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Impact of Monetary Policy on Private Investment: Evidence from Vietnam's Provincial Data

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Abstract: This study sheds new light on the relationship between monetary policy and private investment using Vietnam's provincial data and a system generalized method of moment (GMM) framework. To capture monetary policy's effect, different indicators, viz. money supply, domestic credit to the private sector, interest rate and exchange rate are examined. We find that private investment is positively affected by respective monetary policies through broad money, domestic credit and interest rate channels, yet no credible evidence regarding the exchange rate's effect. In which, such a surprising co-movement between real interest rate and private investment was illuminated through analysis of the economy's distinctive characteristics over the two development stages (pre- and post-2012). Another notable finding is that economic development prospects of localities, which attract great attention and cause an intense competition between domestic and foreign investors, appear to be a major barrier to investment decisions of private firms.

Keywords: monetary policy; private investment; system GMM; emerging market economies

1. Introduction

Investment is an important component of aggregate demand and a vital resource for economic growth as it helps expand the production capacity of the economy. Meanwhile, investment plans are important to meet the future demands as well as ensuring financial goals. By and large, a strong investment potential could guarantee a rapid and sustainable economic development. Investments in banks and financial institutions help to promote the circulation of funds in serving the operation of the economy. Financial independence, economic prosperity and personal goals could be achieved through investments. The manner in which domestic investment fosters economic growth has been discussed in the study of De Long and Summers (1991). Specifically, investment could, directly or indirectly, raise capital for the economy through promoting technology development. Besides, they also stressed the importance of investment climate in the capital movement process, especially regarding private investment. According to the World Bank (2003), a favorable investment climate may create opportunities and incentives for investors to conduct large-scale operation, create employment and increase output, thus sustaining private investment and economic growth. As noted by Agrawal and Khan (2011), in the context of fierce competition in the attraction of investment, the majority of countries would focus their best efforts on improving environment and institutions for investment. Among important aspects of this issue is the efficiency of the state's macroeconomic policies, namely fiscal policy and monetary policy. Contrary to fiscal policy, monetary policy aims to address issues arising from economic instability. In this regard, Khan (2011) argues that the objectives of monetary policy also interact back and forth with other important macroeconomic

goals, including economic growth, employment creation, price stability, mitigation of shocks in the economic cycle, prevention of financial crisis and stabilization of long-term interest rates and real exchange rates.

Since the comprehensive economic reform (the "Doi moi" or "Renovation") in the mid-1980s towards an open, market-oriented and globally integrated model, Vietnam's economy has suffered from major shocks from the global economy, typically the 1997 Asian financial crisis and most recently, the 2008–2009 global financial crisis (Pham and Hoang 2019; Pham et al. 2019). In an endeavor to restore the health of its economy facing the severe impact of financial crisis, the Vietnamese government has implemented a series of policies and solutions such as lowering interest rate, increasing credit limit and stabilizing exchange rate (Dang and Pham 2020; Pham 2020). These policies are deemed feasible measures to help ensure the money supply of the economy. The question arises as to whether the conduct of monetary policy in line with the government's orientation does affect private investment. This paper seeks to evaluate the impact of monetary policy instruments on private investment in Vietnam. Given the important role of private investment in economic growth, fresh evidence from this study would contribute enormously to the planning and implementation of monetary policy in Vietnam.

The rest of the paper is structured as follows. Section 2 reviews the related literature. Section 3 provides an overview of the private investment and monetary policy management in Vietnam. Research method and data are presented in Section 4. Section 5 discusses the main results. Section 6 concludes the paper.

2. Literature Review

2.1. Theoretical Background

The relationship between monetary policy and private investment is tied to two theories with conflicting views, namely the classical theory and Keynesian theory on private sector investment. According to the classical theory of private sector investment, private investment would be, to a certain extent, affected by changes in monetary policy instruments. Expanding government spending through changes in monetary policy may reduce the prospects for boosting investment of nonbank financial sources. This stems from the difficulties of competing with government borrowing. Maana et al. (2008) also stressed the negative impact of government borrowing on private investment in terms of credit access. In addition, interest rate is considered as an important transmission channel of monetary policy into private investment. Holding money supply constant, an increase in the domestic debt to meet the need to expand government spending may cause interest rates to rise in bringing the capital market into equilibrium. However, interest rate hikes might well lead to an increase in the cost of capital, thus reducing private sector investment.

From a different perspective, the Keynesian theory of investment establishes that government might take appropriate action to stimulate economic growth through the use of macroeconomic policies. Accordingly, a state of natural unemployment in the economy always exists, and the sensitivity of private investment to interest rates remains low. Therefore, monetary policy could be adopted to regulate macroeconomic fluctuations without affecting domestic investors. Thus, contrary to the classical theory, Keynesian theory supports the positive impact of monetary policy on private investment.

2.2. Empirical Evidence

The effect of monetary policy on private investment has caught attention from an enormous number of researchers, and it has been a large and growing body of literature. Most studies confirm that important management tools of monetary policy including money supply, interest rates, exchange rates and credit limits can be used to influence private investment. Employing data of Malaysia, Greece, Thailand, Mexico and South Korea to explore the determinants of private investment,

Wai and Wong (1982) found that along with state investment, bank credit for the private sector plays an important role in deciding private investment flows in developing countries. In a study on the case of Pakistan over the period of 1959–1963, Khan (1988) concluded that an increase in bank credit to the private sector is likely to stimulate private investment. Besides, Sakr (1993) and Syed and Majeed (2007) also found evidence of the positive impact of domestic credit on private investment in Pakistan.

