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The Monetary Transmission Mechanism in Pre-war China

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Abstract: When the international monetary system was on the gold standard, China was the only country adhered to the silver standard. Silver functioned as currency in China but acted as commodity in international markets. Its price experienced downturn trend from 57 cents per ounce in January 1929 to 23.38 ounces per ounce in January 1933. Then it increased to 75 cents per ounce in May 1935. Dramatic fluctuations in silver price seriously impacted Chinese economy. On the initial stage of the Great Depression, devaluated silver price led to currency depreciation which brought "good luck" to China. However, as Britain going off the gold standard in 1931 together with massively scale of countries giving up gold currencies, competitive currency depreciation stimulated silver to regain its price, which dampened Chinese domestic industries and facilitated an increase in silver exports. China's wholesale price index decreased from 114.78 to 99 and its monetary system endured awful shocks which directly led to governmental currency reform in November 1935. The main contribution in the paper is to figure out the monetary transmission mechanism in pre-war China. Based on the testing results of Spearman rank-order correlation and Structural VAR model, a conclusion was drawn that exchange channel worked more significantly in the first period while monetary channel performed better in the second period. Historical analysis is conducted to further verify the conclusion.

Key words: the silver standard, the exchange channel, the monetary channel, Structural VAR Model

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1. Introduction

The Great Depression broke out on 29th October 1929 when the New York stock market crashed and stocks tumbled to its lowest point. This event developed into a global phenomenon without any economic entity could evade a serious slump. Deflation was transmitted from one country to another via financial links and seriously dampened their purchasing power. Dramatic decline in international trade together with descending wholesale price index represented the world economy sank into an ever-deepening crisis.

On the initial stage of the Great Depression most of other countries suffered from financial crisis, while China was the only country experienced inflationary economy. The international monetary system was dominated by the gold standard. Financial crisis happened in gold-standard countries lowered people's confidence in sovereign reserve currency and stimulated their demand for gold. Rising gold price relatively lowered commodity price and brought in deflation. Silver acted as a commodity in the New York market also followed a deflationary trend. However, China was a country on the silver standard. Descending silver price resulted in depreciation of Chinese currency. From 1929 to 1931, Chinese economy experienced inflationary economic booming which signaled China's reaction to the Great Depression was different from those of other countries.

It was not long before China run out of its luck blessed by the silver standard. Without well-performed financial and monetary system, Chinese economy lacked ability to protect itself from external shocks. The international silver price fluctuations would seriously impact China's exchange rate, and meanwhile silver price was not determined by Chinese government. Silver price was influenced by various factors: global silver production amount, balance between demand and supply in international markets and major countries' silver-related polities. China's financial market was closely connected with the world silver markets. Its exchange rate and domestic price level were inevitable impacted by changes in international silver price.

Unlike the first stage when decreasing silver price blessed Chinese economy, the second period from 1933 to 1935 witnessed ascending silver prices resulted in dramatic Chinese currency appreciation and massive outflows of silver stocks. Britain was the first country abandoned the gold standard and conducted currency depreciation policy in 1931. A group of countries followed its steps and induced a wave of competitive depreciation. Depreciation in previous gold-standard countries resulted in a rise of their commodity prices and international

silver prices. Appreciation of silver currency led to deflationary wholesale price in China and handicapped its trade situation. Trade deficits increased together with a new outflow of silver. When the federal government issued the Silver Purchase Act in 1934 which aimed at increasing international silver price twice, Chinese government had to conduct currency reform which suspended the silver standard.

The contrasting economic situations caused by fluctuations in international silver price signaled the vulnerability of Chinese monetary system to the changes in global silver markets. Hence it is an interesting topic to figure out how exogenous silver price pressure was transmitted to China's domestic economy.

Two theoretical explanations would be discussed in this paper. Monetary transmission system could be divided into two categories- monetary channel and exchange channel. The group of economists led by Milton Friedman and Anna Schwartz supported the theory of monetary theory. Monetary theory develops its findings based on price-specie-flow mechanism, which means a country's price level is determined by the amount of money held by central banks. Appreciation in currency would deteriorate trade balance and result in currency outflow. Less money controlled by central banks would limit their abilities to provide sufficient credits and domestic market would experience currency scarcity. Consequently commodity price would increase and further worsen the situation (Friedman and Schwartz, 1963). However, another groups of scientists advocated the theory of exchange channel. Ralph G. Hawtrey and Gustav Cassel argued that the quantity of money circulated in one economic entity could adjust endogenously as a reaction to the exogenous price changes in global markets. Given an internationally determined value of gold or silver, a country's exchange rate is just dictated by the conversion rate of its national currency into gold. Without impacting the currency reserves, wholesale price is a direct reflection of exogenous shocks (Cassel, 1920).

In order to figure out which channel performed more significantly in pre-war Chinese economy, the variables of exchange rate and silver stock are denoted to represent the influence of exchange channel and monetary channel respectively. Likelihood ratio test verifies the rationale for dividing the whole time period into two sub-periods. The first time period ranged from January 1929 to January 1933, when global silver price showed a downturn trend. The second period started from February 1933 to December 1935, when silver price soared dramatically. With the help of Spearman rank-order correlation test and Structural VAR model, the regression results of each period supported the findings that exchange channel worked more significantly in

the first period while monetary channel performed better in the second period. However, only relying on data and econometric results lacked sufficient persuasion. I consulted historical archives to further verify the previous conclusion. These historical facts included the development of domestic industries in Lower Yangzi Delta, financial system in rural and urban areas and China's trade situation. These historical findings confirm the conclusion that exchange channel acted as the primary monetary transmission channel in the first period and monetary channel worked more significantly in the second period.

The rest of the paper is structured as follows. Sector 2 starts with historical contents of Chinese silver standard and banking system, followed by theoretical explanations of monetary channel and exchange channel. Then it gives brief summary of previous research. Sector 3 illustrates the methodology utilized in this paper. It describes data resources, conducts unit root tests and likelihood ratio test, and then quantifies exchange channel and monetary channel through checking the results of Spearman rank-order correlation and Structural VAR model. Sector 4 provides historical explanations by analyzing the performance of exchange channel and monetary channel in two sub-periods respectively. The final sector gives the final conclusion that exchange channel worked more significantly in the first period while the monetary channel performed better in the second period.

2. Theoretical background

2.1 The Chinese silver standard and banking system

In the late 19th century, most of counties had given up the silver standard and adhered to the gold standard. China was the only country still using silver as currency and experienced massive fluctuations in domestic wholesale price (Bratter, 1930). Although silver currency had been circulated in China for centuries, it was not until the end of 1935 that a unified monetary system was established with a central bank controlling the right of issuing currencies. Without effective institutions to conduct independent monetary policies, Chinese domestic economy was exposed to the risk of silver price fluctuations in global markets. In this sector, I will provide background information about the Chinese monetary and banking systems, which helps to explain how the surge in silver price deteriorated Chinese economy and forced the government to carry out monetary reform in 1935.

2.1.1 The Chinese silver standard

Silver has been used as means of hoarding since Han Dynasty (BC. 206). During that time period, silver was not circulated in daily life. It was not until the Ming Dynasty (AD.1368) that silver officially became currencies as complements for copper coins used in prosperous wholesale transactions (Shiroyama, 2008). The monetary system in Ming-Qing dynasties could be defined as "parallel bimetallism". Silver circulated side by side with copper, at varying ratio and for different purposes. Copper coins owned small amounts of value and they were widely used in retail transactions. Meanwhile, silver was circulated as the medium of exchange in wholesale commerce, long-distance trade and tax payments because of its high value. Silver was used as bullion bars, or in the form of imported foreign coins (Leavens, 1939)

With the development of Chinese economy, copper coins could hardly satisfy people's daily usages. Silver gradually took the place of copper coins and became the major transaction intermediates. Copper coins still circulated in markets for retailing transactions, but the ratio between copper coins and silver varied in different cities or regions. Hence, it is not proper to say that Chinese monetary system was bimetallism in this time. China adhered to the silver standard not only due to the mushrooming international trade required silver to function as wide-accepted clearing intermediary, but also for catering the need generated in economic activities.

Chinese currency in the early twentieth century could be classified into three main groups: silver *Tael*, silver coins and banknotes. Although these three major forms of currencies differed in weight, shape and areas of circulation, they were intimately linked. The exchange rates between them were determined by the fineness of silver contained in each currency and also influenced by local users' consensus.

Tael (Sycee)

The silver *Tael* or *Sycee* was widely used as bank reserves or in large transactions. Historically, the *Tael* was a unit of weight, the *liang* (Shiroyama, 2008). The precise fineness of a particular *Tael* is difficult to determined, because it was fixed by weight and custom. Generally speaking, the Chinese *Tael* might be taken roughly as 1.33 ounces avoirdupois, but various standard *Taels* differentiated in fineness and circulated regions. The complicity of *Tael* system inevitably hindered long-distance transactions. But with the development of interregional business, commonly welcomed *Tael* gradually took the place of local less-used *Tael*. In the late nineteenth century, *Taels* gradually diminished into three categories. These three categories have been of national importance: the Shanghai *Tael*, the Kuping or Treasury *Tael* and the Customs *Tael* (Bratter, 1933).

The Shanghai *Tael* acted as the standard currency in most treaty ports. It was also the base of China's international trade for over 75 years (1857-1933). The Shanghai *Tael* was melted from silver bars or refined coins, but shaped into so-called "shoes of *Sycee*". *Sycee* literally means "fine silk" with a boat-like shape, or reference to the footgear of a Chinese woman with small bound feet (Leavens, 1939). A shoe was about 3*3*5 inches overall and weighted around 50 *Tael*s or about 4 pounds avoirdupois. The name of smelting shops would be stamped in the metal. Its weight and fineness would be examined by *Kung-ku-chu*, an institution sponsored by Native banks. Detailed information of each Shanghai *Tael* like color, smoothness would be inked on surface. If we took a scientific view towards the measurements utilized one hundred years ago, their testing methods were far from accuracy or preciseness as we require nowadays. But margin error could not impede the circulation of Shanghai *Tael* so long as authorized evaluations from *Kung-ku-chu* were well accepted by all market participants. The value of a Shanghai *Tael* was determined by three factors: standard of weight, standard of fineness and the Shanghai convention. Generally speaking, equivalent fine silver content of a Shanghai *Tael* was around 518.51 grains (Leavens 1939).

