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Felipe Beltrán
David Coble

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Agustinas 1180, Santiago, Chile
Teléfono: (56-2) 3882475; Fax: (56-2) 38822311

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Monetary Policy Surprises on the Banking Sector: the Role of the Information and Pure Monetary Shocks*

Felipe Beltrán†
Central Bank of Chile

David Coble‡
Central Bank of Chile

Abstract

This paper analyzes how monetary policy surprises in Chile affects the real and financial sector separating between a pure monetary policy shock and an information shock. Using inter-day movements of futures of interest rate in the banking system, we identify an information shock when labor data is released and a pure monetary policy shock when the central bank reveals their interest rate decision, and their effects are quantified through an external vector autoregression model. Our results suggest that a pure monetary policy shock produce an appreciation of nominal exchange rate, and contractionary effects on the economy. However, an information shock does not necessarily produce adverse effects. This paper contribute to the literature in two dimensions: studying the effect of the main driver behind the central bank announcements, and their transmission to the banking sector and consequently to the real and monetary sector.

Resumen

Este documento estudia cómo las sorpresas de política monetaria en Chile afectan el sector real y financiero, separando el movimiento de tasa de interés entre un shock monetario puro y uno de información. Usando movimientos de alta frecuencia de tasas de interés del sistema bancario, identificamos un shock de información en base a la publicación de nuevos datos laborales, mientras que el shock monetario puro se construye en base a anuncios del Banco Central. Cuantificamos su impacto relativo a través de un proxy-SVAR, cuyos resultados sugieren que un shock monetario puro produce una apreciación del tipo de cambio nominal y efectos contractivos en la economía. Sin embargo, un shock de información no necesariamente produce efectos adversos. Estos hallazgos contribuyen a la literatura a identificar el driver específico detrás del movimiento de tasas de la autoridad monetaria, su transmisión al sector bancario y consecuentemente sus efectos en el sector real y monetario.

* The views expressed are those of the author and do not necessarily represent the views of the Central Bank of Chile or its board members.

† fbeltran@bcentral.cl

‡ dcoble@bcentral.cl

1 Introduction

Central bank announcements are relevant as these show the reasons and the underlying information for the decision-making process of policymakers. The literature on monetary policy primarily focuses on the effect of a general shock associated with surprises in the monetary policy rate (MPR) and its transmission to the rest of the economy. However, this approach may need to be revisited to understand the actual reasons behind the central bank reaction (Hoek, Kamin, and Yoldas (2022)). In this paper, we attempt to disentangle the effects of two types of shocks behind the monetary policy surprise: a "pure" monetary policy component associated with the standard policy shock that negatively affects prices and activity; and an "informational" component of the shock, which responds to other macroeconomic data releases. We postulate that the effects of an unexpected monetary policy tightening may have different effects on the economy, depending on the underlying reason of the shock.

Lately, the literature has renewed its interest in these types of questions. One strand uses new identification methodologies that provide SVAR models with external instruments (also known as Proxy-SVARs). These papers use central bank statements and high-frequency variable movements around these announcements as an exclusion condition for identification of monetary policy shocks (See for example, Gertler and Karadi (2015) and Jarociński and Karadi (2020)). Even though the literature has undoubtedly advanced in recent years, interest rate surprises can reflect deviations from a central bank's usual policy actions and simple reactions to the central bank's assessment of the economic outlook. In the first case, an expansionary surprise should positively affect activity. In contrast, in the second, it may be contractionary if the central bank forecasts a pessimistic economic outlook. The external instruments method commonly used in the literature needs to differentiate between these two channels, which can lead to conflicting effects on economic activity and may result in empirical puzzles.

This paper aims to add to the existing literature on the topic by exploiting information on changes in interest rate expectations around the time of both central bank announcements and macroeconomic data releases. Combining these two events allows us to distinguish between the pure monetary policy shock and information components within the same surprise. For this purpose, we use the Chilean economy as a case study and employ the movements of the 90-day banking lending rate around the releases of the Central Bank of Chile's statement and the employment data release provided by the National Bureau of Statistics as instruments. We use a similar econometric approach undertaken by Nunes, Ozdagli, and Tang (2022), and Lakdawala (2019). The second objective of this paper is to understand the effects of these shocks on the financial sector. In particular, its effects on credit growth and non-performing loans. Depending on the origin of the shock, a pure contractionary monetary policy shock is expected to reduce the growth of credit and worsen

the measure of non-performing loans. On the other hand, if the contractionary shock is due to, say, a better outlook of future economic activity, it may not be as contractionary, or even it could be expansionary on the credit market activity.

