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Research Article

Managerial efficiency and failure of U.S. commercial banks during the 2007-2009 financial crisis: was this time different?

Eficiencia en la gestión y quiebra de bancos comerciales estadounidenses durante la crisis financiera de 2007-2009: ¿fue diferente esta vez?

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Abstract

Compared with previous crises few banks failed as a result of the U.S. financial crisis of 2007-2009. We investigate the role played by managerial efficiency in the non-systemic bank failures during the crisis. During previous waves of bank failures, cost-inefficient banks and banks with relatively less capital or low-quality assets were more likely to fail. Using data from 2001 to 2010, we show that profit inefficiency—our proxy for managerial inefficiency— is a robust predictor of bank failures while cost inefficiency is unrelated to them. In addition, capital adequacy lost importance in predicting non-systemic bank failures during the crisis while loan quality remained a strong predictor. Our results suggest that profit efficiency can be an important managerial indicator in monitoring banks.

Resumen

En comparación con crisis previas, pocos bancos quebraron como resultado de la crisis financiera estadounidense de 2007-2009. En el presente artículo se investiga el papel que la eficiencia en la gestión bancaria jugó en la quiebra de bancos comerciales considerados no-sistémicos. Durante las olas de quiebras bancarias anteriores, los bancos ineficientes en costos y con baja capitalización o con activos de baja calidad tenían una mayor probabilidad de quebrar. Usando datos entre 2001 y 2010, en este artículo se utiliza la eficiencia en beneficios para capturar la eficiencia en la gestión bancaria. Se encuentra que la eficiencia en beneficios es un predictor robusto de la probabilidad de que un banco quiebre. Contrario a la literatura previa, se encuentra que la eficiencia en costos no lo es. Además, la capitalización bancaria perdió poder predictivo en la probabilidad de quiebra mientras que la calidad de los préstamos aún conserva un alto poder predictivo.

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Los resultados presentados sugieren que la eficiencia en beneficios puede ser un indicador importante en la supervisión y el monitoreo de los bancos.

1. Introduction

During and immediately after the 2007-2009 U.S. financial crisis, 322 U.S. commercial banks failed. The estimated loss for the Federal Deposit Insurance Corporation (FDIC) was $86 billion. Both the number of bank failures and their associated cost increased tenfold compared to the years between 2000 and 2007. From 1980 to 1989, 1,467 U.S. commercial banks failed (estimated cost $62 billion) and from 1990 to 1999 this number was 436 (estimated cost $7 billion)[1]. Despite the severity of the recent crisis, the number of bank failures was low compared to previous crisis episodes. The natural question arising from these facts is what was different this time around.

In the U.S. the FDIC manages bank failures and is usually appointed as a receiver for failing banks. The narratives presented in the Material Loss and In-Depth Reviews (MLIR) conducted by the FDIC Office of Inspector General indicate that a bank fails mainly because the bank has: 1) inadequate corporate governance; 2) weak risk management; 3) lack of risk diversification/lending concentration; 4) deteriorating financial conditions; and 5) insufficient capital to continue sound operations[2]. The risk management manual of examination policies of the FDIC (the FDIC closure guidelines, henceforth), includes six factors to assess the soundness of supervised banks: capital adequacy, asset quality, managerial practices, earnings quality, liquidity position, and sensitivity to market risk. These six factors are commonly known by the acronym CAMELS. By construction, the proxies for CAMELS factors have high explanatory power regarding the probability of bank failures in the U.S. since the FDIC recommends bank closures or prompt corrective actions based on them. Not surprisingly, a robust finding in the academic literature is that CAMELS components constitute the main factors influencing the probability that a bank fails (e.g. Cole and Gunther 1995; Wheelock and Wilson 2000; Cole and White 2012).

According to the FDIC, "the quality of management is probably the single most important element in the successful operation of a bank" (FDIC guidelines, 2005, p. 4.1.1). However, out of the six CAMELS factors, the managerial component is usually overlooked in the literature since the assessment of managerial practices is not readily amenable to econometric or statistical analysis, in part, because the definition of managerial practices is broad and vague.

In economics, efficiency is defined broadly as the ratio between outputs and inputs. It describes a relationship between ends and means and is measured by comparing their relative values, Heyne (2008). Consistent with this definition, managerial efficiency can be defined as the ability to achieve the firm's objectives (ends) using the minimum level of resources (means). Ideally, it can be measured by comparing the value of resources used with the value of the outputs produced. However, in applied work this is a difficult task. Bates and Sykes (1962) argue that managerial efficiency necessarily should be reflected in the profitability of firms: more managerial-efficient firms should be more profitable. Jovanovic (1982) states that in a market economy profits represent the reward for greater managerial efficiency. Following Bates and Sykes and Jovanovic, we measure managerial efficiency using profit efficiency as a proxy. Profit efficiency is a financial performance measure of the distance between

1 Data on commercial banks' failure are available at the Federal Deposit Insurance Corporation (FDIC) (http://www2.fdic.gov/hsob/index.asp).

2 See (Ragalevsky and Ricardi, 2009) and the MLIR reports at https://www.fdicig.gov/mlr.shtml. The MLIR are conducted only when the FDIC insurance funds suffer material losses as a consequence of a bank failure.

actual profit and the best practice frontier. It captures how efficiently a bank can extract profits from the resources deployed in its operations (see Berger and Mester 1997; Kumbhakar and Lovell 2003; Akhigbe and McNulty 2003, 2005)[3].

To our knowledge, there are only two directly related papers to our work (Wheelock and Wilson 2000 and Berger, Imbierowicz and Rauch 2016). Wheelock and Wilson argue that management quality is difficult to measure directly since it can take several forms. They favor the use of cost and technical efficiency measures as proxies for managerial quality[4]. They find that both proxies are statistically and economically significant predictors of bank failures in the U.S. Most recently, Berger et al. tackles the difficult issue of establishing if a banks' corporate governance system is an important predictor of bank failures in the U.S. They investigate the impact of bank ownership and management structures on the probability of bank failure. They find that a bank's ownership structure strongly influences the probability of bank failures.

We contribute to the financial literature on bank failure and complement the existing studies by showing that profit efficiency, our proxy for the quality of banks' managerial practices, strongly influ- ences the probability that a bank survives the U.S. Financial Crisis of 2007-2009 . We find that profit inefficiency—arguably the most important measure of managerial inefficiency—is a robust predictor of bank failures[5]. Wheelock and Wilson (2000) present empirical evidence indicating that cost effi- ciency positively influenced the survival probability of U.S. commercial banks. Our findings indicate that cost efficiency played no direct role on the survival probability of banks during the last financial crisis. In contrast to Moore and Seamans (2013) and traditional wisdom, our estimates show that the capital adequacy of banks is not a robust predictor of banks' survival during the last crisis. However, loan quality and bank profitability remain strong predictors. Our results suggest that banks' regulators should focus on loan quality and loan mix in monitoring the soundness of banks and that banks' profit efficiency can be an important managerial indicator in monitoring banks.

We use standard hazard regression models to estimate the conditional probability of bank failures. Namely, we show how efficiency and traditional proxies for bank failure affect this probability. Unlike the standard classification models (Logit or Probit), hazard models account for incompletely-observed lifespans of banks surviving past the sample period. Post-crisis studies exclusively use Logit models to model bank failures (e.g. DeYoung and Torna 2013, Cole and White 2012, Berger et al. 2016). Our results offer a robustness check to their results.

Our main hypothesis is that after accounting for traditional factors influencing bank failure, managerial efficiency—as captured by profit efficiency—should be negatively correlated with banks' failure probability as relatively more profit-efficient banks should be less likely to fail, Amel and Prager (2013). We find that banks' profit efficiency has independent explanatory power and negatively influences the probability of bank failures: the higher the profit efficiency of a bank, the lower its probability of failure. In contrast to previous studies (e.g., Wheelock and Wilson, 2000), we find that cost efficiency

3 We acknowledge that profit efficiency is an imperfect proxy for managerial efficiency. However, according to the managerial efficiency theory of Jovanovic (1982), more efficient firms are more profitable and more likely to survive. Thus, profit efficiency and managerial efficiency should be highly correlated.

4 Cost efficiency measures the ratio between actual and minimum total variable costs which are estimated using standard stochastic frontier techniques, Kumbhakar and Lovell (2003). Technical efficiency measures the ratio between actual and minimum inputs for producing a given level of outputs.

5 In the data revenue and cost efficiencies are negatively correlated (Rogers, 1998). Thus, profit efficiency is potentially a better measure of overall managerial efficiency than revenue and cost efficiencies alone.

measures are unrelated to bank failures. The results are robust to the inclusion of different sets of control variables and the use of different model specifications. As in Wheelock and Wilson (2000), we find that less diversified banks, as measured by loan-to-asset ratios, are more likely to fail. Thus, recent regulatory measures intended to limit banks' ability to carry out non-traditional activities may actually increase the likelihood of bank failures. In addition, the ratio of real estate and commercial loans to total loans is positively related to bank failures. Banks with low-quality loans, as measured by non-performing loans and loan loss provisions, are also more likely to fail.

An interesting result is that banks that rely on deposits as a major source of loan funding have a higher probability of failure. This result may indicate that deposit insurance leads banks to take on more risk, an explanation consistent with Wheelock and Wilson (1995) and Demirguc-Kunt and Detragiache (2002). Further, after accounting for the above factors and earnings quality (measured using returns on assets or return on equity), we show that leverage, asset size, and off-balance sheet activities are unrelated to bank failures. This latter finding may imply that off-balance sheet activities help banks to diversify their portfolio and do not increase their risk of failure.

The paper is structured as follows: Section 2 reviews the literature; Section 3 presents the basic model and variables and describes the data; Section 4 reports the empirical results; Section 5 concludes.

2. Literature Review

The recent U.S. financial crisis of 2008-2009 spurred research on the determinants of the failures of systemically-important banks—systemic banks. This new research focuses on the interconnectedness of modern banking systems and its effects on bank stability and the interconnection with key factors like regulatory framework, monetary policy, bank leverage, capital requirements, bank size, shared risk exposure, liquidity, and funding sources, among others. (Glasserman and Young 2016, Brunnermeier and Sannikov 2014, Gorton and Metrick 2012, Lo 2012, Tirole 2011, Brunnermeier 2009, Hoshi 2011). As a consequence, our understanding of such matters as systemic risk, financial instability, and monetary and regulatory policy regimes improved in recent years. However, the causes and determinants of non- systemic bank failures stemming from the crisis are not yet well understood (DeYoung and Torna 2013, Cole and White 2012). In this section, we review the post-crisis literature on why U.S. commercial banks failed during the crisis and compare its main results to the pre-crisis evidence.

Given that the U.S. financial crisis was triggered by a mortgage default crisis and the subsequent bad performance of mortgage-backed securities (Adelino, Schoar and Severino 2016, Demyanyk and Van Hemert 2011, Mian and Sufi 2009), the post-crisis literature focuses on three main topics: i) the relation between bank failures and their exposure to the real estate market—in particular, to subprime and non-household borrowers (Antoniades 2015, Cole and White 2012); ii) the role played by non- traditional banking activities; and iii) the relation of bank failures to bank characteristics—as measured by CAMELS factors—and economic fundamentals.

One of the first papers investigating why U.S. commercial banks failed during the crisis is Cole and White (2012). They investigate the ability of CAMELS components and measures of banks' real estate investment to predict bank failures during the crisis. They find that after accounting for CAMELS components, banks' exposure to residential mortgage-based securities (RMBS) has no explanatory power in predicting non-systemic bank failures. Higher levels of capital, better asset quality, higher earnings, and more liquidity make banks less likely to fail. However, the exposure to the real estate market in general was associated with a higher probability of failure. These results are broadly consistent with those in Oliveira, Martins and Brandao (2015) and Li (2013).

The results in Cole and White (2012) support the main finding of the pre-crisis literature: CAMELS components are robust predictors of bank failures (Whalen 1991, Cole and Gunther 1995, Wheelock and Wilson 2000, Kolari, Glennon, Shin and Caputo 2002, Estrella, Park and Peristiani 2000, DeYoung 2003). In a related paper, Shaffer (2012) investigate the relative importance of CAMELS components in determining bank-failure probabilities during the crisis and compare these differences to the pre-crisis literature. They find that the risk of bank failure was more sensitive to non-performing loans and banks' profitability in 2008 than in the 1980s. The effect of leverage and capital adequacy seems to have diminished over time.

Non-traditional banking activities like securities brokerage, insurance sales, venture capital, investment banking and securitization figured prominently as contributing factors to the U.S. financial crisis. DeYoung and Torna (2013) investigate the role of such activities in predicting bank failures during and in the aftermath of the crisis. They find that pure-fee based non-traditional activities (e.g., securities brokerages and insurance sales) reduce the probability of bank failures. Asset-based non-traditional activities (e.g., venture capital, investment banking, and securitization) increase it. DeYoung and Torna show that banks' risk-taking through non-traditional activities is associated with greater risk-taking in their traditional lines of business. Their results suggest that managerial decisions play an important role in determining the riskiness of banks' activities and that other soft factors (e.g., bank ownership, management efficiency, and corporate governance in general) may play an important role in influencing bank failures.

Other researchers investigate how local economic conditions relate to the survival and failure of banks. According to Cebula (2010), non-systemic bank failures between 1970 and 2007 were linked to fundamental economic factors (e.g. unemployment rate, bank's funding costs, stock market uncertainty, regulatory changes, and loan quality). Aubuchon and Wheelock (2010) show that most bank failures in the 1980s and early 1990s occurred in U.S. regions experiencing unusual economic distress. Regulatory constraints seem to have played an important role as banks were unable to geographically diversify their risk. Aubuchon and Wheelock (2010) investigate the role of local economic conditions in bank failures during the U.S. financial crisis. They find that bank failure rates were higher in states with severely-deteriorated economic conditions. Thus, in spite of the lifting of most intra-states regulatory constraints between 1995 and 2005, local economic conditions still played an important role in determining the survival probability of banks.

Other studies investigate the role of individual CAMELS components on the probability of bank failures. Hambusch and Shaffer (2016), for instance, propose an early warning model using bank leverage as the main determinant of bank failures. They show that their model performs well in predicting bank failure in normal times but not during economic downturns or crisis episodes, highlighting the limitations inherent in focusing on only some CAMELS components to predict bank failures.

Bologna (2015) investigate the role of funding structure and funding mix in predicting bank failures during the crisis (2008-2009). They use the loan-to-deposit ratio as a proxy for banks' funding structure. Consistent with empirical and theoretical arguments regarding the superiority of deposit funding over non-deposit funding, they find that bank failures are positively related to banks' reliance on non-deposit funding and that the larger the share of non-deposit funding, the higher the probability of failure. These results are similar to those reported by Schaeck (2008) and Miller, Olson and Yeager (2015).

None of the above-mentioned studies deal with the issue of how managerial efficiency affects the probability of a bank failure, which is the focus of the present paper. The literature regarding these effects is scant and by now dated. The seminal paper in this line of research is Wheelock and Wilson (2000). Using data from 1984 to 1993 and after controlling for traditional CAMELS factors, they find that managerial efficiency, as measured by cost and technical efficiency, was a robust predictor of bank survival probabilities. More recently, Berger *et al.* (2016) shed some light on why low managerial efficiency may be associated with lower rates of bank survival. It turns out that bank ownership, and in particular, the stakes in the banks, determines the risk-taking of lower-level management and, ultimately, bank failures. They present evidence that bank failure probabilities increase when chief officers and lower-level management incentives are aligned in this way.

In a related managerial paper, Gilbert, Meyer and Fuchs (2013) investigate what distinguishes thriving U.S. community banks. They define thriving banks as those that were able to maintain a high supervisory rating during the crisis (2006 to 2011). Supervisory ratings capture the overall performance of banks with respect to the CAMELS components. In addition to hard information (e.g. financial ratios), supervisory ratings also include soft information regarding banks' managerial quality. Gilbert *et al.* (2013) analyze the differences between the thriving banks and the "surviving banks"—i.e., those that did not fail but maintained a low supervisory rating. They interviewed the leaders of a sample of thriving banks to investigate how they were able to outperform their peers during the crisis. They find that managers of thriving banks maintained a strong commitment to conservative lending practices. However, thriving banks follow different business plans to achieve their objectives. No single model seems to be able to capture the diversity of these banks' business strategies or explain their success.

3. Methodology

In our analysis we estimate the time-to-failure probability of U.S. commercial banks using standard hazard model regressions. We focus on testing if managerial efficiency measures commonly used in the literature (e.g., profit, cost, and revenue efficiency) have independent explanatory power to predict bank failures. To measure managerial efficiency we favor the use of a profit efficiency measure over cost or revenue efficiency measures taken in isolation. In this section, we explain the econometric methods used to estimate managerial efficiency and time-to-failure probabilities.

We follow Wheelock and Wilson (2000) in modeling the time-to-failure of U.S. banks. We use Cox (1972) proportional-hazard models with time-varying covariates[6].We favor the use of hazard models over static classification models (e.g. Probit and Logit models) for several reasons. First, hazard models can control for the time a bank is at risk of failure. Static models give biased and inconsistent probabilities of failure given that they ignore that banks change over time. Second, hazard models incorporate the panel structure of the data and accommodate bank-specific and industry or macro-economic covariates. Third, hazard models outperform static models in out-of-sample forecasting (See Shumway 2001, Cole and Wu 2009, and Demyanyk and Hasan 2010 for details)[7].

6 For a detailed account of the models' estimation see (Wheelock and Wilson, 2000, p. 136)

7 Cole and Wu (2009) report that a simple logit model performs better in predicting recent bank failures in the U.S.. As a robustness check, we also include results from logit regressions.

We use four measures to proxy for bank managerial efficiency. We estimate profit and revenue efficiencies using the non-standard profit function framework of Humphrey and Pulley (1997) and estimate cost efficiency using a cost function, which is standard in the literature[8]. We also estimatea composite profit efficiency measure following Restrepo-Tobon and Kumhakar (2011). This measure is a profit efficiency measure that captures both revenue and cost efficiency. It differs from the traditional profit efficiency measure in that it is computed from separate measures of revenue and cost efficiencies rather than from a profit function. Previous studies focus on cost and technical efficiency. For instance, Wheelock and Wilson (2000) use three measures of efficiency: cost efficiency, input-oriented technical efficiency, and output-oriented technical efficiency[9]. We believe that profit efficiency provides a superior measure of efficiency over these measures since it encompasses all of them in a single measure.

We follow Humphrey and Pulley (1997) and assume that banks maximize profits, $\Pi = R - C = \sum_m p_m y_m - \sum_j w_j x_j$, subject to technological and market constraints, where p_m, $m = 1, \cdots, M$ are the prices for the corresponding vector of output quantities y and w_j, $j = 1, \cdots, J$ are the input prices for the corresponding vector of input quantities x_j. We model the bank' technology using the transformation function, $A f(y, \Theta \cdot x) = 1$. The market constraints are modeled using the price possibility frontier (PPF), $g(\eta \cdot p, w, z) = 1$, where z capture any bank characteristic that influences its pricing strategies other than prices and outputs. $g(\cdot)$ captures the ability of banks to set output prices for given input prices conditional on banks technology. It is analogous to the transformation function. It is natural to think that banks take into account input prices in setting prices. However, their ability to charge differential prices will depend on bank technology, therefore, the $g(\cdot)$ function should share some properties with the transformation function. It can be thought as the banks' assessment of appropriate output prices given its technology and exogenously given input prices. Technically, it plays a similar role to the demand function in the classical monopoly model. Technical inefficiency (input-oriented) in the transformation function is introduced via $0 \leq \Theta \leq 1$. Similarly, price inefficiency (measured radially like technical inefficiency) shows the rate at which banks could increase their output prices (represented by $\eta \geq 1$) given market conditions[10]. The PPF could includeother exogenous variables that could potentially affect banks' pricing policies.

Note that unlike in Berger, Humphrey and Pulley (1996) and Humphrey and Pulley (1997), Restrepo- Tobon and Kumhakar (2011) explicitly introduce price inefficiency ($\eta \geq 1$) into the PPF. This allows the PPF to dispense with output quantities. In this case, the relation between input prices and output quantities, in the spirit of Berger *et al.* and Humphrey and Pulley, results naturally from the first order conditions of the profit maximization problem. We present details of the derivation of the profit, revenue, and cost efficiency measures in the Appendix.

We assume a flexible (translog) functional form for modelling the non-standard profit function, $\Pi(w, y)$, the non-standard revenue function $R(w, y)$, and the standard cost function $C(w, y)$. The translog function is widely used in the stochastic frontier literature, Kumbhakar and Lovell (2003)[11].

8 Revenue efficiency is defined as the ratio between actual revenues and maximum revenues. Maximum revenues are estimated using standard stochastic frontier techniques, Kumbhakar and Lovell (2003).

9 Input-oriented technical efficiency measures the proximity of current levels of inputs to their optimal levels. Output-oriented technical efficiency measures the proximity of the current level of outputs to their optimal levels (See Kumbhakar and Lovell 2003 for details)

10 Price inefficiency refers to setting output prices below their optimal level, which causes actual revenues to be below maximum revenues.

11 Translog functions are flexible, easy to calculate, and permit the imposition of homogeneity restrictions. Thus, we think they are a good starting point for our purposes.

The econometric specification is:

$$\ln Q_i = \mathrm{TL}(w,y,t) + v_i + \epsilon_i \tag{1}$$

In equation 1, Q represents either total profits, total revenues, or total variable costs. TL(w,y,t) corresponds to the translog function of input prices (w), output quantities (y), and time (t). v_i is a one-sided, half-normally distributed error term, $N^+(0, \sigma_v^2)$, and ϵ_i represents a two-sided error term for each bank i = 1...N. The distributional properties of the one-sided error term have little impact on the estimated efficiency ranks (e.g. Kumbhakar and Lovell, 2003)[12]. Thus, $v = -\ln\gamma$, $v = -\ln\eta$, or $v = \ln\Theta$ capture profit, revenue, or cost inefficiencies, respectively.

3.1 Data

As in Wheelock and Wilson (2000), Cole and White (2012), and Berger et al. (2016), we use the following variables to proxy for the traditional factors used in the FDIC's CAMELS rating system:

- Capital Adequacy: Total Equity/Total Assets, and Tier 1 and 2 of Risk-Weighted Capital Ratio.
- Assets Quality: Total Loans/Total Assets, Real Estate Loans/Total Loans, Commercial and Industrial Loans/ Total Loans, Loan Loss Provision/Total Loans, Non-Performing Loans/Total Loans, Loan Loss Provision/Total Assets, and Non-Performing Loans/Total Assets, Off-balance Sheet Activities/Total Assets
- Earnings Quality: Net Income Before Taxes/Total Equity, Net Income Before Taxes/Total Assets.
- Funding Liquidity: Total Loans/Deposits.
- Liquidity Quality: Cash and Federal Funds Sold/Total Assets, Cash and Net Federal Funds/Total Assets.
- Other Factors: Log(Total Assets).

Profit, revenue, and cost efficiency estimation requires the specification of banks' output and input prices. We follow the previous literature and define output and input quantities according to the balance-sheet approach of Sealey and Lindley (1977)[13]. We use quarterly data from 2001Q1 to 2010Q4 from the Reports of Condition and Income (Call Reports) published by the Federal Reserve Bank of Chicago and from FDIC's historical statistics. We include only insured commercial banks operating within the 50 U.S. States and the District of Columbia[14].All nominal quantities are deflated using the 2005 Consumer Price Index for all-urban consumption from the Bureau of Labor Statistics (End of Year). We drop observations for which prices or output quantities have negative values. The

12 See Kumbhakar and Lovell, 2003 for details on estimating stochastic frontiers.

13 Berger, Hancock and Humphrey (1993); Akhavein, Berger and Humphrey (1997); Lozano-Vivas and Pasiouras (2010); Liadaki and Gaganis (2010); Krasnikov, Jayachandran and Kumar (2009); Koutsomanoli-Filippaki, Mamatza- kis and Staikouras (2009); Akhigbe and Stevenson (2010) ; Delis and Tsionas (2009).

14 We exclude other institutions that operate under different structures like commercial banks primarily conducting credit card activities and Standalone Internet Banks (SAIB), etc.

dataset includes 48,999 observations of which 39,378 (corresponding to 6,767 banks) have complete information for the hazard model estimations. Bank failure data on commercial banks are available at the FDIC[15]. There are 302 failed banks in the sample with complete data. However, since the hazard model requires at least two observations per bank, the failed-bank sample is further reduced to 241 observations.

4. Empirical Results

Tables I and II present the estimation results for the time-to-failure hazard model. The dependent variable is time-to-failure. A positive coefficient indicates that an increase in its accompanying variable is associated with an increase in the probability of failure. Each column corresponds to a different regression. Regression (1) uses the composite profit efficiency measure as a proxy for managerial efficiency. Regressions (2), (3), and (4) do the same using non-standard profit, revenue, and cost efficiencies, respectively.

Managerial efficiency is negatively related to bank failures. The coefficients for profit (columns 1 and 2) and revenue efficiency measures (column 3) are significant and negative. Contrary to Wheelock and Wilson (2000), the coefficient associated with cost efficiency (column 4) is insignificant. Since our study covers a different sample period it indicates a shift in bank managerial strategies during the past decade. Relatively more revenue- and profit-efficient banks have a lower probability of failure.

The qualitative results regarding the proxies for the other CAMELS ratings are robust across the four specifications. Robustness checks (not reported) including different sets of explanatory variables give similar results. As expected, non-performing loans and loan loss provisions are positively related to bank failure probabilities. Further, banks whose loans represent a high proportion of their assets are also more likely to fail. Real estate loans and commercial and industrial loans increase the probability of bank failures. In addition, off-balance sheet activities, which were prominent in recent discussions on risk-taking behavior at banks, are unrelated to the bank failure probability. This latter

Table I: Time-to-Failure Hazard Regressions: Left-hand-side Variable is Time-to-Failure.

