

The Expanding Consumer Credit Sector and the Efficiency of Monetary Transmission Mechanism

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In this paper, we argue that as China's consumer credit sector is expanding, the central bank's role in smoothing economic fluctuation and promoting economic growth becomes more important. Our paper focuses on analyzing how the consumer credit sector affects the transmission mechanism of monetary policy. It can be explained by both the conventional interest rate channel and the new credit channel. The latter emphasizes that when monetary policy is loosened and liquidity is increased, the available consumer credit will increase. Meanwhile, since consumer credits are more sensitive to interest rate change, monetary policy will become more effective in expanding consumption and aggregate output.

We write down a general equilibrium model with durable and nondurable goods to explore the qualitative and quantitative relationship between monetary injections and the availability of consumer credit and real activity. We ask whether (and how) monetary policy will affect consumer credit and whether (and how) such a change in consumer credit will transform to consumption and then to aggregate output. The model finds that after an unanticipated monetary injection, the nominal interest rate and the relative price of durable goods to nondurable goods falls; both the goods producer and the credit-service producer will hire more labor; both the production and consumption levels of total goods and credit-services increase; the proportion of durable goods consumption out of total consumption also rises. As a result, employment and output in both sectors respond positively to the current monetary injections.

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1 Introduction

According to the People's Bank of China's Statistics, total consumer loans issued by all financial institutions in China increase from almost zero in 1997 to 1.67 trillion yuan by the end of March 2004. The real estate loan balance is 1.28 trillion yuan, about 77% of the total consumer loans outstanding. The auto loan balance of .19 trillion yuan accounts for 11% of the total consumer loans. Consumer loans have amounted to 10% of total loans. With the growth of consumer loans and its increasing proportion in total loans, it becomes an urgent question for the People's Bank of China to take into account of these changes and decide what adjustments might be needed when making and implementing monetary policies.

Our paper argues that as China's consumer credit sector is expanding, the central bank's role in smoothing economic fluctuation and promoting economic growth becomes more important. We focus on analyzing how the expanding consumer credit sector affects the transmission mechanism of monetary policy. Monetary policy can be transmitted through both the conventional interest rate channel and the new credit channel. The latter emphasizes that when monetary policy is loosened and liquidity is increased, the available consumer credit will increase. We argue that the expansion of the consumer credit sector will not only widen the credit channel but also increase the transmission efficiency of the traditional interest rate channel.

In the paper, we write down a general equilibrium model with durable and nondurable goods to explore the qualitative and quantitative relationship between monetary injections and the availability of consumer credit and real activity. We ask whether (and how) monetary policy will affect consumer credit and whether (and how) such an effect on consumer credit will transform to consumption and then to aggregate output. The model is based on Fuerst (1992) and Li (2000), but we distinguish durable goods from nondurable goods and assume the purchase of durable goods can be only financed by the consumer credit sector.

Li's (2000) model setup is based on Fuerst's (1992) real business cycle (RBC) paper. But Li looks at the importance of the consumer credit instead of the business credit as Fuerst

(1992) does. Li (2000) uses his model to explain a different issue than Fuerst (1992). Fuerst (1992) uses a RBC model to replicate the liquidity effect and the loanable funds effect. Li (2000) instead explains why the liquidity effect may dominate the anticipated inflation effect in the short run, but he does not discuss the credit channel of monetary transmission mechanism.

Our model looks at an economy with the consumer credit sector as in Li (2000), but our purpose is to analyze how the existence of the consumer credit sector will change the direction and the magnitude that monetary policy influences the real activity through both the interest rate channel and credit channel. Our paper does it through directly calculating the liquidity effect and the loanable funds effect. The liquidity effect describes when the extra money in the economy pushes down interest rates, it will stimulate economic activity. The loanable funds effect, instead, focuses on when the central bank reduces money supply, and therefore of loans, spending by customers who depend on bank credit must fall, and therefore so must aggregate demand.

In our model, there are two sectors in the production side of the economy. Sector one is the consumption goods producing sector, and goods-producers hire labor to produce durable and nondurable goods. Sector two is the finance sector consisting of both financial intermediaries and credit-service producers. Financial intermediaries do not hire any labor but channel the funds between households and credit producers. Credit producers in sector two employ labor to produce a flow of credit services. We assume σ fraction of such credit services must be in terms of cash, so credit producers must borrow cash from financial intermediaries to produce credit services.