The Shanghai *Tael* was well-accepted by domestic mercantile and banking community. In light of its high value, Shanghai *Tael* was not usually used for daily transactions but reserved in bank vaults. Bank notes or checks based on Shanghai *Tael* were widely circulated. Most of wholesale-trade or foreign exchange transactions may utilize Shanghai *Tael* for international remittances.

Kuping *Teal*, which equals to 1.096 Shanghai *Tael*, was used for government transactions under the Empire period. It was replaced by Chinese dollar under the Republic government. The Haikwan or Customs *Teal*, which equals to 1.114 Shanghai *Tael*, was merely used as a money of account. These two categories of *Teal* were closely related to Shanghai *Tael.* In 1933, the contemporary Chinese government suspended the conversion of Shanghai *Tael* and issued Chinese dollar (Chinese yuan) as new currency. All subsequent transactions should be accounted in terms of Chinese dollars. Since then, *Teal* left the stage of Chinese currency.

Silver coins

The developing path of Chinese silver coins could be separated into three steps. Initially, no domestically smelted silver coins were circulated in China. China lacked the technology to cast coins. Imbalanced international trade with Britain or other countries resulted in inflows of foreign silver coins. In the late 18^{th} century, majority of silver coins circulated in treaty ports were foreign silver coins. Then in 1890 Zhang zhidong, a pioneer who absorbed foreign advanced technology to Chinese industries, produced the first Chinese-minted silver dollar at Canton (Ho and Lai, 2013). On the second step, China established minting factories that produced large quantities of silver coins without the necessity of getting authorization from central government. The national silver coins quickly took the place of foreign coins. By 1920 imported silver coins were completely drove out of Chinese market. Finally, governmental realignment of silver coins abolished the usage of Shanghai *Tael.* During the transition period between January 1933 and March 1935, the parity between Chinese dollars and silver price was kept at 1.295.

Two major types of foreign silver coins circulated in China were Spanish dollar and Mexico dollar. The Spanish dollar was the principal form of silver firstly entered China. At the beginning of utilizing Spanish dollar, it was only accepted by the Chinese businessmen according to its weight. But as the coins became more familiar and widely circulated, especially because of their uniform weight and fineness, their convenience was recognized and turned into medium of exchange at Canton (Leavens 1939). In this period, massive inflows of foreign coins

acted as compensation of Chinese goods. From the early eighteenth century, the British East India Company started to buy tea from Canton and paid by Spanish dollars. One century later, American merchants travelled to China and utilized Spanish dollars in exchange for Chinese silk and other products. After Mexico gained its independence from Spain in 1821, its silver production continued to be coined into dollars of the same weight and fineness as Spanish ones but with a new superscription. Mexico dollars began to flow into China instead of Spanish coins. Before the breakout of the Opium war, foreign coins were mostly used in Canton port, the only treaty port authorized by Qing Empire to trade with other countries. After the Opium war Chinese government was forced to open up several treaty ports along southeast coastline. Foreign coins began to be used widely in other cities like Shanghai or Amoy, and later penetrated into interior areas. In 1857, all accounts in Spanish dollars were converted into Shanghai *Teal* at the rate of one dollar per *Tael* (Leavens 1939). By the end of the nineteenth century, Mexico dollars became the principal dollar coins in circulation, which were named as "Mexican" or "Mex".

In 1890 Zhang zhidong opened up the first Chinese mint in Canton to produce silver coins. These silver coins were marked with a dragon design and contained inscriptions in both English and Chinese. They were circulated provincially rather than nationally. In later years other provinces set up their mints as well. There was no uniformed standard for weights or fineness of domestic smelted silver coins, and it led to a range of variety in their silver content. The actual daily exchange rate between the *Tael* and dollars was determined by the relative supply and demand in market, together with their content of pure silver. Silver coins issued in one region would be used on discount in another region, which definitely hindered economic transactions.

Bank notes

The central bank which took the responsibility to monitor the process of issuing bank notes was not appeared until 1935, when Chinese government conducted monetary reform. Before that most of the financial intermediates owned the rights to issue their banknotes, including traditional Chinese native banks and foreign banks. By 1907, one commercial bank, two government banks, and one provincial government bank owned the right to issue notes. By 1927, more than 28 commercial and 11 provincial banks were printing money (Shiroyama, 2008).

The conversion of banknotes merely relayed on credibility of banks. A national law was enacted in 1914 which regulated the banknotes to be secured by 60 percent cash reserved and 40

percent securities (Cho, 2009). Based on calculation from Rawski, 13.3 percent of monetary supply was made up by bank notes, which was one fourth of silver currencies (Rawski, 1989).

2.1.2 The Chinese banking system

Before the World War II, Chinese banking system mainly consisted of three parts: native banks, foreign banks and commercial banks. Without a central bank to conduct monetary policies or monitor economic development, Chinese banking system worked smoothly during the prosperous period when silver price depreciated. Massive inflows of silver provided abundant credit and positive expectations of wholesale price. However, when the global silver price started to surge, Chinese fragile banking system lacked the ability to defend domestic real economy from shocks generated abroad. Silver outflows drained out domestic currencies. Bankruptcy started from interior areas where banking system was closely linked to agriculture. Numbers of native banks transported silver reserves to foreign banks located in treaty ports. It was not long before the inner land pressure transmitted to coastline areas. Chinese banking system faced with the danger of entire bankruptcy in 1935.

Native banks were the most traditional form of financial intermediaries in China. Originated from agricultural economy, they naturally owned the features of wide-spread locations, close connection with social networks and high risk of default. Chinese peasants worked in small-scale farms. Their costs and returns of agricultural products were profoundly influenced by climatic situations. Hence their financial condition was instable. During the seeding and gathering seasons, farmers had to borrow money from native banks and pay back loans when they earned money. Interconnected social networks and good reputation guaranteed the business of native banks. These private owned agencies undertook unlimited liability for the discharge of bank obligation. As Rawski stated that "The *ch'ien-chuang* (native banks) accepted deposits, extended loans and undertook direct investments in business ventures, conducted interregional transfers, prepared and accepted bills of exchange, issued banknotes and orders (promises to pay specific sums on specified future dates). Transferred funds among depositors, and preformed other functions associated with these services. Although free of government supervision, the *ch'ien-chuang* were subject to self-regulation through their own field, which also performed some central banking functions, including the provision of interbank clearing facilities in the largest commercial centers" (Rawski, 1989).

Foreign banks were established in treaty ports when China had to open up the trade with other countries. Initially, foreign banks were functioned as intermediates for exchanging currencies in overseas export and import transactions. The Hong Kong and Shanghai Bank was the first established foreign bank in 1864 (Rawski, 1989). It offered financial service to British merchants. With more countries setting up trade relationships with China, their banking delegations were set up in treaty ports. Until the Sino-Japanese war broke out, fifty-three foreign banks owned 150 branches in China. They monopolized currency exchange services and controlled China's foreign debt and indemnity payment. Foreign banks were rich in short-term silver cash flows, so they acted as loans providers for native banks and government institutions. They also attracted deposits from China's wealthy class due to lower political risks and stable interest rates. Inter-bank borrowing was common in the early 1930s. Massive amount of silver gathered in treaty ports from interior areas or aboard facilitated foreign banks to arbitrage in bullion. They also acted as main players who exported silver out of China in 1934 when New York silver price increased and speculating space was enormous (Hu, 2013).

Commercial banks came about much later than the previous two categories of banks. Warlords and politicians tried to pursue profits through capital operation. They also need institutions to monitor economic system and carry out monetary policies. *Bank of communications* was set up in 1908, which was the first commercial bank owned by government and undertook cashing managements of railways, telegraphs and postal industries. It also offered financial services to agriculture, mining, and trading institutions. The second government-controlled bank was *the Bank of China* (1912), which offered foreign exchange transactions for governments. The other two commercial banks were *Central Bank of China* (1928) and *Farmers Bank of China* (1935). These four commercial banks had a profound influence on the monetary reform in 1935 (T'ang, 1936).

2.2 Monetary channel and exchange channel

From January 1929 to January 1933, New York silver price decreased from 57 cents per ounce to 23.38 cents per ounce. Countries stuck to the gold standard suffered a lot during the Great Depression. Their demand for gold stimulated three-year continuous increase in gold price, which relatively lowered silver price in international precious metal markets. However, since Britain first went off the gold standard in 1931, groups of countries followed its steps and conducted competitive depreciation policies. Silver once again became the target for speculators.

Meanwhile, a series of acts issued by the federal government guaranteed the appreciated expectation of silver price in future market. Since February 1933, silver price in the New York market increased from 25.88 cents per ounce to 74.69 cents per ounce, which almost rose by three times. China as the only country adhered to the silver standard; its domestic wholesale price index was serious influenced by global silver price. In the first period, relatively depreciated silver price isolated Chinese economy from the Great depression because of inflationary price level. However, when silver started to regain its previous value, massive amounts of silver was exported abroad to gain arbitrary profits, which deteriorated Chinese fragile monetary system.

Sticking to the silver standard forced the Chinese central government to abandon independent monetary policies. Domestic exchange rate and economic price level were exposed to the risk of fluctuations in international silver market. As a price taker, China's economy was closely linked with global market. But how this linkage works or how the price pressure from abroad was transmitted into domestic economy needs further discussion.

Previous economic theories that explain monetary transmission systems are divided into two categories. One group of economists led by Milton Friedman and Anna Schwartz promoted the theory of monetary theory. Monetary theory develops its findings based on price-specie-flow mechanism (Friedman and Schwartz, 1963). This is to say a country's price level is determined by the amounts of money held by central banks. More money controlled by central banks generally could be interpreted as more bank credits and moderately easy monetary policy. Slightly over-supply currencies lead to inflation which enhances rising expectation of commodities' price level and further increases wholesale price index. Similarly, if central banks controlled insufficient currency reserves, breakages in monetary chains would occur and domestic price level would decline. Besides, the amount of currency held by central banks is determined by trade situation. Imbalanced trade would result in currency outflows or inflows as compensation (Friedman and Schwartz, 1963). In a sum, monetary theory pays more attention to the relationship between a country's currency stock and its trade situation. Inflow or outflow of currencies could alter silver stock and further influence amounts of currencies circulating in domestic markets, which results in fluctuations of price level. Monetary policy values monetary channel. In this paper, I utilized the variable of silver stock in Shanghai major finance intermediates to represent monetary channel.