RHSV	(1)	(2)	(3)	(4)
Equity/Assets	6.469	9.414	6.534	6.507
	(1.61)	(2.28)*	(1.67)	(1.61)
Total Loans/Assets	5.483	5.24	5.341	5.473
	(5.09)**	(4.80)**	(4.96)**	(5.08)**
Real Estate Loans/Total Loans	11.219	10.49	10.898	11.149
	(6.50)**	(6.21)**	(6.45)**	(6.51)**
Business Loans/ Total Loans	8.954	8.178	8.604	8.904
	(4.66)**	(4.31)**	(4.57)**	(4.67)**
Other Real Estate Owned	-0.791	2.723	-0.408	-1.142
	(0.15)	(0.53)	(0.08)	(0.22)

15 http://www2.fdic.gov/hsob/index.asp

RHSV	(1)	(2)	(3)	(4)
Non-Performing Loans	21.091	20.801	20.924	21.418
	(10.14)**	(9.33)**	(10.30)**	(10.47)**
Return on Equity	-0.968	-0.777	-0.934	-0.996
	(4.19)**	(3.23)**	(4.12)**	(4.36)**
Liquidity Creation	1.28	0.989	1.247	1.314
	(2.31)*	(1.79)	(2.26)*	(2.36)*
Off-Balance Sheet Activities	0.827	1.051	1.282	1.327
	(0.61)	(0.76)	(0.97)	(0.92)
Log(Assets)	0.234	0.253	0.232	0.227
	(2.38)*	(2.48)*	(2.36)*	(2.32)*
Composite Profit Efficiency	-0.026			
	(4.32)**			
NSPF Efficiency		-1.005		
		(2.73)**		
Revenue Efficiency			-5.67	
			(2.28)*	
Cost Efficiency				1.623
				(1.1)
Observations	39593	39357	39593	39593
Number of Banks	6778	6728	6778	6778
Bank failures	241	236	241	241
Robust z statistics in parentheses. * significant at 5%; ** significant at 1%				

Table II: Time-to-Failure Hazard Regressions: Left-hand-side Variable is Time-to-Failure.

RHSV	(1)	(2)	(3)	(4)
Equity/Assets	6.764	9.659	6.99	6.78
	(1.64)	(2.33)*	(1.74)	(1.64)
Total Loans/Assets	5.181	4.852	4.948	5.168
	(4.74)**	(4.38)**	(4.51)**	(4.72)**
Real Estate Loans/Total Loans	11.475	10.603	11.105	11.37
	(6.56)**	(6.28)**	(6.53)**	(6.57)**
Business Loans/ Total Loans	9.132	8.204	8.711	9.05
	(4.69)**	(4.31)**	(4.58)**	(4.69)**
Other Real Estate Owned	0.675	3.954	1.387	0.46
	(0.12)	(0.73)	(0.26)	(0.08)

RHSV	(1)	(2)	(3)	(4)
Loan Loan Provision	24.82	29.94	29.072	24.949
	(1.83)	(2.07)*	(2.29)*	(1.95)
Non-Performing Loans	17.053	15.699	16.355	17.466
	(6.03)**	(5.01)**	(6.04)**	(6.32)**
Return on Equity	-0.801	-0.57	-0.72	-0.822
	(2.96)**	(2.02)*	(2.72)**	(3.10)**
Funding Liquidity	1.319	1	1.284	1.351
	(2.40)*	(1.81)	(2.34)*	(2.44)*
Off-Balance Sheet Activities	0.638	1.099	1.204	1.185
	(0.46)	(0.79)	(0.9)	(0.81)
Log(Assets)	0.231	0.253	0.229	0.225
	(2.35)*	(2.49)*	(2.32)*	(2.29)*
Composite Profit Efficiency	-0.028			
	(4.59)**			
NSPF Efficiency		-1.194		
		(3.29)**		
Revenue Efficiency			-6.946	
			(2.79)**	
Cost Efficiency				1.698
				(1.13)
Observations	39593	39357	39593	39593
Number of Banks	6778	6728	6778	6778
Bank failures	241	236	241	
Robust z statistics in parentheses. * significant at 5%; ** significant at 1%				

result is robust to different measures of off-balance sheet activities.

The coefficient associated with funding liquidity (total loans/ total assets) is positive and significant across all regressions. A higher coefficient implies a higher probability of failure. Thus, it indicates that banks that heavily rely on short-term funding are more likely to fail. It also may indicate that deposit insurance increases the banks' incentive to fund their operations using short-term borrowing.

We also conducted some robustness checks using static classification models (Probit and Tobit). The results for the Probit model are reported in Table III (The logit models give almost identical results). In those regressions all efficiency measures are significant and negatively associated with the probability of bank failure. However, as pointed out above, given the superior properties of hazard models to estimate the risk of failure, we favor the results presented in Tables I and II.

Overall our empirical evidence support our main hypothesis. Managerial efficiency, as proxied by profit efficiency, is positively correlated with the probability of bank failures and has independent explanatory power beyond the traditional factors associated with bank failures—CAMELS factors.

5. Conclusions

As a consequence of the 2007-2009 U.S. financial crisis, 322 U.S. commercial banks failed between 2008 and 2010. According to the FDIC estimates, both the number of bank failures and their associated cost increased tenfold compared to the years between 2000 and 2007. Despite the severity of the recent crisis, the number of bank failures was low compared to previous decades. For instance, from 1980 to 1989, 1,467 U.S. commercial banks failed, and from 1990 to 1999 this number was 436. The natural question arising from these facts is what was different this time around.

In this paper we investigate the role played by managerial efficiency in the non-systemic bank failures during the crisis and compare our empirical results to those available for previous waves of bank failures in the U.S.. Using data from 2001 to 2010, we show that profit efficiency—our proxy for managerial efficiency— is a robust predictor of the ability of a bank to survive the crisis. As expected, traditional measures used in the literature as proxies for CAMELS components are highly

Table III: Probit Regressions: Left Hand Side Variable is Failure.

RHSV	(1)	(2)	(3)	(4)
Equity/Assets	3.121	3.36	3.178	2.983
	(4.18)**	(4.40)**	(4.30)**	(4.01)**
Total Loans/Assets	2.631	2.62	2.569	2.696
	(14.08)**	(13.89)**	(13.78)**	(14.47)**
Real Estate Loans/Total Loans	2.931	2.744	2.926	2.9
	(11.92)**	(11.52)**	(11.93)**	(11.92)**
Business Loans/ Total Loans	2.712	2.456	2.693	2.663
	(9.57)**	(8.88)**	(9.56)**	(9.43)**
Other Real Estate Owned	0.024	-1.386	0.092	-0.438
	(0.02)	(0.92)	(0.06)	(0.3)
Non Performing Loans	9.671	7.878	9.5	9.624
	(14.31)**	(9.65)**	(14.06)**	(14.19)**
Return on Equity	-0.001	-0.149	-0.001	0
	(0.24)	(2.19)*	(0.25)	(0.2)
Liquidity Creation	0.46	0.38	0.44	0.47
	(4.03)**	(3.38)**	(3.85)**	(4.22)**
Off-Balance Sheet Activities	0.053	0.376	0.233	-0.256
	(0.23)	(1.63)	(0.99)	(1.04)
Log(Assets)	0.02	0.032	0.017	0.028
	(1.21)	(1.89)	(1)	(1.64)

RHSV	(1)	(2)	(3)	(4)
Composite Profit Efficiency	-0.01			
	(2.34)*			
NSPF Efficiency		-0.596		
		(6.84)**		
Revenue Efficiency			-2.248	
			(3.75)**	
Cost Efficiency				-0.902
				(3.77)**
Constant	-8.977	-8.81	-6.908	-8.151
	(12.45)**	(11.99)**	(7.88)**	(10.38)**
Observations	46549	46258	46549	46549
Number of Banks	7361	7320	7361	7361
Bank failures	291	283	291	291
Robust z statistics in parentheses. * significant at 5%; ** significant at 1%				

correlated with the probability of bank failures. After controlling for these factors, we find that profit efficiency has additional explanatory power and should be taken into account in studies investigating the determinants of bank failures.

In contrast to previous crises, this time around cost efficiency was unrelated to bank failures. During previous waves of bank failures, cost-inefficient banks and banks with relatively less capital or low-quality assets were more likely to fail. We find, however, that during the recent crisis capital adequacy lost importance in predicting non-systemic bank failures, while loan quality remained a strong predictor. Our results suggest that profit efficiency can be an important managerial indicator in monitoring the quality of managerial practices and the overall soundness of U.S. commercial banks.

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A. Appendix

Banks maximize profits, $\Pi = R - C = \sum_m p_m y_m - \sum_j w_j x_j$, subject to technological and market con- straints, where p_m, $m = 1, \cdots, M$ are prices of output y_m and w_j, $j = 1, \cdots, J$ are prices of inputs x_j.

The Lagrangian associated with the profit maximization problem is:

$$\max_{p,x} L = \Pi + \lambda \left[A f(y, \Theta \cdot x) - 1 \right] + \mu \left[g(\eta \cdot p, w) - 1 \right] \tag{2}$$

Defining $p^* = p \cdot \eta$ and $x^* = x \cdot \emptyset$, the first order conditions (FOCs) for p_m and x_j are:

$$y_m + \mu \frac{\partial g(\eta \cdot p, w)}{\partial p^*_m} \frac{\partial p^*_m}{p_m} = 0 \tag{3}$$

$$-w_j + \lambda \cdot A \frac{\partial f(y, \Theta \cdot x)}{\partial x^*_j} \frac{\partial x^*_j}{x_j} = 0 \qquad \forall \tag{4}$$

From (3) we get:

$$\frac{p_m y_m}{p_1 y_1} = \frac{\dfrac{\partial \ln g(\eta \cdot p, w)}{\partial \ln p^*_m}}{\dfrac{\partial \ln g(\eta \cdot p, w)}{\partial \ln p^*_1}} \quad \forall \quad m : 2, \cdots, M. \tag{5}$$

Likewise, from (4) one gets:

$$\frac{w_j x_j}{w_1 x_1} = \frac{\dfrac{\partial \ln f(y, \Theta \cdot x)}{\partial \ln x^*_j}}{\dfrac{\partial \ln f(y, \Theta \cdot x)}{\partial \ln x^*_1}} \quad \forall \quad j : 2, \cdots, J. \tag{6}$$

Since x_j does not appear in (5) and p_m always appears along η , one can solve for $\eta\, p_m$ together with the price opportunity set $g(\eta \cdot p, w) = 1$ in terms of w and y. Hence, $\eta\, p_m = p^*_m = \emptyset(w, \hat{y})$, $\hat{y} = y_m / y_1$. This expression relates optimal prices to output quantities and input prices.

Likewise, since p does not appear in (6) and x_j always appears along $\emptyset$, one can solve for $\emptyset x_j$ together with the transformation function $Af(y, \Theta \cdot x) = 1$ in terms of w and y. Hence, $\Theta x_j = x^* = \text{Ш}(\hat{w}, y)$. This expression represents the conditional input factor demands.

The solutions of optimal input quantities and output prices can be used to compute the CNSPF as:

$$\pi^{cnspf}(w, y) = \sum p_m(\cdot) y_m - \sum w_j x_j(\cdot) = 1/\eta \sum p_m(\cdot)\, \eta\, y_m - 1/\Theta \sum w_j x_j(\cdot)\, \Theta \tag{7}$$

$$\pi^{cnspf}(w, y) = 1/\eta\, R(w, y) - 1/\Theta\, C(w, y) \tag{8}$$

Equation (8) shows that profits can be lower than optimal due to both technical and price inefficiencies[16]. Technical inefficiency increases costs (cost inefficiency) and price inefficiency lowers revenues (revenue inefficiency).

Profit efficiency from a non-standard profit function are obtained by estimating equation (8) making it equal to $\pi^{nspf} = \pi^{optimal} \times e^{-\gamma}$. Where γ capture profit inefficiency.

By definition:

$$R = \sum p_m y_m = 1/\eta \sum p^*_m y_m \equiv 1/\eta R^* \leq R^* \tag{9}$$

$$C = \sum w_j x_j = 1/\Theta \sum w_j x^*_j \equiv 1/\Theta C^* \geq C^* \tag{10}$$

Therefore, the dollar-value profit inefficiency is given by

$$\Pi^* - \Pi = R^* (1 - 1/\eta) - C^*(1 - 1/\Theta) \tag{11}$$

Where Π^* and Π are optimal and current profits, respectively. The composite profit efficiency measure we use in this paper is given by Π/Π^*.

16 Price inefficiency refers to setting output prices below optimal levels.

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Research Article

Macroeconomic Effects of Oil Price Fluctuations in Colombia

Efectos macroeconómicos de las fluctuaciones de los precios del petróleo en Colombia

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Palabras clave: SVAR, impulso-respuesta, mercado petrolero, Colombia.

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Abstract

This research aims to study the effects of oil price changes on the Colombian economy during 2001:Q1 to 2016:Q2. A structural vector auto-regression model in the spirit of Blanchard and Galí (2010) is estimated under a recursive identification scheme, where unexpected oil price variations are exogenous relative to the contemporaneous values of the remaining variables. Drawing on impulse-response estimates, a 10% increase in the oil price generates the following accumulated orthogonalized responses: i) a contemporaneous 0.4% increase in GDP growth, later on the effect reaches its maximum in the first quarter (1.7% increase) and starts to decay after two quarters; ii) a contemporaneous 1.2% decrease in unemployment, then the effect remains slightly negative and reaches its maximum after ten quarters (5.1% decrease); iii) a contemporaneous 0.9% decrease in inflation, followed by an 0.2% increase by quarter three, and thereafter the effect remains slightly negative.

Resumen

Esta investigación busca estudiar los efectos de las variaciones en el precio del petróleo en la economía Colombiana durante 2001:T1 a 2016:T2. Un modelo estructural de vectores auto-regresivos, similar al de Blanchard y Galí (2010), es estimado bajo un esquema de identificación recursiva, donde las variaciones inesperadas en el precio nominal del petróleo, son exógenas con respecto a los valores contemporáneos del resto de las variables. Con base a las funciones de impulso-respuesta, un aumento del 10% en el precio del petróleo genera las siguientes respuestas acumuladas ortogonalizadas: i) incremento contemporáneo de 0.4% en el crecimiento del producto, luego el efecto alcanza su máximo en el

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primer trimestre (incremento de 1.7%) y comienza a decaer luego de dos trimestres; ii) disminución contemporánea de 1.2% en el desempleo, seguidamente el efecto se mantiene ligeramente negativo y alcanza su máximo luego de diez trimestres (disminución de 5.1%); iii) disminución contemporánea de 0.9% en la inflación, seguida de un aumento de 0.2% en el tercer trimestre, y luego el efecto se mantiene ligeramente negativo.

1. INTRODUCTION

Oil is a key component of the global economy, and the relationship between its price and macroeconomic indicators has been addressed by economic researchers since the late 1970s, such as Hamilton (1983, 1996), Rotemberg and Woodford (1996), Kilian (2009), Blanchard and Galí (2010), among many others. However, most of the research on the subject has focused on advanced economies (especially the U.S.), which have been historically net-importers of oil. For emerging and developing economies, the effects of oil price fluctuation have been explored to a much lesser extent in recent work, for example by Lorde, Jackman and Thomas (2009) for Trinidad and Tobago, and Farzanegan & Markwardt (2009) for Iran.

Previous work has presented a variety of results, which suggest that the responses to oil price fluctuations might be heterogeneous from one country to another, depending on the characteristics of the economy, including whether it is emerging or developed, a net oil-exporter or a net oil-importer.

There were three main motivations for conducting this research. First, Colombia represents an interesting country for a case study, as it is an emerging market economy with relatively low oil reserves (when compared to other oil giants such as Venezuela and Mexico) that has managed to obtain a place among the largest oil exporters in the Latin American region during last years (BP, 2016). Second, although the oil sector in Colombia is substantial, the country has a somewhat diversified economy, which is not common among major oil producers; for instance, oil revenues as a percentage of GDP have consistently been less than 9% during 1970-2014 (World Bank, 2016). Third, as stated previously, the majority of journal articles on this subject have been focused on the U.S. or other industrialized economies, and to the best of my knowledge, the Colombian case has not been widely explored in the empirical macroeconomic literature. That said, this work aims to make another contribution to the understanding of the oil prices-macroeconomy relationship, focusing on Colombia.

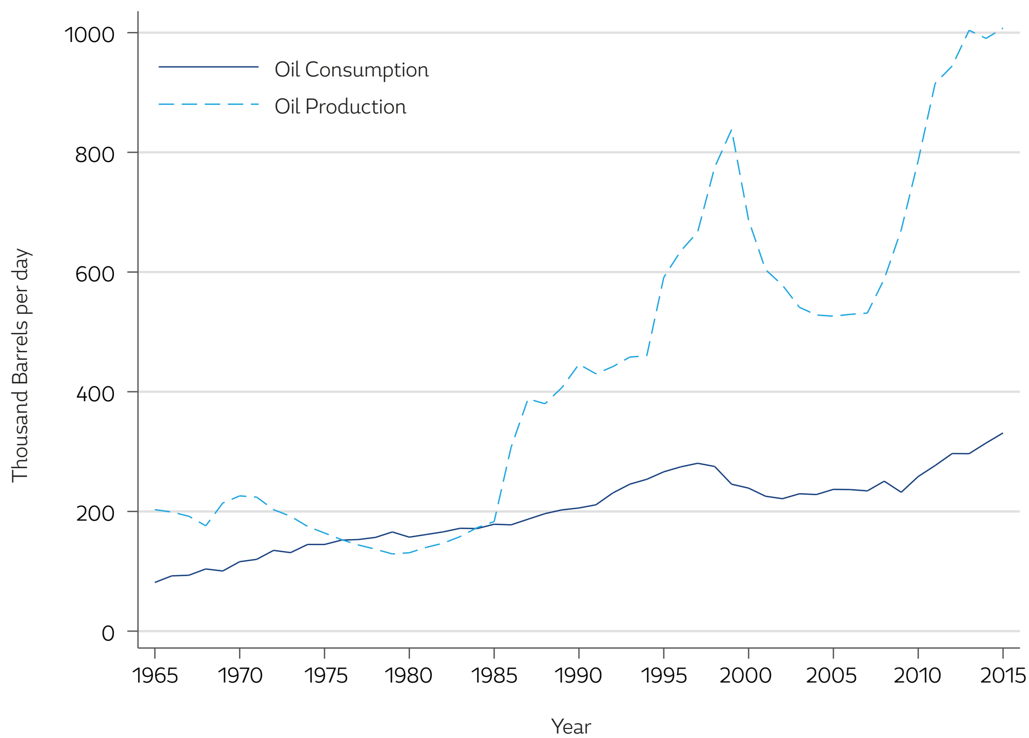
The empirical strategy used here relied on the standard structural vector auto-regression (SVAR) methodology, a heavily-used tool in modern macroeconomic research. I began the empirical analysis by examining the statistical properties of each time series and estimating a simple, unrestricted vector auto-regression. After this model was tested and accepted, I proceeded to estimate a structural specification in the spirit of Blanchard & Galí (2010), under the identification assumption that unexpected variations in the nominal price of oil are exogenous relative to the contemporaneous values of the main macroeconomic variables for Colombia.

The conclusions are driven mainly by an impulse-response analysis with a time horizon of 10 periods (quarters) ahead, which also applies for the structural forecast error variance decomposition. A unit shock in the oil price (1% increase) generates a contemporaneous increase in GDP growth (which starts to decay after one or two quarters) and contemporaneous decreases in unemployment and inflation (thereafter both effects remain slightly negative). Such results are inspected and discussed to a larger extent in the last two sections. Additionally, oil price innovations do not explain a significant share of the structural forecast error variance in the GDP growth rate, the unemployment rate, and the inflation rate.

2. THE OIL SECTOR IN THE COLOMBIAN ECONOMY

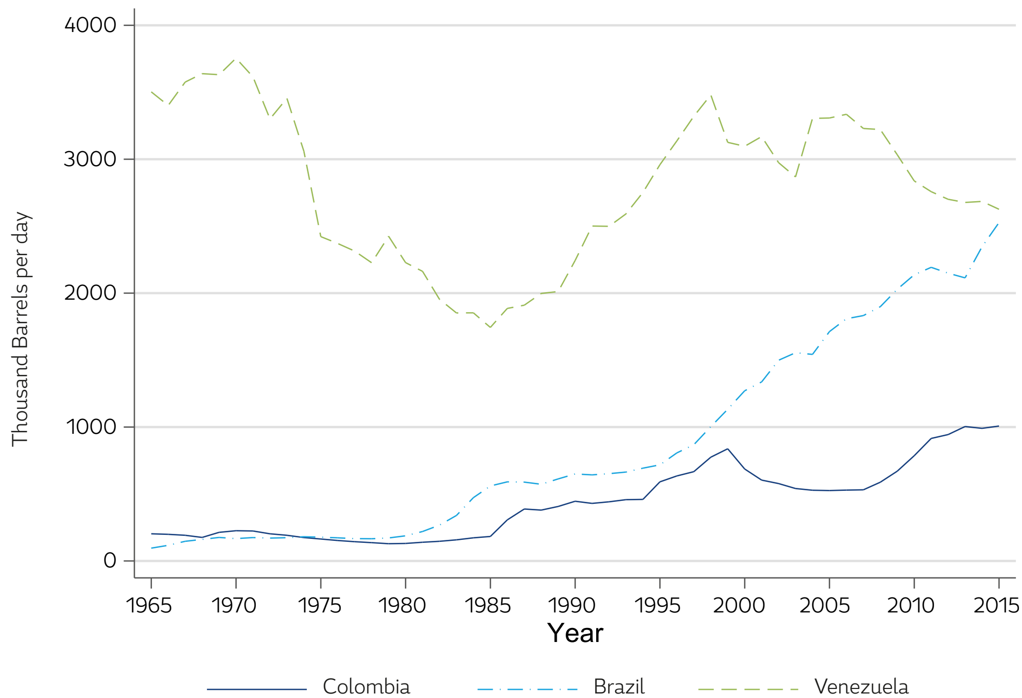
Colombia's proved reserves of oil are not as large as those of other major oil producers, such as Venezuela or Mexico. Nevertheless, its production has increased sharply during the last decades. According to BP (2016), Colombia is the third largest oil producer in South America, after Venezuela and Brazil, and the fourth largest in Latin America if Mexico is included. Oil production in Colombia increased about 400% between 1965 and 2015, and between 2005 and 2015 it increased about 92%. Oil consumption has been increasing since 1965, but at a much slower pace; the gap between supply and demand reached its historic peak in 2015.

Figure 1. Oil Production and Consumption in Colombia.



Source: Author's elaboration. Data: BP (2016).

Figure 2. Oil Production in Colombia, Brazil and Venezuela.

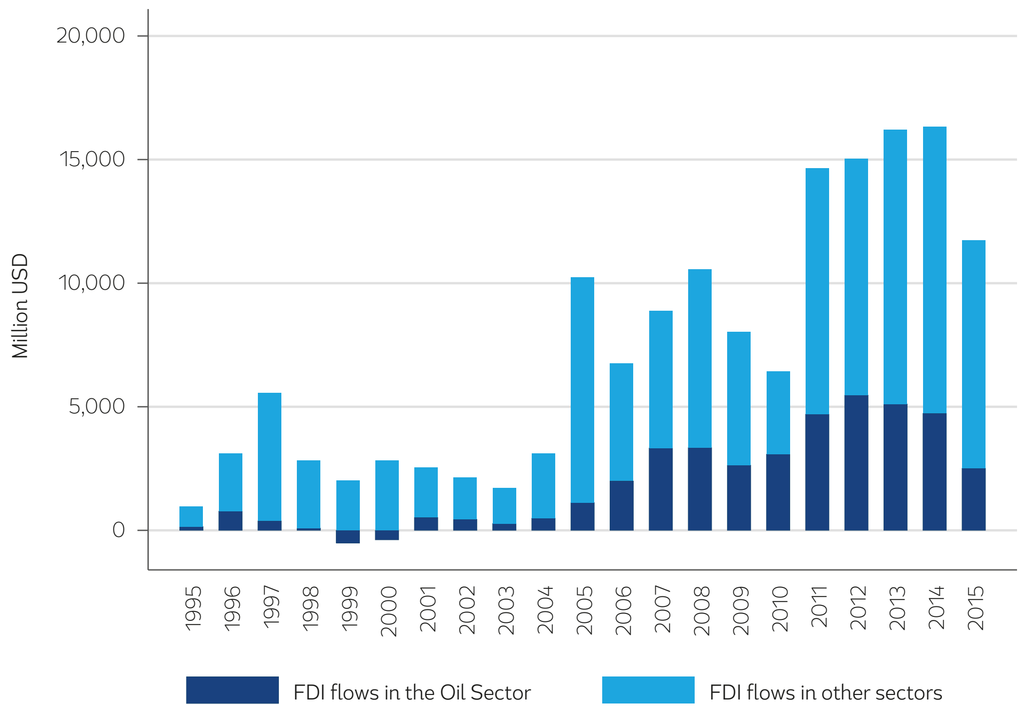


Source: Author's elaboration. Data: BP (2016).

According to the U.S. Energy Information Administration (2016), Colombia's oil production grew rapidly from 2007 to 2013 in response to increased exploration and development. New exploration and development were spurred by the regulatory reforms of 2003. Its main oil export destinations are the United States and Panama, and in 2015, China expressed interest in financing new infrastructure projects in Colombia to transport oil to the Pacific coast for export.

The Americas Society (2010) gave the name of *Energy Renaissance* to the post-2003 period, which was preceded by an era where production started to decline (mainly by the end of the 1990's and early 2000's) due to geological setbacks and security problems, as the upstream activity was often located in remote places where the State had limited presence, thereby increasing the likelihood of kidnappings, pipeline bombings, extortions, etc. Following the sharp decline in oil production, reforms took place in 2003 to revisit the regulatory and fiscal framework to account for Colombia's less competitive geology. Such reforms were accompanied by other actions in the security sphere. Moreover, since the 2003 reforms, the Colombian oil sector has attracted a total of 38.8 billion USD of foreign direct investment (FDI) during 2003-2015 (Banco de la República de Colombia, 2016), and additionally the share of investment out of total FDI increased. The years of high foreign direct investment flows in the petroleum sector are linked with years of rapid growth in crude production, as shown in Figures 1 and 3.

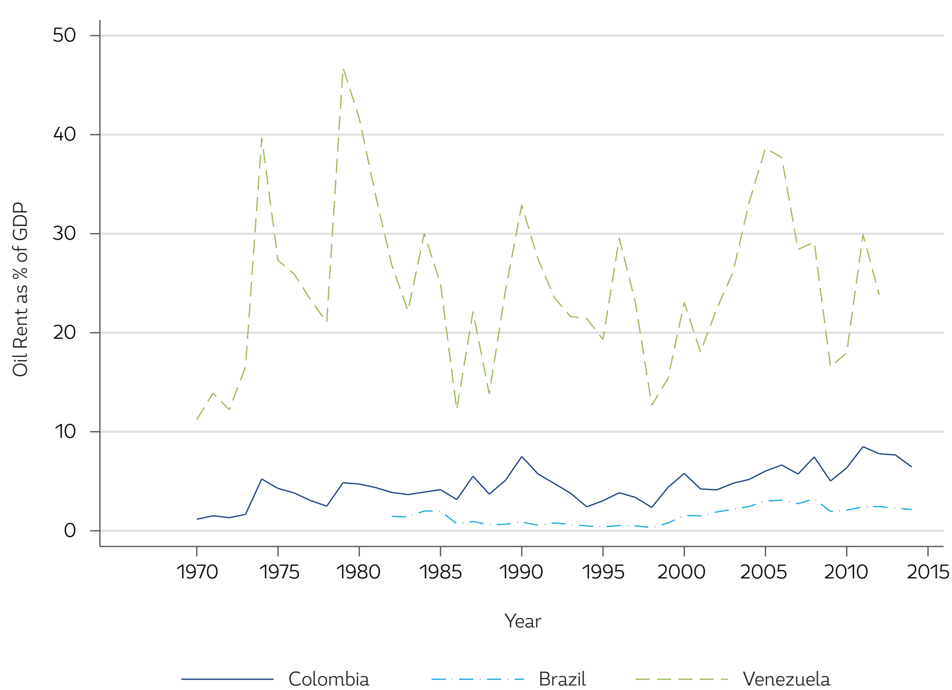
Figure 3. Foreign Direct Investment Flows in the Colombian Oil Sector.