As indicated in Oshikoya's (1994) study, output growth is among key dynamics of private investment decisions in African countries. Specifically, either fiscal policy or monetary policy actions such as increasing public investment in infrastructure, restructuring budget expenditures towards efficiency, reducing public debt ratios, stabilizing exchange rates or curbing inflation would have a positive impact on private investment. Akkina and Celebi (2002), using Turkey's data over the period of 1970–1996, found that the scale and cost of credit have a significant impact on private investment. However, no evidence was revealed for the impact of medium-term lending rates on investment decisions.

Using data on 27 subsectors of the manufacturing sector in South Africa during 1970–2001 and a two-step generalized method of moment (GMM) estimation procedure, Ndikumana (2008) indicated that monetary policy really matters for private investment, in which the direct effects of interest rate reduction on private investment appear rather weak; however, through stimulating domestic demand and reducing credit costs, the indirect impacts on private investment become significant. Aside from that, the research results also highlight that the avoidance of exchange rate instability is likely to boost private investment.

Ang (2009), applying the ordinary least squares (OLS) and auto regressive distributed lag (ARDL) approaches to study the impact of financial sector policies on private investment for India and Malaysia, revealed that interest rate control has a positive impact on private investment, and this trend appears more evident in Malaysia. Besides, this research also indicates that credit programs in support of priority sectors tend to prevent the formation of private capital, and high reserve and liquidity requirements have a heterogeneous impact on private capital in both countries (the impact is positive for India and turns negative for Malaysia). In another study on 18 African countries during 1991–2004, Misati and Nyamongo (2011) showed that the trends of interest rates and credit to the private sector contradict each other. If interest rate hikes reduce private investment, then expansion of credit lines would help to encourage the investment in this region.

In addition, the development of stock market and institutional quality plays a vital role in determining the level of private investment in Africa. Olweny and Chiluwe's (2012) study for the case of Kenya indicated the positive impact of the monetary policy on private investment. Meanwhile, as suggested in the study of Ndikumana (2016) on 37 sub-Saharan African countries during 1980–2012, the indirect impact of contractionary monetary policy on private investment was explored though the bank lending or quantity channel, whereas direct impact was through the interest rate or cost of capital channel.

The study of Alawneh et al. (2015) for Jordan during 2000–2011 also yields similar results, specifically, through the required reserve ratio, monetary policy has a significant impact on private investment in Jordan. Such relationship was also detected in Ethiopia during 1975–2011. Hailu and Debele (2015) noted that, in the short term, public investment, money supply and real output may negatively affect private investment whilst real exchange rate tends to have the positive effect; yet in the long term, these trends are in a complete reversal. The real interest rate's effect on investment was found to be positive in Ethiopia, yet insignificant in the long-term. Using Nigeria's data covering 1970–2012, Agu (2015) claims that the investment rate appears positively correlated with both growth rate of disposable income and real interest rate of bank deposit. In addition, this research indicated that a sharp decline in investment in Nigeria between 1970 and 2012 was largely due to the rise of lending rates, the reduction of public spending and savings, political instability and unsecured infrastructure. Earlier study of Anastasia et al. (2011) also showed that monetary policy through money supply has an impact on private investment in Nigeria.

Fu and Liu (2015) examined the impact of monetary policy on the investment adjustments of China's listed firms during 2005–2012 and concluded the dynamics of monetary policy are dictated through two main channels, namely money supply and credit. Specifically, companies tend to adjust investment cashflows faster during tight monetary policy period. On the other hand, the adjustment speed of corporate investment tends to be faster as the money supply and credit increase. Noticeably, this trend becomes significant during the period of tighter monetary policy.

In a more recent study, Brima and Brima (2017) adopted the Error Correction Model (ECM) approach to examine the effect of monetary policy's rate of change on private investment behaviour in Sierra Leone and found that the money supply and gross domestic saving positively affect investment activity, whilst treasury bill rate, inflation and gross domestic debt reveal a negative impact. Despite most empirical studies confirming the significant impact of monetary policy variables on private investment, a few have shown such impact remains vague. According to Emmons and Schmid (2004), the change in interest rates does affect the present value of expected cash flow (through discount rate) and the time value of investment decisions. On the one hand, low interest rates would induce the present value of investment cash flows to rise, thus encouraging investment activities. This, on the other hand, may defer investment as it reduces the opportunity cost of capital when making decision. Briefly speaking, since interest rates could influence investment decisions in both directions, the impact of monetary policy on capital investment through interest rate channel appears inconclusive.