The other group of economists advocating the theory of exchange channel is represented by Ralph G. Hawtrey and Gustav Cassel. According to Hawtrey and Cassel, it is possible for prices of gold or silver to change exogenously. The quantity of money circulated in one economic entity could adjust endogenously as a reaction to the exogenous price changes in global markets. Given an internationally determined value of gold or silver, a country's exchange rate is just dictated by the conversion rate of its national currency into gold (Cassel, 1920). In exchange channel, exchange rate plays an essential part because it has direct impact on price level. In this paper, I used Chinese domestic exchange rate to represent exchange channel.

If we conclude the transmission mechanisms in monetary channel and exchange channel, we could get the following logical relationships:

Monetary channel: silver price increase $\rightarrow$ exchange rate appreciates $\rightarrow$ silver outflows / trade deficits $\rightarrow$ silver stocks decrease $\rightarrow$ commodity price decreases $\rightarrow$ price level decreases

Exchange channel: silver price increase $\rightarrow$ exchange rate appreciates $\rightarrow$ commodity price decreases $\rightarrow$ price level decreases

2.3 Previous research

Ho and Lai (2013) evaluated the exchange channel and monetary channel through the econometric method of historical simulation. They controlled the influence of exchange rate and silver stock to the wholesale price performance and estimated the anti-factual situation. After cutting down the monetary channel and exchange channel respectively, they found that exchange rate was the primary factor lead to price fluctuations in Chinese domestic economy. From 1929 to 1931, China was under inflationary pressures when the world silver price was on a downward trend; whereas from 1932 to 1934, China suffered from deflationary pressures when the silver price was rising (Ho and Lai, 2013). Conducting the silver standard let the domestic economy expose to the exogenous shock in the global market, which seriously hindered development. In order to stabilize economy and carry out independent monetary policies, Chinese government executed currency reform in 1935 to prevent massive silver exports and deflation. In their mind, it is the exchange channel alone that transmits silver price pressure to domestic economy via the fluctuations of exchange rate.

The other researchers mainly focus on the discussion of one channel instead of the two. The monetary channel seems to be more popular in the field of explaining monetary transmission system. Friedman and Schwartz (1963) emphasized the effect of trade balance under the

analyzing framework of monetary channel. They believed increasing global silver price from 1933 to 1935 deteriorated China's trade balance. More trade deficits called for export of silver to balance the trade account, which in turn drained domestic silver stock and caused deflation and recession.

Rawski (1989) also supported the view that monetary channel worked more importantly in pre-war China's economy. He calculated the Chinese monetary velocity from 1919 to 1936 and he compared related data in two geographical scales: China proper and Manchuria. Combined with theory of Monetary Velocity, he believed velocity curve of Manchuria experienced continuously decline, which matched the typical feature of velocity in newly developing industrial counties. The faster economy developments, the sharper curve declines. However, the curve of China proper showed a 'U-shape' bottomed at the year of 1934, and then it had a slight increase afterwards. In that sense, China had hardly experienced prolonged depression after the U.S. Silver Purchase Act.

Shiroyama (2008) also emphasized the importance of monetary channel through discussing the operation of China's monetary and financial system. She argued that depreciated silver price enhanced China's cost competitive and purchasing power. Although continuous decline in world wholesale price diluted the effect of currency depreciation in promoting trade, Chinese domestic industries seized opportunists to develop their productivity in the early 1930s. While the international silver price soared twice, Chinese trade situation was seriously damaged by appreciated currency. Trade deficits called for exports of silver to balance the account. Meanwhile, huge difference between silver price in foreign market and domestic exchange rate stimulated speculators to export money, which drained silver reserves and resulted in deflation.

In contrast, Chang (1998) stressed the important of exchange rate channel in inducing Chinese economic disaster between 1932 and 1935. He argued that "By international arbitrage, Chinese dollar price of many commodities fell as a direct consequence of the appreciation of the Chinese currency, independent of China's money supply."

3. Methodology

I followed the research methodology of Ho and Lai (2013), Bachmann and Sims (2011), Kilian and Lewis (2011), and Sims and Zha (2006). The method was widely used in quantifying transmission mechanism of monetary police to real economy. For example, Kilian and Lewis analyzed the extent to which the endogenous policy response of federal central bank to oil price shocks has contributed to real output contraction (Kilian and Lewis, 2011). Structural VAR model is used here to figure out the influence of exchange and monetary channels in Chinese pre-war economy.

Denote SP_t be the New York silver price, E_t be the Chinese exchange rate, SS_t be the silver stock in Shanghai major financial intermediates, and P_t be the Shanghai wholesale price index. Starting the SVAR model from order:

$$A_0 Y_t = A_1 Y_{t-1} + A_2 Y_{t-2} + \cdots + A_p Y_{t-p} + \varepsilon_t \quad \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots \quad (3.1)$$

Where $Y_t = (SP_t \; E_t \; SS_t \; P_t)'$ is K-dimensional vector of variables, ε_t denotes a $K \times 1$ vector of structural innovations. A_0 is a $K \times K$ lower triangular matrix with ones on the diagonal. Denote $B \equiv [\, A_1 \; A_2 \; \ldots \; A_P \,]$, and the VAR model is expressed as:

$$A_0 Y_t = \sum_{s=1}^{\infty} B_{(s)} Y_{(t-s)} \quad \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots \quad (3.2)$$

The response of the Shanghai wholesale price at horizon h to a silver price shock at data 0 and the response is due to variable i could be expressed as:

$$d_{P,i,h} = \sum_{m=0}^{\min(p,h)} B_{4,mK+i} \theta_{i,1,h-m} \qquad h = 0,1,2, \ldots ; i = 1,2, \ldots K, \ldots\ldots\ldots\ldots \quad (3.3)$$

Where $\theta_{i,1,h-m}$ refers to the $\{i.2\}$ element of the $K \times K$ impulse response coefficient matrix at horizon $h - m$.

Through defining element of lower triangular matrix A_0, I could isolate the mutual influence between exchange rate and silver stock, which is closest proximity of a controlled experiment available in empirical economics. Once the monetary channel and exchange channel are separated, the transmission mechanism of international silver price to Shanghai wholesale price is unfolding. By comparatively observing the impulse response functions and structural decompositions of Shanghai wholesale price in separate periods, we could weigh the importance of exchange rates and silver stock as monetary transmission mechanism.

3.1 Descriptive statistics

3.1.1 Data resources

Non-stationary time series usually cause spurious regression results (Taylor and Taylor, 2004). Before proceeding to Structural VAR analysis, it is necessary to provide descriptive statistics and the features of data we employ. The time series include New York silver price, Chinese exchange rate, Shanghai silver stock in major financial intermediates, Shanghai silver export amounts, Tianjin wholesale price and Shanghai wholesale price index from January 1929 to December 1935. All series are monthly frequency and their origins are illustrated in Appendix A.

New York silver price is expressed in US cents per ounce. After the First World War, there were two major international silver markets - London and New York. In each market, silver was expressed in local currencies. Most of British colonies circulated silver coins before they moved to the gold standard. International clearing between them enabled London as the biggest silver transmission market (Leavens, 1939). To some extent, silver price in London market might be more representative than New York silver price. However, as England going off the gold standard in September 1931, massive depreciation of sterling twisted silver price in London market. Moreover, a series of acts issued by federal government aiming at artificially increasing silver price facilitated the close bond between New York market and Chinese economy. In light of the research period ranging from 1929 to 1935, it is preferable to utilize New York silver price to represent international silver fluctuations.

Chinese exchange rates are expressed as US dollars per 100 Chinese dollars. From fifth April 1933, Nanking government abolished *Tael* and unified currency unit as Chinese dollars. Foreign exchange banks began to quote exchange rates in foreign currencies per Chinese standard dollar instead of per Shanghai *Tael.* Bank accounts, contracts, securities and outstanding accounts expressed in *Tael* were converted into dollars at the fixed rate of Shanghai *Tael* 71.5 per C.H.$100 (Leavens, 1939). The statistical data shown before April 1933 were also recalculated to unified currency unit.

Shanghai WPI (1926=100) consists of 155 commodities and clarifies into 8 groups: cereals, other food provisions, textiles and manufactures, metals, fuels and lighting, building materials, chemicals and miscellaneous. Tianjin WPI (1926=100) is collected from *Nankai Ecnomic Indicators.* Except for Shanghai, Tianjin was the only treaty port with statistical data in

pre-war China. There were other treaty ports which played important roles in Chinese international trade such as Canton, Dairen and Harbin (Hsiao, 1974). But due to data limitation, only Tianjin could be utilized as a representation of economic development in North Chinese and comparative variable against Shanghai.

Shanghai silver stock in major financial intermediates is expressed as thousand Chinese dollars. Before the abolishment of Shanghai *Tael*, statistical data of silver stock in Shanghai major financial intermediates were illustrated by clarification of silver bar, Shanghai *Tael* and Silver dollars. Each silver bar imported from New York and London silver markets weights around 980 to 1198 ounces. Equivalent fine silver content of one Shanghai currency *Tael* equals to 1.2 ounce (565.65*0.9*.98=518.512 grains=1.2 ounce). Hence one silver bar equals approximately 1000 Shanghai *Tael* (Leavens, 1939). The silver stock data shown before April 1933 were also recalculated to unify currency unit. Shanghai silver exports are expressed as thousand Chinese dollars. Due to the data limitation, monthly statistics are only available from 1934 to 1935, while yearly data range from 1929 to 1935.