Source: Author's elaboration. Data: Banco de la República de Colombia (2016).

Regarding the oil revenues, they represented 6.4% of Colombian GDP in 2014 and consistently accounted for less than 9% of the GDP during 1970-2014, which is not a common trend among major oil producers; that fact makes Colombia less exposed to oil price risk when compared to Venezuela, where the oil revenues accounted for 38% of GDP in 2005 and 23% in 2012.

Figure 4. Oil Revenues as % of GDP in Colombia, Brazil and Venezuela.



Source: Author's elaboration. Data: World Bank (2016).

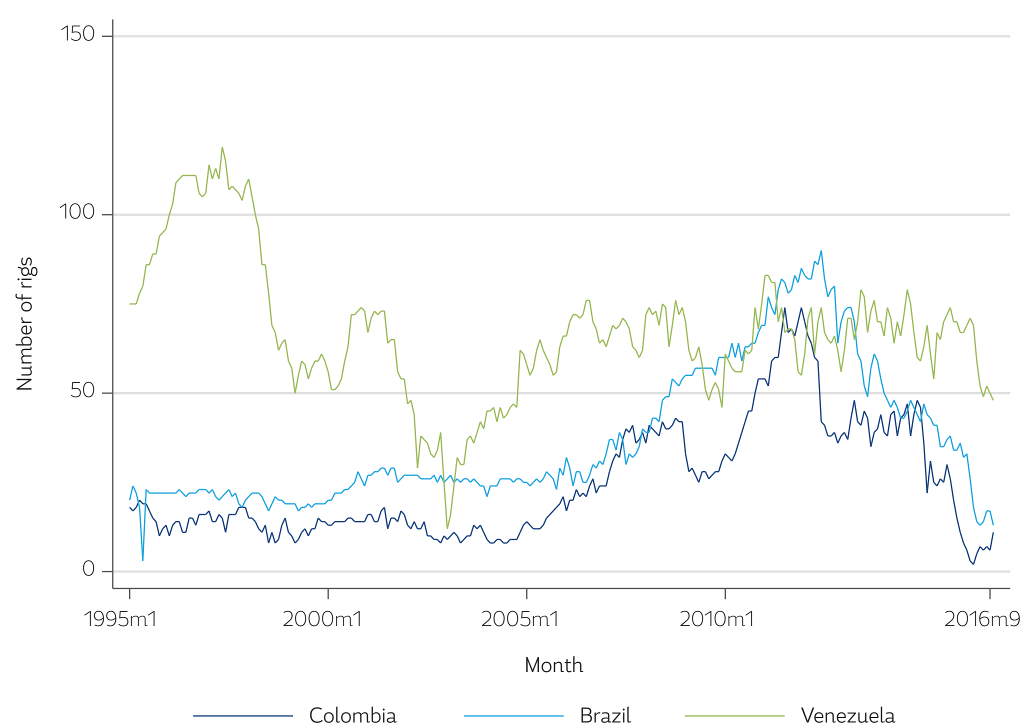
The Colombian oil sector is dominated by *Ecopetrol*, which is a public stock-holding corporation, 88.5% percent state-owned, and associated with the Ministry of Energy. According to its management report (Ecopetrol S.A., 2015), the company ranks 19th in the *Platts Top 250 Global Energy Company Rankings* and has a value of USD 2.0 billion. The company has the capacity to participate in every stage of the hydrocarbons chain, including both upstream (exploration and production) and downstream (trading, lubricants, petrochemicals) activities.

By the end of 2015, Colombia produced around one million barrels of oil per day and had 290,850 barrels per day of crude oil refining capacity at five refineries owned by *Ecopetrol*. The company aims to increase the refining capacity and improve the ability to process heavier crude oils by expanding the *Barrancabermeja* refinery, located in Santander Department. It has just started operations in the new *Cartagena* refinery, located in Bolívar Department (U.S. Energy Information Administration, 2016).

Despite being a state-owned company and unlike similar peers such as *PDVSA* in Venezuela and *Petrobras* in Brasil (which have been linked to corruption scandals by the international press), *Ecopetrol* is run in a business-oriented manner, with clear corporate strategies and values. It aims to increase its production by 1-2% up to 2020, maintain its current credit rating, invest 5 billion USD every year, and cut costs by 1 billion USD every year (Ecopetrol S.A., 2015).

Much of Colombia's crude oil production takes place in the Andes foothills and in the eastern Amazonian jungles. Meta Department, in central Colombia, is also an important production area where heavy crude oil predominates. The Llanos basin contains the Rubiales oilfield, the largest producing oil field in the country. Also, it should be noted that the number of operating oil rigs has declined recently, as Figure 5 shows, but that is a common trend among South American producers.

Figure 5. Oil rigs in Colombia, Brazil and Venezuela.



Source: Author's elaboration. Data: Baker Hughes (2016).

The petroleum sector faces a number of limitations, including a still deficient infrastructure. Pipelines and other energy facilities have been the target of attacks by anti-government guerrillas for many years, which have caused an important number of unplanned production disruptions: around 41 000 barrels per day (U.S. Energy Information Administration, 2016). Also some local communities oppose energy projects on their lands for spiritual beliefs about protecting natural resources, a concern that oil-related activity will attract criminal or violent groups to their territory (Americas Society, 2010), or a concern about the adverse effects of operating in environmentally-sensitive areas.

3. METHODOLOGY

This analysis of the effect of oil prices on the macroeconomy follows the Structural Vector Autoregression (SVAR) tradition, a well-known multivariate time series framework heavily-used in modern empirical macroeconomics. This methodology was initially developed by Christopher Sims (1980, 1986), but it has been extended by many other contributors. A full review of the estimation, identification strategies, benefits and drawbacks of SVARs can be found in work done by Lütkepohl (2005) and Kilian (2013).

SVARs are *data-driven* but still incorporate meaningful elements from economic theory or intuition just by setting a minimum quantity of restrictions, an appealing feature to establish cause-effect relationships. According to Kilian (2013), despite the increase in the use of dynamic stochastic general equilibrium models, SVARs continue to be the main tool for empirical work in macroeconomics. That said, the decision of selecting the empirical strategy was not a difficult task as it coincides with previous work done by Kilian (2009) on the same subject, and especially by Blanchard and Galí (2010), the main empirical reference for this paper.

3.1 Identification and Estimation

Although SVARs are structural models, they depart from reduced-form vector autoregressions (VARs). Hence, following Lutkepohl (2005), the empirical workflow of this paper begins with the estimation of a simple VAR, which is tested, before proceeding to perform structural analysis.

After that, a structural model is set up consisting of $Y_t=(OIL_t, GDP_t, UNEMP_t, CPI_t)'$, where OIL_t is the percent change of the WTI crude price in USD; GDP_t and CPI_t, are percent changes of the —seasonally adjusted- GDP and the consumer price index, respectively; and $UNEMP_t$, the averaged-by-quarter unemployment rate. Thus, The SVAR representation is:

$$A_o Y_t = \alpha + \sum_{i=1}^{p=4} A_i Y_{t-i} + \varepsilon_t . \qquad (1)$$

α is a vector of constants or intercept terms, A_i is a matrix of coefficients in period t-i,and ε_t is a four-dimensional vector with serially uncorrelated and mutually uncorrelated errors. It is assumed that A_o has a recursive structure, such that the reduced form errors e_t can be decomposed according to $e_t = A_o^{-1} \varepsilon_t$:

$$\begin{pmatrix} OIL_t \\ GDP_t \\ UNEMP_t \\ CPI_t \end{pmatrix} = \begin{bmatrix} a_{11} & 0 & 0 & 0 \\ a_{21} & a_{22} & 0 & 0 \\ a_{31} & a_{32} & a_{33} & 0 \\ a_{41} & a_{42} & a_{43} & a_{44} \end{bmatrix} \begin{pmatrix} \varepsilon_t^{OIL\text{-}shock} \\ \varepsilon_t^{GDP\text{-}shock} \\ \varepsilon_t^{UNEMP\text{-}shock} \\ \varepsilon_t^{CPI\text{-}shock} \end{pmatrix} \qquad (2)$$

Following a recursive structure, restrictions placed on matrix A imply that unexpected variations in the nominal price of oil are exogenous relative to the contemporaneous value of the remaining macroeconomic indicators included in the SVAR, which is consistent with Blanchard and Galí (2010). They explain that such identification assumption would be clearly incorrect if macroeconomic developments in the country of consideration affect the world price of oil contemporaneously. This may be either because the economy under consideration is large, or because developments in the country are correlated with world developments. Thus, their research explored alternative assumptions and obtained nearly identical results among them. In the case of Colombia, a small open economy, it is unlikely that national macroeconomic fluctuations have a direct and contemporaneous effect on the global price of oil. Note that matrix B was set to an identity as no restrictions were imposed on it.

As stated in equation (2), the model can account for four shocks, however the empirical effort of this paper will focus on $\varepsilon_t^{OIL\text{-}shock}$ or the *oil price shock*, as it is the most relevant with regard to the purpose of the study. *A priori*, given the importance of the oil sector in Colombia and also considering the relevance of the country in terms of crude production, following oil price increases, there were expected an increase in GDP growth, a decline in the unemployment rate, and a slight decrease in the inflation rate. Additionally, increases in oil prices increase oil exports, which is expected to strengthen the Colombian currency, causing a deflationary effect on domestic prices.

4. DATA

Preliminarily, the following time series were collected: (i) from Banco de la República de Colombia (2016), quarterly data on the real seasonally-adjusted gross domestic product, and monthly data on the consumer price index and the unemployment rate; (ii) from the International Monetary Fund (2016), quarterly data on the nominal West Texas Intermediate crude global price (period averages).

Subsequently, some transformations were applied to the time series in order to account for unit roots and to convert them to quarterly frequency where applicable. The resulting dataset covers the period 2001:Q1 to 2016:Q2, and includes: OIL_t, the percent change (%) of the nominal WTI crude price in USD; GDP_t and CPI_t, percent changes (%) of the real —seasonally adjusted- GDP and the consumer price index, respectively; and $UNEMP_t$, the averaged-by-quarter unemployment rate (%). In the specific case of CPI_t, the end-of-quarter values were used to construct the final time series.

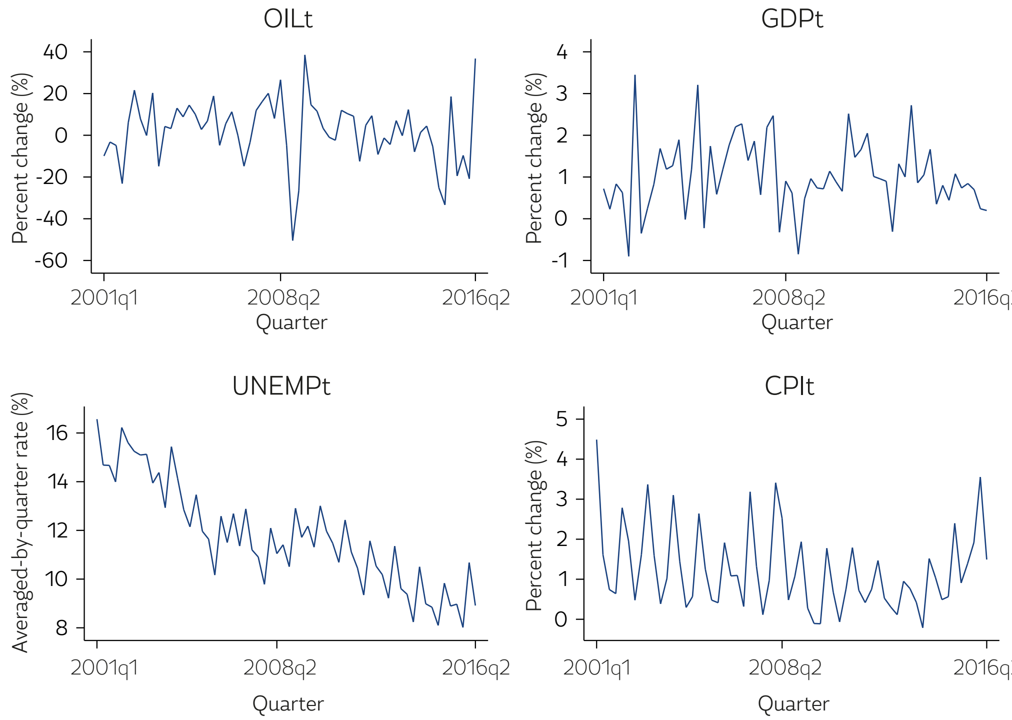
The stationarity of every series was confirmed by means of the KPSS test developed by Kwiatkowski et al. (1992), whose null hypothesis is that the tested time series is stationary. Every test included automatic lag selection procedure by Newey and West (1994). The results are shown in Table 1.

Table 1. KPSS stationarity test

Series	t statistic	Critical value*	I(n)	Decision
OILt	0.233	0.739	I(0)	Null is not rejected
GDPt	0.378	0.739	I(0)	Null is not rejected
UNEMPt	0.113	0.216	I(0)	Null is not rejected
CPIt	0.297	0.739	I(0)	Null is not rejected

Source: Author's elaboration. Null hypothesis: Variable is stationary. *At 1%

Figure 6. Variables for estimation, 2001:Q1 to 2016:Q2.



Source: Author's calculations using data from Banco de la República de Colombia (2016) and the International Monetary Fund (2011).

There was no particular reason for selecting the 2001:Q1 to 2016:Q2 period besides the availability of reliable data, as both Banco Central de la República de Colombia (2016) and the International Monetary Fund (2016) offer the possibility of accessing such time series with ease. Notwithstanding what coincidentally makes the selected period interesting is the fact that it includes both low and high oil price sub-periods. For instance, the crude price went from 28.7 USD in 2001:Q1 to its peak of 123.9 USD in 2008:Q2, and some years later it started to decline by around 50% by the end of 2014. That oil price *roller* coaster was accompanied by internal developments and reforms in Colombia that made oil take a more important role in the national macroeconomy; as seen in Figure 1 and 3 (previous section), the oil production and foreign direct investment flows in the oil sector increased during the selected period, although unlike other Latin American peers, oil revenues as a share (%) of GDP remained low and relatively stable.

5. RESULTS

The first part of this section addresses the evaluation process of a preliminary VAR estimation, while the second one covers the final SVAR results.

5.1. Preliminary VAR results

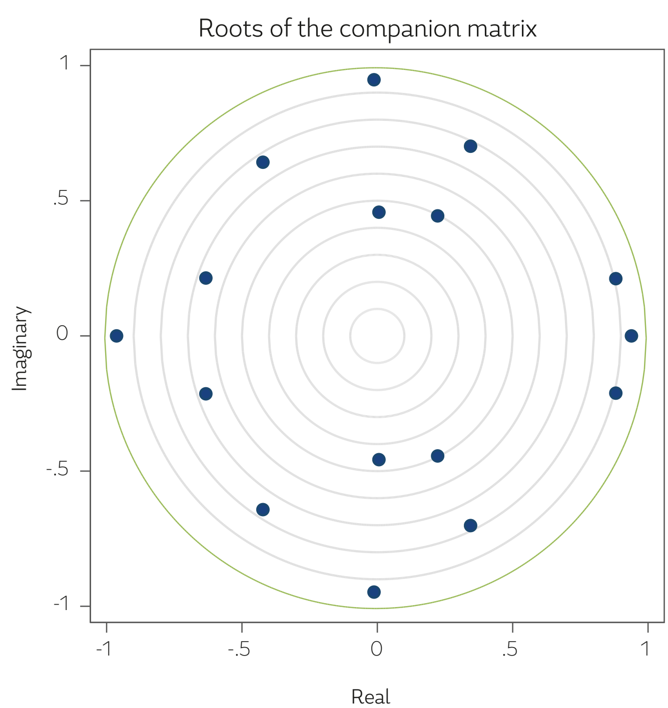
Given the frequency of the data and following the Akaike and Hannan & Quinn information criteria for lag order selection, a VAR of order 4 was estimated. The following checks were performed: a) the absence of serial correlation was confirmed by means of the Lagrange-multiplier test; b) the model satisfied the stability condition, as all the roots of the companion matrix were inside the unit circle, i.e. less than one; c) the multivariate version of the Jarque-Bera test suggested the presence of normality in the residuals, although Lutkepohl (2011) explains that normality is not a *sine qua non* condition for the validity of statistical procedures related to VARs.

Table. 2. Serial Correlation test related to the VAR

Lag	chi2	Prob > chi2	Decision
1	17.5182	0.35285	Null is not rejected
2	19.6896	0.23453	Null is not rejected
3	8.2259	0.94185	Null is not rejected
4	16.1718	0.44104	Null is not rejected
5	16.9833	0.38668	Null is not rejected
6	16.7916	0.3992	Null is not rejected
7	19.3118	0.25283	Null is not rejected
8	18.5574	0.29228	Null is not rejected

Source: Author's elaboration. Null hypothesis: no autocorrelation at lag order

Figure 7. Stability condition related to the VAR.



Source: Author's elaboration.

Table 3. Normality test related to the VAR

	chi	Prob > chi	Decision
VAR system	5.94	0.65395	Null is not rejected
OILt equation	0.24	0.88705	Null is not rejected
GDPt equation	3.625	0.16326	Null is not rejected
UNEMPt equation	0.944	0.62365	Null is not rejected
CPIt equation	1.131	0.56804	Null is not rejected

Source: Author's elaboration. Null hypothesis: Skewness and excess kurtosis are zero, i.e. residuals follow a normal distribution

5.2 SVAR results

After having tested and accepted the preliminary VAR model, it is possible to proceed with the underlying structural estimation, which follows the identification strategy explained previously. The following Â matrix was obtained:

$$\hat{A}=\begin{bmatrix} -0.08548505 & 0 & 0 & 0 \\ -0.00515696 & 1.3962177 & 0 & 0 \\ 0.01959192 & -0.04876581 & 1.7716763 & 0 \\ -0.01026868 & 0.03737936 & 0.7296998 & -2.1447715 \end{bmatrix}, \tag{3}$$

and the corresponding estimated contemporaneous impact matrix is:

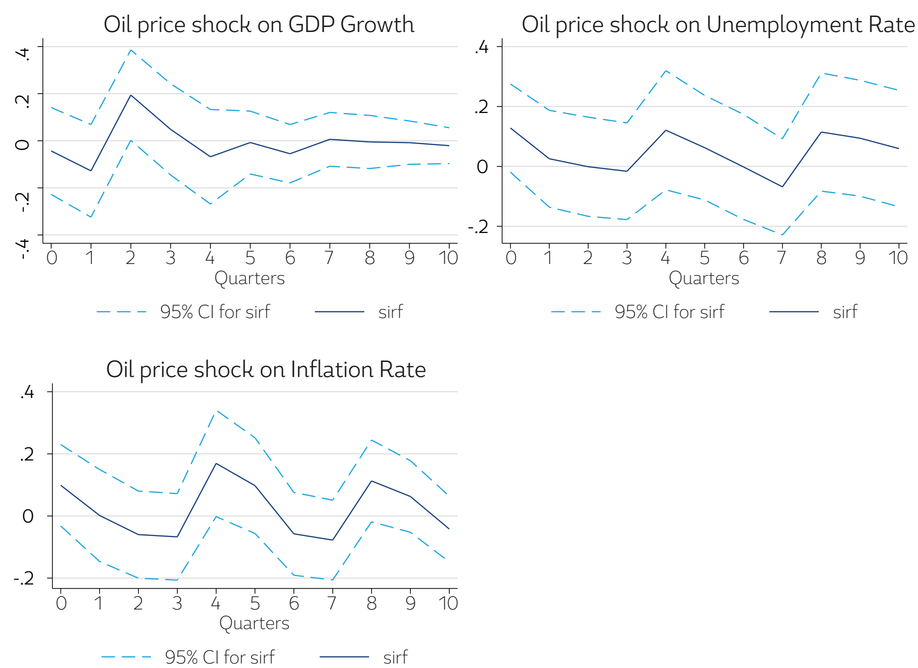
$$\hat{A}^{-1}B=\begin{bmatrix} 11.697951 & 0 & 0 & 0 \\ 0.04320662 & 0.71622069 & 0 & 0 \\ -0.12817143 & 0.01971413 & 0.56443704 & 0 \\ -0.09886095 & 0.01918957 & 0.1920341 & 0.46625011 \end{bmatrix}. \tag{4}$$

Given the estimated matrix A, or Â, SVAR coefficients a_{21} and a_{41} (effect of oil price changes on GDP growth and inflation, respectively) were negative, and coefficient a_{31} (effect of oil price changes on unemployment) was positive. However, the coefficients were not statistically significant at conventional levels.

To better observe the effects of structural shocks across time, impulse-response functions are often more informative than estimated structural parameters themselves (Breitung, Brüggemann & Lütkepohl, 2004). Both structural and cumulative orthogonalized impulse-response functions were estimated with a time horizon of 10 quarters ahead in order to inspect visually the effect of $\varepsilon_t^{OIL\text{-}shock}$ on macroeconomic variables.

According to the structural impulse-response functions in Figure 8, following an oil price shock, the GDP growth rate declines immediately but increases after one quarter, and the positive effect reaches its peak around quarter two; after that, the effect starts to decay. On the other hand, the response in the unemployment rate and the inflation rate are quite similar: following an oil price shock, both variables decline up to quarter three, and then increase to a maximum around quarter four; the effects are time-varying and do not decay even after ten quarters.

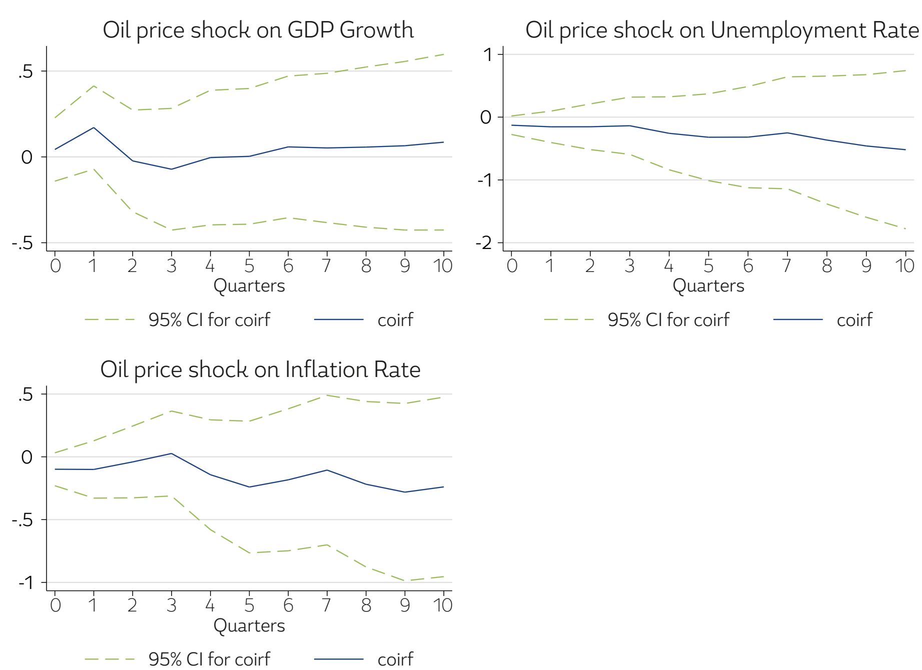
Figure 8. Structural impulse-response functions (SIRF) to an Oil Price Shock.



Source: Author's elaboration.

Cumulative orthogonalized impulse-response functions are shown in Figure 9. The accumulated response in GDP growth reaches its maximum around quarter one, and thereafter starts to decay. Once again, the responses in the unemployment rate and inflation are quite similar: the accumulated responses in those two variables remain close to zero, although slightly negative even after ten quarters.

Figure 9. Cumulative orthogonalized impulse-response functions (COIRF) to an Oil Price Shock.



Source: Author's elaboration.

Regarding innovations accounting, the structural forecast error variance decomposition was estimated. It should be noticed that in such case the forecast errors are not decomposed into contributions of the different variables (as in regular forecast error variance decomposition) but into the contributions of structural innovations. Table 4 shows that $\varepsilon_t^{OIL\text{-}shock}$ innovations do not explain a significant share of structural forecast error variance in either GDP_t, $UNEMP_t$, or CPI_t. In general, each variable's structural forecast error is highly affected by own structural shocks of the variable.

Table 4. Structural forecast error variance decomposition (SFEVD) based on the identification scheme

		Proportions of structural forecast error variance, h periods ahead, accounted by innovations in			
Structural forecast error in	Forecast horizon (h)	OILt	GDPt	UNEMP	CPIt
OILt	1	1	0	0	0
	2	0.97953	0.007376	0.012775	0.000318
	4	0.880324	0.078049	0.026878	0.014748
	8	0.773964	0.124526	0.052747	0.048763
	10	0.754451	0.12082	0.059245	0.065484
GDPt	1	0.003626	0.996374	0	0
	2	0.032412	0.955353	0.011591	0.00064
	4	0.089191	0.858383	0.022895	0.029531
	8	0.079396	0.710262	0.028958	0.181384
	10	0.076427	0.694099	0.035348	0.194125
UNEMP	1	0.048979	0.001159	0.949862	0
	2	0.045601	0.002689	0.948635	0.003076
	4	0.037328	0.015048	0.928985	0.018639
	8	0.045101	0.035754	0.767172	0.151974
	10	0.048492	0.026568	0.601388	0.323552
CPIt	1	0.036964	0.001393	0.139471	0.822173
	2	0.031101	0.001533	0.119439	0.847927
	4	0.050076	0.041995	0.129859	0.778071
	8	0.108571	0.058563	0.117119	0.715747
	10	0.118061	0.06225	0.118942	0.700747

Source: Author's elaboration.