For the particular case of Vietnam, previous studies mainly focus on the transmission effect of monetary policy through money supply, interest rates, exchange rates and domestic credit (for instance, Cao and Le 2015; Pham 2015; Pham 2016; Tran and Nguyen 2013; Vo and Nguyen 2017) or its effect on the stock market (Duong et al. 2015). To our best knowledge, (i) there has been no research on the relationship between monetary policy and private investment for Vietnam; and (ii) most empirical studies associated with endogenous growth, investment and monetary policy for Vietnam are conducted with time series data which is often criticized for poor quality and incompleteness of the time length and frequency (Bui and Pham 2016; Dang et al. 2019; Nguyen and Nguyen 2010; Pham 2020), whilst those employing provincial panel data are rather scarce. Therefore, we fill this void by examining the effect of different monetary policy instruments on private investment using, for the first time, the provincial panel of Vietnam. On the other hand, among the panel data analysis approaches, system GMM will be opted for analysis as it could resolve the endogeneity issue that some explanatory variables might not be exogenous or predetermined (Beck and Levine 2004; Chu and Chu 2020; Pham and Hoang 2019). Notably in terms of the GMM techniques harnessed, we also recommend solutions to the over-fitting problem as raised by Roodman (2009). Besides validating the fundamental theory, the present study could provide further evidence concerning Asia's emerging market economies (including Vietnam) to reinforce the growing literature as discussed above.

3. Private Investment and Monetary Policy Management in Vietnam

3.1. Private Investment in Vietnam

Private investment has been clearly an important resource for economic development in Vietnam. According to the General Statistics Office of Vietnam, during 2009–2017, private investment constituted a significant contribution to Vietnam's gross domestic product (GDP) at 23%, which surely outperforms state investment (20.29%) and foreign direct investment (5.74%). In terms of development, private investment saw a three-fold increase in 9 years' time, from nearly 6800 to over 23,000 billion Vietnamese dong (VND), with the highest growth of 33.13% in 2017. As a percentage of GDP, private investment in Vietnam fluctuated at around 23% during 2009–2015 before soaring to 33% in 2017 as Vietnam's economy has regained its balance following the global financial crisis (see Figure 1). This sudden movement could be explained by the introduction of the Five-year Economic Restructuring Plan from 2016 to 2020 (as stipulated in Resolution No. 24/2016/QH14 dated 8 November 2016 of the National Assembly of Vietnam and Resolution No. 27/NQ-CP dated 21 February 2017 on the Program

of Action of the Vietnamese government). Under the Plan, public investment discipline has been tightened through the promulgation of a system of the replaced legal documents towards transparency and publicity, namely the New Law on Public Investment, Bidding Law and Construction Law. According to Dinh (2019), the widespread implementation of measures to restructure public investment during recent years has contributed significantly to the improvement in public investment quality through modernization of infrastructure systems such as electricity, roads, schools and medical stations, thereby stimulating private investment.
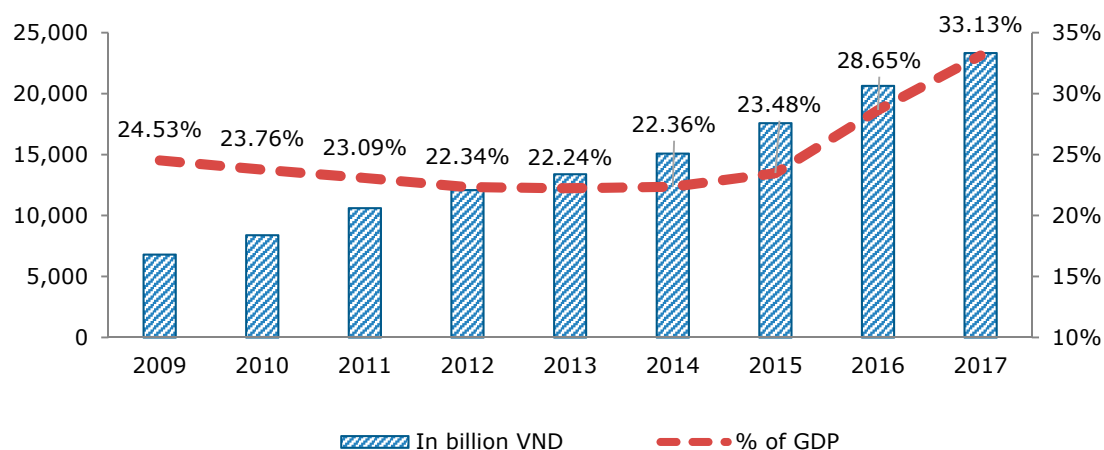
Figure 1. Private investment in Vietnam, 2009–2017. Source: General Statistics Office of Vietnam (2020).

3.2. Monetary Policy Management in Vietnam

During and after the global financial crisis, like any other country, Vietnam's economy witnessed strong fluctuations. To stabilize and promote economic growth, the State Bank of Vietnam (SBV) has implemented a flexible monetary policy with respect to the economic situation of each year. Prior to 2009, Vietnam was confronted with rapid inflation and stagnant growth under the profound impact of the crisis. To deal with, the SBV had to tighten monetary policy through several ways, specifically selling short-term bonds on the open market, increasing levels of reserve requirements and the discount rates, and imposing strict control over the foreign exchange rate market. During 2009 and 2010, to cope with the continuing decline in GDP growth, the SBV decided to loosen monetary policy in a more prudent and flexible manner. In the context of Vietnam's inflation rate reaching a record high in 2011, the SBV reversed the monetary policy towards inflation control and macroeconomic stability. Subsequently, since the GDP growth was strong and stable in 2012, the SBV has implemented the monetary policy in a proactive, flexible and prudent manner, harmonizing with the fiscal and other macroeconomic policies with a view to controlling the inflation, fostering the economic growth and stabilizing the money and forex markets. Briefly, monetary policy instruments, to a certain extent, have been effective in the implementation of the monetary policy, thus creating the fresh impetus for the nation's economic development in general and private investment in particular.