The model finds that after an unanticipated monetary injection, the nominal interest rate and the relative price of durable goods to nondurable goods falls; both the goods producer and the credit-service producer will hire more labor; both the output and consumption level of total goods and the credit-service increases; the proportion of durable goods consumption out of total consumption also rises. As a result, employment and output in both sectors will respond positively to the current period monetary injections.

Two policy implications are derived from the model. One is that the central bank should

encourage the growth of the consumer credit sector to improve the efficiency of the monetary transmission mechanism. Second, as the expansion of the consumer credit sector and the increasing importance of it in the total loans, the central bank should put more focus on the market-based monetary policy tools instead of those regulative monetary policy instruments controlling the liquidity or the availability of credit. Between the market-based interest rate and market-based quantity tools, we should pay more attention to the interest rate tools. The reason is that the interest rate movements influence the consumer credit demand which directly affects the consumption demand and aggregate output. Moreover, in China, banks and firms are wholly or partially state owned, and their decision making is more or less under regulation. Individuals' decision making is more market-based. Therefore monetary policy is not that effective when the central bank controls the commercial banks' loan supply through liquidity management or loan availability, or when the central bank adjusts the interest rate to affect the firms' investment demand. Whereas, when the central bank changes the interest rate and influence the individuals' consumption demand, the monetary policy becomes more effective in raising aggregate output and lowering the unemployment rate. Our conclusion is that as the consumer credit sector growing in China, focusing on the market-based interest rate tool is the better choice for the central bank.

2 Literature Review

Christiano and Eichenbaum (1992) look at three real business cycle models and find out that when there is some kind of friction in the household saving decision, the liquidity effect not only exists but also persists even after the realization of monetary shock. Their paper explains the empirical evidence that the liquidity effect is bigger than the anticipated inflation effect.

Fuerst (1992) develops a general equilibrium model to explain the liquidity effect and the loanable funds effect. These effects are modeled with a monetary production economy in which central bank injections of cash are funneled into the economy through the credit market. Since only borrowers have direct access to the newly injected cash, monetary injections cause nominal interest rates to fall. If firms are borrowers, then monetary injections

also increase current and future real activity.

Li (2000) extends Fuerst (1992). Instead of production credit market, Li (2000) evaluates the role of household credit markets in the transmission of monetary policy. Unlike Christiano and Eichenbaum (1992), Li (2000) does not impose additional restrictions on the timing of household decisions. But the author does assume that the household saving decision is made prior to the realization of the current monetary shock, monetary injections of cash enter the economy asymmetrically through the financial sector and credit producing firms, creating a liquidity premium for producers of credit services. He reveals that a positive contemporaneous correlation between monetary shocks and consumption which helps to explain both the negative correlation between nominal interest rate and monetary policy, and the positive money-credit relationship.

3 The Model

3.1 Preferences, Production, and Constraints

To evaluate the role of consumer credit sector in the transmission of monetary policy, we will follow Fuerst (1992) and Li (2000) to construct a model with both durable and nondurable goods where durable goods consumption must be financed through household credit markets. We assume that in the economy, there are infinite number of identical households, infinite number of homogenous firms residing in a goods producing sector and a financial sector. There is a central bank that controls the money supply. We study a deterministic model instead of a stochastic one so that model solution can be calculated directly without resorting to numerical methods

3.1.1 Preferences

All households in the economy are infinitely lived and have identical preferences regarding consumption and leisure. The maximization problem of a representative household is shown

here,

$$U_0 = \sum_{t=0}^{\infty} \beta^t [u(c_t) + v(1 - n_t)], \quad (1)$$

where n_t is work effort at time t , c_t is consumption at time t $u(\cdot)$ and $v(\cdot)$ are the utility functions of consumption and leisure respectively. The consumption c_t can be either financed by cash or credit as shown below

$$c_t = (g_t + q_t), \quad (2)$$

where g_t represents goods financed by cash, and we can look at them as nondurable goods; and q_t represents goods financed by credit, and we can think of them as durable goods. In this simple model, we assume goods financed by cash and goods financed by credit are perfect substitutes as in Fuerst (1992) and Aiyagair and Eckstein (1994). The price of goods is given by P_{gt} .

3.1.2 Production

In the production side of this economy, there are two sectors. The sector one is the goods producing sector where a representative goods-producer employs labor¹ n_{1t} to produce output y_t .

$$y_t = F(n_{1t}). \quad (3)$$

The sector two is the financial sector. Following Aiyagair and Eckstein (1994) and Li (2000), we assume the financial sector consists of both financial intermediaries and credit-service producers.

