# Heterogeneous Effects of Monetary Policy on Industries: Evidence from Publicly Traded Firms in Peru (2000 – 2019)

*Efectos Heterogéneos de la Política Monetaria en las Industrias: Evidencia de empresas que cotizan en bolsa en Perú (2000 – 2019)*

***Carlos Chávez****

## Abstract

This paper studies the effects of a monetary policy shock on the industry's profitability through publicly traded firms in Peru. I use a monetary policy shock that controls the possible endogeneity between the monetary policy with the economic activity and the Central Bank's anticipation of economic events. I use two profitability measures: ROA and Net Profits. The methodology is Local Projections (LP) because it allows for control of the persistence of monetary policy shocks; in case of biases, it is usually smaller than the traditional methodologies used, such as vector autoregressive (VAR), and because Local Projection is parsimonious. The results I find are heterogeneous and differentiated in terms of quantification and persistence for those dependent variables through industries. These results suggest the existence of a strong credit channel in the transmission mechanism of a monetary policy shock.

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**Keywords:** Monetary Policy – Heterogeneous Industries – Local Projections.


## Resumen

Este artículo estudia los efectos de un shock de política monetaria sobre la rentabilidad de la industria a través de empresas cotizadas en Perú. Se utiliza un shock de política monetaria que controla la posible endogeneidad entre la política monetaria y la actividad económica, así como la anticipación del Banco Central a eventos económicos. Se utilizan dos medidas de rentabilidad: ROA y beneficios netos. La metodología utilizada es Proyecciones Locales (LP) porque permite controlar la persistencia de los shocks de política monetaria, y en caso de sesgos, suele ser más pequeña que las metodologías tradicionales utilizadas, como Vector Autorregresivo (VAR), y porque las Proyecciones Locales son parsimoniosas. Los resultados encontrados son heterogéneos y diferenciados en términos de cuantificación y persistencia para aquellas variables dependientes a través de las industrias. Estos resultados sugieren la existencia de un fuerte canal de crédito en el mecanismo de transmisión de un shock de política monetaria.


**Palabras clave:** Política Monetaria – Industrias Heterogéneas – Proyecciones Locales.

## 1.- Introducción

The effects of monetary policy on an economy at the aggregate level have been extensively studied. The seminal papers focused on examining the impact on GDP and Inflation and the mechanisms by which monetary policy is transmitted. Subsequent studies diversified the analysis, focusing on other aggregate variables. However, most of these studies have focused on two major groups, the United States, and the Euro Zone, i.e., developed countries.

The literature on the effects of monetary policy at the disaggregated level is increasing but relatively scarce. The monetary policy shock can have heterogeneous effects at the disaggregated level. Considering the positive and negative effects among the different groups analyzed, welfare gains or losses can be estimated. One way to analyze the effects of a monetary policy at a disaggregated level is through industries and sectors. However, most papers estimating these effects have focused on developed countries. This paper contributes to the literature by studying the effects of a monetary policy shock on firms' profitability across industries in the peruvian case for the period 2000 – 2019.

It is essential to emphasize the relevance of the selected case study. Peru is an emerging economy with a unique set of characteristics that distinguish it from developed countries. These characteristics include a high degree of informality in the economy, high volatility in commodity prices, and limited access to external financing. These factors can significantly affect how a monetary policy shock is transmitted to different industries and sectors. Therefore, studying the effects of monetary policy on firms' profitability across industries in Peru can provide valuable insights into the transmission channels of monetary policy in emerging economies. This analysis can be particularly relevant for policymakers in Peru and other emerging economies, as it can inform the design of monetary policy that promotes sustainable and inclusive growth.

This paper contributes to this literature because it allows us to understand the effects of a monetary policy shock across firms in different industries and quantify the distributional effects across these industries. I work with 512 firms distributed across seven sectors like Agriculture, Business, Electricity, Finance, Manufacturing, Mining, and Retail. The disaggregation level is broader than most papers that only focus on the manufacturing industry.

Also, to control for the possible endogeneity of a monetary policy shock with economic activity and to capture the anticipation of central banks in certain economic events, I construct a monetary policy shock based on the seminal paper by Romer and Romer (2004). The econometric strategy I use to estimate these effects is called Local Projections (LP) proposed by Jordá (2006); I use this methodology over other traditional methods such as vector autoregressive regression (VAR) because it is more parsimonious and more stable in the face of misspecification, which allows not to enlarge the biases in the predictions.

