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REGIONAL EFFECTS OF CHINESE MONETARY POLICY

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ABSTRACT

The objective of this study is to determine the impact of monetary policy on real output in China and its provinces using the vector error correction (VEC) method for the 1980-2004 period. It compares and contrasts two alternative indicators of monetary policy - M2 and interest rates. Our findings indicate that the bank lending rate is a better indicator of the direction of monetary policy in China. Using VEC-generated impulse response functions, we find that coastal provinces respond more to shocks in monetary policy than inland provinces. We also determine that the differential provincial responses to monetary policy changes are positively related to the share of loans accounted by industrial firms and to the primary sector's GDP share. Finally, the percentage of firms that are state-owned (a proxy for the soft budget constraint) has a negative, albeit statistically insignificant, relationship to a province's response to monetary policy shocks.

Key words: *monetary policy, vector autoregression, vector error correction, impulse response, variance decomposition*
JEL Classification: E52

REGIONAL EFFECTS OF CHINESE MONETARY POLICY

1. Introduction

The effectiveness of monetary policy in China has been the subject of discussion and study since the country's transition to market-based reforms. The importance of a "national" monetary policy is underscored by the passing of the People's Bank of China (PBOC) Act in 1995 which directs the central bank, the People's Bank, to formulate and conduct monetary policy under the leadership of the State Council and to use policy instruments such as reserve ratios and open market operations to control the money supply. To further strengthen its control and independence (from provincial and local political influences), the People's Bank abolished its 31 provincial branches and established nine regional branches in major cities in 1998 (Kong, 2003). Despite its national focus, monetary policy may have different effects on China's regions and these regional effects, in turn, may affect the formulation of national monetary policy.

The objectives of this study are: (1) to analyze the impact of monetary policy shocks on China's aggregate economy and on its various provinces or regions; and (2) to determine the factors that explain differences in the regional responses to national monetary policy. This study follows earlier studies by Hsing and Hsieh (2004), Yu (1997), and Carlino and DeFina (1999, 1998) using the vector autoregression (VAR) model.

2. Review of the Literature

The conduct and influence of China's monetary policy on macroeconomic variables such as output and prices have been discussed recently by Chan, Deaves, and Wang (1992), Hafer and Kutan (1993), Yu (1997), and Hsing and Hsieh (2004).

Chan et al (1992) employ Granger causality tests to analyze the relationship between money held by firms and gross industrial output. Using monthly data for the 1980-88 period, they find two-way causality during the pre-monetary reform period (01/80-06/84) and one-way causality from money to output during the post-reform period (07/84-07/88).

Subsequent researchers have used the method of vector autoregression to examine the monetary policy-real output relationship. In a VAR system, all endogenous variables are determined simultaneously, and each endogenous variable is affected by the lagged values of all endogenous variables. More importantly, the VAR generates impulse response functions that show the response of, say, output to a shock or impulse in the monetary policy variable. The method also provides variance decompositions that indicate the amount of variation in real output which is explained by the monetary variable (and any other variables).

Similar to Chan et al, Yu (1997) also uses monthly data (for 12/83-05/94 period) and Granger tests derived from vector autoregressions. Yu initially applies unit root tests for 17 economic data series, including three monetary aggregates, two bank credit variables, five industrial output variables, three retail sales, fixed asset investment, merchandise exports, imports, and retail price index. The augmented Dickey-Fuller test with constant and time trends shows all variables (in log form) are stationary in first differences. Although the variables are non-stationary in levels, there may be linear combinations of these data series, i.e., cointegrating vectors, which signify long run interrelationships. He finds at least two cointegrating vectors. As a result, Yu estimates vector error correction (VEC) model systems with each system containing a non-price macro variable, a price variable, and a financial variable. Each system also includes exogenous tight money control variables proxied by a dummy variable equal to one on the current and twenty-four lags of each tight-money date and zero otherwise (the People's Bank of China applied tight monetary controls four times to solve economic overheating: 01/81, 04/85, 09/88, and 07/93). Applying Granger causality tests generated by the VEC, Yu determines that tight monetary policy has significant negative impacts on output, retail sales, and prices, but no effect on imports and fixed investment. Finally, he concludes that money supply is better than bank credit in predicting economic conditions.