In this paper, we use an extended version of a Proxy-SVAR model developed by Gertler and Karadi (2015), containing two instruments, one for each policy shock. The identifying assumption relies on the fact that monetary policy statements are generally announced on different days than macroeconomic data releases of employment, except for rare coincidences. In particular, we attribute the pure monetary policy component of the shock to those that can move the 90-day lending rate near the policy announcement. On the other hand, the information component is identified as those that affect the same 90-day lending rate but around the employment data release. Only in a handful of cases do both dates coincide, days in which we assign the full effect to the pure monetary policy shock.

Our results align with economic theory and solve some counter-intuitive results found in previous studies for Chile (Aruoba, Fernández, Guzmán, Pastén, and Saffie (2021)). First, a pure monetary policy shock has contractionary and persistent effects on activity, prices, and credit growth. At the same time, it appreciates the domestic currency against the US dollar and worsens non-performing loan risks. This finding is consistent with the standard macroeconomic theory for small open economies with free-floating exchange rates and minimal capital markets intervention. Second, the information component of the monetary policy shock has very different but expected results. A contractionary informational shock does not necessarily negatively affect the economy and, if any, has minimal effect. This evidence is consistent with the role of cyclical attenuation of the monetary policy and the findings of Nakamura and Steinsson (2018), which demonstrate the tendency for analysts to change their growth projections higher in response to unforeseen increases in real yields, which we interpret as proof of the information effect. When the central bank tightens its policy, which occurs for "good reasons," it contributes to offset, at least partially, the effects of demand shocks.

This paper is organized as follows. Section 2 considers recent literature and how we add to existing published works; section 3 shows the econometric methodology and the data used in this paper. Section 4 shows results and robustness checks for the analyses. Finally, section 5 summarizes and gives concluding remarks.

2 International evidence and the Chilean case

In the last few years, some authors have studied the effects of monetary policy surprises on the economy, but separating them between two components: an informational shock and a pure monetary policy shock (see, for instance Nunes et al. (2022), Hoek et al. (2022), Eterovic and Eterovic (2022), and Ciminelli, Rogers, and Wu (2022)). The informational shock is a monetary policy surprise related to a revision to the macroeconomic outlook. Participants in the market might perceive announcements of restrictive (stimulative) monetary policy as the central bank's response to a better (deteriorating) economic prediction,

potentially leading to increased optimism (gloominess) concerning the overall macroeconomic outlook. On the other hand, the pure monetary policy shock responds to the needed action from central banks to curve inflation. Both types of shocks are combined in the same surprise, but their effects may significantly differ. In this paper, we study the effects of monetary policy surprises, separating the effects of information and pure monetary policy shocks in the Chilean economy. In particular, our research differs from previous studies in that it focuses on the effects of these components on the banking market.

Even though plenty of papers study the effects of monetary policy on the Chilean economy, none of these make a case for this differentiation (for example, Calvo and Mendoza (1998), Parrado (2001), Chumacero (2005)). The present study postulates that disentangling both shocks may contribute to explaining facts that are difficult to comprehend. For instance, Figure 1 shows that there is generally no clear pattern to aggressive monetary policy interest rate movements on employment, nominal exchange rate, and inflation. In particular, except for the 2007 episode, the unemployment rate improves after aggressive interest rate hikes, which appears to be counter-intuitive. Moreover, the nominal exchange rate shows a downward trend, consistent with an appreciation pattern excluding the 2001 episode, while the consumer price index slowed down only in 2007. This evidence suggests another factor influencing the economy that may still need to be accounted for.