I find heterogeneity in the effects through industries. For Agriculture, Retail, Finance, and Electricity industry. Also, I find a persistent positive response in those industries from a monetary policy shock after four quarters; the industry with a lower impact is the Electricity industry. For Manufacturing, Mining, and Business, I find a persistent negative response in those industries from a monetary policy shock after four quarters; manufacturing and Business industries have low impacts.

This paper is related to the empirical literature on transmission channels at the disaggregated level, such as Ganley and Salmon (1997) and Hayo and Uhlenbrock (2000), considering the firms' profitability. Also, it is related to the literature on the sectoral effects of a monetary policy shock, such as Dedola and Lippi (2000), Peersman and Smets (2005), Jansen et al. (2013), and Skaperdas (2019). Furthermore, especially for developing countries such as Alam and Wahhed (2006), Moussir and Chatri (2017), and Aginta and Someya (2022). The novel contribution of this paper is the use of Local Projections in this field.

The paper is written as follows, the next section presents the literature review, Section 3 presents the methodology used in this paper, Section 4 presents the estimation results, and Section 5 presents the impulse-response graphs. Finally, section 6 presents the conclusions of this paper.

## 2.- Literature Review

Monetary policy shocks' macroeconomic effects have been extensively studied in the literature. Earlier studies, such as Christiano et al. (1996), Christiano et al. (1998), Romer and Romer (2004), and Uhlig (2005), reported minimal effects of monetary policy on macroeconomic variables. However, more recent studies have focused on the disaggregated impacts of monetary policy shocks, revealing non-uniform effects on different sectors of the economy.

The credit channel, labor market frictions, and industrial structure are the three main factors driving the heterogeneity of monetary policy shock effects. Bernanke and Blinder (1988), Bernanke and Gertler (1995), and Oliner and Rudebusch (1996) studied the effects of monetary policy on GDP and prices through the credit channel in the United States. Ehrman and Fratzscher (2004) found adverse effects of monetary policy shocks on the stock market due to financial restrictions. Faia (2006), Gali (2015), and Lechthaler et al. (2010) studied labor market frictions and the trade-off between inflation and the unemployment rate. Hayo and Uhlenbrock (2000) examined the industrial channel and its intensity of exports, while Chang (1979) found that monetary policy shocks are more significant in regions with large concentrations of durable goods manufacturing firms than in regions with agriculture or mining predominate. Gertler and Gilchrist (1994) and Carlino and DeFina (1999) studied the effects of monetary policy shocks on smaller firms and the manufacturing industry. Peersman and Smets (2005) found that the durability of products and different financial structures explain the heterogeneous effects in the Euro Zone. Jansen et al. (2013) reported heterogeneous impacts on net sales in eight industries in the U.S. economy, with a more significant effect in the trade, retail, and wholesale industries. Skaperdas (2019) found that more sensitive industries performed better than industries not generally affected by monetary policy. Dedola and Lippi (2005) concluded that monetary policy has a heterogeneous industry impact, while Milena (2020) found adverse effects of a monetary policy shock on industrial production in the Euro Zone.

Empirical studies have also shown that the distribution of industries and regions is essential for the heterogeneous effects of monetary policy shocks. Ganley and Salmon (1998), Hayo and Uhlenbrock (1999), Loo and Lastrapes (1998), Arnold and Vrugt (2002), and Raddatz and Rigobon (2003) reported differentiated effects across industries and regions due to different sensitivities to monetary conditions. The degree of heterogeneity of monetary policy can be transmitted even across industries, as Carlino and DeFina (1998) found that a monetary policy shock at the level of regions is related to industry composition across states. Kaufmann (2002), Dolado and Maria-Dolores (1999), Peersman and Smets (2005), and Skaperdas (2019) studied the distributional effects of monetary policy during a boom or recession. Karaki (2018) found that labor reallocation can expand the effects of monetary policy shocks. Jansen et al. (2013) studied the sectoral effects of monetary policy on publicly traded firms, finding heterogeneous effects.

While the literature has extensively studied the sectoral effects of monetary policy in developed economies, such as the United States and the Euro Zone, there is little research on the topic in developing countries, especially in Latin America. Brandao-Marques et al. (2020) studied monetary policy shocks for 40 EMDEs using local projections, finding that effects of monetary policy in Latin American countries, focusing on the case of Brazil.