As proved in the real practice, money supply, domestic credit to the private sector and interest rates are the three best to operate monetary policy. The years 2009 and 2010 witnessed the ease of monetary policy, accordingly, money supply and credit to the private sector tended to expand along with a downward trend in the interest rates. Turning into 2011, to combat rapid inflation, the SBV decided to tighten the monetary policy by raising interest rates and reducing money supply and credit to the private sector. As the monetary policy has been conducted in a proactive, flexible and prudent manner so as to achieve moderate inflation and economic growth since 2012, money supply and domestic credit started rising (of which credit grew more slowly) whilst the interest rates were maintained at low levels. It is worth noticing that, unlike money supply, domestic credit and interest rates, the exchange rate revealed a sustained rise over the study period. It is worth noticing that,

unlike money supply, domestic credit and interest rates, the exchange rate revealed a sustained rise over the study period (see Table 1).

Table 1. Macroeconomic and monetary policy indicators in Vietnam, 2009–2017.

Year	GDP Growth (% yoy)	Inflation (% yoy)	M2 (% of GDP)	Credit to Private Sector (% of GDP)	Real Lending Interest Rate (%)	Exchange Rate (VND per USD)
2009	5.32	6.5	105.61	103.32	10.07	17,065
2010	6.78	11.8	114.85	114.72	13.14	18,612
2011	5.90	18.6	99.80	101.80	16.95	20,509
2012	5.03	6.81	106.47	94.83	13.47	20,828
2013	5.42	6.04	117.03	96.80	9.63	20,933
2014	5.98	1.84	127.55	100.31	8.16	21,148
2015	6.68	0.63	137.65	111.93	6.96	21,697
2016	6.21	4.74	146.37	123.82	6.96	22,716
2017	6.81	3.53	165.38	130.72	7.40	23,012

Source: General Statistics Office of Vietnam (2020) and Pham (2020).

4. Methodology

4.1. Model

Among three financial decisions of a firm, investment decision (involving capital budgeting decision and working capital management) is deemed the most important trigger, based on which the firm continues to make their decisions regarding capital structure (financing decision) and distribution of funds (dividend decision). When making decisions on investment, it is crucial that firms be well aware of the risk of their future cashflows (both cash inflows and outflows). Therefore, apart from the mobilization of resources for cash inflows, macroeconomic policies also need special attention.

To gauge the influence of monetary policy on private investment for Vietnam, we establish an empirical model framework consisting of private investment (PrvI, expressed as a percentage of the local GDP) being dependent variable, lagged private investment, monetary policy variables of interest and control variables that were commonly adopted in the extant literature, specifically:

- The lagged private equity (PrvI(−1)): Previous studies on the determinants of private investment reveal the profound influence of the lagged values of private investment. This suggests that the investment decisions of private firms are clearly dependent on the historical transaction information. Hence, we included the dependent variable at a one-year lag as an explanatory variable to capture the impact of the preceding year's information on private investor's decisions.
- Monetary policy (MP)'s effect, captured by broad money (M2), credit to the private sector (CR), interest rate (IR) and exchange rate (ER) (Handa 2009; Horngren 1995). The inclusion of the exchange rate variable as a monetary policy instrument in the research model could be explained as follows. Under the Law on the State Bank of Vietnam 2010, official instruments used for implementing the national monetary policy include re-financing, interest rates, exchange rates, reserve requirements, open market operations and other measures as prescribed by the Vietnamese government. As regards the transmission mechanism, a change in the exchange rate would cause the trade balance to change, thereby affecting private investment activities. Meanwhile, adjustments to the broad money, domestic credit and interest rate may have a direct impact on investment capital flows and prospects of private firms with a lag (says, 1–3 months).
- Public investment (PubI) and foreign direct investment (FDI), proxies for local investment activities (Agu 2015; Akkina and Celebi 2002; Farla et al. 2016; Khan 2011; Oshikoya 1994), in which: (i) Public investment was measured as the value of public investment relative to the local GDP. The previous literature on public investment's effect on private investment yielded mixed results, i.e., in both positive and negative ways. On the one hand, public investment development may hinder private investment from gaining access to bank credit (the so-called "crowding-out" effect). On the other hand, public investment could also benefit the private investment through provision of social infrastructure systems. (ii) Foreign direct investment is measured as the percentage

of foreign direct investment to the local GDP. Analogous to public investment, foreign direct investment's effect on private investment could be deemed a double-edged sword. Aside from the benefits deriving from technology transfer or market development orientation, foreign investors may pose certain risk to the private sector through heating up competition to dominate the domestic market.

