución 1139, April 22, 2010), (v)(Resolución 1291, May 7, 2010), (vi)(Resolución 2968, October 6, 2010)

Table A2: Total resources in FRECH

	(Millions of pesos)
Decreto 1143 **(April 1, 2009)**	$500.000
Decreto 984 **(March 25, 2010)**	$50.000
Budget 2010 **(Ley 1365, December 21, 2009)**, **(Decreto 4996, December 24, 2009)**	$100.000
Line of credit agreement Banco Agrario de Colombia **(Resolución 1278, May 5, 2010)**	$200.000
Budget 2010 **((Resolución 2610, September 7, 2010)**	$100.000

Source: Finance Ministry