Recent studies have found heterogeneity in the sectoral effects of monetary policy in Brazil. Barbosa et al. (2020) analyzed the effects of monetary policy shocks on Brazilian manufacturing industries and found that the response varies depending on the industry's degree of competition and the firm's size. Larger and more competitive firms were affected less by monetary policy shocks, while smaller and less competitive firms experienced a more significant impact on their sales and investment.

Similar results were found by Curi et al. (2021), who analyzed the sectoral effects of monetary policy in Brazil using a dynamic factor model. They found that monetary policy shocks had a more substantial impact on the output and investment of smaller and less productive firms, while larger and more productive firms were less affected.

Other studies have focused on the role of financial frictions and the credit channel in explaining the heterogeneity of the sectoral effects of monetary policy in Brazil. Carvalho et al. (2018) found that monetary policy shocks have a more significant impact on firms with higher debt levels and lower liquidity, while firms with stronger balance sheets are less affected.

Overall, these studies suggest that the sectoral effects of monetary policy in Brazil are heterogeneous and depend on a variety of factors, including firm size, degree of competition, productivity, financial constraints, and the structure of the industry. These results highlight the importance of considering the sectoral effects of monetary policy when formulating macroeconomic policies and designing financial regulations.

## 3.- Database and Methodology

This section is divided into two subsections. In the first subsection, I construct the new monetary policy variables following Romer and Romer (2004); the second subsection presents the methodology used to estimate the impacts of a monetary policy shock on the outcomes of heterogeneous industries. The profitability data is published by the Superintendency of the Securities Market (SSM and it is available for the period 2000Q1 to 2019Q4. There are 512 firms public distributed in seven industries, Agriculture, Business, Electricity, Finance, Manufacturing, Mining, and Retail, using version 4 of the International Standard Industrial Classification (ISIC), following the guidelines of the United Nations Organization (UN). The first dependent variable I choose is the profitability (ROA) measured by dividing a company's net income by total assets:

$$ROA_{j,i,t} = \frac{Net\ Income_{j,i,t}}{Total\ Asset_{j,i,t}} \quad . \quad . \quad . \qquad (1)$$

Where $ROA_{j,i,t}$ is the profitability of firm *j* in the industry *i* in period *t*, $Net\ Income_{j,i,t}$ is the net income of firm j in the industry i in period t and $Total\ Asset_{j,i,t}$ is the total assets of firm j in the industry i in period t. And the second dependent variable is the $Net\ Profis_{j,i,t}$ is measured by the difference between Total Incomes and Total Costs. The following subsection presents the new measures of monetary policy shock that I use in this work.

### 3.1.- New Measure of Monetary Policy Shock

Most of the papers that have studied the transmission channels of a monetary policy shock consider the monetary policy interest rate as a monetary policy shock variable. However, according to Romer and Romer (2004), this variable can cause two problems. First, it may lead to endogeneity between the monetary policy and economic activity, inducing biases in the estimates. Second, the Central Bank can anticipate movements in the real economy and apply a monetary policy shock in advance. Thus, the monetary policy interest rate would not represent a shock as such, as demonstrated in Ramey (2016). A shock should represent an unanticipated movement of some exogenous or endogenous variable and, therefore, cannot be predicted. This implies that the dynamic response to the presence of a serially correlated shock is reflected in a graph of the impulse response, as shown by Alloza et al. (2020).

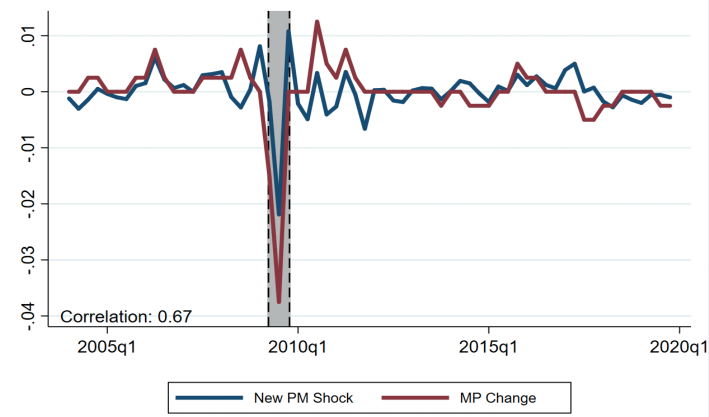
To address these possible problems or risks, I construct a new measure of a monetary policy shock, which has also been used in this literature by Jansen et al. (2013) and Skaperdas (2019), as well as in other literature, such as Miranda-Agrippino and Rey (2020) and Romer and Romer (2010). The new measure of a monetary policy shock is expressed in Equation 2:

$$\Delta r_t = \alpha + \gamma r_{t-1} + \delta \tilde{\pi}^{BCR}{}_t + \Gamma \Delta \tilde{\pi}^{BCR}{}_t + \Omega \tilde{y}^{BCR}{}_t + \omega \Delta \tilde{y}^{BCR}{}_t + \bar{Y}_t + \epsilon_{4,t} \qquad (2)$$

Where $\Delta r_t$ is the monetary policy interest rate differential for the previous period, $\alpha$ is the constant term, $\gamma r_{t-1}$ is the monetary policy interest rate but in the previous period. $\tilde{\pi}^{BCR}{}_t$ is the expected inflation from the Central Reserve Bank Inflation Report for period t. $\Delta\tilde{\pi}^{BCR}{}_t$ is the differential of the expected inflation from the Central Bank Inflation Report for the previous period. $\tilde{y}^{BCR}{}_t$ is the expected economic growth of the Central Bank Inflation Report in period t.

$\Delta\tilde{y}^{BCR}{}_t$ is the differential of the expected economic growth of the Central Bank Inflation Report with respect to the previous period, $\bar{Y}_t$ is the international economic activity in the period t and $\epsilon_{4,t}$ is the residual, which would be the new measure of a monetary policy shock. Figure 1 presents the evolution of this new measure of monetary policy shock and monetary policy interest rate change. These monetary policy shock measures are correlated in 67%.

*Figure 1. Monetary Policy Shock vs Change of Monetary Policy Rate*




Source: Central Bank of Peru and author's estimates.
Shaded area denotes Great Financial Crisis period
Peruvian monetary policy rate did not hit its zero lower bound over the estimated sample period.

Figure 1 shows that the measure of a monetary policy shock estimated from equation (2) captures the Central Bank's monetary policy changes. However, it can also be seen that the changes in the new measure are more modest than the changes in the Central Bank's monetary policy. Additionally, I use control variables such as inflation, economic growth, real exchange rate, M1, and domestic credit. I also include a variable that measures global economic activity developed by Killian (2009) and updated in Killian (2019). Table 1 presents the statistical description of ROA and Net Profits by industry and the Macroeconomic Control Variables included in the model.

**Table 1. Statistics Summary**

| Industries | Observations | Mean | ROA Standard Deviation | Minimum | Maximum |
|---|---|---|---|---|---|
| Agriculture | 726 | 0.06 | 0.11 | 0 | 1.9 |
| Mining | 1761 | 0.17 | 0.12 | 0 | 0.14 |
| Manufacturing | 4661 | 0.21 | 0.15 | 0 | 0.14 |
| Electricity and Water | 1586 | 0.11 | 0.07 | 0 | 0.68 |
| Finance | 9298 | 0.55 | 5.46 | -0.17 | 147.79 |
| Business | 1531 | 0.19 | 0.22 | -0.02 | 0.95 |
| Retail | 942 | 0.31 | 0.18 | 0 | 0.89 |
| **Industries** | **Observations** | **Mean** | **Net Profits Standard Deviation** | **Minimum** | **Maximum** |
| Agriculture | 726 | 227.25 | 1016.41 | -4147 | 12299 |
| Mining | 1761 | 3862.17 | 8919.31 | -40586 | 89262 |
| Manufacturing | 4661 | 992.45 | 3673.64 | -22521 | 54920 |
| Electricity and Water | 1586 | 2120.1 | 7575.17 | -99411 | 255442 |
| Finance | 9298 | 1542.84 | 7098.2 | -90619 | 96425 |
| Business | 1531 | 214.75 | 1289.13 | -9161 | 35243 |
| Retail | 942 | 704.34 | 1485.58 | -4138 | 9796 |
| **Variables** | **Observations** | **Mean** | **Standard Deviation** | **Minimum** | **Maximum** |
| Inflation | 80 | 0.03 | 0.01 | 0.00 | 0.06 |
| Economic Growth | 80 | 0.05 | 0.03 | -0.01 | 0.11 |
| Real Exchange Rate | 80 | 0.49 | 0.02 | 0.44 | 0.51 |
| Money Supply | 80 | 26991.36 | 13478.1 | 5812.97 | 49669.41 |
| Domestic Credit | 80 | 187238.2 | 101568.3 | 52113.51 | 374649.7 |
| Global Activity Index | 80 | 7.88 | 76.38 | -133.88 | 180.37 |

Source: Superintendency of the Securities Market, Central Bank of Peru and Killian (2019).