Hafer and Kutan (1993) employ a similar procedure but on annual data for the 1952-87 period. They examine the interrelationships between China's real income, money supply M0 (only currency) and M2 (currency plus savings deposits), and prices (retail price index and GDP deflator). Hafer and Rutan conduct the standard preliminaries of unit root tests (variables are stationary in first-differences) and cointegration tests (one cointegrating vector is present), and then estimate VAR models with one lag on each variable to conserve degrees of freedom. Analyzing the significance of the lagged terms in the estimated VARs, Hafer and Rutan conclude that the relationships are sensitive to the type of price index, and that monetary aggregates M0 and M2 are useful indicators for monetary policy in China.[1]

Hsing and Hsieh (2004) also utilize the VAR method but unlike previous studies, they make use of the VAR-generated impulse response functions and variance decompositions to evaluate the impact of monetary (and fiscal) policy on the Chinese economy. Using annual data for the 1980-2000 periods, Hsing and Hsieh include real GDP, monetary policy (real M2 versus bank lending rate), fiscal policy (government deficit versus debt), the exchange rate, and inflation rate in the VAR model. They do not conduct unit root tests on the data series but proceed to the Johansen cointegration test (one cointegrating relationship is found thus confirming long run relationships among the variables). Hsing and Hsieh then estimate VARs with a maximum lag length of two years. Given a time period of six years to represent long run impact, accumulated impulse responses are generated from the VARs. They find that real GDP responds negatively to a shock to the lending rate, real appreciation of the Chinese yuan, the debt ratio, and the inflation rate, while it responds positively to a shock to own

[1] Another VAR study by Hasan and Taghavi (1996) also support the one-way causality from broad money stock M3 to real income.

lagged output. Examining the variance decompositions for real GDP when the lending rate and government deficit are included in the model, they find that the lending rate is the most important variable explaining changes in GDP. Hsing and Hsieh conclude that a lower interest rate, greater money supply M2, and lower government debt will increase real GDP.

The preceding literature confirms the importance of monetary policy as a determinant of national economic growth in China. The geography, industrial diversity, and political division of China into numerous provinces, autonomous regions, special economic zones, and municipalities, however, begs the question as to whether there are regional differences in the impact of a national monetary policy.

Carlino and DeFina (1999, 1998a) analyze the effects of monetary policy shocks on different U.S. regions and states and also applied the same analysis to the European Monetary Union (1998b).[2] They use structural vector autoregression procedure to estimate the effects of monetary policy shocks (here measured by changes in the federal funds rate) on state-level real per capita income for 48 states for the 1958-1992 period. Carlino and DeFina find that states respond differently compared to the regional average response and to each other. The authors then employ the estimated state impulse responses in a cross-state regression model to determine the causes of these state responses. The main causal factors they consider include industry mix (percentage of gross state product accounted for by manufacturing), the concentration of small versus large firms (percentage of state's firms with fewer than 250 employees), bank size (proxied by a state's 3-bank concentration ratio or percentage of state's loans made by banks at or below the 90th percentile in assets in 1982), and regional dummy variables. Results show that a state's response to monetary policy is positively related to its manufacturing share and negatively related to the percentage of small banks. In summary, Carlino and DeFina state that: "The existence of disparate responses underscores the difficulty of conducting a national monetary policy…" (1998a, p. 586)