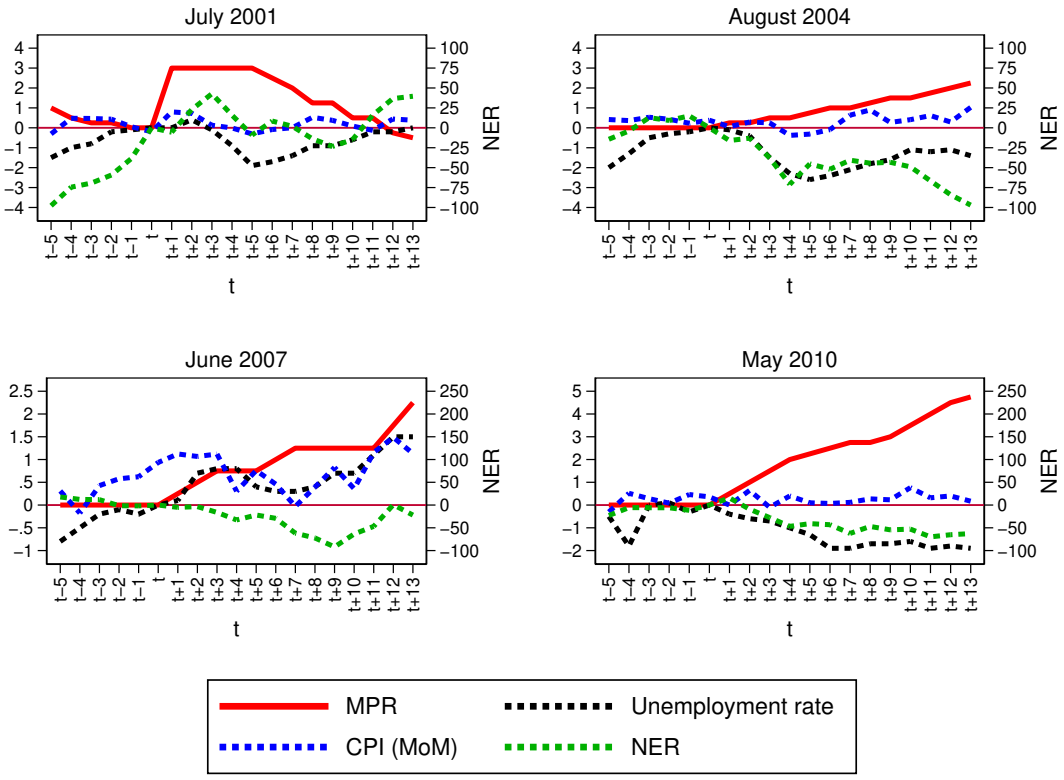

Figure 1: MPR hikes in Chile

Notes: Time is measured in months after (before) the MPR hikes starting at t. All variables are measured as simple differences with respect to their level at t (except CPI). MPR (Monetary policy rate) is the nominal interest rate set by the Central Bank of Chile. The unemployment rate is the percentage of unemployed people in the labor force. NER (Nominal exchange rate) is the nominal value of one USD in Chilean pesos. CPI (MoM) indicates a month-over-month change in the price of goods and services.

Most recently, there have been further efforts to identify the information channel of the monetary policy impacts in Chile. Pescatori (2018), for example, uses a proxy-SVAR identification approach and finds that monetary policy contractions through the communication channel of the central bank have exerted significant adverse effects on economic activity and produced appreciations of the exchange rate. In turn, González and Tadle (2020) analyze the text in central bank press releases and constructs a sentiment score index that helps predict future monetary policy movements. Their results suggest that their index anticipates the movements of the interest rate by about twelve months but has yet to have a lasting impact on economic indicators. Finally, and most related to the empirical approach of this paper, Aruoba et al. (2021) use a Bayesian VAR with external instruments, using monetary policy surprises based on a Bloomberg survey of financial market participants. They find that monetary policy surprises negatively affect activity, consumer prices, and funding costs but depreciate the domestic currency. The effect on the exchange rate is counter-intuitive, which could also be explained by an information shock of the monetary surprise.

To the best of our knowledge, the specific drivers behind central bank announcements: information, and pure monetary policy shocks, still need to be examined for the Chilean economy. We fill this gap by proposing a methodology that allows us to disentangle both components by exploiting the fact that central bank announcements and employment data are released on different days within a month. The identifying assumption is that the change in the 90-day lending rate the day after the announcement is only due to either the monetary policy statement for the pure monetary policy shock or the employment data release. This methodology avoids utilizing other measures of monetary policy surprises employed in previous studies, such as a two-week interval market expectations survey. [1]

3 Methodology and data

3.1 Econometric approach

To estimate the dynamic response of real and financial variables to pure monetary policy and information shocks, we use a VAR model with external instruments. Stock and Watson (2012) and Mertens and Ravn (2013) were the first authors to use this method that utilizes the assumption that data from an external variable (the instrument) that is correlated with a specific shock of interest but uncorrelated with other shocks is available. In this subsection, we describe procedure:

As in Gertler and Karadi (2015), consider Y_t a vector, X and C_j $\forall i \geq 1$ coefficient matrices. Then, the structural form of the VAR model is given by:

$$XY_t = \sum_{i=1}^{p} C_i Y_{t-i} + \epsilon_t \tag{1}$$

The components of the error term ϵ_t are assumed to be orthogonal to each other and interpreted as structural shocks. Then, provided X is invertible, we pre-multiply by X^{-1} we have the reduced-form VAR given by:

$$Y_t = \sum_{i=1}^{p} B_i Y_{t-i} + u_t \tag{2}$$

Keep in mind that the residuals u_t contain both the information and pure monetary policy components and are both zero-mean with covariance matrix Ω=E$[u_t u_t]$. Since we are interested in the impact of each element of the structural shock, we need to focus on the elements of the first column of X^{-1}. Since we are interested in the impulse-response

[1] This type of measure could lead to biased conclusions as the time window it operates may contaminate the identification assumption of the instrument. In addition, surveys used to construct these come from sources such as Bloomberg or financial surveys from the central bank (i.e., Economic Expectation Survey and Financial Operators Survey); historical respondents constantly change, which could lead to responses that are not comparable over time.

function of the external instrument shocks, we need to estimate the following:

$$Y_t = \sum_{i=1}^{p} B_j Y_{i-j} + x_k^{-1} e_{k,t} \tag{3}$$

The first column of x_k contains the parameters of interest that quantify the impact of the pure monetary policy and the information shocks.

The essential requirements in the external instruments methodology are to find instruments that satisfy two conditions. First is the relevance condition, which states that the instrument must be correlated with the shock of interest (in this case, shocks related to the monetary policy actions). Second, the exclusion condition indicates that the instrument must be uncorrelated with other structural shocks (shocks to all the other variables except to the monetary policy) (Lakdawala (2019)). Consider Z_t a vector of external instruments and ϵ_t^{iv} a vector of shocks that only includes the monetary policy shock. To obtain a valid instrument set for shock-related instrumental variables, Z_t must correlate with ϵ_t^{iv} but be orthogonal to any other structural shock:

$$E(Z_t \epsilon_t^{iv}) = \delta \tag{4}$$

$$E(Z_t \epsilon_t^{q}) = 0 \tag{5}$$

In the case of this paper, we use two instruments, one for each component of the shock. Since we exclude days when employment data releases coincide with central bank announcements, the procedure is the same as in the single-instrument case to obtain the impulse response functions.

There have been other approaches used in the literature to separate the two components of the monetary policy shock, such as VAR models with sign restrictions (see for example, Pinchetti and Szczepaniak (2021), Hoek et al. (2022), Ciminelli et al. (2022)). However, two major disadvantages are associated with this methodology when applied to this context and specific research question. First, a pure monetary policy shock whose sign has been restricted to have negative effects on activity could also have been caused by several other reasons, such as movements in commodity prices, foreign activity, or variables omitted from the model but which are quantified by the shock. Second, an information shock that has been sign restricted to having a positive impact on the stock market would be contrary to the body of research showing that interest rate increases cause increases in the discount rate for future dividends, which would harm the stock market, even if the rate increase is justified. (Burger, Warnock, and Warnock (2017), Iacoviello and Navarro (2019)).

The identifying restrictions of our paper is based on a different set of assumptions. We assume the monetary policy shock exclusively occurs within a small time window after the central bank announcement. As in Nunes et al. (2022), this hypothesis allows us to use the changes in expected official rates measured close to the main macroeconomic events as an external instrument for exogenous changes in the systematic component of monetary

policy only. Then, this allows us to isolate the effect of central bank information shocks from the effects of pure monetary shocks, both of which provide interest rate surprises around the announcement.

3.2 External instruments for pure monetary policy and information shocks

This first instrument is the bank interest rate change between 30-89 days in a one-day window around the central bank announcement. As in Nunes et al. (2022), this instrument captures the change in the expected average banking system rate level over the third calendar month out from the day of the announcement, a horizon that typically also covers the following central bank meeting and thus captures near-term forward guidance Gertler and Karadi (2015) Jarociński and Karadi (2020). The second instrument is also the bank interest rate change between 30-89 days in a one-day window but around the release of the employment data by the National Bureau of Statistics. To fully identify both shocks, we exclude days the employment data releases coincide with central bank monetary policy announcements, which occur on rare occasions.[2] Our identifying assumption is that in the small time window after the central bank announcement or labor data releases, it is unlikely to be other events that systematically affect the market expectations of future policy interest rates (Lakdawala (2019)). Figure 2 provides the time series of monetary policy surprises. Equation 6 provides how we construct monetary policy surprises, where t, d and p are month, day, and type of shock, respectively.

$$iv_t^p = B_{t,d} - B_{t,d-1} \tag{6}$$

[2]Out of the 221 employment data releases in our sample, monetary policy announcements have coincided only 7 times.