– Other local economic factors, namely economic growth (Gdpg), trade openness (Trade), inflation (Inflat), infrastructure development (Infras), labor force (Labor) and human capital (HuC). They have been proved empirically to have an impact on both the input and output of an enterprise's business activities, thereby affecting its investment capital flows (Ahmed and Miller 2000; Carrasco 1998; Cavallo and Daude 2011; Erden and Holcombe 2005; Ghura and Goodwin 2000; Gjini and Kukeli 2012). Quantitatively, we used the annual growth rate of the local real GDP as an economic growth measure; the value of trade relative to the local GDP as a trade openness measure; the annual growth rate of the local consumer price index (CPI) as an inflation measure; the annual growth rate of the local landline subscribers as an infrastructure development measure; the annual growth rate of the local employed aged 15 and over as a labor force measure; and the annual growth of the number of students in local vocational secondary schools as a human capital measure.

Description of variables employed in the model is presented in Table 2.

Table 2. Description of variables.

Variables	Notation	Calculation
Dependent variable		
Private investment	PrvI	Private investment (% of local GDP)
Explanatory variables		
Lagged private investment	PrvI(−1)	One-year lagged private investment
(1) Monetary policy	MP	
Broad money	M2	M2 (% of local GDP)
Credit to the private sector	CR	Credit to the private sector (% of local GDP)
Interest rate	IR	Lending interest rate, adjusted for inflation (%)
Exchange rate	ER	Exchange rate of VND vis-à-vis USD
(2) Investment activities		
Public investment	PubI	Public investment (% of local GDP)
Foreign direct investment	FDI	Foreign direct investment, net inflows (% of local GDP)
(3) Local economic development		
Economic growth	Ggdp	Annual growth rate of local real GDP (%)
Trade openness	Trade	Trade (% of local GDP)
Inflation	Inflat	Annual growth rate of local CPI (%)
Infrastructure development	Infras	Annual growth rate of local landline subscribers (%)
Labor force	Labour	Annual growth rate of local labor force aged 15 and over (%)
Human capital	HuC	Annual growth rate of local students in vocational secondary schools (%)

Notes: In Vietnam, monetary policy could affect the economy in general and the private sector in particular through the following mechanisms: (1) controlling the amount of money in circulation through lending activities; (2) using interest rates to influence the ability to borrow or deposit, therefore impacting the level of corporate spending and investment; (3) opting for an appropriate management mechanism of the exchange rate between VND and foreign currencies.

The baseline equation was thus set as follows.

$$\text{PrvI}_{it} = \beta_0 + \beta_1 \text{PrvI}_{it-1} + \beta_2 \text{MP}_{it} + \text{Control} + \eta_i + \varepsilon_{it} \tag{1}$$

By in turn replacing the MP variable with specific measures, namely M2, CR, IR and ER and declaring the control variables, we derived four corresponding equations as follows.

$$\begin{aligned} \text{PrvI}_{it} = \beta_0 + \beta_1 \text{PrvI}_{it-1} + \beta_2 \text{M2}_{it} + \beta_3 \text{PubI}_{it} + \beta_4 \text{FDI}_{it} + \beta_5 \text{Gdpg}_{it} + \beta_6 \text{Trade}_{it} + \beta_7 \text{Inflat}_{it} \\ + \beta_8 \text{Infras}_{it} + \beta_9 \text{Labour}_{it} + \beta_{10} \text{HuC}_{it} + \eta_i + \varepsilon_{it} \end{aligned} \tag{2a}$$

$$\begin{aligned} \text{PrvI}_{it} = \beta_0 + \beta_1 \text{PrvI}_{it-1} + \beta_2 \text{CR}_{it} + \beta_3 \text{PubI}_{it} + \beta_4 \text{FDI}_{it} + \beta_5 \text{Gdpg}_{it} + \beta_6 \text{Trade}_{it} + \beta_7 \text{Inflat}_{it} \\ + \beta_8 \text{Infras}_{it} + \beta_9 \text{Labour}_{it} + \beta_{10} \text{HuC}_{it} + \eta_i + \varepsilon_{it} \end{aligned} \tag{2b}$$

$$\begin{aligned} \text{PrvI}_{it} = \beta_0 + \beta_1 \text{PrvI}_{it-1} + \beta_2 \text{IR}_{it} + \beta_3 \text{PubI}_{it} + \beta_4 \text{FDI}_{it} + \beta_5 \text{Gdpg}_{it} + \beta_6 \text{Trade}_{it} + \beta_7 \text{Inflat}_{it} \\ + \beta_8 \text{Infras}_{it} + \beta_9 \text{Labour}_{it} + \beta_{10} \text{HuC}_{it} + \eta_i + \varepsilon_{it} \end{aligned} \tag{2c}$$

$$\begin{aligned} \text{PrvI}_{it} = \beta_0 + \beta_1 \text{PrvI}_{it-1} + \beta_2 \text{ER}_{it} + \beta_3 \text{PubI}_{it} + \beta_4 \text{FDI}_{it} + \beta_5 \text{Gdpg}_{it} + \beta_6 \text{Trade}_{it} + \beta_7 \text{Inflat}_{it} \\ + \beta_8 \text{Infras}_{it} + \beta_9 \text{Labour}_{it} + \beta_{10} \text{HuC}_{it} + \eta_i + \varepsilon_{it} \end{aligned} \tag{2d}$$

where i and t denote province/city and year, respectively; βs are the regression coefficients; η_i is the province-specific effect and ε_{it} is the error term. In every single equation, time dummies were also included to capture the period-specific effect.