Owyang and Wall (2004) critique and extend the Carlino and DeFina study by considering: (1) the effects of monetary policy over different time periods; (2) the depth and total income costs of a recession caused/induced by monetary policy action; and (3) the various channels of monetary policy (money channel, broad credit channel, and bank lending channel). Owyang and Wall divide the 1960-2002 period into a pre-Volcker sub-period (1960-78) and a Volcker-Greenspan sub-period (1983-2002), and find that monetary policy effects are different across states and over time. Monetary shocks result in "deeper and more persistent" recessions during the pre-Volcker period than during the Volcker-Greenspan period. Moreover, there is little to no inflation response during the Volcker-Greenspan period. To determine the causes of these differential state responses, Owyang and Wall

[2] Ibrahim (2005) analyzes the case of Malaysia and finds sectoral differences in the effects of monetary policy. However, he does not provide reasons beyond speculating on the industry's interest sensitivity and reliance on bank loans.

estimate VAR impulse responses for 19 sub-regions, each with two or four states grouped according to proximity and similarity in business cycles (in contrast to Carlino and DeFina who estimated responses for 48 states), and regress them on manufacturing share, small firms' share, and banking concentration. Their results indicate that, for the Volcker-Greenspan period, the sub-regions with bigger banks have milder recessions (contrary to Carlino and DeFina), and that the total income loss from recessions is greater for regions with a larger manufacturing share of the economy.

In a different approach, Cortes (2005) built on previous studies by examining if and how national monetary policy and its induced state responses are translated into or transmitted to other measures of state economic performance, specifically output, jobs, and business failures. He regressed changes in state economic variables on the VAR-estimated impulse responses calculated by Carlino and DeFina. After controlling human capital, export share, and regional differences, the results showed a significant impact of monetary impulse responses on output and business failures. The monetary impulse variable was positively and significantly related to the growth rate of gross state product, indicating that the more sensitive a state is to monetary policy shock, the greater the change in output. Similarly, states that were highly sensitive to, for example, an increase in the federal funds rate, were more likely to subsequently experience not only a significant decline in income, but also an increase in bankruptcies or business failures. There was no evidence, however, that state sensitivity to monetary policy led to changes in manufacturing employment. Finally, the estimated coefficients on the regional dummy variables reflected the importance of locational characteristics in explaining state economic performance.

This paper follows the approach of Hsing and Hsieh, but with important differences: (1) it focuses primarily on the monetary policy effects on the Chinese economy; (2) it evaluates and determines the best indicator of monetary policy – monetary aggregate measure (M2) versus interest rates; and (3) it extends Hsing and Hsieh's study by analyzing the impact of national monetary shocks on various regions or provinces of China, similar to Carlino and DeFina.

3. Methodology

Following Hsing and Hsieh and earlier studies, the empirical approach is the method of vector autoregression. This method represents standard practice and more importantly evaluates the interrelationships among different variables in a model or system as well as the impact of policy shocks. Two VAR systems, a national GDP system and a provincial GDP system are estimated here. Each system consists of four endogenous variables (monetary policy variable (M2 or bank lending rate), exchange rate, price index, real GDP (national versus provincial)) and one exogenous variable, world GDP. Our model follows that of Hsing and Hsieh with the main difference being that we exclude the fiscal policy variable from our system. Annual data for China for the 1980-2004 period for the macroeconomic variables (bank lending rate, M2, real effective exchange rate, GDP deflator, and real GDP) are taken from the World Bank's 2006 World Development Indicators CD-ROM. Real provincial GDP figures for 29 provinces for 1980-2002 are from the 1949-2002 China Statistical Data Compilation (All China Marketing Research Co.) and the China Statistical Yearbooks. All variables except for the lending rate are expressed in logarithmic form.

It is expected that real GDP will respond directly to a positive shock in real money supply and lagged GDP, and negatively to a positive shock in the lending rate and prices. However, the impact of a shock in the real exchange rate on real output is ambiguous. An increase in the exchange rate or appreciation of the Chinese yuan may lead to a decline in import and domestic prices, thereby increasing real income. Alternatively, an appreciation of the yuan might cause Chinese exports to be less price-competitive, thereby reducing export revenues and real income (Hsing and Hsieh, p. 129).