6. CONCLUSIONS

This analysis examines the effect of world oil price shocks on the Colombian economy. The identification assumptions used in the analysis were motivated by the work done by Blanchard and Galí (2010), and are consistent with the well-known fact that Colombia is a small open economy; therefore internal economic fluctuations are unlikely to generate an effect in the global economy, or in the price of oil.

A priori, given the importance of the oil sector in Colombia and also considering the relevance of the country in terms of crude production, following oil price increases, there were expected an increase in GDP growth, a decline in the unemployment rate, and a slight decrease in the inflation rate. The estimated effects were consistent with these expectations.

Based on the SVAR estimation, a unit price shock in the oil price (1% increase) generates the following accumulated orthogonalized responses: i) GDP growth shows a contemporaneous increase of 0.04%, then the effect reaches its maximum in the first quarter (0.17% increase) and starts to decay after two quarters; ii) The unemployment rate decreases by 0.12% contemporaneously, and later on the effect remains negative, reaching its maximum after ten quarters (0.51% decrease); iii) Inflation decreases 0.09% contemporaneously, but increases by 0.02% by quarter three, thereafter the effect remains negative. Moreover, the structural forecast error variance decomposition suggests that each variable's structural forecast error is highly affected by the own structural innovations of the variable.

Impulse-response analysis is regularly based on unit price shocks or innovations, which in this case would be a 1% increase in the oil price. However, it is relevant to consider that changes in the oil price are often larger than 1%; for instance, from 2002:Q1 to 2002:Q2 the oil price increased by 21%, and from 2008:Q3 to 2008:Q4 it declined by 50%. Hence, following a 10% oil price increase, the maximum positive effect on GDP growth would be around 1.7% after one quarter, and accordingly, the negative effect on unemployment rate and inflation would be larger too. Furthermore, as shown in Figure 8 and 9, the effect of $\varepsilon_t^{OIL\text{-}shock}$ on GDP_t starts to decay after two quarters, approximately, while the effects on $UNEMP_t$ and CPI_t seem to last longer and remain slightly negative.

Although it was possible to analyze other shocks from the estimated SVAR (e.g. GDP growth shock, unemployment rate shock), such impulse-responses are not reported both for space and convenience reasons, as the main focus of this work was to evaluate the effect of oil price shocks, $\varepsilon_t^{OIL\text{-}shock}$.

In spite of the fact that Colombia's economy does not rely on oil as much as Venezuela or Mexico, both upstream and downstream petroleum sectors are key players in the country, so an increase (although moderate and not long-lasting) in GDP growth after an oil price shock was reasonably expected, and the results also match the expectation that output increases are often accompanied by reductions in unemployment. With regard to inflation, the obtained estimates match the a priori expected response too, as the variable increases slightly but just by quarter three.

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Research Article

Efectos sobre la oferta de trabajo de la extensión del seguro de salud a cónyuges. La experiencia de Uruguay

The labor-supply effects of extending health insurance to workers' partners: The experience of Uruguay

Cecilia Parada*

Palabras clave: Oferta de trabajo, Incentivos de trabajo, Seguro de salud, Asignaciones dentro del hogar.

Key words: Labor supply, Work incentives, Health insurance, Intra-household allocations.

JEL classification: J21, O17, J16

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Resumen

A partir de diciembre de 2010 el Seguro de Salud en Uruguay se extiende a los cónyuges de los trabajadores formales. Esta extensión pudo haber modificado los incentivos laborales, estimulando una menor ocupación y formalidad de aquellos individuos que tuviesen una pareja con empleo formal. Mediante una metodología de diferencias en diferencias, se estiman los efectos de la expansión del seguro de salud comparando en el tiempo a las personas afectadas por la política con aquellas semejantes pero no afectadas. Se observa un efecto negativo y significativo de 0.95 puntos porcentuales de la expansión de la política sobre la formalidad para el total de la población económicamente activa, y un efecto negativo y significativo de 2.13 puntos porcentuales cuando se observa únicamente a las mujeres asalariadas privadas. Además de diferencias según sexo, se encuentran efectos heterogéneos de acuerdo a la edad de las personas, nivel educativo y condición de formalidad de la pareja. También se encuentran efectos sobre la ocupación, aunque estos fueron de menor magnitud y no siempre significativos.

Abstract

In December 2010 Health Insurance in Uruguay was extended to the partners of workers in the formal labor market. This extension may have modified the incentives to participate in the formal and informal labor markets, potentially reducing overall participation or the share of individuals in the formal labor market whose partners were formally employed. Using a difference-in-differences methodology, effects of the Health Insurance expansion are estimated by comparing individuals affected by the policy over time with similar but

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unaffected individuals. We find negative and statistically significant effects: the policy extension reduces the share of the economically-active population in the formal labor market by 0.95 percentage points and women in formal employment in the private sector by 2.13 percentage points. In addition to these effects, we find significant heterogeneous effects by age, educational level, and the formality conditions of the partners. We also find an effect of the policy on occupation, though of smaller magnitude and not always statistically-significant.

1. Introducción

Los hombres y mujeres que se encuentran en pareja registran diferencias en su inserción laboral, tanto respecto a sus pares solteros como entre sí. En particular, en Uruguay si bien las brechas en las tasas de actividad y empleo entre hombres y mujeres se han reducido significativamente en los últimos 50 años, los hombres continúan registrando mayores niveles de ocupación (tabla A1-Anexo). Si se analiza otra variable del mercado laboral, particularmente relevante en países en desarrollo, como la formalidad[1], también se encuentran diferencias importantes entre personas en pareja y solteras para el promedio de los asalariados del sector privado (tabla A2-Anexo).

Estudios sobre oferta laboral acerca de horas trabajadas y salario, observan para distintos países una relación positiva entre estas dos variables y encuentran que las mujeres casadas son el grupo con mayor sensibilidad a variaciones en los ingresos propios y de su pareja (reportan las mayores elasticidades relativas) (Tamm, 2009; Eissa y Honey, 1999 y 2004; Espino y otros 2014; Espino y Machado, 2009). Si bien en las últimas décadas la elasticidad de la oferta femenina respecto a su salario se ha reducido, así como la elasticidad respecto al salario del marido (Goldin, 2006; Blau y Kahn, 2005), en la mayoría de los trabajos empíricos se continúa hallando diferencias entre las elasticidades de acuerdo al sexo (Blundell y MaCurdy, 1999).

En el momento de analizar el comportamiento de hombres y mujeres en pareja en Uruguay (Espino y Machado, 2009) observan que los hombres no modifican significativamente sus elasticidades cuando se controla por la presencia de hijos, confirmando su rol de proveedor de ingresos en el hogar. La condición de estar casado sobre la probabilidad de participación ha evolucionado en forma diferente para hombres y mujeres en Uruguay. Mientras que el estatus de casado ha influido positivamente sobre la probabilidad de participar en los hombres de forma estable, en las mujeres estar casadas tiene una incidencia que, si bien ha sido siempre negativa, ha disminuido considerablemente a lo largo del tiempo, reflejando el cambio que se observa en el comportamiento de la oferta laboral (mayor participación de las mujeres y estabilidad en las tasas de participación masculina).

Por lo tanto, a pesar de los cambios en el efecto ingreso y sustitución de la oferta laboral femenina, que han provocado un aumento de su participación laboral, cuando se analiza el comportamiento de hombres y mujeres en pareja continúan encontrándose diferencias en las tasas de participación asociadas a los roles de género[2].

Por otra parte, existe amplia evidencia acerca de los incentivos que generan sobre las decisiones de empleo los programas de protección social en países desarrollados (Bosch y Manacorda, 2012). Existe menor evidencia acerca de estos efectos en países en desarrollo y, en particular, acerca de incentivos que generan las políticas sobre las decisiones de empleo de trabajadores considerados secundarios

1 Se entiende que un empleo es formal si se el trabajador se encuentra registrado en la seguridad social y realiza aportes jubilatorios.

2 La división sexual del trabajo ha conducido a una división de las tareas de acuerdo al sexo, donde las mujeres aparecen como "cuidadoras" y los hombres como "proveedores" dentro de los hogares.

en el hogar. Debido a que las mujeres se han incorporado al mercado laboral históricamente complementando los ingresos del jefe, es esperable que los incentivos sobre las decisiones de participación laboral afecten en forma heterogénea a los trabajadores de acuerdo al sexo.

Este trabajo se propone evaluar el impacto de Reforma de Salud sobre las decisiones de participación en el mercado laboral de los trabajadores uruguayos. Concretamente, se busca estimar el efecto sobre las elecciones de formalidad y empleo de la reglamentación que establece el ingreso de los cónyuges de los trabajadores formales al Seguro Nacional de Salud (SNS) a partir de diciembre de 2010. De esta forma, se busca contribuir a la literatura desde dos dimensiones. Por un lado, examinando los efectos en el mercado de trabajo que pueden originarse como resultado de la ampliación de los beneficios de la seguridad social. Por otro lado, se evalúan las potenciales diferencias entre hombres y mujeres en las respuestas ante los mismos incentivos. Con este objetivo, se empleará una estrategia de estimación basada en la metodología de diferencias en diferencias, donde los tratados serán las personas afectadas por la política (aquellos que viven en pareja y van siendo alcanzados por la extensión del seguro) y el grupo de control los no afectados (quienes viven en pareja y no son afectados política y los solteros). Se propone trabajar con datos provenientes de las ECH entre 2007 y 2014. De esta forma, se busca generar evidencia que permita evaluar si persisten las diferencias en los roles que juegan hombres y mujeres en el mercado laboral desde el punto de vista de la oferta de trabajo.

Los resultados sugieren que la expansión del seguro de salud introdujo incentivos a que las personas en pareja se muevan entre formalidad/informalidad y, en menor medida, entre el empleo/no empleo. Se registró una caída de la formalidad de 0.82 puntos porcentuales para el total de los asalariados privados, pero no resultó ser significativa. Si se encontraron resultados negativos y estadísticamente significativos cuando se observa al total de la población económicamente activa (PEA), estimándose un efecto de -0.95 puntos porcentuales. Al analizar la presencia de efectos heterogéneos, se observaron diferencias según sexo, años de educación y condición de formalidad de la pareja. Ser mujer, tener menos de 12 de años de estudio y tener pareja formal inciden negativamente sobre la probabilidad de ser formal. El aumento de la informalidad se explica por un desplazamiento hacia empleos no registrados, teniendo poca incidencia el aumento de los no ocupados. En concordancia con la literatura previa, se observa que las mujeres ajustan en mayor medida sus decisiones de inserción laboral respecto a las características de la ocupación de su pareja.

El trabajo busca contribuir a la literatura que analiza la oferta laboral. En particular, aporta al estudio de los efectos de políticas públicas sobre el comportamiento de los individuos y su inserción en el mercado de trabajo. Adicionalmente, se provee de evidencia acerca de las diferencias existentes en las respuestas de hombres y mujeres que viven en pareja ante los mismos incentivos. Este último resultado es relevante en la medida en que da luz acerca como el aumento de los beneficios de la seguridad social afectan en forma heterogénea a los integrantes de una pareja, siendo las mujeres las que ajustan en mayor medida su conducta. Finalmente, el trabajo aporta a una línea de investigación aún escasa en la región, que consiste en el estudio de la relevancia de los seguros de salud que brindan los empleos sobre las decisiones de oferta laboral conjunta en los hogares.

El trabajo se organiza de la siguiente manera. En el capítulo 2 se realiza una revisión de la literatura económica enfocada al estudio de incentivos sobre el empleo, dentro de la cual se distingue aquella enfocada en los efectos del seguro de salud. En el capítulo 3 se describe la política que se está analizando. A continuación, en el capítulo 4, se detalla la estrategia de estimación elegida para abordar el estudio. En el capítulo 5 se muestran los principales resultados obtenidos y, en el capítulo 6, se resumen las principales conclusiones del análisis.

2. Revisión de la literatura

2.1 Incentivos de las políticas y empleo

La mayor parte de los programas sociales, y diversas políticas púbicas, tienen por objetivo contribuir con la mejora del bienestar de los individuos. Sin embargo, estas políticas pueden introducir nuevos incentivos sobre los agentes económicos que muchas veces no han sido deseados o buscados en el diseño original. En lo que respecta al mercado de trabajo, existe una gran variedad de artículos que analizan los efectos de ciertas políticas sobre la oferta de trabajo, la tasa de empleo y, en menor medida, los incentivos sobre la formalidad/informalidad.

En lo que respecta a la participación de los individuos en el mercado de trabajo, se ha encontrado evidencia a nivel internacional acerca de una disminución de la participación de los individuos ante un aumento de la protección social. En esta dirección se encuentran estudios sobre modificaciones de los seguros de desempleo (Krueger y Meyer, 2002), beneficios por incapacidad (Bound y Burkhauser, 1999) y políticas de transferencias (Hoynes, 1996; Moffitt, 2002).

El fenómeno de la informalidad ha sido abordado por la literatura económica desde diferentes perspectivas. Por una parte, se encuentra un conjunto de trabajos que se apoyan en la existencia de una economía dual donde operan al mismo tiempo el sector formal y el informal. En este marco, la presencia de informalidad no responde necesariamente a decisiones de los trabajadores o empleadores, sino que es resultado de imperfecciones en el mercado laboral. Por otra parte, trabajos más recientes se han preocupado por analizar los factores que pueden estar incidiendo en las decisiones de los agentes. Esta discusión también se da bajo los términos de exclusión o escape (Perry y otros 2007). Al plantearse la informalidad como un fenómeno de exclusión, no se considera que los trabajadores tengan la capacidad de tomar decisiones acerca de en qué sector de la economía ubicarse, mientras que si se tratase de un fenómeno de escape, al menos algunos de los trabajadores elegirían voluntariamente en qué sector incorporarse evaluando las ventajas de cada uno. Perry y otros (2007) acaban por concluir la coexistencia de ambos fenómenos, donde algunos trabajadores (asalariados informales) son afectados en mayor medida por la exclusión, mientras que otros (cuenta propia no registrados) son resultado de decisiones de escape.

A lo largo de esta investigación interesa analizar el fenómeno de la ocupación y la informalidad desde la perspectiva en la cual los agentes tienen la capacidad de tomar decisiones racionales acerca de en qué sector desempeñarse, evaluando los costos y los beneficios de cada uno.

Gran parte de la literatura empírica en América Latina da cuenta de efectos de programas no contributivos sobre la oferta de trabajo (Bosch y Manacorda, 2012), encontrándose poca evidencia acerca de los efectos sobre el empleo registrado. Más recientemente, como resultado del surgimiento de nuevos planes sociales, se han realizado investigaciones que analizan los posibles efectos sobre el empleo formal en la región. Sin embargo, los resultados a los que abordan las investigaciones no son todos coincidentes y, por tanto, no pueden extraerse tesis sólidas acerca de los efectos de los programas sobre los incentivos a la formalización.

Levy (2008), sugiere que en países como México, la ampliación de los programas de protección social no contributivos conduciría a un aumento de la utilidad del empleo informal respecto al formal, lo cual, en un contexto de libre movilidad entre los sectores, terminaría por inducir a un desplazamiento de trabajadores del sector formal al informal. Al igual que otros autores (Maloney, 1999 y 2003 y Perry y otros, 2007), el autor argumenta que, al menos, parte de los trabajadores eligen operar en el sector informal, se autoseleccionan, debido a que perciben que existe una mayor cantidad de beneficios en él.

Para Uruguay, Amarante y otros (2011) y Bérgolo y Cruces (2014), a partir del análisis del PANES (Plan de Atención Nacional a la Emergencia Social) y de la Reforma de Salud en su etapa inicial, respectivamente, encuentran que los trabajadores uruguayos responden a los incentivos no buscados de las políticas, moviéndose entre el sector formal y el informal en función de los beneficios que perciben por operar en cada uno de ellos.

Ahora bien, los incentivos que enfrentan los trabajadores dependen no solo de sus características sino también de las características del hogar en el que viven (Eissa y Hoynes, 1999; 2004). De esta forma, las políticas pueden afectar sus decisiones a través de modificaciones en la función de utilidad agregada de los distintos miembros del hogar. Galiani y Weinschelmbaum (2012) elaboran un modelo simple para ilustrar de qué forma la ampliación de los beneficios de la seguridad social, como puede ser la extensión del seguro de salud a los cónyuges, pueden afectar las decisiones de empleo de los individuos, en particular la elección acerca de en qué sector de la economía desempeñarse. Los autores estiman un modelo probit bivariado recursivo con el fin de analizar en particular cuáles son los incentivos a formalizarse que tienen los trabajadores secundarios. Los resultados que obtienen para un conjunto de países de América Latina indican que la probabilidad de ser formal del trabajador secundario disminuye cuando el trabajador principal es formal.

2.2 Seguro de salud y oferta de trabajo

Los cambios en los beneficios de la seguridad social pueden arrojar efectos sobre el comportamiento de los trabajadores. En particular, diversos trabajos se han ocupado de estimar los impactos que puede tener modificaciones en la cobertura sanitaria de los países. Uno es estos trabajos es el realizado por Gruber y Hanratty (1995), quienes estudian los efectos sobre el empleo de la introducción del Seguro Nacional de Salud (NHI por sus siglas en inglés) en Canadá, explotando el hecho de que el mismo fue introducido escalonadamente entre las distintas provincias del país. En materia de empleo, en general, los autores encontraron un efecto positivo sobre el mismo. Sin embargo, al comparar las provincias en las que se financió el seguro de salud con impuestos generales versus aquellas donde se debía pagar primas de suma fija, se observó que en las primeras la tasa de crecimiento de empleo fue menor, destacándose la importancia que tienen las distintas formas de financiamiento.

Gruber y Madrian (1997) realizan una revisión crítica de alrededor de 50 artículos que se encuentran enfocados a analizar el vínculo entre los seguros de salud, la oferta de trabajo y la movilidad de los individuos entre el empleo formal y el informal. En particular, uno de los grupos de individuos en los que centran su análisis es el de las personas que viven en pareja. Los autores destacan que los trabajos basados en datos de Estados Unidos han arrojado evidencia robusta acerca de que las decisiones de empleo y la cantidad de horas trabajadas de las mujeres casadas dependen de si acceden al seguro de salud a través del trabajo de su cónyuge o no. En este sentido, Buchmueller and Valletta (1999) estiman que la participación laboral de las mujeres casadas se reduce en entre un 6% y 12% cuando tienen disponible el seguro de salud a través de sus esposos. Olson (1998) encuentra una reducción de entre 7-8% de la misma variable, Schone and Vistnes (2000) estiman una caída de 10 puntos porcentuales en la participación laboral de las mujeres casadas y Cobb-Clark (2000) es quien encuentra el mayor efecto; una reducción de 20 puntos porcentuales la participación laboral. En la misma línea se encuentran los hallazgos sobre los efectos en las horas trabajadas. En todos los casos se verifica una caída en la cantidad de horas que las mujeres casadas destinan al trabajo fuera del hogar.

Sin embargo, Gruber y Madrian (2002) advierten que posiblemente se esté ante la presencia de endogeneidad entre la decisión de empleo de las esposas y la provisión del seguro por parte del empleador de los maridos.

Chou y Staiger (2001), analizan los efectos sobre la tasa de actividad de las mujeres casadas del seguro subsidiado a la población que no trabaja en Taiwan. Antes de volverse universal en 1995, este seguro fue puesto a disposición de las esposas de los funcionarios del gobierno. Esta implementación en etapas fue lo que permitió a los autores la construcción de su estrategia de identificación. Encuentran que la disponibilidad de un seguro para quienes no trabajaban se asoció con una disminución porcentual de 4 puntos en la participación laboral de las mujeres casadas.

Por otra parte, en lo que respecta a los efectos sobre la oferta laboral de los hombres, Wellington y Cobb-Clark (2000) encuentran que, al igual que las mujeres, el hecho de que los hombres tengan disponible el seguro de salud a través del empleo de sus esposas reduce su participación laboral y la cantidad de horas que trabajan por semana. Sin embargo, los efectos estimados son de menor magnitud, ubicándose entre 4-9 puntos porcentuales la caída en la participación y, entre 0-4% la disminución de las horas. Asimismo, Gruber and Madrian (1997) hayan que el hecho de que los hombres cuenten con seguro de salud a través de sus esposas una vez que se retiran del mercado laboral, aumenta el no empleo y la duración del tiempo en que permanecen no ocupados.

3. El Seguro de Salud en Uruguay y la extensión del beneficio a los cónyuges de los trabajadores formales

En términos generales, la atención de salud en Uruguay se divide en dos subsectores: el subsector público y el subsector privado. A su vez dentro de cada uno de éstos existen diversos prestadores de servicios que compiten y se complementan entre sí. Dentro del subsector público, se encuentra la Administración de los Servicios de Salud del Estado (ASSE), principal prestador a nivel nacional, Sanidad Militar y Sanidad Policial, exclusivas para los trabajadores del Ministerio de Defensa y del Ministerio del Interior y sus familiares, el Hospital de Clínicas, dependiente de la Universidad de la República, Policlínicas Municipales, a cargo de cada una de las Intendencias y el Banco de Previsión Social, que presta en especial servicios materno-infantil y de salud laboral. Por su parte, al subsector privado lo conforman las Instituciones de Asistencia Médica Colectiva (IAMC), los Seguros Privados de Salud, las Emergencias Médicas Móviles y las Clínicas privadas. No todos estos prestadores brindan atención integral de salud a sus usuarios, sino que en algunos brindan atención específica ante determinadas contingencias. Los prestadores que brindan aseguramiento integral[3] son ASSE, Sanidad Militar y Sanidad Policial en el subsector público y, dentro del subsector privado, las IAMC y los Seguros Privados.

En diciembre de 2007 se aprobó en Uruguay una Reforma del sistema sanitario que dio lugar al nuevo Sistema Nacional Integrado de Salud (SNIS), y estableció el derecho a la protección de la salud

3 El Plan Integral de Atención a la Salud (PIAS) especifica las prestaciones de salud que constituyen la cobertura de atención médica integral.

a todos los habitantes del país[4]. La misma ley que aprobó el SNIS dio creación al Seguro Nacional de Salud (SNS), determinando que fuese quien se encargue de pagar las cuotas salud que correspondan a los prestadores de los servicios sanitarios de aquellas personas que obtienen la cobertura a través del sistema de seguridad social. Con esto, se sustituyó el viejo seguro, que protegía únicamente a los trabajadores privados, por otro que extendió el beneficio tanto a los trabajadores del sector público, como a los hijos y cónyuges de los trabajadores formales y a los pasivos.

La Ley estableció que la ampliación de los beneficios se realizara en etapas. En mayo de 2007 se incorporaron la mayor parte de los trabajadores públicos, y en enero de 2008 los hijos menores de 18 años, o mayores con discapacidad, a cargo de los trabajadores formales. La incorporación de los pasivos se fue dando por dos vías, por un lado, a partir de enero de 2008 los trabajadores que se retirasen y estuvieran incluidos en el seguro continuarían siendo parte de este y, por otro lado, se elaboró un cronograma de ingreso de antiguos pasivos que terminarán de incorporarse en 2016. Los profesionales, que no se encontraban amparados en el viejo seguro de salud, se incorporaron al nuevo a partir de junio de 2011. Finalmente, en lo que respecta a la extensión del seguro a los cónyuges o concubinos de los trabajadores formales que no fuesen aportadores al seguro, se estableció que estos se incorporasen al mismo en forma escalonada. En un primer momento, diciembre de 2010, ingresaron al SNS los cónyuges de los trabajadores aportadores con 3 hijos o más menores de 18 años a cargo. Luego, en diciembre de 2011, se incorporaron también los cónyuges con 2 hijos a cargo; en diciembre de 2012, el beneficio se extendió a los cónyuges con 1 hijo a cargo; y, a partir de diciembre de 2013, todos los cónyuges de un aportador que no obtuviesen el beneficio por su propio empleo, pasaron a ser beneficiarios del SNS (tabla 1).

Tabla 1: Etapas de la incorporación de nuevos colectivos al SNS

Colectivos	Ingreso al Seguro Nacional de Salud
Trabajadores públicos	Mayo 2007-Junio 2008
Hijos a cargo	Enero 2008
Pasivos	Enero 2008 - Junio 2016
Profesionales independientes	Junio 2011
Cónyuges	Diciembre 2010 - Diciembre 2013
Cónyuges con 3 hijos o más	*Diciembre 2010*
Cónyuges con 2 hijos	*Diciembre 2011*
Cónyuges con 1 hijo	*Diciembre 2012*
Cónyuges sin hijos	*Diciembre 2013*

Fuente: elaboración propia.

En lo que refiere al financiamiento, como se mencionó anteriormente, el SNS es el encargado de pagar las cuotas salud a los prestadores, lo cual realiza a través del Fondo Nacional de Salud (FONASA). Los ingresos del FONASA provienen de tres fuentes: aportes de los trabajadores públicos y privados, aportes de los empleadores y rentas generales del gobierno central. Un elemento importante de la reforma, que acompañó la inclusión de nuevos colectivos, fueron los cambios en las tasas de aporte que deben realizar los trabajadores. Mientras que en el régimen anterior los trabajadores contribuían con un 3% de su ingreso al aseguramiento de la salud, en el nuevo régimen se establecen tasas diferenciadas, de acuerdo a la composición del hogar de los trabajadores y su nivel de ingresos laborales (ver tabla 2). Por su parte, los empleadores no sufrieron alteraciones en sus tasas de aporte. Además, las transferencias de rentas generales al FONASA no se han visto incrementadas durante los primeros

4 Artículo 66 de la Ley 18.211.

años de implementación del nuevo sistema de salud, lo cual se encuentra ligado a la estabilidad del mercado de trabajo uruguayo, que en los últimos años ha mostrado tasas de desempleo inferiores al 10%.

Tabla 2: Tasas de aporte al SNS.

	Patronal	Personal	Por hijos	Por cónyuge
Ingresos < 2.5 BPC*	5%	3%	-	-
Ingresos > 2.5 BPC*	5%	4.5%	1.5%	2%

El principal beneficio de la incorporación al SNS es que permite a los individuos elegir en qué prestador de salud atenderse, entre la Administración de los Servicios de Salud del Estado (ASSE), una Institución de Asistencia Médica Colectiva (IAMC) o un Seguro Privado (este último, sin son admitidos). Es decir, los trabajadores y sus familias pueden optar por afiliarse en ASSE o en una IAMC, sin necesidad de pagar un costo adicional al del aporte para la obtención de la atención integral de la salud, o afiliarse a un Seguro Privado, sin son aceptados y pagando el diferencial que corresponda. Ante la posibilidad de elegir, un conjunto de individuos optó por cambiar su afiliación de ASSE a una IAMC y viceversa. Entre 2007 y 2014 el total de afiliados a una IAMC se incrementó un 32% aproximadamente, mientras que la población usuaria de ASSE se redujo cerca de un 24%[5]. Esto trajo como resultado un cambio en la distribución de los individuos entre las prestadoras de salud, aumentando el número de personas que optan por el subsector privado y disminuyendo las del subsector público (ver tabla 3 y 4). Ello da muestra del valor que tiene para los individuos ingresar al Seguro, ya que una vez dentro optan, en su mayoría, por tener cobertura en el subsector privado.