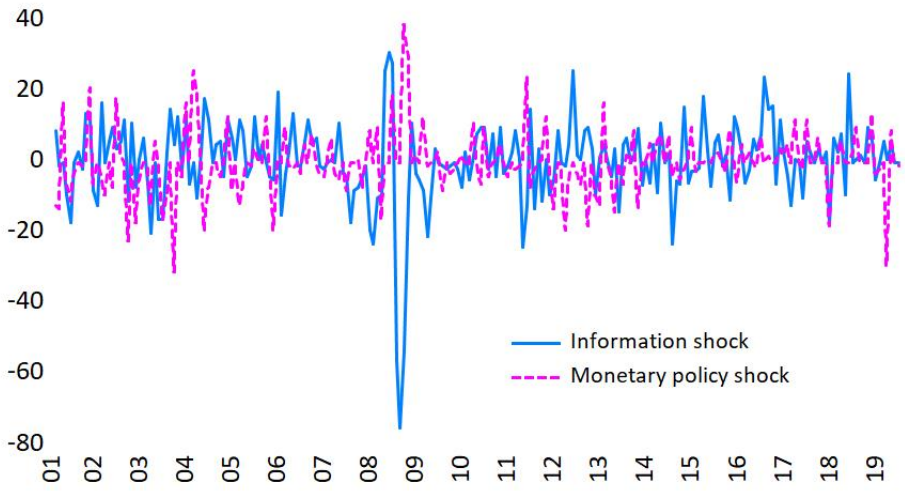

Figure 2: Historical movements of the instruments

Notes: The monetary policy and information shocks are shown at a monthly frequency (2001-2019) and in basis points. The monetary policy shock corresponds to the change in the banking interest rate between 30-89 days in a one-day window around the central bank announcement. The information shock corresponds to the change in the banking interest rate between 30-89 days in a one-day window around labor releases.

3.3 Data

We use monthly data from the Central Bank of Chile between September 2001 and December 2019. The baseline model includes seven variables: monetary policy rate (MPR), economic activity index (IMACEC), consumer price index (CPI), the nominal exchange rate (NER), total loans (LOANS), unemployment rate (U), and a non-performing loans indicator (NPL). We use a VAR model with two lags and natural logarithms of all variables except MPR and U. In order to maintain our assumption that monetary policy shocks are not contributing to these interest rate surprises resulting from labor market news, we exclude the days that coincide with central bank meetings and labor data releases.

4 Results

4.1 Impulse Responses

In this section, we estimate the dynamic response of consumer prices, economic activity, nominal exchange rate, loans, unemployment rate, and non-performing loans to a 10 basis point increase in the monetary policy rate. We measure the impulse response in the other variables in percentage points and the dotted lines represent 68% confidence intervals based on robust standard errors following Mertens and Ravn (2013) and Nakamura and Steinsson (2018).

Figure 3 shows the effect of a 10 b.p. increase in the reference rate related to a pure monetary policy shock, which has considerable and persistent effect on consumer prices,

with a decrease of almost 0.15 p.p. over five months. In terms of the real sector, he monetary surprise has a faster effect on activity than the previous inflation reaction, falling in the first month 0.3 p.p and standing below its long-term level. Consequently, as activity suffers, unemployment rate instantly increases by 0.04 p.p and returns to its level after two years. In terms of the dynamic response of the exchange rate our results are congruent with the classical UIP framework, which in this case shows an appreciation of 0.3 p.p although not significant. Regarding the banking sector, our findings are consistent with international theory and literature. In other words, a monetary surprise with contractive effects on activity and employment increases credit risk, which is a key determinant in the behavior of banks' loans and their provisions Vithessonthi (2016) and Cucinelli (2015). Our findings suggest that loans decreases by 0.3 p.p, while non-performing loans increase by 0.4 p.p over five months. As the real sector is significantly affected, this overreaction can be explained because the loan loss provisions have a strong impact on the banks' cost income and they could have an immediate effect on the lending strategy in the short term. In addition to the classic effect of the unexpected increase in the monetary policy, the information revealed by the monetary authority in its decision amplifies the transmission to the economy, which also leads to a revision of agents expectations associated with the inflationary phenomenon Aruoba et al. (2021). These findings are consistent with similar research in advanced and emerging market economies (Gertler and Karadi (2015), Burger et al. (2017), Lakdawala (2019), Jarociński and Karadi (2020), Hoek et al. (2022), Ciminelli et al. (2022)).