The representative financial intermediary does not hire any labor but channels the funds between households and credit producers. It accepts cash deposits D_t from households at the beginning of period t , receives monetary injections X_t from the central bank during the

¹We assume it is an economy without capital (or with a fixed amount of capital) to simplify the analysis but not affect the major findings of our paper. In our model, even without capital, the production of consumer goods will be affected by the monetary policy through the relative price movement of nondurable goods vs. durable goods. The demand for credit services and thereafter the reallocation of labor between the goods producer and the credit service producer will adjust.

period t , and provide loans to credit producers. The nominal interest rate the financial intermediary charges for loans and pays on deposits is given by R_t .

The representative credit producer in the sector two employs labor n_{2t} to produce a flow of credit services $Q(n_{2t})$. The household can purchase one unit of credit services to purchase one unit of goods with credit. To finance the credit goods consumption q_t , the credit producer needs to produce the q_t units of credit services. To provide $Q(n_{2t})$ units of credit services, σ fraction of such credit services must be in terms of cash, so the credit producer must borrow cash B_t from financial intermediaries to produce credit services.

3.1.3 Cash-in-Advance Constraints

In this economy, there are two cash-in-advance constraints.

For the household, it brings in money balance M_t to the period t , puts aside D_t out of M_t in the financial intermediary, and then starts supplying labor n_{1t} , n_{2t} to the sector one and sector two productions. The household consumes g_t units of nondurable goods using the cash in hand, so the first cash-in-advance constraint in this model is

$$P_{gt}g_t \leq (M_t - D_t). \quad (4)$$

The household also buys q_t units of credit services to consume q_t units of durable goods. The $Q(n_{2t})$ units of credit services, in equilibrium equal to q_t , are produced by the credit-service producer using n_{2t} units of labor supplied by the household and B_t amount of cash borrowed from the financial intermediary. Since only σ fraction of durable goods consumption must be in terms of cash, the second cash-in-advance constraint is the constraint faced by the credit-service producer when producing $Q(n_{2t})$ units of credit services,

$$\sigma P_{gt}Q(n_{2t}) \leq B_t. \quad (5)$$

3.1.4 Money Supply Process

The money supply process is controlled by the central bank and follows

$$M_{t+1}^s = M_t^s + X_t, \quad (6)$$

where M_{t+1}^s is the money supply at the beginning of period $t+1$, and X_t is the monetary injection during the period t . As in Lucas (1990), we assume that D_t is determined before X_t . Thus D_t is not a function of the current-period's monetary injection but can be a function of the past $\{X_s\}_{s=0}^{t-1}$.

3.1.5 Individual Budget Constraints

The household supplies n_t units of labor in which n_{1t} units are hired by the goods producer, and n_{2t} units are employed by the credit-service producer. The nominal wage rate is given by W_t . At the end of each period, the family receives labor income and pools its cash receipts and enters period $t+1$.

$$\begin{aligned} M_{t+1} = & [M_t + D_t R_t + W_t n_t - P_{gt}(g_t + q_t) - P_{qt} q_t] + X_t(1 + R_t) \\ & + [P_{gt} F(n_{1t}) - W_t n_{1t}] + [P_{qt} Q(n_{2t}) - W_t n_{2t} - B_t R_t]. \end{aligned} \quad (7)$$

The left hand side is the end-of-period t (also the beginning-of-period $t+1$) cash holdings. On the right hand side, the first term in bracket represents the cash receipts of the household. The second is cash holdings of the financial intermediary. The third is the profits of the good producing firm, and fourth is the profits of the credit producer minus loan interest payments to the financial intermediary.

The optimization problem thus becomes choosing a sequence $\{g_t, q_t, n_{1t}, n_{2t}, D_t, B_t, n_t$ and $M_{t+1}\}$ to maximize (1) subject to (4), (5), and (7).

3.2 First-Order Conditions for the Representative Household's Problem

The Lagrange equation looks like

$$\begin{aligned}
L = & \sum_{t=0}^{\infty} \beta^t \{ u(g_t + q_t) + v(1 - n_t) - \lambda_{1t}(P_{gt}g_t - M_t + D_t) - \lambda_{2t}(\sigma P_{gt}Q(n_{2t}) - B_t) \\
& - \lambda_{3t}[M_{t+1} - M_t - D_tR_t - W_tn_t + P_{gt}(g_t + q_t) + P_{qt}q_t - X_t(1 + R_t) - P_{gt}F(n_{1t}) + W_tn_{1t} \\
& - P_{qt}Q(n_{2t}) + W_tn_{2t} + B_tR_t] \}.
\end{aligned} \tag{8}$$