Tabla 3: Evolución de personas pertenecientes al Seguro según condición de actividad.

	Ocupados	Pasivos	Menores	Paraestatales	Cónyuges (5)			Total
	(1)	(2)	(3)	(4)	total	mujeres	hombres	
Ene-08	733,764	57,434	172,696					963,894
Jul-08	822,455	68,915	405,831	7,239				1,304,440
Ene-09	857,977	72,460	433,521	8,181				1,372,139
Jul-09	869,378	77,724	451,557	12,659				1,411,318
Ene-10	894,851	90,827	462,814	16,519				1,465,011
Jul-10	915,122	101,426	477,732	18,467				1,512,747
Ene-11	936,431	112,293	492,180	18,809	4,330	3,718	612	1,564,043
Jul-11	992,069	126,268	537,424	28,067	26,483	21,662	4,821	1,710,311
Ene-12	1,039,128	142,631	567,790	45,239	36,161	29,608	6,553	1,830,949
Jul-12	1,053,970	276,984	585,765	46,510	69,641	54,186	15,455	2,032,870
Ene-13	1,074,965	318,565	593,793	48,320	85,699	67,051	18,648	2,121,342
Jul-13	1,086,515	323,800	605,211	49,472	123,197	93,111	30,086	2,188,195
Dic-13	1,101,939	353,728	611,418	50,888	133,389	99,741	33,648	2,251,362
Dic-14	1,114,202	395,216	622,129	53,085	184,161	134,424	49,737	2,368,793

(1) Activos privados y públicos y para-estatales (A partir de marzo de 2008 se incorporan los activos y pasivos bancarios. A partir de marzo de 2009, los activos y pasivos de la Caja Profesional. A partir de julio de 2011 se incorporan los activos y pasivos de la Caja Notarial.). (2) Incluye solo a pasivos del Banco de Previsión Social. (3) A partir de enero de 2008 se incorporan hijos menores de 18 años o mayores con discapacidad de los usuarios afiliados al FONASA. A partir de marzo de 2008 se incorporan los hijos de bancarios y a partir de 2009 los hijos de profesionales. (4) A partir de diciembre de 2010 se incorporaron los concubinos de acuerdo con las etapas descritas en la Tabla 1. Distribución aproximada entre mujeres y hombres a partir de la cantidad de recibos pagos a IAMC y ASSE. Fuente: Anuario estadístico BPS 2014.

5 Información estimada en base a microdatos de las ECH.

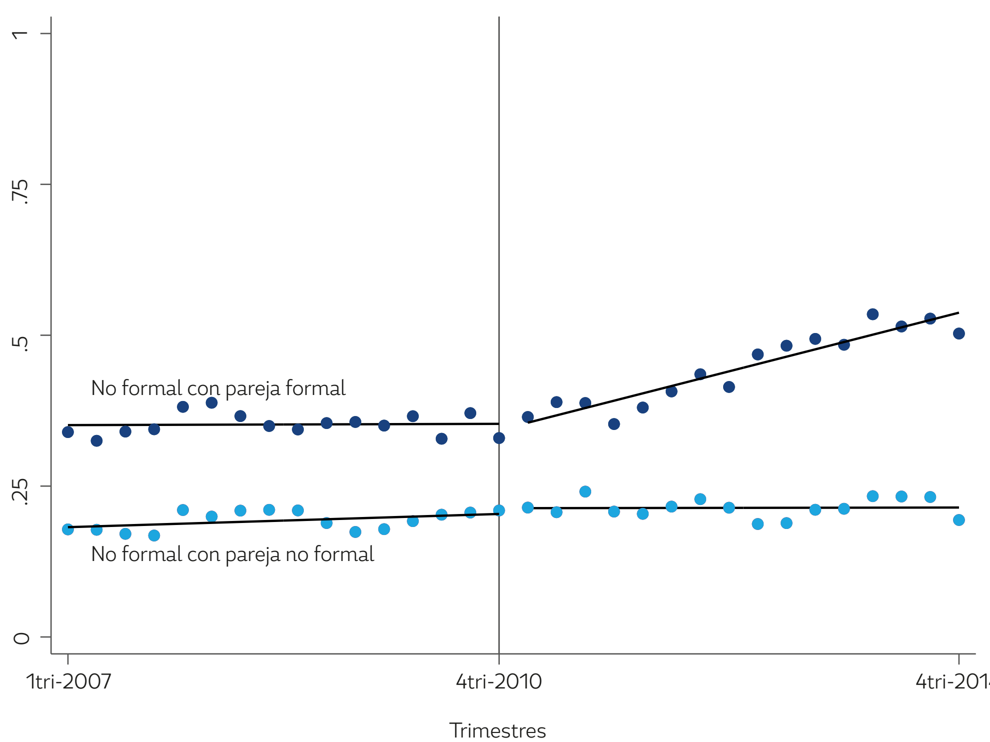
Tabla 4: Porcentaje de la población con cobertura en el subsector público y en el privado, según sexo y año.

	Pública (ASSE)			Privada (IAMC + Seguros)		
	total	hombres	mujeres	total	hombres	mujeres
2007	**36.2%**	16.0%	20.2%	**45.5%**	22.3%	23.1%
2008	**29.9%**	12.8%	17.1%	**53.4%**	26.2%	27.3%
2009	**30.2%**	12.8%	17.4%	**54.6%**	27.1%	27.4%
2010	**31.9%**	13.7%	18.2%	**54.0%**	27.0%	27.0%
2011	**28.3%**	12.4%	15.9%	**56.9%**	28.7%	28.3%
2012	**27.1%**	12.1%	15.0%	**58.0%**	28.6%	29.4%
2013	**27.8%**	12.5%	15.3%	**59.0%**	29.0%	30.0%
2014	**27.6%**	12.7%	14.9%	**60.0%**	29.4%	30.6%

Fuente: elaboración propia en base a microdatos de ECH 2007-2014.

En la misma línea, en la Figura 1, se puede observar la evolución entre 2007 y 2014 de la probabilidad de tener cobertura en el sector privado para los trabajadores informales que viven en pareja. Se muestra en forma separada para aquellos cuyo cónyuge no es un trabajador formal de aquellos que su cónyuge es un trabajador formal y, por lo tanto, son afectados por la política. Puede observarse que para el grupo de personas con cónyuge formal la probabilidad de tener cobertura en el subsector privado aumenta luego de 2010 mientras que para quienes están en pareja con un trabajador informal, no afectados por la extensión del seguro de salud, la probabilidad se mantiene constante.

Figura 1: Probabilidad de tener cobertura privada para personas en pareja que tienen trabajo informal, según el estatus de formalidad del cónyuge.



Fuente: elaboración propia en base a microdatos de ECH 2007-2014.

Nota: Resultados a partir de estimaciones mediante un modelo probit simple.

Por lo tanto, hay indicios de que la extensión de la cobertura de salud a través del SNS a la familia de los trabajadores formales y el mantenimiento de la cobertura una vez que estos trabajadores se retiran del mercado laboral, junto con la modificación en las tasas de aporte, significó una alteración de incentivos a la formalidad, debido a un cambio en la utilidad del empleo formal respecto al informal, tal como lo sugiere Levy (2008).

4. Estrategia de estimación

4.1 Datos

Se utilizan microdatos de las Encuestas Continuas de Hogares (ECH) de Uruguay entre 2007 y 2014, representativos a nivel nacional, publicados por el Instituto Nacional de Estadística de Uruguay (INE).

Del período comprendido entre 2007 y 2014, los primeros cuatro años son previos a la extensión del seguro de salud a los cónyuges, a partir del año 2011 y hasta 2014 es que se expande la política, hasta comprender a todas las personas en pareja. Debido a que no puede identificarse efectivamente a través de la ECH los individuos que son alcanzados por la política, a partir de las condiciones establecidas por la reglamentación del programa se identifican los posibles beneficiarios y se consideran dentro del grupo afectado, independientemente de si efectivamente fueron alcanzados por la política. El análisis se restringe para los adultos de entre 25 y 60 años de edad, se excluyen los datos correspondientes al mes de diciembre de cada año por ser en dicho mes que se producen los nuevos ingresos al seguro de salud.

Se analizan cuatro variables de resultado: Formalidad/AP, Formalidad/PEA, Informalidad y No Ocupación. Al referirse a Formalidad/AP se está considerando el efecto sobre la formalidad que se observa sobre los asalariados privados, mientras que Formalidad/PEA refiere al resultado sobre el total de la población económicamente activa - PEA - (restringida por al grupo de edad antes señalado). El motivo de estimar en forma separada para los asalariados privados es indagar si existen diferencias entre este grupo de ocupados y el total de la PEA. Asimismo, la Informalidad y la No Ocupación se estiman sobre el total de la PEA. En ningún caso se considera a los trabajadores del sector público, esta decisión se basa en que este grupo de trabajadores tenía previo a la expansión del seguro, arreglos particulares con el Estado acerca de la cobertura de salud de las familias.

En todos los casos la definición de formalidad adoptada es desde el punto de vista legal (Gasparini y Tornarolli, 2009), donde un trabajador es formal si realiza aportes al sistema de seguridad social. Por lo tanto, un trabajador informal es aquel que no se encuentra amparado por la seguridad social. Esta definición de formalidad adoptada, en lugar de considerar un enfoque productivo, se debe a que la extensión del seguro se encuentra asociada al vínculo de los individuos con el mercado formal de trabajo, por lo tanto, lo efectos esperados por la política deberían buscarse desde esta dimensión.

4.2 Metodología

El objetivo es evaluar los efectos sobre ciertas decisiones de empleo que arrojó la extensión del seguro de salud a los cónyuges de los trabajadores formales. Para ello se explota la extensión plausiblemente exógena de la cobertura que se produjo, a partir de diciembre de 2010, a los cónyuges de los trabajadores que se encuentran registrados en la seguridad social. Lo que se buscará es aislar el efecto causal mediante la comparación entre lo que efectivamente ocurrió con un escenario contrafáctico que permita observar cómo hubiesen evolucionado las variables de resultado de no haberse extendido el beneficio del Seguro Nacional de Salud. Por lo tanto, siendo un experimento de política, este se evalúa mediante un enfoque econométrico de diferencias en diferencias. Debido a que no se observa quienes efectivamente fueron alcanzados por la política, sino que se considera como afectados a aquellos que cumplen con las condiciones necesarias en cada año a partir de lo observado en la ECH, lo que se está estimando es una intención del tratamiento.

En concreto, se explota las diferencias en el *timing* de extensión de la cobertura a los cónyuges en función del número de hijos a cargo que tiene la pareja como experimento natural que proporciona el cambio exógeno en los beneficios relativos de ser formal/informal estar ocupado/no ocupado. Los tratados serán las personas afectadas por la política en cada año y en el grupo de control se encuentran los individuos que la extensión no los afecta. Las personas solteras no son afectadas por la política de extensión del seguro en ningún momento, por lo cual no ven cambios en los beneficios de estar ocupados o ser trabajadores formales. Por otra parte, las personas en pareja que van siendo alcanzadas por la extensión del seguro, al tener la posibilidad de contar con el aseguramiento a través del empleo de sus parejas pueden notar una disminución de la utilidad de estar ocupado y/o ser formal, como plantea Levy (2008). Esto último también estará sujeto a la condición de ocupación y formalidad que tenga la pareja. Formalmente, el modelo a estimar puede ser expresado como:

$$Y_{it} = a + \beta\, treat_{it} + X_{it}'\, \gamma + \lambda_g + \delta_t + \Theta_r + \varepsilon_{it}$$

Donde Y_{it} es la variable de resultado del individuo *i* en el año *t*; *treat* es una variable binaria que vale uno cuando el individuo *i* es afectado por la política en el año *t*; X_{it}' es un vector de regresores que incluye características a nivel individual y de los hogares; el término λ_g controla la presencia de heterogeneidad no-observada a de acuerdo al grupo que pertenece la persona[6]; δ_t es un conjunto de variables binarias que indican el año de la encuesta, estos efectos fijos que controlan por la presencia de shocks a nivel agregado, mientras Θ_r controla por efectos fijos por región y ε_{it} representa un término de error idiosincrático.

La metodología aplicada es diferencias en diferencias (DD). El estimador DD es la diferencia entre grupos (grupo afectado y de comparación) de sus diferencias en el tiempo (antes y después de la reforma), y se corresponde con la solución mínimo cuadrática del parámetro β (Todd, 2006), que captura el impacto de la extensión de la cobertura sobre la variable de resultado analizada.

Para que la estrategia de identificación sea válida, el supuesto esencial es que en ausencia de la política las tendencias entre el grupo afectado y el de control son similares. A tales efectos, el análisis de las trayectorias pre-tratamiento permite tener una primera aproximación. Asimismo, a los efectos de complementar dicho análisis, se realiza un test de tendencias previas para cada variable de resultado entre el grupo plausiblemente afectado y el de comparación y se estima un experimento "falso" que busca someter a prueba la veracidad del supuesto (sección 5.2).

5. Resultados

5.1 Estimación del efecto de la extensión del Seguro de Salud sobre las decisiones de empleo

En las tablas 5 y 6 se resumen los resultados estimados para el total de la población y distinguiendo según el sexo de los individuos. El principal resultado de interés es el efecto que la extensión del seguro pudo haber tenido sobre la formalidad de los trabajadores. Para ello, se observan los efectos sobre el conjunto de trabajadores asalariados privados, sin considerar a los no ocupados (columna 1 de cada tabla). Luego,

6 Se identifican 5 grupos: 1) en pareja con 3 hijos o más, 2) en pareja con 2 hijos, 3) en pareja con 1 hijo, 4) en pareja sin hijos y, 5) sin pareja.

se estiman los efectos sobre la formalidad para el total de la PEA (columna 2) y, con el fin de entender a qué responden esos cambios, se estiman los efectos sobre la informalidad (columna 3) y sobre la no ocupación (columna 4). Esto es debido que los cambios en la formalidad pueden darse, o bien porque las personas se mueven entre formal - informal, o bien porque se mueven entre ocupado - no ocupado.

A partir de las estimaciones, se observa un efecto negativo de la expansión de la política sobre la formalidad, que para el total de la población asalariada del sector privado es de 0.82 puntos porcentuales, sin embargo, este efecto no resulta estadísticamente significativo. El efecto que si es significativo es el que estimado sobre la formalidad para el total de la PEA y que, coincidiendo con lo anterior, es de signo negativo y de 0.95 puntos porcentuales. Al distinguir entre hombres y mujeres se obtienen efectos heterogéneos. En el caso de los hombres, los efectos sobre la formalidad son de una magnitud muy pequeña y en ningún caso significativos del punto de vista estadístico, obteniéndose un efecto positivo, algo menor a un punto porcentual, sobre la no ocupación. Por su parte, las mujeres muestran una caída de 2.13 puntos porcentuales de la formalidad cuando se considera a las asalariadas privadas y de 1.76 puntos porcentuales cuando se considera al total de la PEA. A su vez, puede establecerse que la caída en la formalidad de las mujeres se debe a un movimiento entre el sector formal y el informal, dado que los efectos son de magnitudes muy similares, mientras que el efecto sobre la no ocupación es extremadamente pequeño.

Tabla 5: Efectos de la extensión del seguro de salud. Estimaciones de Diferencias en Diferencias - Total.

	Formal/PO	Formal/PEA	Informal/PEA	No ocupado/PEA
Afectados	-0.0082	-0.0095*	0.0055	0.0039
	[0.0059]	[0.0057]	[0.0055]	[0.0027]
Observaciones	120,176	223,399	223,399	223,399
R- cuadrado	0.140	0.116	0.095	0.028

Nota: La muestra incluye individuos de 25 a 60 años. La columna 1 es condicional a asalariados privados. Los datos corresponden a la Encuesta Continua de Hogares (ECH) desde 2007 a 2014. Los controles incluyen edad y edad al cuadrado de los individuos y variables dummy por: nivel educativo (seis categorías), condición de jefe de hogar, departamento de residencia, sector en el que se desempeñan y año (8 categorías). Además los controles incluyen interacciones entre año y número de hijos y entre edad y número de hijos. Errores estándar robustos en paréntesis. ***p<0.01, **p<0.05, *p<0.1

Tabla 6: Efectos de la extensión del seguro de salud. Estimaciones de Diferencias en Diferencias - según sexo.

	Formal/PO	Formal/PEA	Informal/PEA	No ocupado/PEA
Hombres				
Afectados	0.0017	-0.0038	-0.0039	0.0077***
	[0.0072]	[0.0075]	[0.0073]	[0.0024]
Observaciones	69,121	123,547	123,547	123,547
R- cuadrado	0.066	0.078	0.077	0.003
Mujeres				
Afectados	-0.0213**	-0.0176**	0.0179**	-0.0003
	[0.0098]	[0.0087]	[0.0084]	[0.0053]
Observaciones	51,055	99,852	99,852	99,852
R- cuadrado	0.209	0.158	0.123	0.032

Nota: La muestra incluye individuos de 25 a 60 años. La columna 1 es condicional a asalariados privados. Los datos corresponden a la Encuesta Continua de Hogares (ECH) desde 2007 a 2014. Los controles incluyen edad y edad al cuadrado de los individuos y variables dummy por: nivel educativo (seis categorías), condición de jefe de hogar, departamento de residencia, sector en el que se desempeñan y año (8 categorías). Además los controles incluyen interacciones entre año y número de hijos y entre edad y número de hijos. Errores estándar robustos en paréntesis. ***p<0.01, **p<0.05, *p<0.1

Con el fin de analizar posibles efectos heterogéneos, se estima por separado según la condición de formalidad de la pareja. En la tabla 7 se muestran los resultados para el total de la población considerando en el panel A a las personas cuyo cónyuge es formal, en el panel B a las personas con cónyuge no formal y en el panel C se restringe el análisis solo a las personas que están en pareja, siendo los afectados las personas con pareja formal (dependiendo del número de hijos) y al grupo de control a quienes tienen pareja no formal. Adicionalmente, en las tablas 3 y 4 del Apéndice, se presentan las mismas estimaciones pero distinguiendo entre hombres y mujeres.

En el panel A de la tabla 7 se observa que las personas que viven en pareja y su cónyuge es trabajador formal reducen en 1.64 puntos porcentuales su probabilidad de ser formales, cuando se trata de asalariados privados y en 0.72 puntos porcentuales cuando se considera toda la PEA. Esta caída en la formalidad se encuentra explicada por un desplazamiento hacia empleos no registrados, como puede verse en la columna 3 de la tabla, y no a un aumento de personas no empleadas. Por el contrario, al observar a las personas cuya pareja es un trabajador informal, se encuentra que la expansión del seguro tuvo un efecto positivo y significativo sobre la formalidad, el cual asciende a 1.52 puntos porcentuales. Los efectos estimados para el resto de las variables no resultan significativos. Finalmente, cuando se restringe el análisis a las personas que se encuentran en pareja, y se considera como grupo afectado a quienes tienen un cónyuge formal y como grupo de control a quienes tienen cónyuge informal, los efectos estimados se incrementan. Esto se debe a que los incentivos de cada grupo, el afectado y el de control, tienen signos opuestos, lo cual refuerza los hallazgos previos.

Tabla 7: Efectos de la extensión del seguro de salud, de acuerdo a la condición de formalidad del cónyuge. Estimaciones de Diferencias en Diferencias - Total.

	Formal/PO	Formal/PEA	Informal/PEA	No ocupado/PEA
Con pareja formal				
Afectados	-0.0164***	-0.0072*	0.0074*	-0.0002
	[0.0043]	[0.0041]	[0.0039]	[0.0020]
Observaciones	120,176	223,399	223,399	223,399
R- cuadrado	0.147	0.127	0.108	0.028
Con pareja informal				
Afectados	0.0152***	0.0031	-0.0061	0.0030
	[0.0048]	[0.0045]	[0.0043]	[0.0021]
Observaciones	120,176	223,399	223,399	223,399
R-cuadrado	0.147	0.127	0.108	0.028
Pareja formal vs pareja informal				
Afectados	-0.0275***	-0.0090*	0.0094*	-0.0004
	[0.0058]	[0.0052]	[0.0050]	[0.0026]
Observaciones	90,855	168,265	168,265	168,265
R-cuadrado	0.095	0.128	0.108	0.030

Nota: La muestra incluye individuos de 25 a 60 años. La columna 1 es condicional a asalariados privados. Los datos corresponden a la Encuesta Continua de Hogares (ECH) desde 2007 a 2014. Los controles incluyen edad y edad al cuadrado de los individuos y variables dummy por: nivel educativo (seis categorías), condición de jefe de hogar, departamento de residencia, sector en el que se desempeñan y año (8 categorías). Además los controles incluyen interacciones entre año y número de hijos y entre edad y número de hijos. Errores estándar robustos en paréntesis. ***p<0.01, **p<0.05, *p<0.1

Continuando el análisis de efectos heterogéneos, se agrupa a los individuos de acuerdo a cantidad de años de educación y edad en años. Los resultados de estas estimaciones para el total de las personas se presentan en las tablas 8 y 10, respectivamente, y en las tablas 5 a 8 del Apéndice se muestran los resultados para hombres y mujeres por separado.

Los resultados muestran que, las personas con menos de 12 años de educación afectadas por la política reducen en promedio 1.24 puntos su probabilidad de ser formales (al 90% de confianza) cuando se considera a los asalariados privados. Al considerar a toda la PEA, se observa una variación de la formalidad del mismo singo pero algo superior (1.41), siendo estadísticamente significativo el aumento de los no ocupados, mientras que la informalidad no resulta significativa a los niveles usuales de confianza. Por su parte, no se observan resultados estadísticamente significativos cuando se considera a las personas con 12 años de educación o más. Al observar por separado a hombres y mujeres de acuerdo a la cantidad de años de estudio, se encuentra nuevamente resultados significativos para los individuos con menos de 12 años de educación. Los efectos estimados para las mujeres son los de mayor magnitud, mostrando que las aquellas con menor cantidad de años de educación afectadas por la política reducen su probabilidad de ser asalariadas formales 3.27 puntos y 3.23 cuando se considera a toda la PEA femenina. Al distinguir entre el efecto sobre la informalidad y la no ocupación, se observa que la caída en la formalidad se debe a un desplazamiento de trabajadoras formales al sector informal y, en menor medida, a un desplazamiento hacia el no empleo. Por el contrario, entre los hombres el único efecto que resulta ser estadísticamente significativo es el aumento del no empleo.

En función de la edad de los individuos, el único efecto que resulta significativo para el total de la población es el del aumento de los no ocupados para aquellas personas que tienen 40 años o más. Resulta interesante el hecho de que son los hombres de mayor edad quienes muestran un aumento de la no ocupación. Este hallazgo esta en línea con los encontrado en trabajos previos (Gruber and Madrian, 1997), donde se encuentra que el contar con aseguramiento en salud a través del empleo de las esposas disminuye en los hombres casados la necesidad de estar empleados, siendo más fuerte en los tramos de mayores edades.

Tabla 8: Efectos de la extensión del seguro de salud de acuerdo con la cantidad de años de educación de los individuos. Estimaciones de Diferencias en Diferencias - Total.

	Formal/PO	Formal/PEA	Informal/PEA	No ocupado/PEA
Menos de 12 años de educación				
Afectados	-0.0124*	-0.0141*	0.0080	0.0061*
	[0.0075]	[0.0075]	[0.0074]	[0.0034]
Observaciones	86,931	152,803	152,803	152,803
R- cuadrado	0.127	0.073	0.050	0.035
12 años de educación o más				
Afectados	0.0097	0.0016	0.0002	-0.0018
	[0.0076]	[0.0080]	[0.0071]	[0.0041]
Observaciones	33,225	70,543	70,543	70,543
R- cuadrado	0.073	0.046	0.042	0.011

Nota: La muestra incluye individuos de 25 a 60 años. La columna 1 es condicional a asalariados privados. Los datos corresponden a la Encuesta Continua de Hogares (ECH) desde 2007 a 2014. Los controles incluyen edad y edad al cuadrado de los individuos y variables dummy por: nivel educativo (seis categorías), condición de jefe de hogar, departamento de residencia, sector en el que se desempeñan y año (8 categorías). Además los controles incluyen interacciones entre año y número de hijos y entre edad y número de hijos. Errores estándar robustos en paréntesis. ***p<0.01, **p<0.05, *p<0.1

Tabla 9: Efectos de la extensión del seguro de salud de acuerdo con la edad de los individuos. Estimaciones de Diferencias en Diferencias - Total.

	Formal/PO	Formal/PEA	Informal/PEA	No ocupado/PEA
Menos de 40 años de edad				
Afectados	-0.0127	-0.0110	0.0105	0.0005
	[0.0084]	[0.0085]	[0.0081]	[0.0044]
Observaciones	55,823	91,050	91,050	91,050
R- cuadrado	0.147	0.142	0.107	0.043
40 años de edad o más				
Afectados	-0.0017	-0.0074	-0.0003	0.0077**
	[0.0082]	[0.0078]	[0.0076]	[0.0032]
Observaciones	64,353	132,349	132,349	132,349
R-cuadrado	0.140	0.101	0.089	0.016

Nota: La muestra incluye individuos de 25 a 60 años. La columna 1 es condicional a asalariados privados. Los datos corresponden a la Encuesta Continua de Hogares (ECH) desde 2007 a 2014. Los controles incluyen edad y edad al cuadrado de los individuos y variables dummy por: nivel educativo (seis categorías), condición de jefe de hogar, departamento de residencia, sector en el que se desempeñan y año (8 categorías). Además los controles incluyen interacciones entre año y número de hijos y entre edad y número de hijos. Errores estándar robustos en paréntesis. ***p<0.01, **p<0.05, *p<0.1

Luego, con el fin de contrastar los resultados obtenidos, se procede a estimar los posibles efectos de la extensión del seguro mediante una especificación alternativa del modelo de diferencias en diferencias. En concreto, se estima por MCO la siguiente regresión:

$$Y_{it} = \alpha + \beta\, EnPareja_i * Post_t + X_{it}'\gamma + \delta_t + \Theta_r + \varepsilon_{it}$$

En esta oportunidad, Y_{it} continúa representando la variable de resultado del individuo *i* en el año *t* que nos interesa analizar; *EnPareja* es una variable binaria que vale uno cuando el individuo vive en pareja y cero en caso contrario; $Post_t$ es una variable binaria que vale uno en el período pos-programa (considerando 2010-2014) y cero en los años pre-programa (2007 a 2010). X_{it}' es un vector de regresores que incluye características a nivel individual y de los hogares; δ_t es un conjunto de variables binarias que indican el año de la encuesta, estos efectos fijos controlan por la presencia de shocks a nivel agregado, mientras Θ_r controla por efectos fijos por región y ε_{it} representa un término de error idiosincrásico. Finalmente, el coeficiente que acompaña la interacción entre la dummy de período de tiempo y la dummy de grupo ($EnPareja_i * Post_t$) es el estimador de diferencias en diferencias ($\hat{\beta}$) que nos interesa estudiar. Los resultados se resumen en las tablas 9 y 10 del Apéndice.