Our data begin at 1929 when the world started to sink deep into the mire of the Great Depression. They end at 1935 when Chinese central government abandoned the silver standard in November, which successfully broke the close linkage between international silver price fluctuations and domestic price deflation. During the in-between six years, international silver price experienced downward growth trend and sharply increased as shown in Figure 3.1. The turning point lies in January 1933, which was not long after Franklin D. Roosevelt successfully defeated Hoover and became the President in the United States. “Do something for silver” turned into a critical component of the New Deal as a reward for the election support from the silver bloc in the congress (Blum, 1959).

Correspondingly, Shanghai WPI (Tianjin WPI) and the New York silver price are negatively correlated with a correlation coefficient of -0.76(-0.63) respectively. In the first two or three years, Chinese wholesale price levels experienced inflation instead of wide-spread global depression. Internationally growing demand of gold as currency reserves enhanced its ascending prices. As most of countries conducted gold standard in the late 1920s, currency appreciation lowered the price of commodities. Silver acted as commodities in New York market naturally experienced downturn growth trend. It decreased from 57 cents per ounce in January 1929 to 23.38 ounces per ounce in January 1933, which shrunk half of its original value. However, silver functioned as currency in China and brought “good luck”. Relatively prosperous Chinese interior

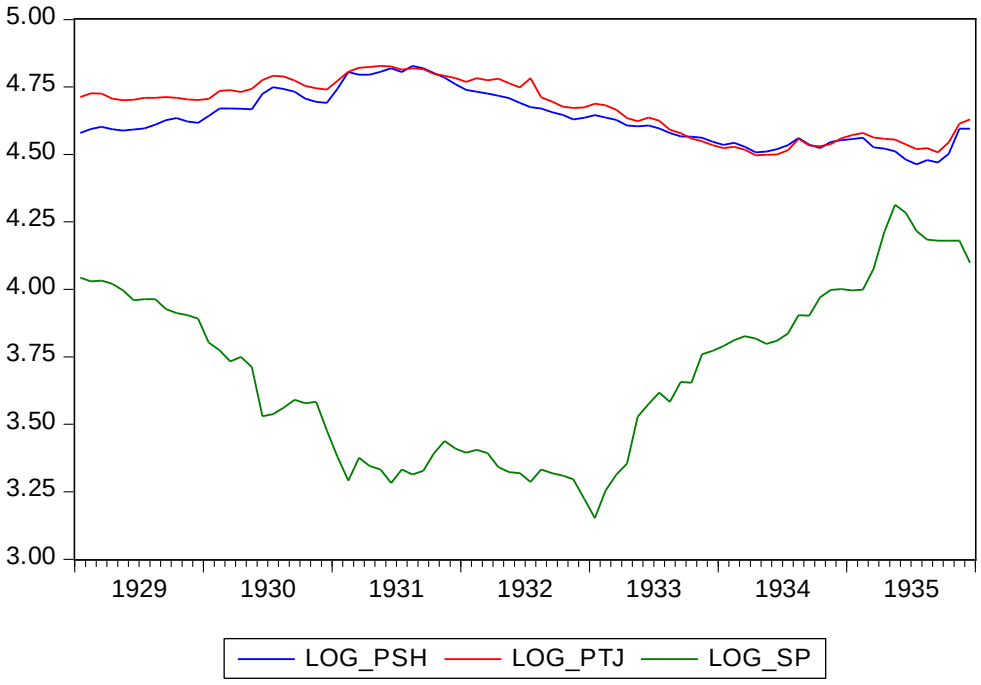

Figure 3.1 New York silver price, Shanghai WPI and Tianjin WPI, 1929-1935

industries experienced fast development and optimistic expectations of real asset markets existed in treaty ports (Friedman, 1992). However, Britain going off the gold standard in 1931 acted as a prelude of massively scale of countries giving up gold currencies. Competitive currency depreciation stimulated silver to recover from its devaluation, especially after federal government issued a series of acts aiming at artificially raising international silver price to promote domestic trade situation. From January 1933 to May 1935, silver price climbed from 23 cents per ounce up to 75 cents per ounce, roaring fifth times. Meanwhile, Chinese wholesale price index decreased from 114.78 to 99. Massive amounts of silver was exported through legal channels or smuggling. Chinese monetary system endured awful shocks which directly led to governmental currency reform in November 1935 (Rawski, 1989).

3.1.2 Unit root tests and Likelihood ratio test

In empirical research, non-stationary time series often cause spurious regressions (Verbook, 2013). It is necessary to ensure that variables are stationary before conducting Structural VAR model. Well-accepted methods to testify stationarity are Augmented Dickey-Fuller (ADF) test and the Phillips-Perron (PP) test. ADF tests are based on assumptions that the residuals are statistically independent with a constant variance. PP tests loosen this precondition

Table 3.1 Unit-root test results at logarithmic and first difference levels

logarithmic level	Lag	Trend or constant	ADF Test statistic	PPTest statistic	Critical Value
lnsp	1	C, no T	-1.017	-0.883	-2.897
lnp-sh	3	C, no T	-1.341	-1.215	-2.897
lnp-tj	1	C & T	-1.537	-1.526	-3.466
lnss	1	C & T	-0.661	-0.676	-3.466
lne	1	C & T	-1.802	-1.8	-3.466
first difference level	Lag	Trend or constant	ADF Test statistic	PP Test statistic	Critical Value
d_lnsp	0	C, no T	-6.478**	-6.463**	-2.897
d_lnp-sh	1	C, no T	-6.452**	-6.501**	-2.897
d_lnp-tj	0	C & T	-6.842**	-6.843**	-3.466
d_lnss	0	C & T	-4.994**	-5.119**	-3.466
d_lne	1	C & T	-8.392**	-8.368**	-3.466

Note: ** represents variables are significant at 5 percent level.

through making a correction to the *t*-statistic of coefficient γ and allowing serial correlation in residuals. The test results of unit roots at different levels are illustrated in Table 3.1. Critical values for ADF and PP tests are chosen at 5 percent significant level. From the table, it is clear that all the variables are integrated at first difference levels I(1). Hence we need to use first different values to conduct Structural VAR model in the following sections.

Whether there is structural break in the modeling system as we expected needs further discussion. The common testing method is to check likelihood ratio and figure out the existence of structural break. The testing equation is:

$$LR = (T - M) * (ln\left|\sum r\right| - ln\left|\sum ur\right|) \sim \aleph^2(q)$$

Where T: the number of observations

M: number of parameters in each equation of the unrestricted system*number of lags + constant + number of dummy variables

$\sum r$: Determinant of the residual covariance matrix

q: number of dummy variables * number of equations

If adding a dummy variable to represent the structural break as we discussed in sector 3.1.1, we could got the following test results in Table 3.2. Calculated likelihood ratio for our model equals to 32.71 ($LR = (82 - (4 * 2 + 1 + 1) * (ln|4.67\text{E} - 11| - ln|4.97\text{E} - 13|)$ =32.71). It is over critical value 9.47 ($\aleph^2{}_{0.05}(1 * 4)$=9.47), which rejects the null hypothesis that no structural break at 5% level. Separating the whole period into two sub-periods is reasonable.

Table 3.2 Restricted and Unrestricted VAR model test results

	Restricted Model	Unrestricted Model
Number of observations	82	82
Log Likelihood	509.85	579.79
Det(Sigma_ml)	4.67E-11	4.97E-13
AIC	-11.95	-13.41

3.2 Quantify exchange channel and monetary channel

3.2.1 Spearman rank-order correlation

The study period was separated into two sub-periods, one from January 1929 to January 1933, and the other one from February 1933 to December 1935. The dividing point was January 1933 when New York silver price reached its lowest point. Table 3.3 reports the Spearman's rank correlation between variables during the whole period and two sub-periods. Spearman's rank correlation coefficient measures the extent to which, as one variable increases, the other variable tends to increase without requiring that the growth to be represented by a liner relationship. All variables are integrated to the first difference level, so Table 3.3 illustrates Spearman's rank correlation at the first difference level.

In the first period, their mutual correlation coefficient equals to 0.884, which means one unit of decrease in New York silver price went together with 88.4 percent depreciation of Chinese exchange rate. They both negatively correlated with wholesale price index in Shanghai and Tianjin at over 40 percent and 30 percent respectively, which means fluctuations in New York market would transmit via influencing Chinese exchange rates and profoundly changing domestic price level. However, correlation between silver stock and price indicator is ignorable (-0.108). In the first period, one unit decrease of silver stock merely went together with 4.5 (1.38) percent inflation in Shanghai (Tianjin) market. Compared with 40.1(31.2) percent correlation values between exchange rate and wholesale price index, silver stock obviously showed less influence on domestic inflation during the early 1930s. Besides, one unit appreciation of silver in New York merely accompanied with 1.3 percent increase of silver stock. Hence, from January 1929 to January 1933, inflation in Chinese market was transmitted from descending silver price in the New York market through exchange channel. This analysis result confirms with viewpoint from Ho, who suggested exchange rates went through together with New York silver

Table 3.3 Spearman rank-order correlation between variables of interest

From January 1929 to December 1935				
	Exchange rate	Shanghai WPI	Tianjin WPI	Silver stocks
NY Silver price	0.772	-0.257	-0.238	-0.070
	NY Silver price	Shanghai WPI	Tianjin WPI	Silver stocks
Exchange rate	0.772	-0.260	-0.223	-0.026
	NY Silver price	Shanghai WPI	Tianjin WPI	Exchange rate
Silver stock	-0.070	-0.153	-0.287	-0.026
From January 1929 to January 1933				
	Exchange rate	Shanghai WPI	Tianjin WPI	Silver stocks
NY Silver price	0.884	-0.481	-0.459	0.013
	NY Silver price	Shanghai WPI	Tianjin WPI	Silver stocks
Exchange rate	0.884	-0.401	-0.312	-0.108
	NY Silver price	Shanghai WPI	Tianjin WPI	Exchange rate
Silver stock	0.013	-0.045	-0.138	-0.108
From February 1933 to December 1935				
	Exchange rate	Shanghai WPI	Tianjin WPI	Silver stocks
NY Silver price	0.587	-0.017	0.075	0.150
	NY Silver price	Shanghai WPI	Tianjin WPI	Silver stocks
Exchange rate	0.587	-0.047	-0.051	0.276
	NY Silver price	Shanghai WPI	Tianjin WPI	Exchange rate
Silver stock	0.150	-0.381	-0.501	0.276

market and played a relatively more important roles in impacting Chinese wholesale prices compared to silver stock or monetary channels (Ho and Lai, 2013).