The first order conditions with respect to $g_t, q_t, n_{1t}, n_{2t}, D_t, B_t, n_t$ and M_{t+1} , are

$$\frac{\partial u}{\partial g_t} = (\lambda_{1t} + \lambda_{3t})P_{gt}, \tag{9}$$

$$\frac{\partial u}{\partial q_t} = \lambda_{3t}(P_{gt} + P_{qt}), \tag{10}$$

$$\lambda_{3t}(P_{gt} \frac{\partial F}{\partial n_{1t}} - W_t) = 0, \tag{11}$$

$$W_t = (P_{qt} - \frac{\lambda_{2t}\sigma P_{gt}}{\lambda_{3t}}) \frac{\partial Q}{\partial n_{2t}}, \tag{12}$$

$$\lambda_{1t} = \lambda_{3t}R_t, \tag{13}$$

$$\lambda_{2t} = \lambda_{3t}R_t, \tag{14}$$

$$\frac{\partial v}{\partial n_t} + \lambda_{3t}W_t = 0, \tag{15}$$

$$\lambda_{3t} = \beta(\lambda_{1t+1} + \lambda_{3t+1}). \tag{16}$$

Equation (13) and (14) implies that

$$\lambda_{1t} = \lambda_{2t} = \lambda_{3t}R_t. \tag{17}$$

Plug (17) back to (9), and then divide it by equation (10), and we get

$$\frac{(P_{gt} + P_{qt})}{P_{gt}} = (1 + R_t), \quad (\text{I})$$

which says that the relative price of credit goods to cash goods equals the nominal interest rate. The intuition here is that the optimizing household will equalize the marginal cost (discounted to the beginning-of-period t value) of using cash to buy nondurable goods, P_{gt} , and the marginal cost of using credit to consume durable goods and repay at the end of period which is $\frac{(P_{gt} + P_{qt})}{(1 + R_t)}$.

Using equation (14), (12) and (11), we find another equation of $\frac{P_{qt}}{P_{gt}}$,

$$\frac{P_{qt}}{P_{gt}} = \frac{\frac{\partial F}{\partial n_{1t}}}{\frac{\partial Q}{\partial n_{2t}}} + \sigma R_t. \quad (\text{II})$$

Plug (II) to (I), we express the nominal interest rate R_t as

$$R_t = \frac{1}{1 - \sigma} \frac{\frac{\partial F}{\partial n_{1t}}}{\frac{\partial Q}{\partial n_{2t}}}. \quad (\text{III})$$

3.3 Market Clearing Conditions

The market clearing conditions are:

$$n_t = n_{1t} + n_{2t}, \quad (\text{18})$$

$$B_t = D_t + X_t, \quad (\text{19})$$

$$F(n_{1t}) = c_t = g_t + q_t, \quad (\text{20})$$

$$Q(n_{2t}) = q_t. \quad (\text{21})$$

And also in market equilibrium, the two cash-in-advance constraints must be binding.

$$P_{gt}g_t = (M_t - D_t), \quad (22)$$

$$\sigma P_{gt}Q(n_{2t}) = B_t. \quad (23)$$

3.4 Model Equilibrium

Solve P_{gt} from (22) and (23), and apply (19) and (21), we solve for q_t ,

$$q_t = \frac{D_t + X_t}{\sigma(M_t - D_t)}g_t. \quad (24)$$

Substitute the above equation into equation (20), we find that

$$Q(n_{2t}) = \frac{D_t + X_t}{\sigma(M_t - D_t) + D_t + X_t}F(n_{1t}), \quad (IV)$$

We assume the preferences and production function looks like

$$u(c) = \ln(c) = \ln(g + q) = \ln(F(n_1)) = \ln(n_1^\alpha),$$

$$v(n_1, n_2) = A(1 - n_1 - n_2),$$

$$F(n_1) = n_1^\alpha,$$

$$Q(n_2) = n_2^\gamma,$$

where A is a positive number; α and γ are positive but less than 1.