Before estimating VAR, we need to test for the presence of unit roots and cointegration among the variables, following standard econometric procedure. Unlike Hsing and Hsieh who do not conduct unit root tests, we applied the augmented Dickey-Fuller (ADF)-Fisher Chi-square test to the levels and differences of the system's variables.[3] To supplement this, we also performed a modified Dickey-Fuller unit root test (DF-GLS) wherein the data series are initially detrended (test developed by Elliott, Rothenberg, and Stock, 1996). The lag length is automatically selected based on the Schwarz information criterion, up to a maximum of four lags. Table 1 provides a summary of the results. The variables in level form are non-stationary, i.e., the null hypothesis of a unit root cannot be rejected (although the ADF test finds real GDP to be stationary). However, all the variables are stationary (no unit roots are present) in their first difference form, that is, they are integrated of order 1.

Table 1: ADF-Fisher Chi-square Unit Root Test

	ADF		DF-GLS	
Series	**Level**	**1st Difference**	**Level**	**1st Difference**
Lending rate	-1.66	-4.02***	-1.38	-4.11***
M2	-1.49	-1.85	-0.86	-1.85*
Real exchange rate	-1.11	-2.96**	-1.03	-2.95***
GDP deflator	-2.94	-2.94**	-0.60	-2.85***
Real GDP	-3.92**	-3.76**	-0.15	-3.22***

Note: Values are significant at the 1%(***), 5%(**), and 10%(*) level.

Even if the variables are non-stationary in level form, there may be linear combinations of these series levels that are stationary, that is, these variables may be cointegrated. If a cointegrating relationship is present, then the dynamic system must be specified as a vector error correction (VEC) model rather than an unrestricted VAR. The Johansen cointegration test determines whether changes in monetary policy will have stable long-run effects on macroeconomic series such as GDP and prices. Table 2 presents our test results for the national or aggregate GDP system. We compare our findings

[3] The statistical package, EViews 6 (by Quantitative Micro Software, LLC), is used here.

with those of Hsing and Hsieh who begin their empirical study by applying the cointegration test. Since a major objective of this study is to determine the more useful monetary policy indicator, we run the cointegration test twice on the GDP system with: (1) Cholesky ordering of lending rate, real exchange rate, GDP deflator, and real aggregate GDP; and (2) Cholesky ordering of money supply M2, real exchange rate, GDP deflator, and real aggregate GDP. To conserve degrees of freedom, we set the maximum lag at one. Table 2 presents the results of testing the null hypothesis that there is r or fewer cointegrating vectors or equations. Rejection of r=0 but not r≤1 denotes the existence of one cointegrating equation. The estimated trace statistics point to the presence of at least two cointegrating equations in the system with lending rate as the monetary variable, and one cointegrating vector in the system with M2. These findings indicate that the monetary policy variables have stable, long run relationships with real output, prices, and the exchange rate.

Table 2: Johansen Cointegration Test

System	Number of Cointegrating Equations	Number of Cointegrating Equations	Number of Cointegrating Equations
	r = 0	r < 1	r < 2
Lending rate, exchange rate, price, real GDP	86.91**	36.03**	11.31
M2, exchange rate, price, real GDP	76.26**	25.21	6.29

Note: Values are trace statistic based on the unrestricted cointegration rank test.
** denotes significance at the 5% level.

3. Analysis of VAR Results for Aggregate Real GDP

Given the evidence of long run, cointegrated relationships between monetary policy and the other macroeconomic variables in the system, we use the vector error correction model instead of the unrestricted VAR to evaluate the impact of a monetary policy shock on real output in China. We examine the impulse response functions and variance decompositions generated by the VEC. The impulse response functions trace the effect of a one-standard deviation shock to the monetary policy variable (lending rate or M2) on real GDP, while the variance decompositions show the relative importance of the monetary variable in explaining variations in real GDP. Given the annual data, the lag length for the VAR is set to one. The forecast period is set to six years to account for long run responses, following Hsing and Hsieh.