In the second period, Now York silver price and exchange rate also have roughly the same correlation values against other variables. Their mutual correlation coefficient decreased from 88.4 percent in the first period to 58.7 percent in the second period. The growth pattern of exchange rates seemed less coordinate with that of New York silver price. Besides, their impact on domestic wholesale price declined from over 40 (30) percent to 4.7(5.1) percent in Shanghai and Tianjin treaty ports respectively. Comparatively, absolute values of correlation between silver stock and wholesale price increase from 4.5 (13.8) percent to 38.1 (50.1) percent in Shanghai and Tianjin market. From February 1933 to December 1935, silver stock values showed stronger correlation with wholesale price index which means monetary channel played a more important role in transmitting silver price pressure from abroad.

In a sum, if we synthesize the findings in two sub-periods to the whole period, we could conclude that New York silver market was more closely linked with Chinese exchange rates than

silver stocks in Shanghai. Meanwhile, in the early 1930s, exchange channel functioned as primary way to transmit pressure generated in international silver market to China, while monetary channel acted more important roles in the later time. Besides, when exchange channel worked, it had a more significant impact on Shanghai market (-0.401) compared with Tianjin market (-0.312). But when monetary channel worked from February 1933 to December 1935, it held stronger influence in Tianjin port (-0.138) than shanghai market (-0.045).

3.2.2 Structural VAR model

Correlation could hardly be used as a proof of causality between variables because it only describes static patterns. Hence only depending on correlations is not enough to testify monetary transmission mechanism. Structural Vector Autoregression (SVAR) model solves the drawback of causality prediction and deposes all variables into their expected and unexpected parts (Asteriou and Hall, 2011). With respect to monetary policies, the SVAR approach recognizes that policy instrument at most times is determined by endogenous factors. Having generated reduced form of model with the help of a VAR system, SVAR analysis proceeds to identify model.

VAR model treats all variables as endogenous and generates similar forms of impact on exogenous variables. SVAR model further identifies shocks into expected and unexpected forms. In Equation (3.2) $A_0 Y_t = \sum_{s=1}^{\infty} B_{(s)} Y_{(t-s)}$, matrix A_0 is a 4×4 lower triangular with ones on the diagonal and $Y_t = (SP_t\ E_t\ SS_t\ P_t)'$ is 4-dimensional vector of variables. In order to stimulate historical fact, I defined New York silver price (SP_t) as an exogenous variable without influence from exchange rate (E_t), silver stock (SS_t) and Chinese domestic price level (P_t). In reality, New York silver price was artificially increased by governments' actions such as Britain abandoning gold standard or the U.S. Silver Purchase acts. Chinese domestic factors like exchange rates or silver stocks could hardly influence silver price in international market. To some extent, China acted as a price taker instead of a leader.

In terms of monetary channel and exchange channel, it is necessary to control their mutual influence in order to figure out the monetary transmission system. I defined their corresponding coefficients in matrix A_0 equal to zero. That is to say, when exchange rate acts as exogenous variable, coefficient of silver stock equals to zero, which assumes silver stock has no impact on fluctuations in exchange rate. Similarly, when silver stock functions as exogenous

Table 3.4 The form of matrix A_0 and B

Model: Ae = Bu where E[uu']=I			
Restriction Type: short-run pattern matrix			
A =			
1	0	0	0
C(1)	1	0	0
C(2)	0	1	0
C(3)	C(4)	C(5)	1
B =			
C(6)	0	0	0
0	C(7)	0	0
0	0	C(8)	0
0	0	0	C(9)

variable, coefficient of exchange rate is zero and it has no influence on monetary channel. Then Shanghai wholesale price index is impacted by other three endogenous variables together. The form of matrix A_0 and $B_{(s)}$ is illustrated in Table 3.4.

I assumed exchange rate and silver stocks as two transmission variables. It is essential to further examine their dynamics. Impulse response function measures how long it will take until a shock in monetary shock reaches its full effect on the other variables. Figure 3.2 illustrates impulse responses to world silver price shocks from 1929 to 1935. Since all the endogenous variables plotted in Figure 3.2 are at first difference level, they represent short-term growth rates.

A shock of one standard deviation in New York silver price causes New York silver price to rise by approximately 5 percent in one month. In the second month, its impact still induces silver price to increase at around 1 percent. It is until the fourth month that impact from the shock in silver price gradually fades. The same situation happens to the series of exchange rate. The exchange rate appreciates by roughly the same magnitude as response of silver price. In that sense, Chinese exchange rates were profoundly influenced by silver price in international market. Next the response of silver stock is negative and significant. Silver depreciation will lead to an increase in silver stock. Its most obvious impact happens in the second month later at around 0.4 percent. In consideration of the average silver stock in Shanghai financial intermediates was around 344.28 million Chinese dollars, 0.4 percent increase equals to 1.38 million Chinese dollars gathering in Shanghai. Finally, response of Shanghai WPI is negative during the first four months. In the fifth month its impact turns to positive and then fades. In the first three months, silver depreciation will result in 0.5 percent domestic inflation continuously. In Figure 3.2, all the variables have significant responses towards a standard deviation in New York silver price.

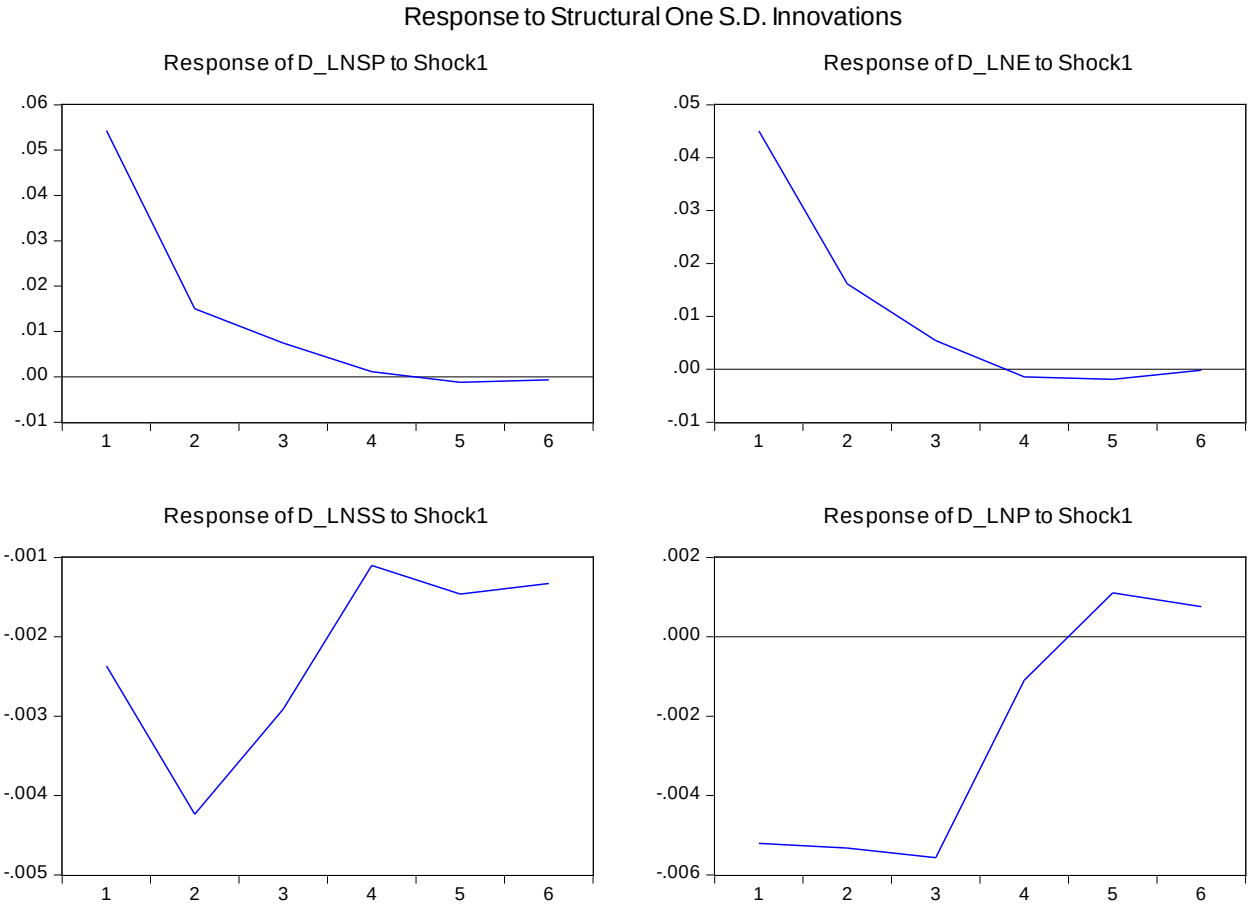

Figure 3.2 Impulse Responses to world silver price shocks, 1929-1935

Notes: the figure plots the impulse responses of endogenous variables to a shock in New York silver price index, obtained from four variables including New York silver price index, exchange rate, silver stocks and Shanghai WPI.

Since exchange rate seems to have a closer linkage with international silver market, is it accurate to conclude that price pressure generated aboard was transmitted through exchange channel to Chinese domestic economy? To answer this question, we need to discuss the importance of exchange channel and monetary channel in two sub-periods.