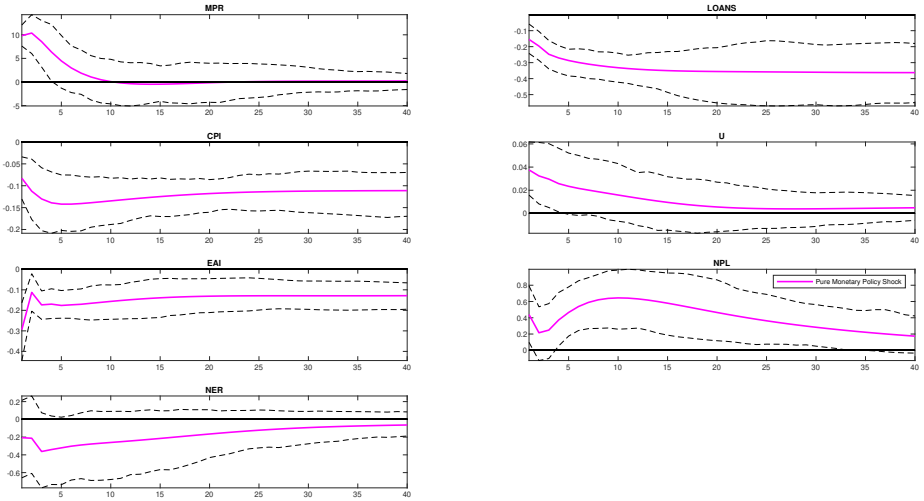

Figure 3: Pure Monetary Policy Shock

Notes: The impulse response shows a 10 basis points increase in the monetary policy rate associated with a pure monetary policy shock with respect to a long-term trend, and 68 percent confidence interval bands. The first column shows the dynamic response to consumer price index, economic activity index, nominal exchange rate, loans, unemployment rate and a non performing loans index. All variables are expressed in p.p except MPR. VAR sample includes 2001-2019.

More interestingly, as shown in Figure 4 a contractionary informational shock, which is related to new information about the current state of the economy not necessarily has negative effects on the real and monetary sector. In particular, a 10 b.p. information shock decrease inflation almost in the same magnitude than the pure monetary policy shock in the first months, but with less persistence and returning to its level after two years. Also, the nominal exchange rate exhibit the a 0.2 p.p appreciation over five months even though the effect is insignificant. In terms of the real sector, in this case the information shock has favourable effects on activity and unemployment rate, with an increase of 0.05 p.p and a decrease of 0.04 p.p over two months respectively. This better conditions for the economy implies that the banking sector is less affected. The dynamic response of loans exhibit a decrease of 0.4 p.p over two months with also less persistence than the previous shock, while the non-performing loans exhibit a decrease of 0.4 p.p. In this case, as the information shock has more persistent effects on the monetary policy rate itself, the initial improvement in non-performing loans and output is offset by tighter financial conditions. This results are consistent with the role of cyclical attenuation of the monetary policy and the findings of Nakamura and Steinsson (2018), which demonstrate the tendency for market analysts to change their forecast higher in response to monetary policy surprises, which are interpreted as proof of the information effect. When the central bank tightens its policy, and this occurs for the "good reasons", it contributes to offset, at least partially, the effects of demand shocks.