Table 3: Impulse Response Functions for Real GDP

Period	Lending Rate	Exchange Rate	GDP Deflator	Real GDP
1	-0.0206	0.0048	0.0066	0.0058
2	-0.0426	0.0064	0.0067	0.0124
3	-0.0470	0.0060	0.0058	0.0136
4	-0.0423	0.0022	0.0091	0.0113
5	-0.0401	-0.0010	0.0105	0.0106
6	-0.0448	-0.0020	0.0090	0.0116
Accumulated response	-0.2375	0.0164	0.0476	0.0652

Cholesky ordering: Lending rate, exchange rate, GDP deflator, real GDP.

Table 4: Variance Decomposition of Real GDP

Period	Standard Error	Lending Rate	Exchange Rate	GDP Deflator	Real GDP
1	0.023	81.01	4.41	8.20	6.37
2	0.051	86.89	2.49	3.40	7.22
3	0.071	88.26	1.99	2.40	7.34
4	0.084	88.56	1.49	2.89	7.05
5	0.094	88.40	1.20	3.54	6.86
6	0.105	88.76	0.99	3.55	6.70

Cholesky ordering: Lending rate, exchange rate, GDP deflator, real GDP.

Table 3 shows that real output responds negatively to a shock in the lending rate and positively to a shock to the exchange rate and lagged real GDP. Contrary to expectations, real output responds positively to a shock in prices. The impulse responses indicate that a one-standard deviation increase in the lending rate results in a cumulative 0.2375% decline in China's real GDP over six years. The relative significance of the lending rate in affecting real output is also supported by the variance decomposition. As shown in Table 4, the lending rate is the most important variable, accounting for 81% of real GDP variance in the first year and approximately 89% in the sixth year. This finding is consistent with that of Hsing and Hsieh.

Tables 5 and 6 present impulse responses and variance decompositions for the VEC system that includes money supply aggregate, M2, as the monetary policy variable.

Table 5: Impulse Response Functions for Real GDP

Period	Money Supply	Exchange Rate	GDP Deflator	Real GDP
1	-0.0060	0.0058	-0.0097	0.0089
2	0.0042	0.0119	-0.0264	0.0109
3	0.0142	0.0180	-0.0289	0.0050
4	0.0139	0.0245	-0.0178	-0.0010
5	0.0047	0.0240	-0.0065	-0.0014
6	-0.0005	0.0186	-0.0028	0.0008
Accumulated response	0.0305	0.1028	-0.0921	0.0233

Cholesky ordering: Money supply, exchange rate, GDP deflator, real GDP.

Table 6: Variance Decomposition of Real GDP

Period	Standard Error	Money Supply	Exchange Rate	GDP Deflator	Real GDP
1	0.016	14.72	14.07	38.59	32.62
2	0.035	4.34	14.47	64.90	16.29
3	0.051	9.80	19.17	62.45	8.58
4	0.061	12.08	29.62	52.27	6.03
5	0.066	10.81	38.46	45.54	5.19
6	0.069	10.01	42.88	42.30	4.82

Cholesky ordering: Money supply, exchange rate, GDP deflator, real GDP.

Table 5 indicates that real output reacts positively to a shock in real M2 and the exchange rate, and negatively to a shock in prices. These results are consistent with *a priori* expectations. More importantly, the cumulative impulse responses show that unexpected money supply shocks have the smallest impact on real output. This finding is supported by the variance decomposition in Table 6 which indicates that M2 is the least important factor affecting real output, accounting for only 15% of GDP variance in the first period and falling to 10% in the last period. Given these results, the lending rate may be a more effective and relevant indicator of Chinese monetary policy than M2.