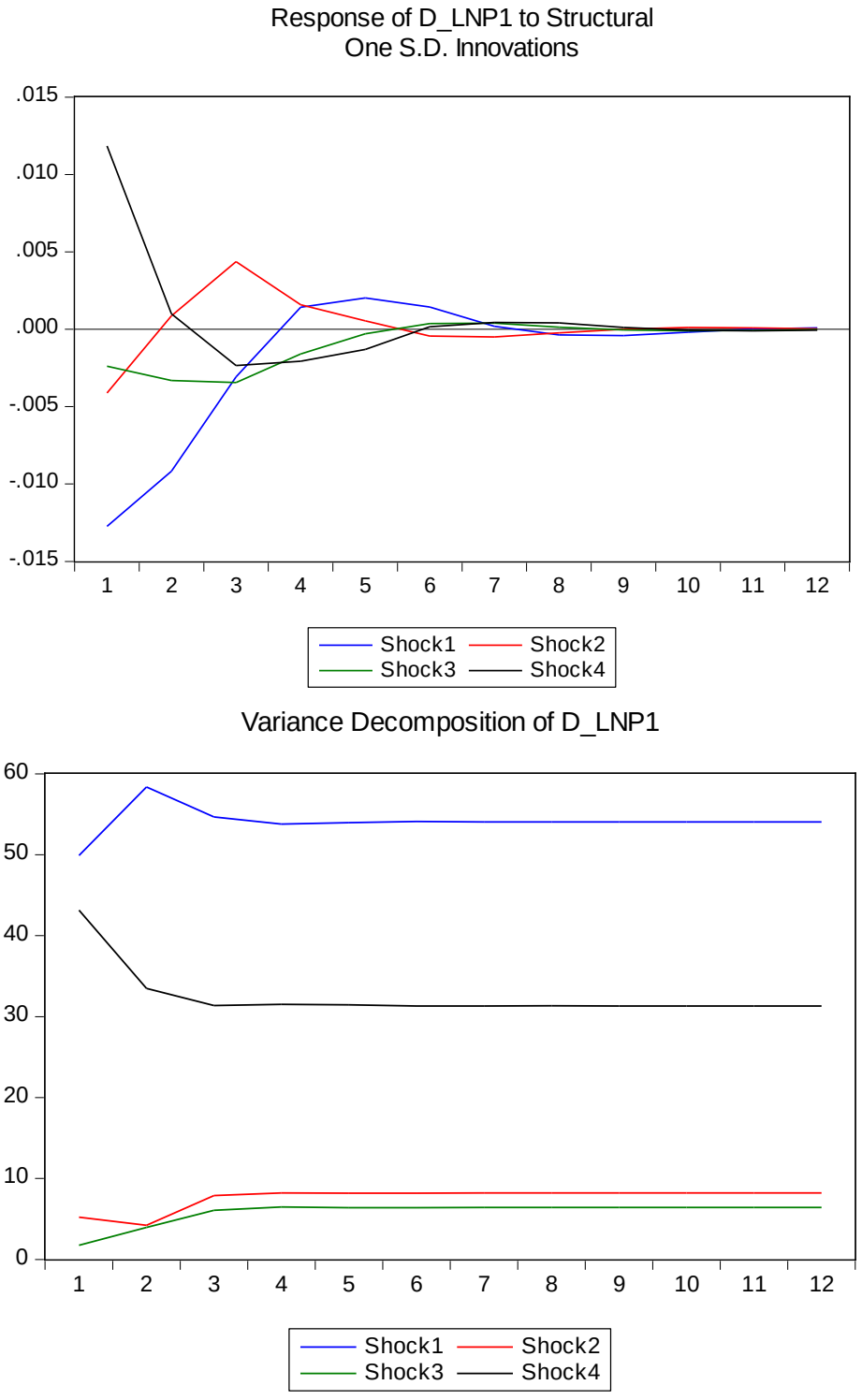

Figure 3.3 Response of Shanghai WPI and its response decomposition, Jan 1929 to Jan 1933

Notes: shock 1 represents New York silver price; shock 2 is exchange rate; shock 3 means silver stock, and shock 4 is Shanghai WPI.

Figure 3.3 plots variance decompostition of Shanghai WPI and its response to shocks in the first period. From January 1929 to January 1933, the driving force of inflation in Shanghai WPI is the depreciation of New York silver price, which could be seen from the lower panel. Nearly 50 percnet of changes in Shanghai WPI generated from New York silver price (blue line). Besides, in the first month, one standard devationation of depreciation in New York silver price will lead to 1.5 percent inflation in Shanghai. This situation lasts for three months and then its influences faded out. As we discussed before, in the first period, New York silver price held a relative more stronger impact on Chinese exchange rate than silver stock. Is it accurate to say that in this period exchange channel acts more significantly compared to monetary channel? Based on the statistical results in the lower panel, the red line (exchange rate) lies above the green line (silver stock) in the figure of decomposition of shock in Shanghai WPI. This means exchange channel works better than monetary channel in this period.

Meanwhile, if we further analyze the response of Shanghai WPI to shock in exchange rate, we could find an interesting phenomenon. In the first month, one unit depreciation in exchange rates lead to 0.5 percent infaltion. While in the third month, one unit depreciation in exchange rates lead to 0.5 percent deflation. Its coefficients turn from negative to positive. That is to say short-term depreication of currency would lead to inflation which could promote economic development. But if the trend of depreication terminates, positive growth expectation turns to economic depression. Depending on currency inflation to promote ecnomic growth is fragile and short-signted. Besides, exposing Chinese domestic market to the risk of fluctuations in international silver price could not guarantee monetary policy independence.

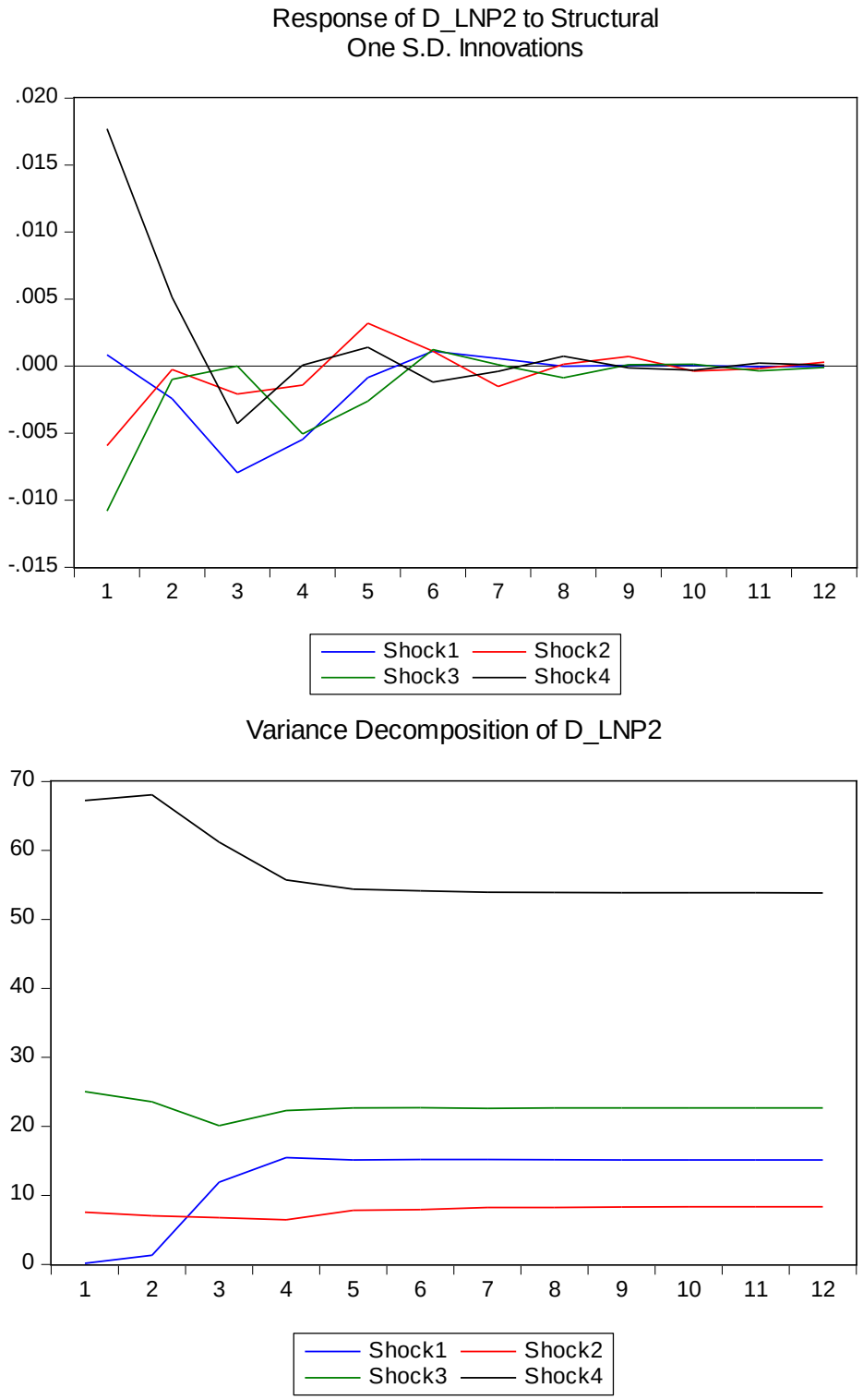

Figure 3.4 Response of Shanghai WPI and its response decomposition, Feb 1933 to Dec 1935

Notes: shock 1 represents New York silver price; shock 2 is exchange rate; shock 3 means silver stock, and shock 4 is Shanghai WPI.

Figure 3.4 plots variance decompostition of Shanghai WPI and its response to shocks in the second period. From February 1933 to Decemeber 1935, influeces from silver price went weaken (blue line), together with the impact from exchange rate (red line). On contrary, silve stock this time plays a relative more important role in promoting Shanghai WPI deflation. During the second period, ascending silver price stimulated silver legal exports and smuggling. Massive amount of silver bars or Chinese dollars were exported aboard for speculation and for gaining profits in over-heated real asset markets in Shanghai. Fragile Chinese monetary system could hardly endure such a heavy pressure transmitted from aboard. If we further analyze the responses of Shanghai WPI to silver stock. In the first month, one shock in silver stock would result in 1 percent decrease in Shanghai WPI. The forth month also illustrates 0.5 percent decrases and then its impact disappears.

In a sum, from January 1929 to Jaunary 1933, the influence of silver depreication in New York market was trasnmited via exchange channel. While in the later period, when the most of countries went off the gold standard and competitively conducted deprecaiton monetary policies, artifically increased silver price facilitated silver exports and resulted in massive defaltion in domestic economy. Monetary channel has a more significnat impact on domestic wholesale price fluctuations in the second period. These SVAR test results are corresponding with the analysis of Spearman rank-order correlation coefficient in sector 3.2.1. But is it acceptable to draw the above conlcusion that exchange channel works well in the first preiod while monetary acts better later? We need to dig out more historical achive materials to support these findings in the next sector.