The finance industry has had higher profitability in this period, but a significant variation across companies, while the electricity and water industry have the lowest profitability. The mining industry has had the highest net profits but significantly varied between companies. At the same time, the business sector has had the lowest net profits and with a significant variation between companies. The following subsection presents and describes the Local Projection methodology that I use.

### 3.2.- Local Projections

Much of the literature that studies the sectoral effects of a monetary policy shock has traditionally used Vector Autoregression (VAR) as a methodology to capture shocks through macroeconomic variables such as GDP and inflation, as seen in Dedola and Lippi (2005) and Peersman and Smets (2005). In this paper, I consider a relatively new methodology developed by Jordá (2005) called Local Projections. This technique is also known as "direct forecasting" as it allows projecting future values of a variable using a horizon-specific regression and enables including fewer forecasts in the impulse responses, as discussed in Ramey (2016). Local Projections have not been commonly used in this literature, but they have been applied in other fields such as Auerbach and Gorodnichenko (2013), who analyzed fiscal spillovers over the business cycle, and Jordá and Taylor (2016), who studied the causal effects of austerity policies on growth. Additionally, Ramey and Zubairy (2018) studied government spending multipliers in the United States when the economy is in a slack or near-zero interest rate period, while Hwa et al. (2018) studied the small and short-lived effects of shocks on supervisory ratings on current economic activity.

I choose to use Local Projections instead of VAR, even though VAR is the most commonly used methodology to estimate impulse-response functions. As Jordá (2005) mentions, VARs can have a significantly poorly specified representation of the data generation process (DGP), unlike Local Projections, which are robust to poorly specified DGP. This difference is crucial because VARs can provide accurate predictions one period ahead, even with a poorly specified DGP, but errors can substantially increase as periods increase, as discussed in Stock and Watson (1999), making forecasting less accurate. Local Projections are parsimonious and do not require complex estimators to make their estimates, and they can use simple least square (OLS) technique, as noted in Hwa et al. (2018). Plagborg-Møller and Wolf (2021) mention that Structural VARs with short- and long-term restrictions are equivalent to simple Local Projections. Thus, VARs with complex estimates can be compared to simple Local Projections. Another advantage of Local Projections is that they do not need asymptotic approximations or numerical techniques to infer the results. Local Projections are flexible because they can accommodate panel structures and do not restrict the forms of the impulse response functions, allowing for controlling misspecifications of the model used, as discussed by Olea and Plagborg-Møller (2020). Additionally, Li et al. (2021) show that Local Projections tend to be less biased than VAR. Bernanke et al. (2005) mention that VARs cannot include more than eight variables, which excludes relevant information from the analysis and biases the coefficients.

Finally, since I use Panel Data with fixed effects, whose estimator is OLS, in this paper, it is more advantageous to use Local Projections because it provides inference with simple estimates compared to simple VARs. The responses to monetary policy shocks tend to have persistence over time, and a poorly specified VAR can result in poor forecasting. In contrast, controlling this persistence yields better estimates with simple Local Projections, as discussed in Alloza (2020). Considering the projections of $Y_t$ in s periods ahead, $Y_{t+s}$ on the space generated by the periods available by $(Y_{t-1}, Y_{t-2}, \ldots, Y_{t-p})$ the local projection is specified in the equation (3):

$$ROA_{j,i,t+h} = \alpha_{j,h} + \omega_{t,h} + \theta_h \Delta ROA_{j,i,t} + \beta_h MP_{k,t-p} + B_{t-p}\Delta X_{t-p} + v_{i,t+h} \quad (3)$$