Si bien el signo del coeficiente es el esperado de acuerdo a las estimaciones previas, no se encuentra que ningún caso efectos estadísticamente significativos. Este resultado puede deberse al hecho de que se están considerando personas afectadas por la política (en el grupo de tratamiento) a individuos que aún no han sido alcanzados por la misma. A modo de ejemplo, en 2011 solo quienes estaban en pareja y tenían 3 hijos o más fueron afectados, por lo cual considerar al resto de las personas en pareja genera que el efecto desaparezca.

Un ejercicio adicional que se realiza para complementar esta estrategia es estimar este segundo modelo de DD para cada año posterior a la política por separado. Es decir, en todos los casos se considera a la variable Post igual a 0 para los años 2007-2010, y se considera Post igual a 1, en primer lugar, solo para 2011, luego solo a 2012, a continuación solo a 2013 y, finalmente, solo a 2014 (omitiendo el resto de los años en cada estimación). De esta forma, se confirma que a medida que más personas van siendo afectadas por la política los efectos resultan de mayor magnitud y adquieren significatividad estadística. En las figuras 2.a, 2.b y 2.c, se muestran los resultados para la variable formalidad sobre los asalariados privados (la que nos resulta de mayor interés) en forma separada para el total de la población, para hombres y para mujeres. Las figuras muestran el valor que adquiere el coeficiente de interés $\hat{\beta}$ en cada año y las líneas que parten de la estimación puntual representan los intervalos de confianza al 95%.

Figura 2.a: Efectos sobre la formalidad para las personas afectadas por la política.

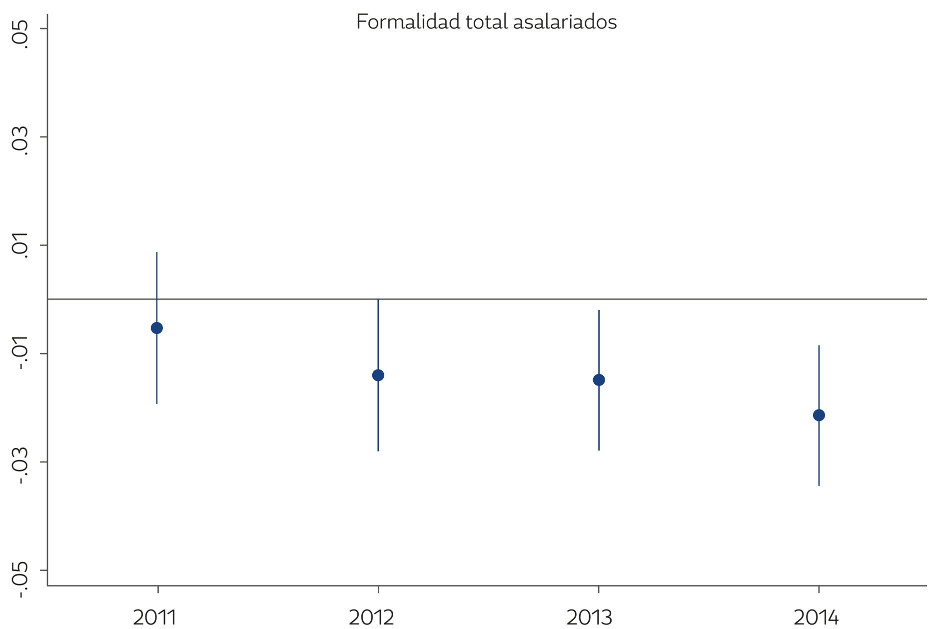


Figura 2.b: Hombres

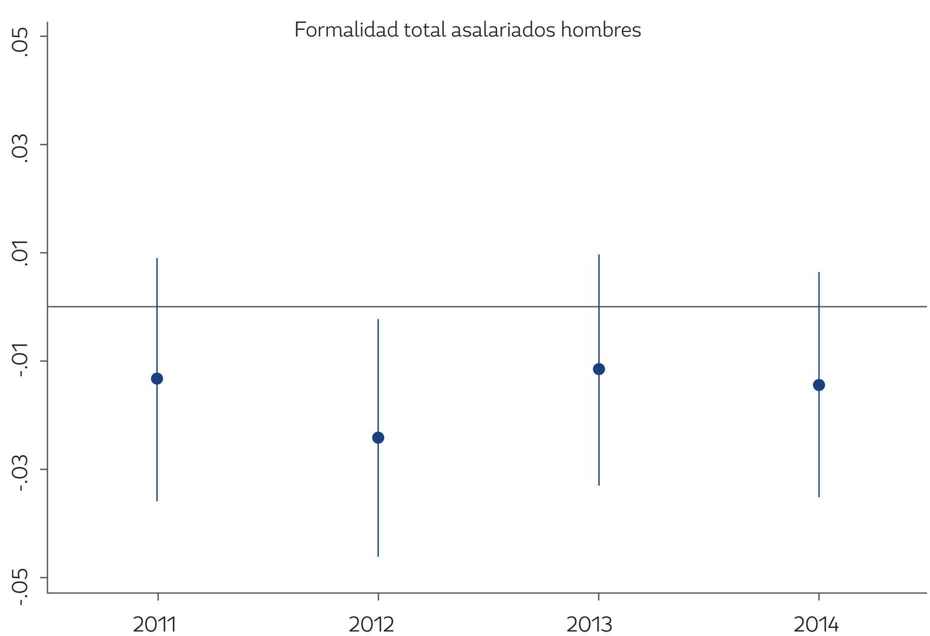
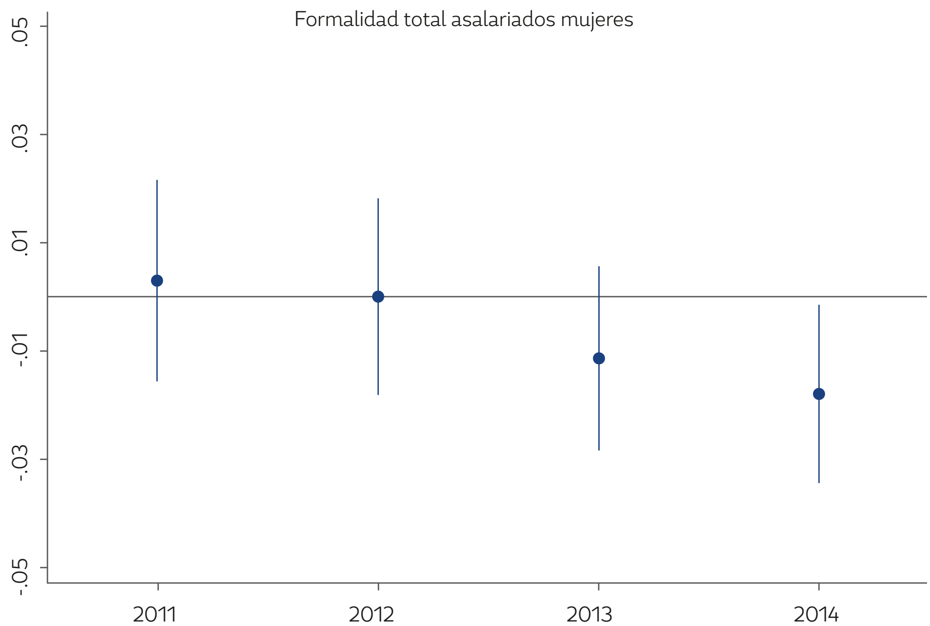


Figura 2.c: Mujeres

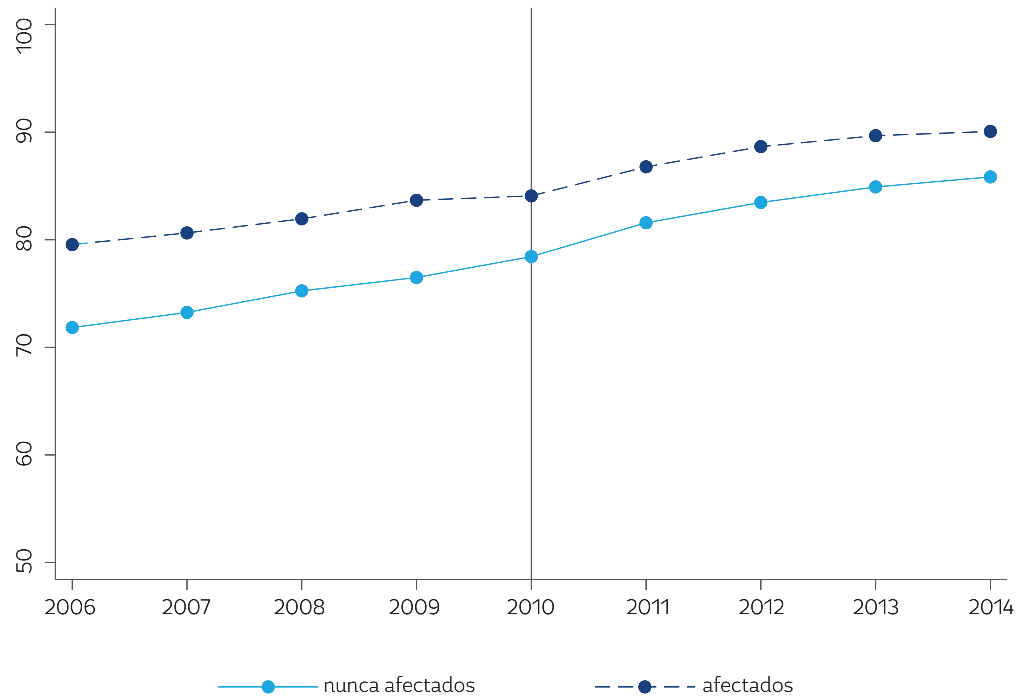


Nota a figuras 2.a, 2.b, 2.c: Representación gráfica de estimaciones mediante MCO donde la variable dependiente es formalidad para asalariados privados sobre un set de variables de interacción entre pertenecer al grupo afectado y antes y después del tratamiento para cada año. El grupo afectado vale 1 para los asalariados privados en pareja y cero para los asalariados privados solteros. Cada barra representa intervalos de confianza al 95% y el centro de la barra representa la estimación específica. La regresión incluye controles. La muestra incluye individuos de 25 a 60 años. Los datos corresponden a la Encuesta Continua de Hogares (ECH) desde 2007 a 2014.

5.2 Validez de la estrategia de identificación

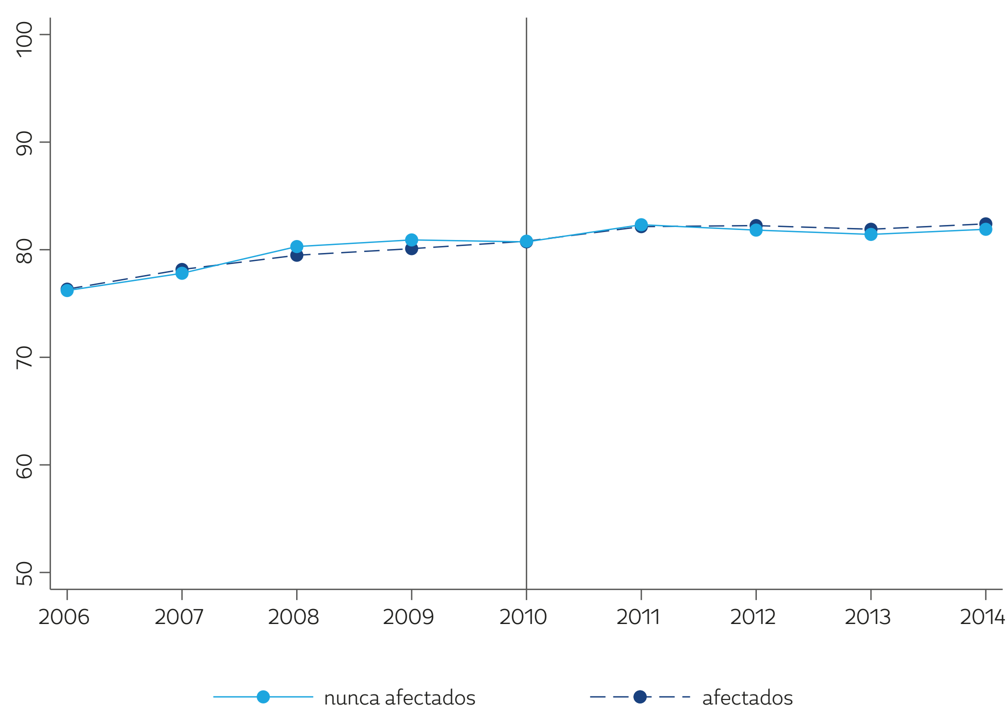
La validez de la estrategia de identificación descansa en el supuesto de que, en ausencia de la extensión del seguro de salud, las decisiones de empleo hubieran presentado tendencias similares entre las personas que viven en pareja y las que no. Si bien el supuesto de identificación es inherentemente no-testeable podemos observar si las tendencias previas a la implementación a la extensión del seguro son similares para el grupo de solteros, que nunca son afectados por la política, y para el grupo de personas que viven en pareja, que van siendo afectados por la política dependiendo del número de hijos hasta estar todos amparados en la misma. En las figuras 3 y 4 se observa, entonces, la evolución de la tasa de formalidad y de empleo y para las personas que viven en pareja y para los solteros antes después de la extensión del seguro. Allí se observa que, efectivamente, las tendencias previas al año 2010 son similares entre los dos grupos de individuos.

Figura 3: Evolución de la tasa de formalidad según grupos. Uruguay 2006-2014. Asalariados privados de 25 a 60 años.



Fuente: elaboración propia en base a microdatos de ECH 2006-2014.

Figura 4: Evolución de la tasa de ocupación según grupos. Uruguay 2006-2014. Adultos privados de 25 a 60 años.



Fuente: elaboración propia en base a microdatos de ECH 2006-2014.

Luego, para complementar el análisis gráfico, se realiza un test de tendencias previas, comparando el grupo de personas que jamás es afectado (soltero) con el de personas plausiblemente afectadas (en pareja). La hipótesis nula de este test es que las tendencias de ambos grupos previo a la extensión del seguro eran iguales. En la tabla 11 del Apéndice se muestran los resultados obtenidos en este test para cada una de las variables analizadas. En todos los casos no es posible rechazar la hipótesis nula, por lo cual no podemos decir que las tendencias previas entre los grupos sean distintas.

Como ejercicio adicional, se realiza una estimación de diferencias en diferencias considerando los años previos a la extensión del seguro. Es decir, se realiza un experimento *falso*, donde se estima la siguiente ecuación:

$$Y_{it} = \alpha + \beta \, EnPareja_i * Post_t + X_{it}'\gamma + \delta_t + \Theta_r + \varepsilon_{it}$$

En esta oportunidad, Post es igual a 0 para los años 2007 y 2008 y es igual a 1 para 2009 y 2010. El resto de las covariables se mantienen con el mismo nombre. Los resultados de esta estimación se muestran en las tablas 12 y 13 del Apéndice, y puede observarse que en ningún caso el coeficiente de interés β resulta significativo.

6. Conclusiones

En este trabajo se analizó el impacto sobre el mercado de trabajo de la extensión del seguro de salud a los cónyuges de los trabajadores formales ocurrida en Uruguay desde diciembre de 2010. Se buscó distinguir los efectos no deseados que pudo haber arrojado la política, poniendo especial interés en aquellos individuos que se encontrasen en pareja. A tales efectos se explotó la extensión del seguro los cónyuges, para evaluar si efectivamente se pudo haber generado incentivos no deseados sobre los individuos que de forma plausiblemente exógena fueron alcanzados por la política.

Puede establecerse que la evidencia en este trabajo está en línea con lo esperado por la literatura previa. Los resultados sugieren que la expansión del seguro introdujo incentivos a que las personas en pareja se muevan entre formalidad/informalidad y, en menor medida, entre el empleo/no empleo. En particular, cuando se considera al total de la PEA, se estimó una caída de la formalidad de 0.95 puntos porcentuales, significativa al 90%. Por otra parte, si bien se encontró un efecto positivo sobre la ocupación de los hombres, no se registraron efectos significativos sobre la ocupación al considerar al total de la muestra. Los efectos estimados son de mayor magnitud y significación cuando se considera únicamente a las mujeres en lo que respecta a formalidad. Como podía esperarse, los efectos estimados guardan relación con la condición de formalidad de la pareja. En este sentido, cuando los individuos tienen una pareja con empleo formal, se encontró que la extensión de la cobertura tiene un efecto negativo sobre la formalidad de -1.64 puntos porcentuales cuando se considera al total de asalariados y de -0.72 puntos porcentuales para el total de la PEA. Por otra parte, si la pareja es informal, los incentivos actúan en forma inversa, encontrándose un efecto positivo sobe la formalidad de 1.52 puntos porcentuales para los asalariados y de 0.31 puntos porcentuales para el total de la PEA, aunque este último no es significativo. Así como la literatura ha encontrado que las mujeres casadas tienen mayor elasticidad de su oferta laboral respecto al ingreso en comparación con los hombres en iguales condiciones, también se observa que ajustan en mayor medida sus decisiones de inserción laboral respecto a las características de la ocupación de su pareja.

En primer lugar, se encontraron resultados heterogéneos de acuerdo al estatus de formalidad de la pareja. Las personas con cónyuge formal tuvieron un efecto negativo sobre su probabilidad de estar registradas, que se explica casi exclusivamente por un traslado a puestos de trabajo no formales. Mientras que las personas con cónyuge informal registraron un aumento en su probabilidad de ser formal, evidenciando que la política tuvo efectos en ambas direcciones.

En las estimaciones por diferencias en diferencias, si bien no se encontró evidencia acerca de cambios en la decisión de estar ocupada, son las mujeres, en particular las menos educadas y, en menor medida las más jóvenes, las que muestran efectos significativos de mayor magnitud en la caída de la formalidad. Los hombres menos educados mostraron un efecto positivo significativo en la probabilidad de estar no ocupados. Es decir, que la extensión del seguro parece haber disminuido los incentivos a estar ocupados para los varones, no encontrándose efectos sobre la formalidad e informalidad.

Los principales resultados son robustos a los test y pruebas realizadas. Puede decirse que no hay evidencia que permita rechazar los supuestos de identificación del efecto causal del modelo DD utilizado.

Finalmente, como recomendación de política podría pensarse en un esquema de contribución familiar. Donde en caso en que ambos miembros de la pareja sean trabajadores formales pueda plantearse una declaración conjunta ante el seguro. De esta forma, se evitaría que como resultado de la condición de formalidad (o informalidad) de un individuo, su pareja vea alterados los incentivos a tener un empleo o ser trabajador formal, debido a que cambia la utilidad relativa de cada escenario.

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Apéndice de cuadros y figuras

Tabla A1: Tasa de ocupación total y según sexo y estatus conyugal, personas de entre 25 y 60 años.

	Total			Hombres			Mujeres		
	Total	Solteros	En pareja	Total	Solteros	En pareja	Total	Solteros	En pareja
2006	76,3	76,2	76,3	89,8	81,7	93,4	64,4	72,0	60,2
2007	78,0	77,8	78,2	91,3	83,9	94,5	66,3	73,3	62,6
2008	79,8	80,3	79,5	91,9	84,8	95,1	69,1	76,9	64,7
2009	80,4	80,9	80,1	92,2	85,4	95,2	69,9	77,4	65,7
2010	80,8	80,7	80,8	92,0	85,0	95,1	70,8	77,4	67,2
2011	82,2	82,3	82,1	92,4	85,9	95,6	72,9	79,2	69,3
2012	82,1	81,8	82,2	92,1	85,3	95,4	73,1	79,1	69,6
2013	81,7	81,4	81,9	91,9	85,7	94,8	72,3	77,7	69,5
2014	82,2	81,9	82,4	92,0	85,3	95,3	73,0	78,8	70,0

Nota: elaboración propia a partir de las ECH 2006-2014.

Tabla A2: Tasa de formalidad de los asalariados privados total y según sexo y estatus conyugal, personas de entre 25 y 60 años.

	Total			Hombres			Mujeres		
	Total	Solteros	En pareja	Total	Solteros	En pareja	Total	Solteros	En pareja
2006	76,7	71,8	79,6	80,4	73,9	83,3	72,5	70,2	74,3
2007	78,0	73,2	80,6	81,1	74,0	84,1	74,4	72,6	75,7
2008	79,5	75,3	81,9	82,8	76,6	85,6	75,7	74,2	76,8
2009	81,1	76,5	83,7	84,4	78,2	87,0	77,3	75,1	78,9
2010	82,1	78,4	84,1	85,7	80,6	88,0	77,9	76,7	78,7
2011	84,8	81,6	86,8	87,7	83,8	89,6	81,5	79,6	82,9
2012	86,7	83,5	88,7	89,3	85,3	91,2	83,8	81,9	85,2
2013	88,0	84,9	89,7	90,1	85,6	92,1	85,5	84,3	86,4
2014	88,6	85,8	90,1	90,2	86,1	92,1	86,6	85,6	87,3

Nota: elaboración propia a partir de las ECH 2006-2014.

Tabla A3. Efectos de la extensión del seguro de salud, de acuerdo a la condición de formalidad del cónyuge. Estimaciones de Diferencias en Diferencias – Hombres (2007-2014).

	Formal/PO	Formal/PEA	Informal/PEA	No ocupado/PEA
Afectados	-0.0144**	-0.0040	0.0010	0.0030*
	[0.0058]	[0.0054]	[0.0053]	[0.0018]
Observaciones	69,121	123,547	123,547	123,547
R-squared	0.073	0.089	0.088	0.003
Con pareja informal				
Afectados	0.0171***	0.0039	-0.0049	0.0010
	[0.0061]	[0.0058]	[0.0057]	[0.0018]
Observaciones	69,121	123,547	123,547	123,547
R-squared	0.073	0.089	0.088	0.003
Pareja formal vs pareja informal				
Afectados	-0.0271***	-0.0097	0.0071	0.0025
	[0.0074]	[0.0066]	[0.0064]	[0.0021]
Observaciones	55,170	98,429	98,429	98,429
R-squared	0.067	0.087	0.086	0.003

Tabla A4. Efectos de la extensión del seguro de salud, de acuerdo a la condición de formalidad del cónyuge. Estimaciones de Diferencias en Diferencias – Mujeres (2007-2014).

	Formal/PO	Formal/PEA	Informal/PEA	No ocupado/PEA
Afectados	-0.0232***	-0.0155**	0.0153**	0.0002
	[0.0071]	[0.0063]	[0.0059]	[0.0039]
Observaciones	51,055	99,852	99,852	99,852
R-squared	0.216	0.174	0.138	0.033
Con pareja informal				
Afectados	0.0178**	0.0070	-0.0079	0.0009
	[0.0086]	[0.0075]	[0.0072]	[0.0045]
Observaciones	51,055	99,852	99,852	99,852
R-squared	0.216	0.174	0.138	0.033
Pareja formal vs pareja informal				
Afectados	-0.0441***	-0.0151	0.0078	0.0074
	[0.0112]	[0.0093]	[0.0088]	[0.0058]
Observaciones	35,685	69,836	69,836	69,836
R-squared	0.128	0.182	0.146	0.031

Tabla A5. Efectos de la extensión del seguro de salud de acuerdo con la cantidad de años de educación de los individuos. Estimaciones de Diferencias en Diferencias – Hombres (2007-2014).

	Formal/PO	Formal/PEA	Informal/PEA	No ocupado/PEA
Menos de 12 años de educación				
Afectados	0.0003	-0.0021	-0.0065	0.0086***
	[0.0087]	[0.0094]	[0.0092]	[0.0029]
Observaciones	53,403	91,462	91,462	91,462
R-squared	0.060	0.048	0.046	0.003
12 años de educación o más				
Afectados	0.0185	-0.0046	-0.0016	0.0062
	[0.0118]	[0.0115]	[0.0108]	[0.0045]
Observaciones	15,708	32,056	32,056	32,056
R-squared	0.026	0.037	0.038	0.004

Tabla A6. Efectos de la extensión del seguro de salud de acuerdo con la cantidad de años de educación de los individuos. Estimaciones de Diferencias en Diferencias -Mujeres (2007-2014).

	Formal/PO	Formal/PEA	Informal/PEA	No ocupado/PEA
Menos de 12 años de educación				
Afectados	-0.0327**	-0.0323***	0.0299**	0.0025
	[0.0137]	[0.0125]	[0.0123]	[0.0074]
Observaciones	33,528	61,341	61,341	61,341
R-squared	0.172	0.068	0.049	0.028
12 años de educación o más				
Afectados	0.0019	0.0068	0.0014	-0.0083
	[0.0098]	[0.0111]	[0.0095]	[0.0067]
Observaciones	17,517	38,487	38,487	38,487
R-squared	0.127	0.060	0.049	0.016

Tabla A7. Efectos de la extensión del seguro de salud de acuerdo con la edad de los individuos. Estimaciones de Diferencias en Diferencias – Hombres (2007-2014).

	Formal/PO	Formal/PEA	Informal/PEA	No ocupado/PEA
Menos de 40 años de edad				
Afectados	-0.0023	-0.0122	0.0052	0.0070*
	[0.0107]	[0.0117]	[0.0113]	[0.0039]
Observaciones	31,164	46,940	46,940	46,940
R-squared	0.077	0.092	0.090	0.004
40 años de edad o más				
Afectados	0.0062	0.0026	-0.0112	0.0085***
	[0.0097]	[0.0099]	[0.0097]	[0.0032]
Observaciones	37,957	76,607	76,607	76,607
R-squared	0.064	0.073	0.071	0.003

Tabla A8. Efectos de la extensión del seguro de salud de acuerdo con la edad de los individuos. Estimaciones de Diferencias en Diferencias – Mujeres (2007-2014).