4. Historical explanation

4.1 Exchange channel in the first period

4.1.1 Prosperity of domestic industries

In this sector, I will further explain the transmission mechanism of monetary channel and exchange channel in pre-war Chinese economy with historical facts. Previous analysis used macroeconomic statistics which offer a broad picture and are fit for conducting quantitative regression models. But if we want to dig out more trustworthy evidence for the final conclusion, merely depending on gross data is far from satisfaction. In order to take a closer look at microeconomic situations, we'd better focus on the growth history of certain industries.

Our research question is to figure out how monetary channel and exchange channel transmitted silver price pressure from abroad to China's domestic economy. Hence, the representative industries should have the features of dominating Chinese modern machined industries, involving in global market and integrating with rural areas. Modern industries burgeoned in China in the 1880s and were disproportionately concentrated in the Lower Yangzi Delta, particularly in Shanghai and cities along the Yangzi River. In 1933 among all the 27 major industries in Lower Yangzi Delta area, cotton spinning accounted for 43.87 percent (86,629,000 yuan) of total output, which acted as the engines of industrial growth in this region (Rawski, 1989). Cotton spinning industry ranked as the largest component of modern machined industries, which matches the first requirement. Secondly, there was an integrated global market for cotton industry. It confronted with keen competition from other countries, especially competitors in Asian regions. Cotton spinning industry was sensitive to price fluctuations. Depreciation of silver price had a huge impact on both the domestic and foreign markets. Finally, urban factories obtained raw material from surrounding regions. In 1933, an estimated 60 percent of raw cotton used in the factories of Jiangsu province came from the regional rural sector (Shiroyama, 2009). Agricultural production and rural handicraft industries were intimately connected. Farm households cultivated cotton, spun yarn and wove cotton cloth in cotton-producing areas. Hence based on the above reasons cotton-spinning industry was chosen to represent how domestic industries reacted to dramatic currency depreciation and appreciation in pre-war China.

The rural parts of the Lower Yangzi Delta have been short-staple cotton producing areas since the 15th century. Initially, farm households spun enough yarn merely to meet their family weaving needs. The raw cotton left over was sold in the market for transactions. For cotton producers in the early stage, it was more profitable to grow cotton and weave cloth. Hence yarn supply became the bottleneck of rural cotton industry in the Lower Yangzi Delta (Shiroyama, 2008). British coarse yarn became the first wave of imported yarn to bridge the gap after China was forced to open up treaty ports in the 1840s. However, due to the American Civil War, raw cotton exported from southern American plantations decreased which threatened production of British cotton industries. Then Indian short-staple yarn came to China in the 1870s. Due to its cheap price and high quality, Indian yarn quickly penetrated into Chinese market, especially in southern regions. Indian yarn competed with yarn produced in the Lower Yangzi Delta because they were both short-staple cotton which became substitution. Although Indian yarn had the merits of lower price and good quality, it took several decades for it became a powerful competitor. Farmers in the Lower Yangzi Delta were reluctant to accept foreign products. They preferred to spin their own yarn and weave cloth, although traditional producing process needed more demand of labor force and produced smaller amount of final goods. With the integration of domestic market, cloth weavers in other regions gradually turned to Indian yarn, which forced farmers in the Lower Yangzi Delta to decrease prices.

The mechanized manufacture of cotton goods began in 1890 as the contemporary government realized the necessity of stemming uncontrolled imports of Indian yarn. Between 1896 and 1899, eight cotton-spinning mills were established. Production capacity rose from 174,564 spindles in 1897 to 336,722 spindles in 1899. Most of newly established cotton mills were located in the Lower Yangzi Delta. Shanghai alone hosted 161,084 spindles, consisting 48 percent of the total production (Yan, 1963). The emerging of mechanized cotton spinning factories integrated the connection between urban manufacturing and rural farming. The factories obtained raw cotton from surrounding rural areas. Chinese mills' managers signed contracts with farmers in exchange for their raw cotton. Afterwards they spun the cotton into yarn, distributed yarn among farmers. Managers ordered farmers to weave yarn into cloth and brought it back later. Their profits generated from the price difference between raw cotton and final cloth. Later Japan started to set up its own factories in treaty ports. Instead of producing conventional inferior cloth using short-staple yarn, they paid their attention to finer yarn which used long-staple cotton. By the end of 1930, 39 Japanese spinning mills produced over 1.6 million spindles in China

(Shiroyama, 2008). They not only produced cotton yarn but also produced cloth. Their major market was Northeast parts of China.

The competition between Chinese, Indian and Japanese yarn not only laid in the quality and price, but also included the exchange rates which reflected the relative price changes in gold-standard Indian rupee and Japanese Yuan against Chinese *Teal* on the silver standard. Theoretical explanation indicates that depreciation of one country's currency will lead to descend in imports and ascent in exports. Export goods benefit from price competitiveness. Import commodities become relatively more expensive, which in turn may stimulate the setting up of domestic substitutive industries. The actual situation in China varied a little bit compared to theories. But the deprecation of silver from 1929 to 1931 indeed stimulated the growth of Chinese cotton industry and helped China to escape from the disaster of Great depression in the beginning.

Silver price slumped from 57 cents per ounce to 30.2 cents per ounce during the January 1929 to December 1931. Currency shrunk half of its previous value in two years increased the price of import goods marked in dollars or starlings. If the commodity price stayed the same, depreciation would lead to advantage. However, the price level of world production index also decreased from 104.28 to 72.23 in the same time period (Mattesini and Quintieri, 2007). That means to some extent the benefits of exchange rate depreciation was offset by global deflation. Another reason why the decline in Chinese imports index was more than assumed was the demand for yarn from aboard. In the brief boom of 1929-1931, Chinese cotton mills needed an estimated 12 million piculs of raw cotton. Domestic market could provide around 7 million and the other 5 million piculs of cotton had to import. Besides, as finer yarn became more popular among Chinese customers, long-staple cotton had to be imported because the main production from domestic farms was short-staple yarn. In a sum, lower commodity price in other countries and irreplaceable demand diminish the shock to import index. The import index was decreased but better than expected.

In term of export, silver currency depreciation indeed enhanced price competitiveness of Chinese exports but did not dramatically increased export amounts. The Great Depression seriously dampened purchasing power and lowered demand for Chinese products. Relatively lower price did not promote consumption as expected. The weakened demand during the depression could hardly be stimulated by low exchange. In light of the depressed economic situations globally, Chinese export index still performed better compared to those of other

countries. The index number of export prices rose a little in 1930 and declined only slightly in 1931, which means the Chinese producer, or at least the middleman, got some benefit from the fall of silver (Leavens, 1939). After 1931, Britain started to give up the gold standard and conduct currency depreciation policies. Sterling block countries followed its step, which weakened silver price advantage. Cotton mills in China suffered from relatively high price. In order to compete in global market, the average per-picul price of raw cotton decreased by 16 percent, from 54.28 yuan in 1931 to 45.84 yuan in 1932 (Shiroyama, 2008)

To sum up, decline in silver from January 1929 to January 1933 did not bring in dramatic change in trade situation as expected. China's trade was in better condition compared to other countries on the beginning stage of the Great Depression thanks to the silver standard (Friedman, 1963). Shocks from exogenous silver price fluctuations did not bring in damage to real economy. Monetary channel which supports the fluctuation in exchange rate alters trade situation did not work well. The theory of exchange channel means that it is possible for prices of gold or silver to change exogenously. The quantity of money circulated in one economic entity could adjust endogenously as a reaction to the exogenous price changes in global markets. Inflation in the early 1930s merely reflected domestically endogenous adjustment to exchange rate depression. Exchange channel performed better in the first period.

4.1.2 Domestic silver movement

Another reason why Shanghai silver stock data did not change much in the first period was that silver flows maintained a balanced movement between China's rural and urban areas. Agricultural harvest in rural areas and prosperity in interior industries absorbed silver imports due to currency depreciation. The pre-war China's financial system was not well established. Industry accounted for only 2.2 percent of domestic production in 1933, whereas the share of agricultural sector was 60 percent (James, 2001). Agriculture acted as economic foundation of pre-war China. However, farmers were the group of people who were vulnerable to natural or social disasters, which disturbed the stability of monetary system.

In 1930, R. H. Tawney, a scholar of European social and economic history was invited to China and investigate the Chinese economy. He described China's rural areas as "There are districts in which the position of the rural population is that of a man standing permanently up to the neck in water, so that even a ripple is sufficient to drown him" (Shiroyama, 2008). Chinese farmers were hard to protect themselves from exogenous shock. A heavy rainfall, disease or

unexpected drought would wipe out a famers' entire annual crop. From 1929 to 1931, the period when the silver standard isolated Chinese economy from the depression and favoring weather for agriculture, rural areas experienced net surpluses of silver shipped from Shanghai. Figure 4.1 shows around 40 million yuan was transported to rural area annually.

Farmers' financial situation showed a strong feature of seasonality. Cotton industries in interior areas strongly depended on raw material so they were influenced by seasonal capital movement. Financial institutions in smaller cities such as Yangzhou, Zhenjiang and Benpu got its short-term credit from foreign banks or big native banks in the treaty ports like Shanghai or Ningbo. The silver gathered by native banks in smaller cities was further lent out to rural areas. As a consequence, silver circulated between cities and villages year round. Interest rates in Shanghai peaked twice a year, from April to June when silk, tea and wheat were on the market, and from August to October, when rice and cotton were harvested. Buyers in rural areas needed cash to pay for goods, hence Shanghai financial institutions experienced tight silver flows as money was sent to rural areas. In the rest of year, farmers had to buy daily necessities in rural market, hence the flow of silver reversed. Silver was transported back to Shanghai through the hierarchy of transactions between small rural retail shops, wholesale shops and merchants in big cities (Yang, 1933). Currency flowed from rural branches of native banks to their headquarters in treaty ports or to foreign banks where they got short-term credit.