For h = 0, 1, 2, 3, 4
For p = 0, 1, 2, 3, 4

Where j = 1,..., J; i = 1,..., N; k = 1,..., K and t=1,..., T. Equation (3) is estimated using OLS panel-data and will be referred to as LP-OLS. $ROA_{j,i,t+h}$ is the profitability of firm j in the industry i in the period t. $\alpha_{j,h}$ are the state-fixed effects to control variation across firms $\omega_{t,h}$ are the time-fixed effects to control variations across time. $\theta_h$ is the vector of coefficients of the lagged differential coefficients of the dependent variables with respect to the previous period of firm j in industry i for period t. $MP_{k,t-p}$ is the new monetary policy shock estimated in the previous subsection. $\Delta X_{t-p}$ is the vector of macroeconomic control variables that I include in the model $Inflation_t$,$Economic\ Growth_t$,$M1_t$,Exchange $Rate_t$,$Credit_t$,$Y_t$. Where $Inflation_t$ is the inflation in the period t, $Economic\ Growth_t$ is the economic growth in the period t. $M1_t$ is the monetary mass in the period t. Exchange $Rate_t$ is the real exchange rate in the period t. $Credit_t$ is the degree of financial development expressed as the amount of domestic credit divided by the GDP in the same period t. $Y_t$ is the international economic activity in the period t. The impulse-responses function is expressed in equation (4):

IR(t,s,d_i )=B_1^s d_i . . (4)
s = 0, 1, 2, …, h

Where $d_i$ is the vector of shocks, IR is a moving average of the error forecast from time t to t+h and, therefore, uncorrelated with regressors between t-1a t-p. Herbst and Johannsen (2020) point out that for small samples, given the high degree of persistence of macroeconomic data, the estimated impulse responses may be biased, even for panel data; in this paper, I consider a T = 80, based on the projections, however, this bias can be partially corrected by the inclusion of control variables and the number of entities to be included in the estimations, in this case, with 512 firms. The following section presents the results.

## 4.- Results

Table 2 presents the Impulse-Response coefficients for up to five periods onwards.

**Table 2. Monetary Policy Shock Impulse to Profitability (ROA)**

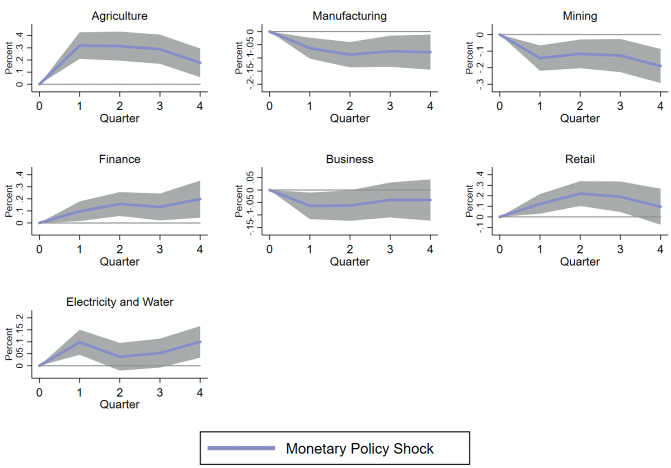
| Industries | Local Projections | | | | |
|---|---|---|---|---|---|
| | 1 | 2 | 3 | 4 | 5 |
| Agriculture | 0.319*** | 0.314*** | 0.289*** | 0.177** | 0.244** |
| | (4.81) | (4.33) | (3.95) | (2.46) | (2.80) |
| Mining | -0.142** | -0.116* | -0.126 | -0.190** | -0.100 |
| | (-3.05) | (-2.21) | (-2.08) | (-3.03) | (-1.39) |
| Manufacture | -0.063** | -0.088** | -0.075* | -0.078 | -0.122** |
| | (-2.61) | (-3.00) | (-2.08) | (-1.93) | (-2.65) |
| Electricity and Water | 0.098** | 0.038 | 0.053 | 0.100* | 0.117** |
| | (3.09) | (1.07) | (1.43) | (2.50) | (2.62) |
| Retail | 0.124* | 0.221** | 0.191* | 0.097 | 0.152 |
| | (2.19) | (3.10) | (2.17) | (0.94) | (1.27) |
| Finance | 0.097* | 0.157** | 0.133* | 0.198* | 0.129 |
| | (1.96) | (2.61) | (1.96) | (2.12) | (1.28) |
| Business | -0.063* | -0.062 | -0.040 | -0.040 | -0.033 |
| | (-1.96) | (-1.68) | (-0.94) | (-0.80) | (-0.57) |
| Control Variables | Yes | Yes | Yes | Yes | Yes |
| Firms-Fixed Effects | Yes | Yes | Yes | Yes | Yes |
| Time-Fixed Effects | Yes | Yes | Yes | Yes | Yes |

t-statistics in parenthesis. *p < 0.05, **p< 0.01, ***p < 0.001. Local Projections estimates for five forward periods considering panel data with firms and time fixed effects included in each column, considering the new measure of monetary policy shock for all industries. The dependent variable is standardized.