4.2. Data

For empirical analysis, a panel of 63 (first tier) provinces and cities across Vietnam[1] covering a 9-year period (2009–2017) was employed. Data on Vietnam's monetary policy indicators were derived from the World Development Indicators database (published by the World Bank), whilst private investment and its economic determinants were taken from the annual socioeconomic statistical data at the provincial level issued by the General Statistics Office of Vietnam.

It should be highlighted that, according to the SBV's annual reports, in addition to the aforementioned instruments, the conduct of monetary policy also entails alternative ones such as open market operations, reserve requirement ratios, refinancing and rediscounting interest rates. However, restrictions on access to unpublished data do not allow us to take these instruments into consideration in the present study.

4.3. Estimation Approach

To estimate the relationship between private investment and monetary policy indicators in a panel data, we employed the system GMM procedure proposed by Arellano and Bover (1995) and Blundell and Bond (1998). This approach appears superior to alternative panel data estimators (e.g., pooled ordinary least squares, fixed effect and difference GMM) as it could address the econometric problems caused by unobserved group-specific effects and endogeneity of the explanatory variables in lagged dependent variable models. In addition, the system GMM estimator was proved consistent in parameter estimation and unbiased (Beck and Levine 2004; Chu and Chu 2020; Hasan et al. 2009; Pham and Hoang 2019).

In this study, two step GMM was chosen rather than one step since the two step procedure appears asymptotically more efficient (Blundell and Bond 1998; Hasan et al. 2009). Aside from that, robust standard errors were derived using finite-sample correction to the two-step covariance matrix as suggested by Windmeijer (2005). To improve the model efficiency, all the available lags of the instrumental variables ($p = t$) were considered. As recommended by Hasan et al. (2009), we treated all of the monetary policy (either broad money, credit to the private sector, interest rate or exchange rate that corresponds to each derived equation) and investment activity (including lagged

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[1] On the first tier, Vietnam is split into 58 provinces and 5 municipalities under the central government. Municipalities are centrally-controlled cities and have special status equal to the provinces. Our panel, thus, consisted of a total of 63 (first tier) provinces and cities.

private investment, public investment and foreign direct investment) variables as endogenous and the remainder as exogenous.

To avert the proliferation of instruments, following the study of Chu and Chu (2020), we limited the number of control variables by adding them separately, i.e., each derived equation was regressed first with only economic growth and trade openness variables. Subsequently, inflation, infrastructure development, labour force and human capital variables were added in turn. Instead of using all the available lags as instruments, we reduced the instrument count to just one ($p = 1$). Additionally, in line with Roodman (2009) criteria, the number of lags used for instrumental variables in this study was capped at two.

Lastly, to judge the validity of the instruments in the GMM procedure, the Hansen test for overidentifying restrictions and Arellano–Bond AR(2) test for autocorrelation were performed.

5. Empirical Results

5.1. Summary Statistics

Table 3 reports the statistical descriptions of the variables used in this study. During 2009–2017, private investment in localities accounted for 23% of the GDP on average, in which the lowest level of investment at 1.14% of GDP was recorded by Ba Ria—Vung Tau province in 2011 and the largest at 71.41% of GDP was achieved by Lai Chau province in 2009. As regards monetary policy indices, the mean broad money supply to GDP was 111.47%, with the highest of 137.65% achieved in 2017 and the lowest of 93.66% of GDP achieved in 2009. The average domestic credit to the private sector constituted up to 99% of GDP, with the highest level of 114.72% in 2010 and the lowest of 82.87% in 2009. The mean real interest rate stood at 1.85% per annum (with the highest level of 7.32% in 2017 and lowest of −5.62% in 2009), whilst the mean exchange rate was recorded at 19,244 VND per USD (with the highest rate of nearly 21,700 VND per USD in 2017 and lowest rate of 16,100 VND per USD in 2009). Our statistical results once again affirm the government's monetary policy tightening to cope with the rapid increase in prices during the 2008–2009 global financial crisis.

Table 3. Summary statistics.

Variables	Obs.	Mean	Std. Dev.	Min	Max
PrvI	567	23.01	9.18	1.14	71.41
M2	567	111.47	13.42	93.66	137.65
CR	567	99.14	10.03	82.87	114.72
IR	567	1.85	3.95	−5.62	7.32
ER	567	19,244	2117	16,105	21,697
PubI	567	20.29	17.52	2.73	180.68
FDI	567	5.74	13.13	0.00	150.83
Gdpg	567	9.34	10.68	−31.60	148.20
Trade	567	111.26	350.30	0.07	4234.26
Inflat	567	11.17	13.49	−9.08	142.89
Infras	567	4.13	86.10	−100.00	1876.63
Labour	567	1.84	2.95	−16.12	17.80
HuC	567	13.51	83.04	−100.00	910.94

Source: The authors.