4. Analysis of Regional or Provincial GDP Results

Another important goal of this study is to estimate and evaluate the effects of monetary policy shocks on the various provinces of China. Based on the 1995 PBOC Act, the nature of China's monetary policy is national in scope. National monetary policy is aimed at promoting economic growth and maintaining a stable exchange rate. In 1998, the PBOC replaced its 31 provincial branches with nine regional banks to increase its autonomy. Nevertheless, the various Chinese provinces vary significantly in many ways, including geography, population, income growth, and industrial structure. Hence, it is imperative to understand how these areas respond to changes in monetary policy.

As we did with aggregate or real GDP, we apply the same procedure (along with the preliminary unit root and cointegration tests) to each of the 29 provinces (Tibet and Chongqing were removed due to inadequate data). The model consists of four endogenous variables (Cholesky ordering: lending rate, exchange rate, GDP deflator, real provincial GDP) and an exogenous variable, world GDP. The bank lending rate is used here as the monetary policy indicator based on earlier results from the national VEC tests. Results of the unit root tests (ADF and DF-GLS) indicate that the real GDP for each province achieves stationarity after first-differencing. The Johansen cointegration test for each province also shows long run, stable relationships between the lending rate and provincial GDP, exchange rate, and prices (with two cointegrating relations). Thus, the vector error correction model is applied here for each province. The VEC-generated cumulative impulse responses for six years (resulting from a one standard deviation monetary policy shock) for the 29 provinces are presented in Table 7.

Table 7: Accumulated Impulse Response of Real Provincial GDP to a Monetary Shock

Province	Response	Province	Response
Beijing	-0.0452	Henan	0.2966
Tianjin	0.0191	Hubei	0.2637
Hebei	0.2633	Hunan	0.2510
Shanxi	0.1716	Guangdong	-0.0349
Inner Mongolia	0.0458	Guangxi	-0.2074
Liaoning	0.1829	Hainan	-0.3905
Jilin	0.0262	Sichuan	0.1705
Heilongjiang	0.0300	Guizhou	0.0936
Shanghai	-0.0158	Yunnan	0.0786
Jiangsu	-0.0914	Shaanxi	0.2418
Zhejiang	-0.1346	Gansu	0.1085
Anhui	0.2319	Qinghai	0.0854
Fujian	0.4154	Ningxia	0.2757
Jiangxi	0.2312	Xinjiang	0.1490
Shandong	-0.0048		

Table 7 shows a very interesting finding: a one-standard deviation increase in the lending rate reduces real output in only eight of the 27 Chinese provinces. Seven of these eight provinces (Shanghai, Jiangsu, Zhejiang, Shandong, Guangdong, Guangxi, and Hainan) are all coastal regions that have benefited much from rapid industrialization, special economic zones, and international trade and investment while Beijing, the political and cultural capital of China, is located near the coast. For example, Zhejiang and Guangdong are manufacturing and shipping centers whose exports account for a large proportion of China's trade while Hainan is an island province specializing in energy resources and tourism. The rapid growth, trading and investment advantages of the coastal provinces relative to the interior and landlocked regions create a dichotomy in terms of provincial responses to monetary policy. Thus, changes in economic geography are important considerations for monetary policy (see Venables, 2006).

Following Carlino and DeFina, we regressed the provincial monetary responses on several factors that represent the channels of the transmission process of monetary policy as well as region-specific factors. The explanatory variables we included are: the percentage of industrial firms which are state-owned, the share of bank loans going to industrial firms, industry mix or the percentage of GDP accounted for by the primary sector, and a coastal dummy variable which equals one if the province is a coastal province, zero otherwise. The first three variables are the averages of 1980 and 2001 values.