*Source: Author's estimates.*

Table 2 shows heterogeneous responses across industries. Industries such as agriculture, finance, retail, and electricity have persistent positive impacts up to four quarters after a monetary policy shock. The agriculture industry shows a 30% increase in profitability due to a 10% increase in the monetary policy rate, while the electricity industry shows a 9.8% increase. The financial industry shows persistent increases of up to 20% in the fourth quarter of profitability in the face of a monetary policy shock. On the other hand, industries negatively affect mining, manufacturing, and business. This last industry has a negative impact but is only significant in the first quarter. The mining industry had a negative effect of 14% in the first period, but in the fourth quarter, this fall is 19% in the face of a 10% increase in the monetary policy rate. The manufacturing industry shows an increasing drop in profitability as the quarters go by. To appreciate these results graphically, Figure 2 presents the impulse-response graphs for each industry.

*Figure 2. Impulse Response: MP Shock to ROA by Industry*




Soruce: Author's estimates.

Figure 2 graphically shows the heterogeneity of results across industries in terms of sign and quantification. It is worth noting the persistence of impacts in the industry, agriculture, and manufacturing sectors, despite having a negative response. Their impacts last up to five quarters later, while in other sectors, such as Business or Retail, the persistence lasts for one and three periods, respectively. Additionally, I estimated the regressions for net profits for each industry.

**Table 3. Monetary Policy Shock Impulse to Net Profits**

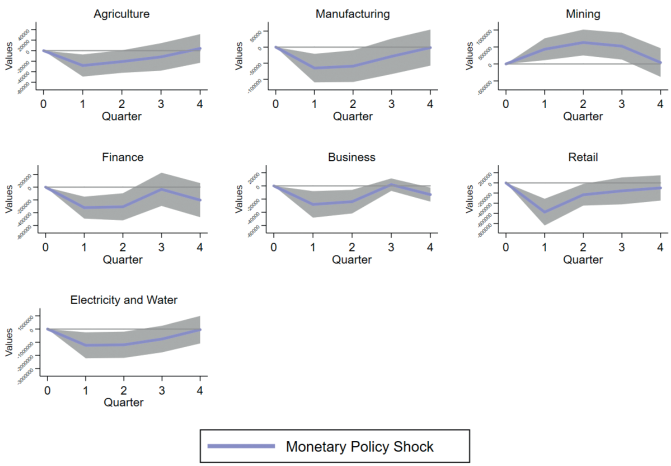
| Industries | Local Projections 1 | 2 | 3 | 4 | 5 |
|---|---|---|---|---|---|
| Agriculture | -28166.2* | -20684.5 | -111843 | 4213.7 | -21835.4 |
| | (-2.21) | (-1.59) | (-0.75) | (0.26) | (-1.28) |
| Mining | 433754.3* | 632047.8** | 524514.6* | 42873.8 | -49268.3 |
| | (2.21) | (2.73) | (2.18) | (0.17) | (-0.17) |
| Manufacture | -65079.8* | -59237.8* | -28688.1 | -1441 | -30387.5 |
| | (-2.42) | (-1.98) | (-0.86) | (-0.04) | (-0.76) |
| Electricity and Water | -1234048.8* | -1193882.7* | -758791.4 | -45031.7 | -936519.3 |
| | (-2.07) | (-1.98) | (-1.24) | (-0.07) | (-1.05) |
| Retail | -574367*** | -233319.7 | -156550.3 | -99080.7 | -311297.3 |
| | (-3.60) | (-1.81) | (-0.97) | (-0.66) | (-1.58) |
| Finance | -321158.1** | -308146.4* | -34257.5 | -203247.9 | -261008 |
| | (-3.08) | (-2.39) | (-0.22) | (-1.25) | (-1.42) |
| Business | -28059.1* | -23922.6* | 1912.8 | -13217.2* | -16119.1* |
| | (-2.30) | (-2.20) | (0.33) | (-2.04) | (-2.58) |
| Control Variables | Yes | Yes | Yes | Yes | Yes |
| Firms-Fixed Effects | Yes | Yes | Yes | Yes | Yes |
| Time-Fixed Effects | Yes | Yes | Yes | Yes | Yes |

t-statistics in parenthesis. *p < 0.05, **p<0.01, *** p < 0.001. Local Projections estimates for five forward periods considering panel data with firms and time fixed effects included in each column, considering the new measure of monetary policy shock for all industries.