Combine equation (15), (16) and (11), we find

$$\frac{n_{2t}^\gamma}{n_{2t+1}^\gamma} \frac{D_{t+1} + X_{t+1}}{D_t + X_t} \frac{n_{1t+1}^{\alpha-1}}{n_{1t}^{\alpha-1}} = \beta(1 + R_{t+1}). \quad (V)$$

Combine equation (11), (15), we find

$$R_t = \frac{\alpha n_{1t}^{\alpha-1} - A}{A}. \quad (\text{VI})$$

The equation (III) and (IV) are rewritten as below.

$$(1 - \sigma)R_t = \frac{\alpha n_{1t}^{\alpha-1}}{\gamma n_{2t}^{\gamma-1}}, \quad (\text{III})$$

$$n_{2t}^\gamma = \frac{D_t + X_t}{\sigma(M_t - D_t) + D_t + X_t} n_{1t}^\alpha, \quad (\text{IV})$$

From these four equations (III) (IV) (V) and (VI), we can compute R_t , n_{1t} , n_{2t} , D_t , R_{t+1} , n_{1t+1} , n_{2t+1} , D_{t+1} as dynamic evolution laws of exogenous money injections $\{X_s\}_{s=0}^{t+1}$.

3.5 Steady State Properties

To separate the anticipated inflation effect and the liquidity effect and loanable funds effect, we analyze the anticipated monetary injection and the unanticipated monetary injection individually. The role that the credit sector plays when there is an anticipated monetary injection can be seen by looking at the steady state of the model. The variables in the steady state will be dropped the subscripts.

In the steady state, the marginal value of cash holdings to the family will be constant across periods, i.e.

$$\lambda_{3t+1}M_{t+1} = \lambda_{3t}M_t.$$

Combining (14) and (16), the nominal interest rate R in the steady state is determined by

$$\frac{M+X}{M} = \beta(1 + R).$$

And the relative price of durable goods to nondurable goods in the steady state is just

$$\frac{(P_g + P_q)}{P_g} = \frac{M + X}{\beta M}.$$

We thus can solve n_1 explicitly from equation (25),

$$\frac{\partial v}{\partial n_1} = -\frac{1}{1+R} \frac{\partial u}{\partial n_1} \Rightarrow n_1 = \frac{\alpha\beta M}{M+X},$$

and n_2 can be solved from equation (18),

$$n_2 = \left\{ \frac{\alpha \left[\frac{\alpha\beta M}{M+X} \right]^{\alpha-1} M}{\gamma(1-\sigma)[(1-\beta)M+X]} \right\}^{\frac{1}{\gamma-1}}$$

D can be solved from equation (25), as

$$D = \frac{n_2^\gamma(\sigma M + X) - n_1^\alpha X}{n_1^\alpha - (1-\sigma)n_2^\gamma}$$

It is straightforward to find in the steady state,

$$\frac{\partial R}{\partial X} > 0,$$

$$\frac{\partial n_1}{\partial X} < 0,$$

$$\frac{\partial n_2}{\partial X} > 0,$$

$$\frac{\partial y}{\partial X} < 0,$$

$$\frac{\partial q}{\partial X} > 0.$$

This steady-state equilibrium here reflects the anticipated future inflation effect of money injection. When the household expects the central bank injects X units of money to the financial intermediary every period, the household will expect a constant inflation and thus prefer using less cash in transactions. The production of credit services increases as the demand for it increases. More resources are used to produce credit services as the relative price of credit services becomes more expensive. So both the production and consumption of goods will decrease.

3.6 The Liquidity Effect of the Money Growth

An unanticipated monetary injection will result in a liquidity effect. To see it, we start with equation (IV),

$$q_t = \frac{D_t + X_t}{\sigma(M_t - D_t) + D_t + X_t} c_t.$$

Since D_t is chosen before the money injection, D_t can be treated as a constant in the determination of the other variables within the period t . So equation (IV) shows that when there is an unanticipated increase in X_t , the proportion of durable goods consumption out of total goods consumption will increase².

Equation (III) and (VI) describe the nominal interest rate as

$$R_t = \frac{\alpha n_{1t}^{\alpha-1}}{(1-\sigma)\gamma n_{2t}^{\gamma-1}},$$

$$R_t = \frac{\alpha n_{1t}^{\alpha-1} - A}{A}.$$

These two equations show us that

$$n_2^{\gamma-1} = \frac{A\alpha n_{1t}^{\alpha-1}}{(1-\sigma)\gamma(\alpha n_{1t}^{\alpha-1} - A)}$$

Combine it with equation (III), we can solve for n_{1t} and n_{2t} . We find that if $\alpha - \gamma > 0$, when there is unanticipated monetary injection,

$$\frac{\partial n_1}{\partial X} > 0$$

$$\frac{\partial n_{2t}}{\partial X_t} > 0,$$

$$\frac{\partial R_t}{\partial X_t} < 0,$$

$$\frac{\partial q_t}{\partial X_t} > 0,$$

$$\frac{\partial y_t}{\partial X_t} > 0.$$

We find that after an unanticipated monetary injection, the nominal interest rate and the relative price of durable goods to nondurable goods falls; both the goods producer and the