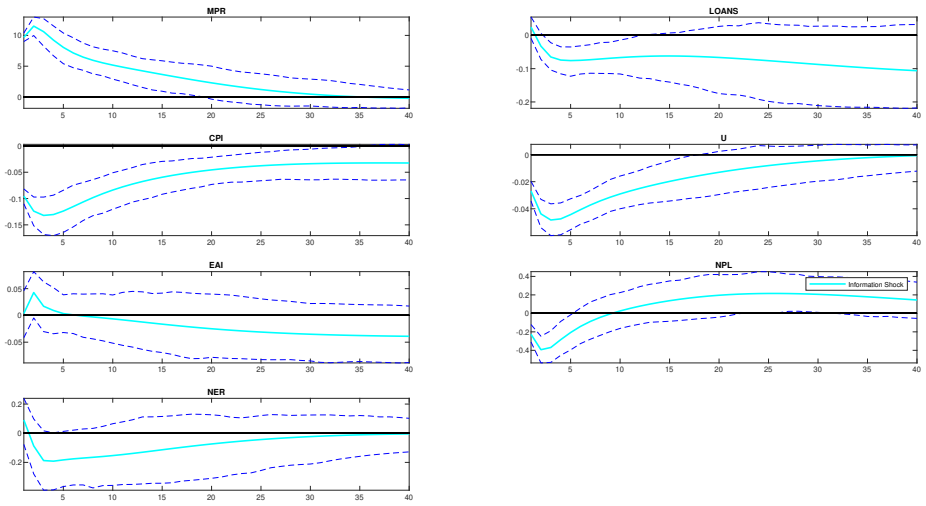

Figure 4: Information Shock

Notes: The impulse response shows a 10 basis points increase in the monetary policy rate associated with the information instrument with respect to a long-term trend, and 68 percent confidence interval bands. The first column shows the dynamic response to consumer price index, economic activity index, nominal exchange rate, loans, unemployment rate and a non performing loans index. All variables are expressed in p.p except MPR. VAR sample includes 2001-2019.

Overall, our results indicates that the monetary policy increase has heterogeneous ef-

fects depending on the driver. Inflation, output, and the banking industry are all negatively impacted by a pure monetary policy shock. However, an upward revision to the macroeconomic outlook given the new information about the current state of the economy has less adverse effects on the economy through an information shock. As the economic agents incorporate this better conditions in their decisions, the economy face less adverse effects given the financial tightness, which also are less persistent that the pure monetary policy shock. This findings are consistent with Jarociński and Karadi (2020), Lakdawala (2019) and Pinchetti and Szczepaniak (2021) who also postulate that pure monetary policy and information shocks can have different consequences to the real and financial sector.

4.2 Robustness

The main findings are contrasted using a sign restriction identification method that is frequently used to analyze the effects of pure monetary policy and information shocks. We present our sign restriction assumptions in table 1 to simulate both shocks. Base on international evidence and since we are interested on the dynamic response on the banking sector and the nominal exchange rate, we assume that a pure monetary policy shock has adverse effects on output, consumer prices, and unemployment rate, while an information shock has favourable effects on activity and unemployment rate but also with a decrease on inflation (Gründler, Mayer, and Scharler (2022), Ciminelli et al. (2022)). Furthermore, we assume that both shock events are just in one period. As this methodology does not capture the specific driver behind the monetary policy increase, we will quantify the dynamic response of our variables but in a broader sense.

As by construction we imposed the dynamic effect on inflation, output and unemployment rate, we turn our attention to the impact on nominal exchange rate, loans and non-performing loans. Figure 5 present a 10 b.p. pure monetary policy shock in the reference rate, which implies similar results to our external instrument identification. It means, an appreciation of the currency (0.8 p.p.), a decrease in banking loans (0.3 p.p) and an increase in non-performing loans (1 p.p.) over five months, although our responses are not significant. On the other hand, as shown in Figure 6 an information shock produce less adverse effects, with the same appreciation pattern of the currency but an increase in loans and a decrease in non-performing loans over 12 months. Overall, our results are in the same direction that the sign restriction methodology.

5 Conclusion

Understanding the drivers behind the central bank announcements is important, as they provide information about the current state of the economy, as well as its outlook. However, the interest rate increase can reveal two components, one associated with the inflationary process observed by the monetary authority, and another associated with new information related to new macroeconomic data. Consequently, recent evidence highlights that monetary policy surprises can lead to heterogeneous and persistent effects on the

economy depending on the driver behind the Central Bank announcement.

In this paper, we attempt to disentangle the effects of two types of shocks behind the monetary policy surprise: a "pure" monetary policy component, associated with the standard policy shock that affects negatively prices and activity; and an "informational" component of the shock, which responds to labor releases. Using 90-day banking lending rate movements around central bank announcements (pure monetary policy shock) and labor releases (information shock), we estimate a SVAR model with external instruments to measure the effect on the Chilean economy.

Our results are aligned with economic theory and international evidence. First, a pure monetary policy shock has contractionary and persistent effects on activity, prices and credit growth. At the same time, it appreciates the domestic currency, and decrease non-performing loans risks. This is consistent with the standard macroeconomic theory for small open economies with free floating exchange rates and very limited capital markets intervention. Second, the information component of the monetary policy shock has less adverse effects on the economy, and if any, it is very limited. This is consistent with the role of cyclical attenuation of the monetary policy and the findings of Nakamura and Steinsson (2018), which demonstrate the tendency for analysts to change their growth projections higher in response to unforeseen increases in real yields, which are interpreted as proof of the information effect. It means, when the interest rate increase is given by the "good reasons", it contributes to offset, at least partially, the effects of demand shocks.