*Source: Author's estimates.*

Table 3 shows that only the mining industry responds positively to a monetary policy shock up to period three; the rest of the industries have a negative response. Figure 3 shows the impulse-response graphs considering the net profit as the dependent variable.

*Figure 3: Impulse Response: MP Shock to Net Profits by Industry*




Soruce: Author's estimates.

Figure 3 illustrates the heterogeneous impacts that monetary policy shock has across industries, and we can also observe their persistence. While the mining sector only experiences the effect in the first quarter, other sectors, such as manufacturing, show effects that persist until the third quarter.

Figures 2 and 3 demonstrate that a monetary policy shock affects the ROA and Net Profits of the same industry differently. The ROA is dependent on the Net Income and the Assets, while the Net Profits depend on the costs. Therefore, a monetary policy shock can lead to a decrease in ROA and an increase in Net Profits for assets and liabilities, causing a rise in the former and a fall in the latter for industries where the ROA rises and Net Profits fall. This finding suggests a possible credit channel through which the monetary policy shock affects these variables.

The results show heterogeneity across industries given a monetary policy shock in terms of magnitude, sign, and persistence. The credit channel can explain this heterogeneity since firms that are financially sound are typically formal and have access to loans in the banking market. For industries with a positive effect, such as Agriculture, Finance, and Retail, there is an increase in ROA because they are more sensitive industries to credit channels. However, for industries with adverse effects, the credit channel may not matter, or there may be other transmission channels to explain the impact.

To summarize the results, a monetary policy shock has a positive impact on industries such as Agriculture, Finance, and Retail since they are more sensitive industries to credit channels. Conversely, other industries, such as Electricity, show a positive effect but are not persistent over time. On the other hand, manufacturing, mining, and business negatively impact profitability. However, they may be affected by monetary policy through the credit channel, and there may also be a pro-cyclical component that explains these impacts.

These results are similar to those obtained in Jansen et al. (2013) for industries such as Retail, Manufacturing, and Mining, using the same type of monetary policy shock for the case of the United States, Moussir and Chatri (2017) in the case of Morocco for industries such as Manufacturing and Finance, and Aginta and Someya (2022) in industries such as Mining and Manufacturing, but different from those found by Alam and Wahhed (2006) in the case of Pakistan. These findings open new avenues for research on sectoral effects in emerging countries. The following section presents the conclusions of this paper.

## 5.- Conclusion

This paper investigates the impact of a monetary policy shock on seven industries through publicly traded firms. To assess the effect of the shock, a new measure based on Romer and Romer (2004) is employed. Two dependent variables, namely ROA and Net Profits, which measure the firms' profitability, are selected for the analysis. Local Projections technique is used to estimate the impact of the shock, as it is more parsimonious, less biased, and more reliable than the traditional VAR technique. However, the analysis reveals that the impact of the shock is heterogeneous and differs across industries.

In terms of profitability, the results indicate persistent positive effects on industries such as agriculture, finance, retail, and electricity up to four quarters after a monetary policy shock. Conversely, the industries negatively affected are mining, manufacturing, and business. In contrast, the Net Profits show a negative response for most industries, except mining, indicating varied effects across different industries. From the model's aggregate variables, it is observed that domestic credit, as a proxy for the country's financial development level, exhibits high sensitivity to the persistence, sign, and significance of a monetary policy shock. Therefore, it suggests that most of the impacts across industries are realized through the credit channel, which is more evident in Agriculture, Finance, and Retail. These results align with Jansen et al.'s (2013) findings.

The results of this study add to the literature on the transmission channels of monetary policy shocks in developing countries. Prior research on the effects of monetary policy on yields has focused on the banking sector, whereas this study examines the legal firms in seven different industries. The findings indicate that the transmission channel must be through the formal financial system. These results open new avenues for research on sectoral effects in emerging countries with similar characteristics to Peru.

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