² $\frac{\partial[\frac{D_t+X_t}{\sigma(M_t-D_t)+D_t+X_t}]}{\partial X_t} = \frac{\sigma(M_t-D_t)}{[\sigma(M_t-D_t)+D_t+X_t]^2} > 0.$

credit-service producer will hire more labor; both the output and consumption level of total goods and the credit-service increases; the proportion of durable goods consumption out of total consumption also rises. As a result, employment and output in both sectors respond positively to the current monetary injections.

Compared with Li (2000), we explicitly solve the liquidity effect. Furthermore, we show how the existence and expansion of the consumer credit sector will affect the liquidity effect. We also show that the greater σ , the slower R_t responds to the exogenous monetary injection³. The intuition here is that the smaller proportion of goods is financed by consumer credit, the less sensitive the nominal interest rate in response to the central bank's monetary policy.

3.7 The Credit Channel of Monetary Transmission Mechanism

The model we construct also exhibits the credit channel of monetary transmission mechanism. The production and consumption of goods and credit services increases not only due to the drop in the nominal interest rate. Besides the interest rate channel, the effect of monetary injection on the economy is magnified by the credit channel. In our model, this magnifying effect is through the financial intermediary. When the central bank injects cash into the financial intermediary, the total amount of cash available for the credit-service producer to borrow, $(D_t + X_t)$, increases. Since the household has to purchase the credit services to consume durable goods, the amount of credit services produced is directly related to how much cash the credit-service producer can borrow from the financial intermediary. So when more cash B_t can be borrowed, the credit-service producer will be able to produce more units of credit services; the household will be able to purchase more units of credit services, and thus to consume more units of durable goods.

In equation (IV),

$$q_t = \frac{D_t + X_t}{\sigma(M_t - D_t) + D_t + X_t} c_t,$$

we see that when X_t increases, the proportion of nondurable goods consumption out of

³mathematically, we can show that as σ increases, $\frac{\partial R_t}{\partial X_t}$ decreases. In other words, we find that $\frac{\partial R_t}{\partial \sigma} < 0$.

total goods consumption will increase because $(D_t + X_t)$ increases. So the factor in front of c_t increases as money is injected into the economy besides the total consumption increases after a money injection. So we find not only

$$\frac{\partial c_t}{\partial X_t} > 0,$$

but also $\frac{\partial q_t}{\partial X_t} > \frac{\partial c_t}{\partial X_t} > 0$, which exhibits the credit channel of monetary transmission mechanism. So different from the previous literature, the loanable funds effect in our paper is explicitly solved and how the introduction of consumer credit sector will affect the loanable funds effect is also shown.

4 Summary and Analysis of Model Results

Before the consumer credit sector exists, the monetary policy affects consumption only through the interest rate channel, and this channel is relatively narrow and indirect. After the expansion of the consumer credit sector in the economy, the effects of the monetary policy on the consumption demand and total output have been magnified in the following two aspects.

First, the consumer credit sector improves the efficiency of the interest rate channel of monetary transmission mechanism. The interest rate channel of transmission describes how the central bank changes the money growth to affect the interest rate level, and the interest rate changes then influence aggregate output.

Although Keynes originally emphasized this channel as operating through businesses' decisions about investment spending, later research recognized that consumers' decisions about housing and consumer durable goods also are investment decisions. As a key component of how monetary policy effects are transmitted to the economy, the interest rate channel becomes more efficient after the introduction of the consumer credit sector.

When there is no consumer credit sector in the economy, consumption will be mainly affected through the interest rate channel of monetary transmission when the interest rate change affects individuals' saving decision. In our model, we follow Lucas (1990) to assume

that period- t deposit D_t is determined before the period- t 's monetary injection X_t . Thus D_t is not a function of the current-period of monetary injection but can be a function of the past monetary injections. In this sense, the interest rate change occurred in period- t does not affect that period's saving decision but will affect the previous periods' saving decisions. Therefore when there is no consumer credit sector in the economy, the interest rate change has only small and indirect effect on the current period's consumption. When the consumer credit sector is introduced into the model, we find that when there is an unanticipated monetary injection, the nominal interest rate and the relative price of durable goods to nondurable goods falls; both the goods producer and the credit-service producer will hire more labor; both the output and consumption level of total goods and the credit-service increases; the proportion of durable goods consumption out of total consumption also rises. As a result, employment and output in both sectors respond positively to the current monetary injections. It implies that after the consumer credit sector is introduced, the interest rate change will directly affect producers' behavior and then affect the consumption demand and aggregate output.