The monetary transmission process in China is closely tied to the four major state-owned commercial banks (Industrial and Commercial Bank of China, Agricultural Bank of China, Bank of China, People's Construction Bank of China). These banks historically function as fiscal agents and account for a majority of all deposits. More importantly, their lending is biased in favor of state-owned enterprises (Kong, 2003). The strong tie between China's state-owned banks and state-owned firms is a prime example of the "soft budget constraint syndrome" introduced by Kornai (1986). As Kong states:

> *In order to protect employment and keep the social stability, they [state-owned banks] have to provide quasi-fiscal loans to ailing SOEs (state-owned enterprises) which are failing commercially. Too much of state bank lending has been insensitive to quality and risk for too long and this leads to the high ratio of non-performing loans. (2003, p.7)*

An important implication is that the effectiveness of monetary policy is questionable in the presence of a soft budget constraint. With a soft budget constraint, firms have no incentive to be efficient and to respond appropriately to, say, a monetary restraint since the state stands ready with subsidies, easy credit, and bailouts. In this study, we expect that the sensitivity of provinces to monetary shocks is negatively related to the percentage of firms that are state-owned. Moreover, since bank loans are the most important financing or credit source for industrial firms in China, we hypothesize that provincial monetary impulse responses are positively related to the percentage of loans to industrial firms.

To represent industry mix, we use the share of GDP accounted for by the primary sector (agriculture and extractive industries). Like Carlino and DeFina, we have no *a priori* expectations regarding the sign of this primary sector variable. Unlike Carlino and DeFina, we do not include the manufacturing GDP share because this variable is highly correlated with the primary sector GDP share. Finally, to measure the impact of fixed regional effects on monetary responses, we employ a coastal province dummy variable. We expect that coastal provinces that have greater urbanization, higher income levels, and more access to international trade and investment (another monetary transmission channel) are more sensitive to national monetary policy shocks.

The results of applying ordinary least squares regression are shown in Table 8. Two provinces (Fujian and Sichuan) are dropped due to missing or incomplete data.

Table 8: Determinants of Provincial Monetary Responses

Independent Variable	Estimated Coefficient
Constant	-0.647
	(-2.96)***
% of State-owned Firms	-0.345
	(-1.34)
% of Loans to Industrial Firms	3.006
	(4.52)***
Primary Sector GDP Share	0.559
	(1.92)*
Coastal Province Dummy Variable	-0.115
	(-2.00)**
Adjusted R-squared	0.49
Number of observations	27

Note: T-statistics are in parentheses. One, two, and three asterisks indicate statistical significance at the 10%, 5%, and 1% level, respectively.

The results show that the percentage of bank loans going to industrial firms is the most important variable affecting monetary policy responses of provincial economies, strongly supporting a bank credit channel of the monetary transmission process. The significant coefficient for the primary sector GDP share also indicates the importance of farming, fishery, and extractive industries in the country’s overall industry mix. Moreover, the differential monetary responses are highly dependent on whether the area is a coastal or interior province. Finally, the percentage of firms that are state-owned (a proxy for the soft budget constraint) has a negative, albeit statistically insignificant, relationship to a province’s response to monetary policy shocks.

5. Conclusion

This study adds to the current literature examining the impact of monetary policy variables on real output in China. It applies the vector error correction method and analyzes the impact of monetary policy variables on both national output and provincial output. We find that the lending or interest rate outperforms the monetary aggregate M2 as a consistent indicator of monetary policy. We also estimated cumulative impulse responses of each Chinese province to a change in national monetary policy. We found significant differential reactions of provinces and determined that coastal provinces respond more appropriately (i.e., an unexpected increase in the lending rate reduces real GDP) to monetary shocks than landlocked areas. We then examined the influence of other locational characteristics such as a province’s industry mix and banking conditions to see if these factors can explain the varied responses of Chinese provinces to national monetary shocks. We found that the differential provincial responses to monetary policy changes are positively related to the share of loans accounted by industrial firms and to the primary sector's GDP share. Although the estimated regression found a negative relation between monetary response and state firm presence, the result was not statistically significant. Finally, sensitivity to monetary policy is highly dependent on economic geography.

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