Nevertheless, A number of questions regarding monetary policy surprises and their transmission to the economy remain to be addressed, like the role of the forward guidance effect and macroprudential tools of the Central Bank,. Furthermore, foreign Central Banks could play a significant role in the global financial tightness, implying another relevant channel in the local economy. Overall, our results highlights the need to understand the true drivers behind Central Bank announcements, so policymakers incorporate these transmission mechanisms to better understand their effects on the economy.

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6 Annex: tables and figures

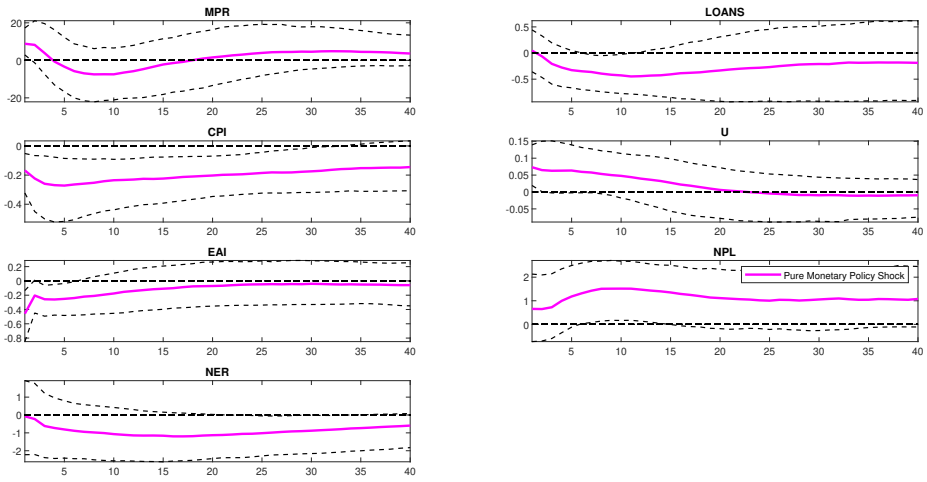

Figure 5: SR Monetary Policy Shock

Notes: The impulse response shows a 10 basis points increase in the monetary policy rate due to a pure monetary policy shock with respect to a long-term trend, and 68 percent confidence interval bands. The first column shows the dynamic response to consumer price index, economic activity index, nominal exchange rate, loans, unemployment rate and a non performing loans index. All variables are expressed in p.p except MPR. VAR sample includes 2001-2019.

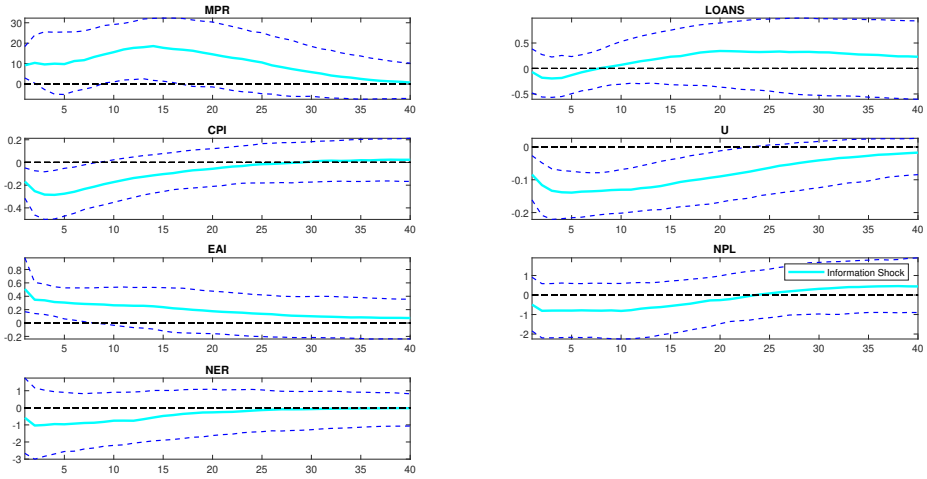

Figure 6: SR Information Shock

Notes: The impulse response shows a 10 basis points increase in the monetary policy rate due to an information shock with respect to a long-term trend, and 68 percent confidence interval bands. The first column shows the dynamic response to consumer price index, economic activity index, nominal exchange rate, loans, unemployment rate and a non performing loans index. All variables are expressed in p.p except MPR. VAR sample includes 2001-2019.

Table 1: Sign Restriction Identification for one period

	Pure MP Shock	Information Shock
MPR	positive	positive
CPI	negative	negative
EAI	negative	positive
NER	?	?
LOANS	?	?
U	positive	negative ?
NPL	?	?

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