	Formal/PO	Formal/PEA	Informal/PEA	No ocupado/PEA
Menos de 40 años de edad				
Afectados	-0.0239*	-0.0091	0.0155	-0.0065
	[0.0132]	[0.0123]	[0.0116]	[0.0080]
Observaciones	24,659	44,110	44,110	44,110
R-squared	0.218	0.187	0.131	0.041
40 años de edad o más				
Afectados	-0.0166	-0.0263**	0.0180	0.0083
	[0.0146]	[0.0128]	[0.0123]	[0.0070]
Observaciones	26,396	55,742	55,742	55,742
R-squared	0.207	0.138	0.116	0.020

Tabla A9. DD antes y después (2007-2010 vs 2011-2014) - Total.

	Formal/PO	Formal/PEA	Informal/PEA	No ocupado/PEA
En pareja*política	-0.0054	-0.0017	0.0030	-0.0013
	[0.0046]	[0.0046]	[0.0045]	[0.0022]
Observaciones	273,203	285,482	285,482	285,482
R-squared	0.117	0.122	0.103	0.026

Tabla A10. DD antes y después (2007-2010 vs 2011-2014) - Según sexo.

	Formal/PO	Formal/PEA	Informal/PEA	No ocupado/PEA
Panel A: Hombres				
En pareja*política	-0.0065	-0.0021	0.0068	-0.0047*
	[0.0074]	[0.0074]	[0.0073]	[0.0026]
Observaciones	142,519	145,588	145,588	145,588
R-cuadrado	0.088	0.085	0.084	0.003
Panel B: Mujeres				
En pareja*política	-0.0006	0.0046	0.0004	-0.0050
	[0.0060]	[0.0060]	[0.0058]	[0.0034]
Observaciones	130,684	139,894	139,894	139,894
R-cuadrado	0.157	0.161	0.128	0.029

Tabla A11. Test de tendencias previas (2006-2010).

	Formal/PO	Formal/PEA	Informal/PEA	No ocupado/PEA
Tendencia	-0.0024	-0.0012	0.0018	-0.0006
	[0.0022]	[0.0018]	[0.0017]	[0.0009]
Observaciones	119,063	244,744	244,744	244,744
R-squared	0.167	0.117	0.091	0.032

Tabla A12. Experimento falso – Total (2007-2010).

	Formal/PO	Formal/PEA	Informal/PEA	No ocupado/PEA
En pareja*política	-0.0036	-0.0060	0.0051	0.0009
	[0.0076]	[0.0067]	[0.0065]	[0.0032]
En pareja	0.0966***	0.1131***	-0.1051***	-0.0079**
	[0.0059]	[0.0058]	[0.0051]	[0.0035]
Observaciones	84,698	159,089	159,089	159,089
R-squared	0.097	0.116	0.093	0.029

Tabla A13. Experimento falso - según sexo (2007-2010).

	Formal/PO	Formal/PEA	Informal/PEA	No ocupado/PEA
Hombres				
En pareja*política	-0.0128	-0.0001	0.0055	-0.0055
	[0.0126]	[0.0105]	[0.0103]	[0.0036]
En pareja	0.1060***	0.1411***	-0.1372***	-0.0039
	[0.0086]	[0.0072]	[0.0071]	[0.0025]
Observaciones	44,865	81,808	81,808	81,808
R-squared	0.064	0.077	0.076	0.003
Mujeres				
En pareja*política	0.0010	-0.0075	0.0092	-0.0017
	[0.0099]	[0.0089]	[0.0085]	[0.0051]
En pareja	0.0459***	0.0344***	-0.0384***	0.0039
	[0.0093]	[0.0113]	[0.0081]	[0.0090]
Observaciones	39,833	77,281	77,281	77,281
R-squared	0.117	0.153	0.117	0.031

Nota tablas A3 a A13: La muestra incluye individuos de 25 a 60 años. La columna 1 es condicional a asalariados privados. Los datos corresponden a la Encuesta Continua de Hogares (ECH). Los controles incluyen edad y edad al cuadrado de los individuos y variables dummy por: nivel educativo (seis categorías), condición de jefe de hogar, departamento de residencia, sector en el que se desempeñan y año (8 categorías). Además los controles incluyen interacciones entre año y número de hijos y entre edad y número de hijos. Errores estándar robustos en paréntesis. ***p<0.01, **p<0.05, *p<0.1

Does managerial discretion affect debt maturity in Chilean firms? An agency cost and asymmetric information approach

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Research Article

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Key words: Debt maturity, agency costs, ownership structure, managerial discretion, monitoring.

Palabras clave: Vencimiento de la deuda, costos de agencia, estructura de propiedad, discreción gerencial, monitoreo.

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Abstract

We address debt maturity determinants for Chilean firms using data whose information was drawn from the Longitudinal Survey of Companies (ELE). Results from pooled Tobit regressions indicate that for firms with high growth opportunities, managerial discretion will encourage longer debt terms, a decision that contributes to reducing liquidity risk. For firms with low growth opportunities, managerial discretion does not affect debt maturity, while external monitoring reduces it. These results provide new evidence for international literature. Other conclusions suggest that debt maturity is positively related to firm size, capital structure, and asset tangibility and negatively related to agency costs and belonging to business holdings. These findings support international studies.

Resumen

Abordamos los determinantes de la madurez de la deuda de las empresas chilenas utilizando datos, cuya información se extrajo de la Encuesta Longitudinal de Empresas (ELE). Los resultados de las regresiones agrupadas de Tobit indican que para las empresas con altas oportunidades de crecimiento, la discrecionalidad gerencial estimulará plazos de deuda más largos, decisión que contribuye a reducir el riesgo de liquidez. Para las empresas con bajas oportunidades de crecimiento, la discrecionalidad gerencial no afecta la madurez de la deuda, mientras que la supervisión externa la reduce. Estos resultados proporcionan nueva evidencia para la literatura internacional. Otras conclusiones sugieren que el vencimiento de la deuda está relacionado positivamente con el tamaño de la empresa, la estructura de capital y la tangibilidad de los activos; y está relacionado negativamente con los costos de la agencia y la membresía en una compañía de cartera. Estos hallazgos son consistentes con estudios internacionales.

1. Introduction

Decisions on debt terms have been widely researched in recent corporate finance literature. A large part of documented evidence shows that debt maturity is positively related to firm size and regulations, but inversely related to growth opportunities and ownership concentration, among other factors.

Transversely, a factor that also influences debt term is managerial discretion. Managerial discretion should be understood as the opportunist behavior of the manager, who can make decisions for personal benefit, rather than in favor of the company, and its owners. These behaviors can increase the risk of bankruptcy for the company. The managerial discretion has been mainly considered by using agency theory and information asymmetries.

Costs associated with managerial discretion affect financing policies and terms. Theoretical and empirical literature has shown that firms adjust their capital structure to debts in response to higher agency costs (Jensen, 1986). This fact becomes more relevant when managerial discretion takes place in larger, inefficient firms with low growth opportunities and low debt firms.

Such an effect also influences debt term decisions. Companies with high agency costs usually reduce debt maturity periods to mitigate overinvestment. Reducing debt terms disciplines administrators, making debt payment a priority over asset accumulation under their control (Leland, 1998; Lasfer, 1999; Ozkan, 2000; Jiraporn and Tong, 2008; Alcock et al., 2011). Endogenously, this form of financing policy reduces managerial discretion.

The degree of discretion and its effect on debt maturity can also be seen through the asymmetric information theory. A greater degree of asymmetric information promotes opportunistic behavior by managers, generating conflicts of interest and in turn affecting company credit quality (Ross, 1977). This fact can increase the liquidity risk or default probability (Flannery, 1986).

Most studies focus on developed markets such as those in the United States and Europe. However, in emerging markets, and specifically in Chile, evidence is sparse, and the effect of managerial discretion on debt maturity is still an unexplored subject.

In Chile, access to financing by companies is heterogeneous, mainly respect to the debt maturity contracted. On the one hand, mature and long operating history firms have access to the markets of bank debt and fixed incomes, which are usually contracted in the long term. Although these companies are characterized by low growth opportunities, financing appears to be explained more by the composition of their assets and diluted ownership structure. According to data from the Longitudinal Business Survey (ELE), these companies would not represent more than 20% of Chile's universal businesses. On the other hand, companies with greater growth options are generally subject to greater operational risk and a limited pool of assets, which restrict debt from a purely bank and short-term source. This type of debt in many cases leads these companies towards a high liquidity risk that, afterwards can lead to bankruptcy.

In relation to managerial discretion in Chile, the ELE reports that in companies with high growth opportunities there is a greater turnover of managers and a greater asymmetry of information associated with their performance. If the opportunistic behavior of the managers increases the risk of insolvency or liquidity of the firm, then these could be associated with the issuance of short-term debt. However, greater supervision of the owners or self-imposed non-discretionary behavior by the managers themselves could mitigate this risk, promoting longer-term debt. The latter may occur if growth opportunities are themselves an implicit control mechanism such as Smith and Watts (1992) and Gaver and Gaver (1995) point out. These authors indicate that the managers associate the firm's growth opportunities with greater economic compensation, which leads them to act in line with business objectives.

This leads us to believe that the growth opportunities of Chilean companies not only condition the maturity of the debt they contract, but also the manager's preference over the debt contracted. That is, between encouraging or mitigating the risk of financial insolvency of the firm they manage.

The main objective of this research is to analyze the factors that determine the debt maturity of Chilean companies. This requires data on a large sample of firms drawn from the Longitudinal Survey of Companies (ELE). This study contributes to the existing literature through two aspects. Firstly, we empirically analyze the effect of past managerial discretion on debt terms in current firms. In this research, discretion is associated with behaviors that the manager developed in other companies in the past, and that potentially can be propagated or controlled in their current companies, affecting the debt maturity decision. The final effect on debt maturity depends on the trade-off between past managerial discretion and actual internal monitoring mechanisms implicit in their growth opportunities. Secondly, we analyze the interaction between the preference for liquidity or control of the problems associated with non-optimal investment policies.

The sample characteristics also reinforce this study's empirical contribution. The diversity of companies in terms of size, organizational structures, ownership structures and growth options allow us to analyze the determinants of debt maturity beyond the companies listed on the stock exchange. These features differ from previous studies in Chile.

Our results demonstrate that debt maturity is positively affected by past managerial discretion when firms have high growth opportunities. Nonetheless, it does not have a significant effect when these opportunities are low. These observations validate the trade-off hypothesis and the greater effects of internal monitoring mechanisms on managerial discretion in firms with high growth opportunities.

The rest of this article is organized as follows. In Section 2, we review the theoretical and empirical literature on relevant topics of debt maturity and its relationship with agency theory, asymmetric information, and managerial discretion. In Section 3, we present the hypotheses of this research. The section 4 presents the variables and statistical and econometric methods while in Section 5 we present the main results. Finally, Section 6 compiles our main conclusions as well as possible extensions of this research.

2. Literature review

2.1. International evidence

Theoretical and empirical literature has extensively studied debt maturity determinants with a clear emphasis on developed markets. Among these factors is managerial discretion, whose effects on debt maturity have been analyzed by agency theories and information asymmetries.

The effect of managerial discretion on debt maturity is studied by the agency theory and typically focusing on the problem of overinvestment. Berle and Means (1932) and Jensen and Meckling (1976) showed that firms adjust their capital structures towards debt when faced with higher agency costs. This aspect has been corroborated by various empirical studies, such as those conducted by Kim and Sorensen (1986), Ang et al. (2000), Harvey et al. (2003), Fleming et al. (2005), Mohd et al. (2012), Kokoreva and Ulugova (2013), and Rakesh and Lakshmi (2013). The purpose of debt, as described by Jensen (1986), is to discipline managers and endogenously mitigate managerial discretion costs. This result has been confirmed mainly for larger, inefficient firms with low growth opportunities (Jensen, 1986; Stulz, 1990; Hart and Moore, 1995; Rajan and Winton, 1995; Stulz, 2000).

Capital structure adjustments towards debts are normally associated with a shortening of maturity. Leland (1998) developed a theoretical basis, indicating that companies shorten debt maturity in response to higher agency costs. Lasfer (1999) empirically argued that large companies, characterized by high agency costs, make use of short-term borrowing mechanisms to meet such costs.

Empirical studies, such as those by Ozkan (2000), Jiraporn and Tong (2008), and Alcock et al. (2011), confirmed previous results with the addition that ownership concentration also affects this relationship by acting inversely on debt maturity. This is due to the fact that short-term debts and concentration of ownership exercise a monitoring role for administrators. Datta et al. (2005), in an empirical study of 4,514 companies from the United States, concluded that ownership concentration and/or higher managerial shareholdings are inversely related to debt maturity. Alcock et al. (2011) provided further insight into the preliminary analysis, indicating that as owners and managers have increasingly aligned interests, the inverse effect of agency costs on debt maturity is reduced.

Other international studies have addressed the effects of managerial discretion on debt maturities from the perspective of ownership dilution. Berger et al. (1997) noted that debts increase when managers notice that their equity share in the company has decreased. This is explained by the role of managers in generating agency costs. Datta et al. (2005), Benmelech (2006), Harford et al. (2008), and Tanaka (2015) added that entrenched managers increase debt maturity, making more space for future discretionary behavior. Nevertheless, evidence has shown that managerial discretion is mitigated endogenously with the use of shorter-term debt (DeAngelo et al., 2002).

Companies with high agency costs also have other characteristics that, according to empirical evidence, determine debt maturity. Barclay and Smith (1995, 1996) and Cuñat (1999) noted that large or regulated companies with low growth opportunities are characterized by a higher proportion of long-term debt in their capital structure. Although international evidence has shown that large companies shorten debt terms to mitigate agency costs, the authors added that the incidence of size is explained in the sense that smaller companies rely more on bank credit. This aspect is corroborated by Johnson (1997).

The effect of managerial discretion on debt maturity is studied by the asymmetric information theory, typically focusing on the problem of underinvestment. Myers (1977) and Myers and Majluf (1984) argued that firms shorten debt maturity in response to underinvestment problems that are generated by managerial/owner discretion. Authors suggest that if companies have higher growth opportunities in their investment set, these companies should use short-term debts to eliminate the disincentive to invest. Billet et al. (2007), Jiraporn and Tong (2008), and Alcock et al. (2011) added that this measure reduces managerial discretion as the manager is exposed to external monitoring.

Information asymmetry can promote opportunistic behavior by managers. Such behavior is based on underinvestment, in order to increase their wealth at the expense of the firm's credit quality. (Leland and Pyle, 1977; Ross, 1977). Johnson (2003) noted that companies exchange the costs of underinvestment with liquidity risk costs when choosing debt maturities. This reflects the contradictory results found in empirical evidence. On one hand, Flannery (1986), Diamond (1991), Guedes and Olper (1996), and Berger et al. (2005) noted that lower risk firms prefer debts with shorter maturities. For these companies, the cost of underinvestment problems is more relevant than liquidity risks. On the other hand, Barclay and Smith (1995) and Stohs and Mauer (1996) indicated that low risk firms have longer debt maturities due to the greater importance of liquidity risk.

But Smith and Watts (1992), Collins et al. (1995) and Gaver and Gaver (1995) argue that managers associate the greatest growth opportunities with better economic compensation. These results could generate a reduction effect of managerial discretion greater than that obtained by the issuance of short-term debt (Myers, 1977; Myers and Majluf, 1984), allowing a greater proportion of long-term debt to mitigate the firm's insolvency risk

Asset composition also determines debt maturity. Stohs and Mauer (1996), Graham and Harvey (2001), Scherr and Hurlburt (2001), Ozkan (2000, 2002), and Heyman et al. (2008) added that firms attempt to match the maturity of their debts with their assets. Thus, as investments in assets are more tangible, firms will employ long-term debt in order to mitigate liquidity risk.

Studies addressing debt maturity determinants in emerging markets are limited, due to differences in the economic and institutional context. Joeveer (2013), analyzed companies from 9 emerging European countries and concluded that country characteristics have a greater impact on the level and term of small company debts, while firm characteristics have a greater influence on large companies. Similar results were found by Mokhova and Zinecker (2014).

In the Latin American market there is also relevant evidence about the factors that determine the debt maturity. Kirch and Soares (2012) point out that the financial development of Latin American markets does not affect corporate debt maturity. However, a higher quality institutional environment does affect debt maturity positively, favoring long term debt.

Mateus and Terra (2013) studied debt maturity for 986 Latin American firms and 686 Eastern European firms. Their results highlight the differences between these markets. In Latin America, debt and maturity are considered complementary policies, while they are considered substitutes in Eastern Europe. Soares (2009, 2011) supported these results for companies in Latin America.

2.2. Evidence in the Chilean market

There are few studies on debt maturity in Chile, and all of them are oriented toward companies listed on the stock market.

Azofra et al. (2004) developed an empirical analysis using incomplete panel data for 169 companies between 1990 and 2001. The authors noted that the high ownership concentration, along with the presence of growth opportunities in Chilean companies, favored debt as a financing source. Furthermore, when these companies require external funding, they decide to fund their growth opportunities through short-term debts. Another result from their research is that larger companies with a greater need for funds prefer more extensive debt maturities. Saona and Vallelado (2005) supported earlier findings, concluding that firms with high growth opportunities, concentrated ownership, and the need for external funding, issue short-term debts to finance their investments. This evidence supports the idea that short-term debt is an efficient funding mechanism that mitigates problems related to agency costs and information asymmetries.

More recently, Saona and Vallelado (2014), in a comparative study of Chilean and Spanish firms, maintained that firms confront a trade-off between debt maturity and bank share in the firm's ownership structure. In firms that allow banks to become stockholders, managers shorten maturity as an instrument of corporate governance. The authors further added that this decision depends on the firm's growth opportunities.

Castañeda and Contreras (2016) elaborated an empirical study based on 50 Chilean companies and concluded that debt maturity, mainly greater than a year, is concentrated mostly in large regulated companies with low growth opportunities. They add that information asymmetries tend to shorten Chilean company debt terms.

Our work extends literature on debt maturity for Chilean firms, but differs from previous studies for two reasons. First, our study measures the effect of managerial discretion on the debt maturity decision. Second, through medium-sized, small and micro-enterprise sampling, it was possible to analyze the debt maturity decision in a different context in terms of access to financing. Nearly two thirds of the samples were taken from small and micro firms, for which credit access and liquidity conditions could affect debt maturity, differing from firms listed on the stock exchange.

3. Hypotheses

The main objective of our investigation is to determine factors that affect debt maturity of chilean companies in a context of differentiated growth opportunities. The hypotheses seek to answer this question, focusing the analysis on managerial discretion, debt and agency costs.

Johnson (2003) points out that the relationship between debt term and debt will depend on the trade-off between the preference to mitigate liquidity risks or the underinvestment problem. When this relationship is positive, firms prefer to mitigate the liquidity problem over the underinvestment problem, and vice versa. In the case of Chile, given the difficulty faced by companies when accessing financing and the pressure to ensure payment, we believe that there is a preference for liquidity at the moment of acquiring the debt. A decision that results in the issuance of longer term debt. Therefore, the following hypotheses are proposed:

H1: In Chilean firms exists a positive relationship between debt and debt term.

As mentioned, Chilean firms with greater growth opportunities are mainly financed by short-term bank debt and have a high operational risk associated with them. These factors raise the risk of insolvency of the firm. Additionally, in this type of companies, there is a greater rotation of managers and ignorance about their past performance. For this reason we believe that managerial discretion may be another factor that affects the maturity of the debts contracted by firms according to the level of growth opportunities they have.

Discretionary managerial behavior can increase the risk of firm insolvency, especially if the firm lacks growth opportunities. However, Smith y Watts (1992), Collins et al. (1995) and Gaver and Gaver (1995) argue that managers associate the greatest growth opportunities with better economic compensation. According to the authors, this relationship reduces managerial discretion, allowing them to act in alignment with the corporate objectives. If conduct is aligned with business objectives, the risk of insolvency is mitigated by selecting a longer debt term. Therefore, we formulate the following hypotheses for Chilean firms:

H2: In Chilean firms exists a positive relationship between past managerial discretion and debt term.

Depending on growth opportunities, loan decisions and managerial discretion can act together on debt maturity in Chilean firms. When growth opportunities are high, the effect on the debt maturity from potential agency costs are associated with non-optimal investment policies (overinvestment/underinvestment) which may be lower relative to the costs associated with liquidity risk (Stohs and Mauer, 1996). In this case, managers can reinforce their preference for liquidity, increasing the term of the additional debt. However, when growth opportunities are low, agency costs can lead to the reduction of debt maturities in order to mitigate non-optimal investment policy problems (Myers and Majluf, 1984; Leland, 1998; Lasfer, 1999). Therefore, the following hypotheses are raised:

H3: The Chilean firms prefer to mitigate liquidity risks with respect to non-optimal investment policies.

4. Data and Methods

4.1. Data

Data used in this research was obtained from the Longitudinal Survey of Companies (ELE), prepared by Chile's Ministry of Economy, Development, and Tourism. Surveys were published in version 1 (ELE1), 2 (ELE2) and 3 (ELE3), containing qualitative and quantitative information on Chilean firms for the periods of 2007, 2009 and 2013, respectively. According to the ministry, the objective of this survey is to characterize the country's enterprises by size and economic activity, in order to identify business development determinants.

Table 1. Size and structure of firm samples.

	Firm size by net sale level				
Legal organization	Larger	Medium	Small	Micro	Total
Open corporation (OC)	149	27	18	8	202
Closed corporation (CC)	1391	618	401	195	2604
Limited liability company (LLC)	937	1044	1546	1008	4535
Individual limited liability company (ILLC)	60	67	156	119	402
Natural person (NP)	61	262	1636	4475	6434
Other structures	99	77	125	240	541
Full sample (firms)	2697	2096	3881	6045	14719
Firm size distribution (%)	18.32	14.24	26.37	41.07	100

Source: Own elaboration

The main advantage provided by the ELE is the possibility of obtaining a representative sample in terms of size and organizational structures that have not been previously studied in Chile. According to Table 1, the total sample from all three versions of the ELE is distributed over 2697 large (18.32% of the sample), 2096 midsize (14.24%), 3881 small (26.37%), and 6045 micro (41.07%) enterprises. Large enterprises are mainly public companies (open and close equity) in which ownership and corporate control are separated, while micro and small enterprises are structured mainly as limited liability companies or one-person companies in which it is possible to observe total ownership concentration in the manager.

Utilizing information contained in the all versions of the ELE, a set of relevant information was developed mainly for accounting, financing, and administration. A pooled database was compiled from 14719 companies, distributed across 6647 (ELE1), 3882 (ELE2), and 4190 companies (ELE3). Firms with incomplete records and those in the financial intermediation sector were eliminated. Table 2 summarizes the categories of variables and their measurements.

Table 2. Categories and variable measurement.

Variable	Definition
A. Agency costs	
Operating expenses to sales (AC)	Annual operating expenses to sales ratio
B. Growth opportunities	
Return on assets (ROA)	Net income to total assets ratio
C. Ownership structure (OS)	
Owner/manager	Dummy 1 if the manager is total owner and 0 otherwise

Variable	Definition
Business associate manager	Dummy 1 if the manager is an associate manager and 0 otherwise
Outsider Manager	Dummy 1 if the manager is outsider (non-owner) and 0 otherwise
D. Manager discretion (MD)	
Previous dismissal	Dummy 1 if the manager was fired from his previous managerial job
Non-operating business	Number of non-operating businesses previously managed by the manager
E. Financing and external monitoring	
Debt to equity (LEV)	Total debt to equity ratio
Monitoring of external funders (EM)	Years extension of the relationship with external funders
Debt maturity (M)	Long-term liabilities on total debt ratio
F. Other control variables	
Size (SIZE)	Natural logarithm of total assets
Holding (HD)	Dummy 1 if the firm belongs to business holding and 0 otherwise
Tangibility (TANG)	Long-term assets on total assets ratio

Source: Own elaboration.

The dependent variable of the study is the debt maturity and the variable for growth opportunities is the variable used to separate the sample into two subsamples; which are then defined.

Debt maturity. This is the dependent variable of the investigation. The debt maturity of the firm (M) is measured by the long-term debt to total debt ratio. This form of measurement has been widely used in previous studies carried out both in Chile (Azofra et al., 2004, Saona and Vallelado, 2005) and in other countries (Lasfer 1999, Mateus and Terra, 2013). Measures ranked in years as elaborated by Barclay and Smith (1995) and Jiraporn and Tong (2008) are not possible to apply without an exact record of debt maturity from the companies within the sample.

Growth opportunities. We measure the firm's growth opportunities through Returns On Assets (ROA). Danbolt et al. (2011) note that accounting indicators of actual returns such as ROA or ROE are positively and significantly correlated with measures of future firm growth (market to book equity, price to earnings per share, or Tobin's Q). The ROA is used to separate samples between firms with high and low growth opportunities as well as to verify the conditional effect of other variables on debt maturity. We calculated ROA for each company to later determine this indicator's average in each economic sector and survey. Firms with high growth opportunities possess an above-average ROA, while firms with below-average ROAs were classified as having low growth opportunities.

Control variables correspond to managerial discretion, agency costs, capital structure, external monitoring, ownership structure, assets tangibility, belonging to business holdings and firm size. These variables are detailed below.

Managerial discretion. Managerial discretion (MD) is measured by the dummy variable previous dismissal (value 1 if the manager was dismissed from his/her previous management position and 0 otherwise) and by the number of previous businesses that ceased to operate under the management of the manager. Both measures have not been evaluated in the empirical literature. Hambrick and Abrahamson (1995) and Finkelstein and Boyd (1998) point out that the measurement of managerial discretion is a complex process. But the advantage of measuring these past discretionary behaviors is that they make it possible to determine if such behaviors are mitigated or prevailing in their current companies, which will depend on the effectiveness of the implicit monitoring mechanisms of these companies. If such mechanisms are effective, these opportunistic behaviors would be mitigated, which would reduce the liquidity risk of the current company through the choice of long-term debt. Otherwise, the discretionary behavior of the manager will increase liquidity risk by encouraging the issuance of short-term debt. Finally, the effect of managerial discretion on the debt maturity will depend on the trade-off between the effectiveness of the monitoring mechanisms implicit in growth opportunities and the past discretionary behavior of the manager.

Agency costs. Agency costs (AC) are used to measure the effect of non-optimal investment policies (overinvestment/underinvestment) on debt maturity (Lasfer, 1999; Ozkan, 2000; Jiraporn and Tong, 2008; Alcock et al., 2011). This measure was proposed by Ang et al. (2000) and has been widely used in a variety of empirical studies.

Capital structure. Debt (LEV) is measured by the debt to equity ratio. As a maturity determinant, is included to quantify the preference for mitigating overinvestment/underinvestment (Flannery, 1986; Diamond, 1991; Guedes and Olper, 1996; Berger et al, 2005) or liquidity risk (Barclay and Smith 1995; Stohs and Mauer, 1996).