The other conclusion from our model shows that after the introduction of the consumer credit sector, the money elasticity of interest rate is greater. It implies that the effects of monetary transmission mechanism is amplified, and the interest rate will drop more after monetary injection.

Second, the expansion of the consumer credit sector also amplifies the credit channel of monetary transmission mechanism. The credit channel of transmission describes how monetary injection affects loans through its influence on the availability of loan. This provides an additional channel of transmission for the central bank policy to the real economy, over and above the usual liquidity effects.

Before the consumer credit sector is introduced, the credit channel of transmission affects the economy mainly through the central bank's control over the investment demand but not over the consumption demand. After the introduction of consumer credit, our model finds that the unanticipated monetary injection causes credit service producers to hire more labor and increase the production of consumer credit. Thus monetary injection affects consumption

demand and finally affects the consumption and output of durable and nondurable goods. If the central bank reduces money supply, and therefore of loans, spending by both firms and consumers who depend on bank credit must fall, and therefore so must aggregate demand.

So the introduction of the consumer credit sector not only propagates the conventional interest rate channel but also amplifies the credit channel (from affecting only the investment demand to affecting both the investment demand and the consumption demand). Compared to firms, consumers are smaller entities and rely more on bank loans to fund their consumption. So the loanable funds effects are more dramatic in the economy with a large number of consumers relying on financial intermediaries to finance consumption than an economy without it.

Therefore the introduction of the consumer credit sector improves the efficiency of monetary transmission mechanism through both the interest rate channel and the credit channel. Such an introduction also makes monetary policies more effective in stabilizing economic fluctuations.

5 Policy Implications

We can derive two major policy implications from the model. One is that the central bank should devise policies to encourage the expansion of the consumer credit sector. In China, the traditional monetary transmission mechanism goes from the central bank to commercial banks and then to firms. In China, firms' loan demand and investment demand are closely related since commercial loans remain the most important source of funds for businesses. So the major effect of monetary policies will be on investment demand. Put in more details, the monetary policy affects firms' behavior using two main instruments. one is the central bank's control of the loan availability through market-based liquidity management or through the administration of guidance planning (before abolishing the quota control on credit in 1998). The second instrument is interest rates. The central bank adjusts the deposit and loan interest rates to affect the loan demand from firms. Since deposit and loan rates are set by the central bank, the liquidity level in the banking system does not affect deposit and loan

rates. So for the central bank, the liquidity instrument and the interest rate instrument are relatively independent from each other.

Since the state enterprise reform is not finished yet in China, the corporate governance problem is still very serious. State-owned firms unanimously face the soft budget constraint problem and thus are insensitive to interest rate changes. Without doubt, the central bank fails to affect firms' investment demand through adjusting interest rates. In fact, the central bank in China mainly uses liquidity management to control the loan availability and then affect the investment demand.

This traditional transmission mechanism has its limitations as it only affects the loan availability. If firms' investment demand and the economy's aggregate demand do not change much, the central bank's expansionary or contractionary monetary policy will directly change the loan availability and affect the firms' investment demand. This unavoidably will cause the inefficiency in the resource allocation and exaggerate economic fluctuations. Moreover, this transmission mechanism usually works better during a monetary contraction. If the central bank injects money to the economy to increase the aggregate demand, it may face the problem that the loan availability increase does not necessarily generate the loan increase and the investment demand increase.

From the macroeconomic point of view, the traditional monetary transmission mechanism also has its own shortcomings. The investment demand is much more volatile than the consumption demand. So when the central bank's policy is to affect the real activity through its influence on the investment demand, the macroeconomy unavoidably will face higher volatility.

The introduction and expansion of the consumer credit sector in China will only improve the efficiency of the interest rate channel of transmission but also widens the credit channel. Since the monetary policy affects the consumer demand directly, the monetary transmission mechanism is more efficient and more elastic. Although whether monetary policy can significantly affect the supply of bank loans becomes a more controversial question in the United States⁴, this channel may still be value for analyzing China's current situation since banks in

⁴U.S. banks are able to raise funds on the margin through issuing large CDs and other "managed liabili-

China can not easily replace lost (retail) deposits with other sources of funds, such as CDs or new equity issues.