Correlation matrix results are presented in Table 4. Accordingly, several key points could be drawn as follows: (i) the simple correlations of explanatory variables with private investment seem rather moderate; (ii) no pair of explanatory variables, exclusive of monetary policy variables, offers a correlation coefficient in excess of the benchmark of 0.5 (as proposed by Gujarati 2003), implying our model is free from multi-collinearity problem; (iii) the private investment is highly correlated with broad money, domestic credit and infrastructure development variables.

Table 4. Correlation matrix.

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)
1. PrvI	1												
2. M2	0.322	1											
3. CR	0.374	−0.510	1										
4. IR	0.199	0.184	−0.210	1									
5. ER	0.223	−0.730	0.721	−0.281	1								
6. PubI	0.148	0.344	0.350	0.198	0.341	1							
7. FDI	−0.280	−0.480	0.465	−0.289	0.512	0.342	1						
8. Gdpg	−0.113	0.516	−0.354	−0.181	−0.486	0.455	−0.349	1					
9. Trade	−0.244	−0.488	0.317	−0.318	0.462	0.185	0.459	0.182	1				
10. Inflat	−0.209	0.120	0.079	0.238	−0.105	0.244	−0.125	−0.033	−0.015	1			
11. Infras	0.488	0.108	0.213	0.211	0.302	0.314	0.102	0.276	0.102	0.119	1		
12. Labour	0.223	0.187	0.101	0.115	0.140	0.146	0.237	0.145	0.086	0.220	0.250	1	
13. HuC	0.300	0.210	0.157	0.220	0.187	0.085	0.311	0.167	0.120	0.168	0.172	0.247	1

Source: The authors.

5.2. Analysis of Results

Table 5 presents the estimation results regarding the role of monetary policy indicators in promoting private investment for 63 localities across Vietnam. For Equations (2a)–(2d), we estimated separate regressions for each indicator, viz. broad money supply (M2), credit to the private sector (CR), interest rate (IR) and exchange rate (ER) to capture the comprehensive effect of monetary policy between 2009 and 2017. In all of the four equations estimated, the p-values obtained from Hansen's overidentification and AR(2) testing results exceeded 0.05, implying that (i) the instruments were valid (Hansen 1982) and (ii) the models were free from the autocorrelation problem. Therefore, our system GMM results are efficient and reliable.

The empirical results demonstrate that among the four monetary policy measures, broad money supply (M2), domestic credit to the private sector (CR) and interest rate (IR) have significant positive impacts on private investment, and exchange rate (ER) reveals no impact at all. Accordingly, monetary policy inverventions such as the expansion of M2, enhanced allocation of credit resources to local firms and interest rate hikes could be seen as the catalyst for private investment development in Vietnam. In terms of magnitude, domestic credit to the private sector is judged to have the greatest impact on private sector investment, followed by real interest rate and broad money supply. Interestingly, the positive impact of real interest rate on private investment as revealed in our research for Vietnam appears contrary to the macroeconomic theory. Given the understanding that real interest rate is refered to as nominal interest rate after eliminating the effect of (expected) inflation, this finding could be brought to light by considering two separate period segments as follows:

(1) The period of 2009–2012 witnessed record highs in both CPI inflation and nominal lending interest rates, with the former having stronger growth. Under such circumstances, most businesses still accepted loans at sky-high interest expenses to invest in the post-crisis production reconstruction alongside setting aside a certain share of around 25–30% in the portfolio to invest in potentially risky areas, namely real estate, securities and precious metals in the expectation of high return to off-set the cost of debt. However, in the context of macroeconomic instability, firms' business performance and return on investment were almost contrary to their prior expectations. Consequently, Vietnam's banking system had to experience four years of unprecedentedly high non-performing loan ratios (estimated level for the peak year of 2012 is at 12% according to Fitch Ratings, 10% according to the International Monetary Fund, 6% according to the SBV and 5% according to self-reported figures by commercial banks). Such challenging situation forced the Vietnamese government to activate a scheme on restructuring the system of credit institutions associated with bad debts handling during the 2016–2020 period (To 2013).

(2) Over the next period (says, 2013–2017), there was a sustained decline in both nominal interest rates and inflation, in which the interest rates fell more deeply due to the SBV's drastic monetary policy interventions under the guidance of the government. In the face of golden

opportunities for development, specifically: (i) rapidly growing and highly stable economic prospects; (ii) a "government-tectonic" environment towards accelerating regional economic development and encouraging five strategic sectors including high-tech/information and communications technology (ICT), processing and manufacturing, supporting industry, tourism services and high-tech agriculture, with special preferences in terms of interest rates and loan conditions; (iii) Vietnam's enhanced integration tendencies through its involvement in regional economic alliances including the ASEAN Economic Community (AEC), bilateral and multilateral trade agreements, for instance, the European Union–Vietnam Free Trade Agreement (EVFTA), the Comprehensive and Progressive Agreement for Trans-Pacific Partnership (CPTPP) among others, investment to consolidate their competitive capabilities and to adapt to changing environments towards global business development is clearly the first priority of private firms. In other words, the benefits perceived from the promising development prospect far outweighing the cost of debt considerations could lead to excessive investment by the private sector, regardless of increases in the real interest rates during this period segment.

Table 5. System generalized method of moment (GMM) model's estimation results (dependent variable: PrvI).