External monitoring. The monitoring of external financers (EM) is measured by the length of the business relationship between the company and its financiers (Ang et al., 2000; Fleming et al., 2005). The longer this term, the greater the monitoring done by external financiers. However, this variable implicitly quantifies the trust or distrust of the external financiers as to the term of payment of the funds that contribute to the financing of the company. A negative (positive) relationship between this variable and the debt maturity is indicative of commercial mistrust (trust), so that greater external monitoring will promote a reduction (extension) of such maturity.

Ownership structure Ownership structure (OS) is measured by three dummy variables associated with the role of the manager in the ownership structure (owner/manager, partner, and manager/outsider). These ownership structure variables are used to measure alignment effects (Ozkan, 2000; Jiraporn and Tong, 2008; Alcock et al, 2011) or managerial entrenchment (Datta et al, 2005; Benmelech., 2006; Harford et al, 2008; Tanaka, 2015) caused by concentration and dilution of ownership, respectively.

Assets tangibility. Tangible assets (TANG) is measured by long-term assets to the total assets ratio of the company. This measure of tangibility or maturity of the assets has been widely used by various international studies to verify if the term of the debts is matched with the maturity of the assets (Stohs and Mauer, 1996; Graham and Harvey, 2001; Scherr and Hurlburt, 2001; Ozkan, 2000, 2002; Heyman et al., 2008).

Other control variables are included such as size and whether the company belongs to a business holding, which are in line with other empirical studies.

4.2. Econometric method

To estimate the determinants of debt maturity for Chilean companies, a pooled Two-limit Tobit regression (2LTR) model was estimated. The use of the 2LTR model is justified because the debt maturity is a continuous variable censored between 0 and 1, for firms that have between 0% and 100% of long-term debt. This model is estimated by maximum likelihood (ML) and problems of efficiency associated with the estimation are corrected with the use of robust variances. The empirical model used is as follows:

$$M_{it} = \beta_0 + \beta_2 OS_{it} MD_{it} + \beta_3 AC_{it} + \beta_4 SIZE_{it} + \beta_5 EM_{it} + \beta_6 LEV_{it} + \beta_7 HD_{it} + \beta_8 TANG_{it} + \delta_0 DSector + \delta_1 DYear + \varepsilon_{it} \quad (1)$$

Where M_{it} is the variable for debt maturity, which is censored in the [0,1] interval. The OS_{it} variable measures ownership structure, defined by three dichotomous variables described in table 2. The MD_{it} variable corresponds to managerial discretion, measured by the number of previous non-operating businesses and the dummy variable for previous dismissal. The AC_{it} variable represents agency costs, $SIZE_{it}$ is the firm size measured by the natural logarithm of total assets, EM_{it} is the variable that measures monitoring of external funders, LEV_{it} is the debt to equity ratio, HD_{it} is a dummy variable assigned to a value of 1 if the company belongs to a business holding, and 0 otherwise, and $TANG_{it}$ indicates asset tangibility.

The estimated model includes dummies in order to control differences by economic sector and by time-year.

5. Empirical results

5.1. Descriptive analysis

Table 3 shows the data descriptive statistics. It is important to note that the surveys are not strictly comparable due to differences in sample size and the fact that companies are not necessarily repeated from one sample to another.

Descriptive results show that agency costs, measured by the operating expenses to sales ratio, represent 11.38%, 24.50%, and 17.75% on average, respectively. Regarding ELE1, an incremental tendency of agency costs is shown towards other surveys.

From ELE1, we observe that the percentage of companies managed by their owners falls from 35.71% to 18.15%, while those with an outsider manager increases from 27.23% to 45.19%. This is due to the fact that in ELE1 sampling design, small and micro enterprises have greater participation, while large enterprises are most likely to participate in ELE3. Regarding 2007, the proportion of companies managed by an owner/manager fell to 14.07% in 2009 and 17.56% in 2013. Accordingly, we observed lower managerial ownership, with figures ranging from 52.57% equity in ELE1 to 35.45% in ELE3. This fact is related to the greater agency costs described previously.

Measures of managerial discretion for 2007 indicate that 5.86% of current company managers were dismissed from their previous managerial job and/or 1.33 companies stopped operating under their previous management. This first proportion dropped to 2.89% and 1.51% for 2009 and 2013, respectively, while the second figure fell from 0.39 to 0.25. This may be due to the increased participation of large enterprises in ELE3.

As the managers are contracted for current managerial jobs, the history of discretion behavior could be offset by restriction mechanisms imposed by the manager himself to improve his discretion, or by means of internal monitoring by owners. This variable captures two expected potential effects on debt maturity given past history. On one hand, a negative ex-ante effect will be defined, marked by the dominance of past managerial discretion on their current behavior. On the other hand, positive ex-post effects are defined and outlined by internal monitoring mechanisms, and restrictions are set by managers for their current performance. It was anticipated that the trade-off between both of these would define the final effect on debt maturity.

Table 3. Descriptive Statistics.

Variables	2007		2009		2013	
	Mean	S.D.	Mean	S.D.	Mean	S.D.
A. Agency costs						
Operating expenses to sales (%)	11.38	15.74	24.50	21.12	17.75	18.30
B. Ownership structure						
Owner/manager (%)	35.71	49.60	21.64	41.21	18.15	38.54
Business associate manager (%)	38.04	48.66	41.05	49.29	36.63	48.18
Outsider Manager (%)	27.23	45.85	38.29	47.47	45.19	49.77
C. Manager discretion						
Previous dismissal (%)	5.86	22.49	2.89	12.64	1.51	12.21
Non-operating business	1.33	1.44	0.39	0.93	0.25	0.65
D. Financing and external monitoring						
Debt to equity	1.45	2.14	1.52	2.13	2.09	2.56
Monitoring of external funders	12.82	12.54	12.65	10.16	16.33	11.56
Debt maturity	16.63	28.81	17.01	28.16	19.72	28.96
E. Other control variables						
Firm size (Total assets, Million $)	20443	338402	150163	816120	168401	683462
Holding (%)	13.57	34.25	21.52	41.10	29.37	45.55
Tangibility (%)	28.56	27.62	29.31	26.67	22.65	26.05

Source: Own elaboration.

Regarding capital structure, it is observed in aggregate terms that Chilean companies mostly use debt as a financing source in relation to equity; this debt is mainly short-term. Firms maintain commercial relations with external funders who play a monitoring role for companies and their management. This relationship ranges between 12 and 16 years on average.

Results also show that most Chilean companies do not belong to business holdings and tend to adopt an important proportion of long-term assets (tangibility), although not primarily in their accounting structure.

5.2. Univariate analysis for growth opportunities

In this section, we will conduct non-parametric tests aimed at verifying the differences in company samples according to their growth opportunities.

Growth opportunities were measured using Return on Assets (ROA). Since the ELE only provides accounting data and not market data, this proxy may impose a limitation. However, Danbolt et al. (2011) note that accounting indicators of actual returns such as ROA or ROE are positively and significantly correlated with measures of future firm growth (market to book equity, price to earnings per share, or Tobin's Q). This justifies the use of this proxy.

For characterization of each company, based on said quality, we calculated ROA for each company to later determine this indicator's average in each economic sector and survey. Firms with high growth opportunities possess an above-average ROA, while firms with below-average ROAs were classified as having low growth opportunities. By this criterion, the original sample was divided into 6,917 companies with high growth opportunities (2,984 companies from ELE1, 1,817 from ELE2 and 2,116 from ELE3) and 7,802 with low growth opportunities (3,663 companies from ELE1, 2,065 from ELE2 and 2074 from ELE3).

Separating samples according to growth opportunities is based on the approaches of Jensen (1986) and Barclay and Smith (1995). Companies with high growth opportunities are characterized by a high ownership concentration. This aspect acts by monitoring managerial discretion, which may implicitly affect the debt maturity decision. Furthermore, Muñoz and Sepulveda (2016) corroborated this idea and added that for firms with low growth opportunities, internal monitoring is less effective on agency costs, leading greater company debt.

The results from Table 4 indicate differences between the groups of companies. Despite differences in company sizes, the Wilcoxon test results are cross-sectional with each of the ELE surveys.

It was noted that firms with high growth opportunities have lower agency costs with respect to companies with low growth opportunities. Differences between operating expenses to sales ratio are significant at 1%. These results are consistent with Jensen (1986) in the sense that firms with low growth opportunities have a greater incentive to incur agency costs associated with overinvestment.

Table 4. Wilcoxon test, mean differences by growth opportunity level.

Variables	2007			2009			2013		
	High	Low	z	High	Low	z	High	Low	z
A. Agency costs									
Operating expenses to sales (%)	11.55	12.91	(-4.26)***	23.43	26.38	(-4.94)***	15.24	19.47	(-9.80)***
B. Ownership structure									
Owner/ manager (%)	52.18	24.96	(24.43)***	40.16	17.04	(19.13)***	39.62	9.85	(21.58)***
Business associate manager (%)	32.26	40.03	(-5.85)***	38.57	41.11	(-2.06)**	31.26	34.86	(-3.80)***
Outsider Manager (%)	15.56	35.01	(-21.49)***	21.27	41.85	(-17.03)***	29.12	55.29	(-22.89)***
C. Manager discretion									
Previous dismissal (%)	8.47	4.45	(6.35)***	2.44	1.51	(2.9)***	2.36	0.94	(4.48)***
Non-operating business	1.32	1.35	(-0.31)	0.37	0.41	(-1.02)	0.28	0.21	(1.58)
D. Financing and external monitoring									
Debt to equity	1.17	1.63	(-8.88)***	1.24	1.77	(-8.56)***	1.81	2.70	(-9.93)***
Monitoring of external funders	10.96	14.84	(-13.79)***	10.84	14.54	(-14.60)***	14.87	17.31	(-8.13)***
Debt maturity	12.73	21.20	(-12.86)***	10.48	20.91	(-15.43)***	15.15	22.59	(-10.77)***

Variables	2007			2009			2013		
	High	Low	z	High	Low	z	High	Low	z
E. Other control variable									
Firm size (Total assets, MM$)	9113	28303	(-3.33)***	10919	237292	(-4.28)***	21692	301479	(-5.77)***
Holding (%)	6.36	19.89	(-20.92)***	10.23	29.40	(-21.23)***	16.32	38.10	(-21.66)***
Tangibility (%)	22.81	33.25	(-16.74)***	24.22	33.13	(-12.87)***	21.33	23.50	(-6.44)***

Superscripts ***, **, * indicate statistical significance at 1%, 5%, and 10%, respectively.
Source: Own elaboration.

Regarding ownership structure, we find that firms with high growth opportunities are managed to a greater extent by their owners. On the other hand, firms with low growth opportunities are managed by a manager with partial ownership (partner) or an outsider. Differences in management proportions and company control are significant at 1%. This supports Jensen (1986), Fleming et al. (2005), and Muñoz and Sepulveda (2016) in the sense that firms with low growth opportunities are more likely to incur high agency costs when a greater degree of separation exists between ownership and corporate control.

Statistically significant differences were also observed regarding debt. We note that firms with low growth opportunities have a higher level of leverage and a more extensive relationship with external funders with respect to firms with higher growth opportunities. Therefore, consistent with Jensen (1986), companies tend to be monitored by financial institutions and/or external creditors as their investment projects are limited. Furthermore, firms tend to be financed mostly through short-term debts, although firms with high growth opportunities have lower debt maturity.

Managerial discretion variables indicate that firms with high growth opportunities have higher proportions of managers who were dismissed from their previous managerial jobs. This result shows the possibility of such firms to hire these outsiders using a costly approach to monitor and control their discretionary behavior. Meanwhile, the variable representing the number of previous non-operative businesses does not differ significantly between firms with high or low growth opportunities.

Results for the tangibility variable reveal that, on average, there is a higher level of this kind of assets in firms with low growth opportunities.

For the other control variables, such as size (using total assets as a proxy, measured in millions of pesos), we observed that companies with low growth opportunities are usually larger companies. Additionally, we find that there are a higher proportion of companies with low growth opportunities that belong to holdings. This difference is significant at 1%.

5.3. Tobit regression analysis

It was concluded in the previous section that growth opportunities affect Chilean companies' financing policies. Companies with low growth opportunities are characterized by having diluted ownership structures, higher agency costs, and being larger companies. These factors induce higher leverage, thus weighing on the financial decision of debt terms.

Regression results from specification (1), specifically marginal effects, are presented in Tables 5 and 6 for companies with high and low growth opportunities, respectively. All model specifications control differences by economic sectors and time-year through dummy variables.

First, we analyzed firms with high growth opportunities, as described in Table 5. If agency costs increase by 1%, debt maturity (long-term debt) is reduced between 2.98% to 6.11% according to the model specifications. Firms with higher agency costs reduce debt maturities, a result that is consistent with previous research (Barclay and Smith, 1995; Barclay and Smith, 1996; Leland, 1998; Lasfer, 1999; Jiraporn and Tong, 2008; Alcock et al, 2011). In addition, larger companies lengthen debt maturities. When firm size increases by 1%, the long-term debt that quantifies the financing maturity increases between 1.39% and 1.79%.

A significant and positive relationship was found between debt maturity and debt level. When debt increases by $1 respect to equity, debt maturity (long-term debt) increases between 1.09% and 1.31%. This support hypothesis H1 and proves that firms prefer longer debt maturities. Johnson (2003) argues that by including debt as a determinant of maturity, positive relationships found are synonymous with firm preference to mitigate liquidity risk or increase firm's credit quality. This evidence is supported through the results obtained by Barclay and Smith (1995, 1996) and Stohs and Mauer (1996). Therefore, for Chilean companies with high growth opportunities, costs associated with liquidity risk are greater than those generated from underinvestment problems.

At a significance level of 1%, a direct relationship was found between debt maturity and asset tangibility. We note that if long-term assets increase by 1%, long-term debt increases between 6.20% and 7.16%. These results corroborate previous studies (Stohs and Mauer, 1996; Graham and Harvey, 2001; Scherr and Hulburt, 2001; Ozkan, 2000, 2002; Heyman et al, 2008). Chilean companies with high growth opportunities match the maturity for assets and debts to mitigate short-term insolvency risks associated with potential agency problems.

External monitoring is not a relevant variable for the debt term decision of companies with high growth opportunities.

An inverse and significant relationship is observed between debt maturity and firms belonging to business holdings. If the firm belongs to a business holding, debt maturity (long-term debt) is reduced between 1.37% and 2.38%. Chilean firms establish a financial hierarchy based on internal capital market to business holdings, with lower funding costs and less restrictive contracts when compared to foreign markets. Our results support findings by Azofra et al. (2004) and suggest that firm financial deficits are financed by internal loans to business holdings. If the firm needs additional resources, it will issue debt with lower financing costs and short-term maturities. This result implicitly mitigates the potential effect of underinvestment, suggesting compliance with the pecking order theory (Myers, 1977; Myers and Majluf, 1984).

It can be seen that firms with high growth opportunities, managed by their owners, have shorter debt maturities (debt maturity is reduced between 1.16% and 1.56% in this type of ownership structure) when compared to those managed by a partner, in which case the debt term increases significantly (between 1.11% and 1.77% in this type of ownership structure). This result contends that ownership concentration reduces debt maturity, confirming international results contributed by Ozkan (2000), Jiraporn and Tong (2008), Alcock et al. (2011), Azofra et al. (2004), and Saona and Vallelado (2005) for the Chilean market. Additionally, it also demonstrates the effects of managerial entrenchment on debt maturity (Datta et al., 2005; Benmelech, 2006, Harford et al., 2008; Tanaka, 2015).

Table 5. Tobit regression, debt maturity in firms with high growth opportunities.

Variable	Models					
	(1)	(2)	(3)	(4)	(5)	(6)
Owner/manager	-0.0116 (-2.47)**			-0.0156 (-2.31)**		
Business associate manager		0.0111 (2.71)***			0.0177 (2.35)**	
Outsider Manager			-0.0036 (-0.74)			-0.0027 (-0.71)
Previous dismissal	0.0140 (3.06)***	0.0147 (2.93)***	0.0161 (3.45)***			
Non-operating business				0.0129 (3.19)***	0.0099 (3.63)***	0.0079 (2.91)***
Operating expenses to sales	-0.0316 (-3.65)***	-0.0611 (-3.91)***	-0.0298 (-4.17)***	-0.0562 (-4.15)***	-0.0519 (-4.01)***	-0.0549 (-3.84)***
Size	0.0139 (17.35)***	0.0151 (20.48)***	0.0147 (21.03)***	0.0161 (8.34)***	0.0177 (9.73)***	0.0179 (11.37)***
Monitoring of external funders	-0.0001 (-0.20)	-0.0001 (-0.29)	-0.0001 (-0.45)	-0.0001 (-0.29)	-0.0002 (-0.62)	-0.0001 (-0.44)
Debt to equity	0.0117 (19.22)***	0.0118 (17.35)***	0.0131 (17.44)***	0.0109 (9.01)***	0.0124 (8.52)***	0.0110 (9.11)***
Holding	-0.0164 (-3.44)***	-0.0137 (-3.26)***	-0.0155 (-3.52)***	-0.0229 (-3.13)***	-0.0220 (-2.93)***	-0.0238 (-3.53)***
Tangibility	0.0716 (14.84)***	0.0711 (14.77)***	0.0703 (14.82)***	0.0642 (7.03)***	0.0651 (7.34)***	0.0620 (6.86)***
Test 1	(11.74)***	(18.14)***	(7.98)***	(13.02)***	(15.29)***	(16.95)***
Observations (firms)	6917	6917	6917	6917	6917	6917
Dummy sector	Yes	Yes	Yes	Yes	Yes	Yes
Dummy year	Yes	Yes	Yes	Yes	Yes	Yes
Pseudo R^2	0.34	0.39	0.37	0.44	0.46	0.43

Estimated by maximum likelihood and use of robust variances. Marginal effects. Z-statistics in brackets.
Superscripts ***, **, * indicate statistical significance at 1%, 5%, and 10%, respectively.
Source: Own elaboration.

The variable numbers of non-operating businesses and previous dismissal, measuring past managerial discretion, have positive and significant effects on debt maturity. The fact that the manager was dismissed from his previous managerial work increases the debt maturity (long-term debt) between 1.40% and 1.61%, while for each business that stopped operating because of his managerial management in other companies, debt maturity increases between 0.79% and 1.29% in its current company. This support hypothesis H2. These unprecedented results show that in firms with high growth opportunities, internal monitoring mechanisms, or self-imposed restrictions by administrators, dominate past managerial discretions, increasing debt terms. At the moment of current debt issue, this evidence supports the hypothesis that these managers prefer the liquidity of the firms.

We include the effect of agency costs in Test 1, which measures the null hypothesis $H_0: \beta_2 + \beta_6 + \beta_3 > 0$. This hypothesis compares the preference for liquidity in the debt decision and discretionary management in relation to effects of agency costs on debt maturity. As observed, this test is rejected at 1% for all specifications. Firms with high growth opportunities have a greater tendency to reduce debt maturity. Such actions constitute a greater preference for mitigating overinvestment problems in relation to liquidity risk. Thus, the hypothesis H3 cannot be sustained.

Secondly, we analyze Table 6, which provides results for companies with low growth opportunities.

Results show that debt, firm size, and asset tangibility positively and significantly affect debt maturity. However, the factors of agency costs and companies belonging to holdings significantly reduce debt terms. These results are similar to those shown for firms with high growth opportunities. Now, the positive effect of debt on debt maturity supports the hypothesis H1. Regardless of growth opportunities level, firms extend the debt-term as a way to mitigate liquidity risk.

Another similar and transverse result for growth opportunities is ownership structure. Ownership concentration significantly reduces debt terms, while dilution extends them. However, the manager being an outsider has no impact on debt maturity.

External monitoring has a negative and significant relationship with debt maturity. External funders who monitor companies with low growth opportunities tend to mitigate risk on debts issued by inducing shorter-term debts. Such an action corroborates approaches by Billett et al. (2007), Jiraporn and Tong (2008), and Alcock et al. (2011), as reducing debt maturity has a mitigating effect similar to the effect that restrictive debt contract covenants have on debt agency costs.

Table 6. Tobit regression, debt maturity in firms with low growth opportunities.

Variable	Models					
	(1)	(2)	(3)	(4)	(5)	(6)
Owner/manager	-0.0182			-0.0203		
		(-5.77)***			(-3.75)***	
Business associate manager		0.0606			0.0193	
		(3.91)***			(4.12)***	
Outsider Manager			-0.0005			-0.0015
				(-0.09)		(-0.23)
Previous dismissal	-0.0071	-0.0190	-0.0087			
		(-0.88)	(-1.16)	(-1.02)		
Non-operating business				-0.0014	-0.0019	-0.0017
				(-0.84)	(-0.92)	(-1.03)
Operating expenses to sales	-0.0538	-0.1035	-0.0521	-0.0361	-0.0366	-0.0349
	(-8.83)***	(-8.95)***	(-8.49)***	(-3.46)***	(-3.63)***	(-3.29)***
Size	0.0120	0.0014	0.0133	0.0138	0.0147	0.0157
	(21.98)***	(26.45)***	(26.28)***	(9.74)***	(8.26)***	(12.44)***
Monitoring of external funders	-0.0039	-0.0025	-0.0036	-0.0186	-0.0131	-0.0149
	(-2.33)**	(-2.95)***	(-2.46)**	(-3.32)***	(-2.91)***	(-2.84)***
Debt to equity	0.0119	0.0121	0.0120	0.0119	0.0139	0.0123
	(23.49)***	(23.71)***	(23.58)***	(11.78)***	(10.92)***	(11.78)***

Variable	Models					
	(1)	(2)	(3)	(4)	(5)	(6)
Holding	-0.0090	-0.0059	-0.0088	-0.0124	-0.0106	-0.0162
	(-3.22)***	(-2.09)**	(-2.99)***	(-2.84)***	(-2.33)**	(-3.85)***
Tangibility	0.0807	0.0803	0.0799	0.0723	0.0893	0.0717
	(21.88)***	(21.93)***	(22.12)***	(9.78)***	(8.95)***	(9.35)***
Test 1	(21.92)***	(15.51)***	(17.38)***	(17.99)***	(16.46)***	(19.27)***
Observations (firms)	7802	7802	7802	7802	7802	7802
Dummy sector	Yes	Yes	Yes	Yes	Yes	Yes
Dummy year	Yes	Yes	Yes	Yes	Yes	Yes
Pseudo R^2	0.31	0.33	0.34	0.35	0.36	0.33

Estimated by maximum likelihood and use of robust variances. Marginal effects. Z-statistics in brackets.
Superscripts ***, **, * indicate statistical significance at 1%, 5%, and 10%, respectively.
Source: Own elaboration.

Managerial discretion variables, previous dismissal, and the number of non-operating businesses have no statistically significant effects on debt maturity. This result does not support hypothesis H2. Regarding this, at a significance level of 1%, Test 1 is rejected. This result, similar to what has been previously observed for firms with high growth opportunities, indicates that the net effect of the debt decision and agency costs promotes debt term reduction. This result does not support hypothesis H3.

6. Conclusions

Debt maturity in Chilean companies is an area with many points of view to be studied, mainly because of its relevance in corporate decisions. There is a vast amount of international literature that analyzes debt maturity determinants. However, there are very few studies in Chile on this topic, and none have characterized the impact of managerial discretion on these decisions.

Despite the difficulty of measuring managerial discretion, our research provides unprecedented evidence for the Chilean market about the role of this factor on debt maturity, conditioning its effects according to firm growth opportunities.

Results suggest that the effect of managerial discretion on debt terms depends on whether or not companies have growth opportunities. When firms have high growth opportunities, managerial discretion promotes longer debt maturities. This reveals two essential aspects about managerial behavior. On one hand, it shows the mechanisms of internal monitoring or self-imposed restrictions by managers to promote improvement of past discretionary behavior, directly affecting debt maturity. On the other hand, this managerial decision demonstrates a preference to mitigate the liquidity risk in relation to shortening debt terms to mitigate the overinvestment problem.

No statistically significant results of managerial discretion on debt maturity are observed for firms with low growth opportunities.

Another important result is related to the effects of monitoring by external funders. In firms with high growth opportunities, monitoring by external funders has no significant effect on debt maturity, and when opportunities are low, such monitoring has a negative effect. These results suggest that external funders exchange their monitoring role for internal company mechanisms or self-imposed restrictions by managers when firms have high growth opportunities. Thus, external funders mitigate risks related to company funds by inducing shorter debt maturities. Such an effect is similar to the role of restrictive clauses in debt contracts (Billett et al., 2007).

Our research also provides evidence supporting previous studies, regardless of firm growth opportunity levels. This evidence is related to the impact of agency costs, whether the company belongs to business holdings, firm size, debts, and asset tangibility.

Agency costs and pertinence to business holdings have a negative effect on debt maturity. In the first case, firms with higher agency costs shorten debt maturity as a way to mitigate overinvestment problems. In the second case, firms belonging to business holdings develop internal markets where they obtain financing under shorter terms and at a lower cost. This action mitigates underinvestment effects and supports compliance with hierarchical funding. These findings corroborate the results of Azofra et al. (2004) and Saona and Vallelado (2005).

Debt levels, firm size, and asset tangibility are variables that positively and significantly affect debt maturity. In the case of debt, our results support the conclusions of Barclay and Smith (1995), Stohs and Mauer (1996), and Johnson (2003) that firms are financed with longer debt terms to avoid insolvency. Additionally, asset tangibility effects confirm that companies match assets and liabilities for the same reason.

From the point of view of corporate decisions, our research has marked implications. Firstly, firms decide debt maturity by accounting for the difficulties imposed by overinvestment, underinvestment, and liquidity risks. Close to 82% of the sample correspond jointly to medium, small, and micro enterprises which, because of their size, are financed under shorter debt terms. For these companies, decisions appear to be dominated by preferences of avoiding liquidity risk. However, the agency costs would force companies to reduce debt-term to control potential problems on investment policy (overinvestment/underinvestment). This result is transversal to growth opportunities.

Secondly, growth opportunities determine the effects of managerial discretion on debt maturities. Firms with high growth opportunities and internal monitoring discipline managers, while in firms with low opportunities, monitoring is performed by external funders in shorter terms.

Finally, we suggest extending empirical literature on Chilean markets through two future investigations. First, it would be interesting to further analyze the relationship between managerial discretion and corporate decisions as well as how these factors affect company performance. Secondly, analyzing the effects of liquidity risk on corporate decisions is another niche that may concentrate an interest for future research.

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Ecos de Economia is an international journal of applied economics, with a particular interest in the quantitative analysis of economic, financial, and public policy issues and/or themes related to Latin America. Articles that include and analyze national data are particularly welcome, since these data are often unavailable to international researchers outside the region. The journal is not interested in manuscripts that are solely conceptual in nature.

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