We believe that expanding the consumer credit sector should become the central bank's adopted policy. To boost the economy and stimulate the consumer market, China has adopted a low-interest policy and continually increased credit. To boost consumer credit, the central bank should lower consumer credit interest rates and extend pay-off terms. Commercial banks should make it easier to apply for credit and give more loans for education, cars and durable goods. Commercial banks must also improve services to guarantee orderly credit. Rural cooperative lenders should give priority to farmers who want fertilizer, farming equipment, housing and education.

Second, as the expansion of the consumer credit sector and the increasing importance of it in the total loan structure, the central bank should focus more on the market-based monetary policy tools instead of those regulative monetary policy instruments to control the liquidity or the availability of credit. In today's China, the central bank directly controls the commercial banks' deposit and loan interest rates, and the interest rate tool are meant to be deposit and loan rates. As analyzed before, after the introduction of consumer credit, the efficiency of interest rate channel improves and the credit channel also widens. So when the central bank adjusts the interest rate, effects on both aggregate output and the price level will be amplified.

Among the market-based interest rate and market-based quantity tools, the central bank should pay more attention to the interest rate tools. The reason is that the interest rate can be used to influence the consumer credit demand which directly affects the consumption demand and thus has more direct impact on aggregate output. Moreover, in today's China, among banks, firms, and individuals, banks and firms are not "independent" economic decision makers compared to individual consumers. Therefore monetary policy is not as effective when the central bank controls commercial banks' loan supply or influences the firms' investment demand as when the central bank changes the interest rate and directly affects the individuals' consumption demand.

ties." Regulation Q (ceiling put on the interest rate banks can pay) has been removed. Reserve requirements have been eliminated for most bank liabilities, with the exception of pure transactions accounts.

6 Conclusion and Future Research

Our paper uses a general equilibrium model with durable and nondurable goods to explore the role of an expanding consumer credit sector in the effectiveness of monetary policy in smoothing economic fluctuation and promoting economic growth. We assume the purchase of durable goods can be only financed by the consumer credit sector, and there is one-to-one relationship between the consumption of durable goods and the amount of consumer credit. Our model finds that after an unanticipated monetary injection, the nominal interest rate and the relative price of durable goods to nondurable goods falls; both the goods producer and the credit-service producer will hire more labor; both the output and consumption level of total goods and the credit-service increases; the proportion of durable goods consumption out of total consumption also rises. As a result, employment and output in both sectors respond positively to the current monetary injections.

Our model shows that the expansion of the consumer credit sector increase the credit channel of monetary transmission mechanism and also improve the efficiency of the interest rate channel. When the central bank injects money to the economy, the liquidity increases, and so does the loan availability to consumers. So monetary policy can directly affect the consumption demand through the consumer credit sector. At the same time, since consumer credit is more interest sensitive, when the interest rate changes, consumer credit and consumption expenditure will be affected which will improve the efficiency of monetary transmission mechanism

Two policy implications are derived from the model. One is that the central bank should encourage the development of the consumer credit sector to improve the efficiency of the monetary transmission mechanism. Second, as the expansion of the consumer credit sector and the increasing importance of it in the total loan structure, the central bank should more rely on market-based monetary policy tools, especially interest rate tools.

In the future, it will be interesting to conduct an empirical investigation to establish the quantitative evidence of the consumer credit sector in monetary transmission. The empirical examination will be closely related to the theoretical model in this paper. A vector auto-

regression (VAR) model will be used to analyze how the change in monetary policy will affect interest rates, mortgage rates (the traditional interest rate channel), and the supply of bank consumer loans (the credit channel). The VAR model will also help to find out how the monetary policy will affect the real economic variables such as consumption and output, and what significant importance of each monetary transmission channel exhibits.

To discriminate between the interest rate and credit channels, we are going to construct the composition of consumer credit data. One candidate is the ratio of bank loans over (bank loans + other nonbank financial credits). We will also include the expenditure components of GDP in the VAR to find out whether the durable goods consumption is much more interest sensitive than the non-durable goods consumption, and whether these sectoral differences have important implications for monetary policy.

The impulse responses generated by VAR can be used to find out qualitatively whether shocks to monetary policy affects the mortgage rate (to detect the liquidity effect), influences the composition of consumer credit (to detect the bank lending effect), and whether the change in mortgage rate and variation in this composition in turn affects consumer expenditure. The variance decomposition results generated by VAR will provide quantitative evidence.

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