Regressors	Equation (2a)	Equation (2b)	Equation (2c)	Equation (2d)
PrvI(−1)	0.930 *** (0.205)	0.847 *** (0.180)	0.912 *** (0.300)	0.853 *** (0.220)
M2	0.057 *** (0.024)			
CR		0.914 *** (0.105)		
IR			0.197 *** (0.001)	
ER				−2.586 (0.160)
PubI	0.007 (0.002)	0.017 (0.001)	0.005 (0.004)	0.003 (0.001)
FDI	−0.025 * (0.130)	−0.010 (0.010)	−0.029 ** (0.010)	−0.015 (0.003)
Gdpg	−0.074 *** (0.224)	−0.088 *** (0.112)	0.063 ** (0.105)	−0.064 * (0.022)
Trade	−0.001 (0.020)	−0.008 (0.014)	−0.006 ** (0.211)	−0.001 (0.036)
Inflat	−0.012 (0.001)	−0.023 (0.101)	−0.064 (0.024)	−0.070 (0.108)
Infras	0.001 (0.019)	0.001 (0.102)	0.019 (0.001)	0.001 (0.002)
Labour	−0.009 (0.014)	0.039 (0.102)	−0.005 (0.003)	0.014 (0.015)
HuC	0.007 (0.120)	−0.001 (0.011)	0.008 (0.002)	0.005 (0.103)
Cons.	−3.962 (2.110)	−4.879 (3.445)	2.358 (2.041)	29.838 (4.667)
Obs.	494	488	478	465
AR(2) test (*p*-value)	0.187	0.193	0.216	0.193
Hansen test (*p*-value)	0.603	0.395	0.391	0.162

Notes: ***, **, * indicate significance at 1%, 5% and 10%, respectively. Robust standard errors are in parenthesis.
Source: The authors.

Our research findings, therefore, posit that in order to boost private investment in prompt and effective ways, from a monetary policy perspective, the SBV may require credit institutions to focus credit on investment activities for local production and business, in addition to the launch of reasonable and preferential interest rates to comply with the government's policy resolution. Markedly, in potentially risky areas such as financial, real estate and securities investment, credit flows must be severely monitored to minimize bad debts for the entire banking system. Despite the fact that the effect of broad money supply might not be truly superior to that of domestic credit and interest rates, depending on general economic context as well as specific conditions of localities, the SBV is still required to make adjustments to the broad money in a proactive, flexible and prudent manner to ensure credit to the economy under control.

During the period studied, Vietnam's economy had been under great pressure of the economic recession. In such circumstances, the Vietnamese government implemented a proactive and flexible monetary policy to consolidate economic stability. Despite being recognized as an official instrument of monetary policy according to the Law on the State Bank of Vietnam 2010, exchange rate only demonstrated an upward trend over time, yet did not contribute significantly to achieving the goals of macroeconomic stability. Thus, based on historical developments and estimation results, the study establishes that the exchange rate has failed to fulfil its role as an effective tool for implementing monetary policy in Vietnam during 2009–2017.

As regards control variables, the lagged value of private investment (PrvI(–1)) and economic growth (Gdpg) have significant impact on private investment in Vietnam. Accordingly, private investment tends to move together with its values in the past, yet in the opposite direction with the provincial economic growth. Indeed, most of private enterprises in Vietnam are small and medium-sized enterprises (SMEs) which are often attributable to deficiencies in their international competitiveness. Private firms' choice of rapid growing localities to put up capital investment, hence, might be taking a major risk due to fierce competitive pressure from foreign investors. This reality seems even more evident as the testing results of Equation (2a) and (2c) indicate the negative impact of foreign direct investment (FDI) on private investment, i.e., private investment seems totally overwhelmed by foreign direct investment in terms of scale and competitiveness levels.

6. Conclusions

This study explores the relationship between monetary policy and private investment for Vietnam. It extends the empirical framework commonly used in the literature to incorporate other economic determinants at the provincial level such as economic growth, trade openness, inflation, infrastructure development, labour force and human capital. Using a data sample of 63 provinces and cities in Vietnam during 2009–2017 and the system GMM estimator, the main findings drawn are three-fold. First, monetary policy indicators including broad money supply, domestic credit and interest rate are found to have a positive impact on the private sector investment. Such a surprising positive effect of real interest rate on private investment could be analyzed based on the two period segments (says, the pre- and post-2012) with contemporary distinct features. Second, we did not found any evidence regarding the effect of exchange rate, which is deemed a key instrument in the implementation of monetary policy. Finally, decisions on private investment rely heavily on the investment results of the prior year and the level of local economic development. Specifically, private investment tends to respond in the same direction as the investment level achieved in the previous period, yet in the opposite direction to the local economic growth. The main reason behind this may be due to the dominant competitive position of foreign direct investment sector over the local investment sector.

Although some fresh evidence has been unveiled concerning the private investment activities in Vietnam, certain limitations of data on open market operations, reserve requirement ratio, refinancing and rediscounting rates prevented us from approaching all the necessary instruments used by the SBV in the conduct of monetary policy during 2009–2017. For future research, we aspire to gain better access to data associated with these tools and intermediate targets of monetary policy so that the

scope of research could be broadened and assessment of the monetary policy's effect on private sector investment would become more specific and comprehensive, not only for Vietnam but for the emerging market economies in general.

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