The Shanghai financial market was closely connected with domestic financial markets and impacted by their situations. The disastrous Yangzi River flood in 1931, together with the continuing military confrontations between the Chinese Communist Party and the Nationalist Party bear heavy burden on rural areas. The year of 1932 witnessed around 130 million of silver yuan drained from rural area to Shanghai. It was clear that the silver movement shifted dramatically in the reverse direction. Without good agricultural production, farmers endured poverty and their purchasing power was declined. Native banks in small cities could not get their cash back from farmers so banks bore the effect of default. Unable to pay back the loan from Shanghai, native banks lost their creditworthiness to foreign banks as well. The fear of massive default was wide-spread after the year of 1933, when the silver price in global market turned to increase. The credit connection between big banks in Shanghai and banks in interior areas started to recede. Rural areas suffered from a lack of both money and credit. The difference in interest rates between rural areas and Shanghai widen.

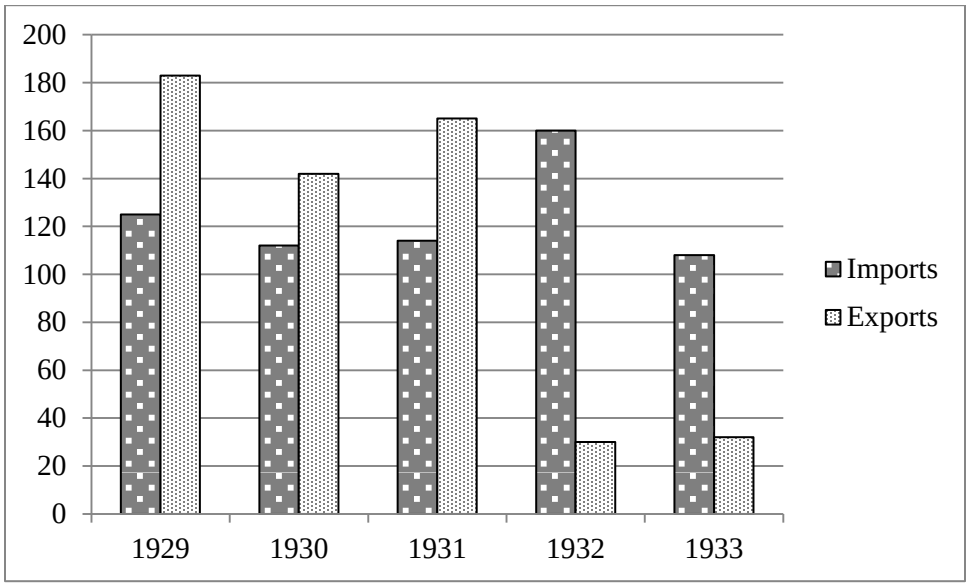

Figure 4.1 Domestic silver movements to and from Shanghai, 1929-1933

Source: Zhongwai shangye jinrong huibian 2. No.12 (Dec. 1935)
Note: These data include shipments between Shanghai and the domestic open ports as well as stations on the Shanghai-Nanjing and Shanghai-Hangzhou-Ningbo railway lines.

In the first time period, Shanghai silver stock was not seriously impacted by depreciation of silver price in the global markets. Trade situation was not significantly benefit from cheaper Chinese currency. The Great Depression weakened purchasing power of many countries and lowered commodities price levels. Sharply reduced demand for Chinese good from aboard could hardly be stimulated by price competitiveness. Lowered commodities price further enhanced price advantages of import goods. Although Chinese trade situation performed better compared to other countries stuck to the mire of the depression, it did not call for net silver inflow in exchange for Chinese goods. Moreover, China's domestic silver movement worked well in the beginning stage of the Great Depression. Shanghai silver stock was not dramatic changed from 1929 to 1933. Inflation in Chinese market was a reaction to exchange rate change through exchange channel. And it could not be ignored that the effect of exchange channel on the silver standard is more significant compared to on a gold stardard because the silver standard has a broader corridor between the silver point. But it is still limited compared to a more floating exchange rate after the China's currency reform.

4.2 Monetary channel in the second period

From February 1933 to December 1935, silver price in global markets experienced dramatic increase ranging from 23.4 cents per ounce to 74.7 cents per ounce. Appreciated trend of currency worsened China's trade situation and deteriorated financial system. Silver flowed from interior areas to Shanghai, where foreign banks and native banks gathered silver and waited for a clear sign of silver appreciation. When the federal government issued a series of acts to "do something for silver", a predictable silver appreciation stimulated massive amounts of speculation. Silver collected by foreign banks and native banks in treaty ports were shipped overseas for gaining arbitrage profits. Shocks to silver price not only impacted exchange rate, but also altered Chinese trade situation and drained silver stock, which enabled the monetary channel to play a primary role in determining deflated wholesale price in the second period.

4.2.1 Breakdown of China's financial system

As illustrated in the previous sector, since 1931 China's domestic silver started to move from interior regions to treaty ports, from rural areas to cities. Farmers suffered from poverty and native banks experienced credit scarcity. Continuously decline in agricultural products further threatened their livings. In the context of the growing trade deficits from 1932 on, large amount of agricultural imports reduced the profits of domestic growers and put the country at the edge of food security. The decline of rural economy endangered the interests of bankers, industrialists and citizens living in cities. A shared concern about reinvesting urban funds to rural areas was generated. However, as long as urban financial intermediates pursued profits, they would not take the risk of investing money in risky and unprofitable agricultural production. Deprived of sources for cash and loans, rural financial system found it extremely hard to sustain business. Massive amounts of silver gathered in treaty ports without reinvesting in rural economy.

Conditions in domestic industries went worse as well. Cotton-spinning industry came across serious difficulty when the silver price appreciated. The international raw cotton price was sensitive to American cotton, which was the largest market share in the world. In the summer of 1933, the federal government agreed to increase American raw cotton prices. The Indian and Egyptian raw cotton followed his step (Kindleberger, 2000). Appreciation of silver price further increased the cost of importing raw cotton to China. Meanwhile, yarn price dropped in global market. Inevitable downturn spiral forced the selling price of yarn below its production price. The cost of producing twenty-count yarn was 218.33 yuan per picul (159.75 for raw cotton, 50

yuan for miscellaneous fees and 8.58 yuan in tax), but market price was only 204 yuan, which means a loss of 14.33 yuan per picul (Shiroyama, 2008). Accumulated inventories disabled Chinese cotton mills to realize its profits, which put them at the risk of defaulting. They borrowed short-term loans from banks to purchase raw material and used their products or stock of raw material as collateral. When the price of raw material or products deceased, they were on the edge of bankruptcy.

If banks believe that factories in question had an opportunity to recover, they would allow the mills to continue their operations under direct control from bank. The way of supervision could be clarified into three categories. First, banks toke over management rights but reserved the previous structure of shareholders. Second, banks suspended the payment of previous loan and resigned a new one, which could be used as working capital so that the mills could repay interest regularly. Third, banks send out employees to take over the management issue and required cotton-spinning enterprises to pay back loans before meeting other expenses (Shiroyama, 2008). The continuous increasing silver price further worsened the economic condition for cotton-spinning industries. Investing in real economy would be of high risk and less profits.

Shrinking profits generated form agricultural and industrial sector channeled banks' investment into real asset markets and government bonds. The phenomenon of real estate investment fever happened in Shanghai as early as 1929. When the depreciated currency trend ensured increasing future real estate price, land prices in Shanghai started to soar together with booming construction and high-speed real estate turn over. Banks assigned many loans based on collateral of real asset, which were seen as secure guarantee and profitable assets. However, as the global silver price started to increase, prosperous real asset markets met difficulties. Investors got used to evaluate real asset price in terms of sterling and dollars. Competitive depreciation conducted by most of countries in 1933 lowered real asset price. The consequences of real asset price descending were enormous, not only because of most capital flows stuck to real asset market without sound cashability, but also due to the availability of credit based on real estate. Banks in Shanghai treaty ports operated with many loans based on real asset, which made them susceptible to real asset price fluctuations. Situation turned bad after August 1934, when massive amount of silver (65.85 million yuan) was exported abroad. People worried about the rapid drainage of silver reserves. They rushed to the banks, withdrew their bank deposits and hoarded the metal. Foreign banks suspended on collateral loans signed against real asset. Chinese native

banks also refused to renew loans on maturity. With devalued real assets on hand, the stability of cash flow in Shanghai financial institutions was undermined.

In a sum, domestic silver movement flowed from interior areas to coastline treaty ports, from rural areas to big cities. Depressed rural economy and unprofitable industries did not attract silver flow into real economic sectors. Money chases after highest profits. Holding massive amount of silver stock on hand, bankers turned to put money into real asset markets and government bonds. However, as more countries depreciating their currencies and increasing silver price, inevitable downturn of real asset price threatened the stability of Chinese banking system. In the second time period, the sound monetary system bridging rural areas and cities, connecting industries with financial institutions were broke down. Silver was gathered in treaty ports and waited for being exported aboard the moment of high speculative space existed.

4.2.2 American Silver Purchase Act and Chinese currency reform

Britain went off the gold standard in September 1931. The depreciation of sterling raised silver price in the London market. Afterwards, the trend of appreciative silver currency against many other countries' currencies appeared. One country after another, starting from sterling bloc to the federal government gave up the gold standard and conducted competitive exchange rates.

The Unite States was the primary silver producer in the world. Utah, Arizona, Montana, Idaho, Colorado, Nevada, and New Mexico were the states where American silver originated from (Pand, 1983). They controlled one-seventh of votes in the senate and supported Franklin D. Roosevelt to win the 1932 presidential campaign. In return, Roosevelt met his commitment-"do something for the silver". Not long after he took office in March 1933 an issue of addressing the U.S. inflationary monetary and fiscal policies was carried out. One month later, Roosevelt issued an executive order forbidding the export of gold except to complete previous existing contracts or for transactions which approved by the president. In that sense, this act represented the United States went off the gold standard. Commodity price rose up including silver price in the New York market. On December 21, 1933 the Present ratifies the Pittman London Siler Amendment and issued the silver-purchase proclamation. It granted the U.S. mints the rights to purchase entire domestic newly minted silver at 64.5 cents per ounce, the price matched statutory price but 20 cents more than market level.

On June 19 1934, the Silver Purchase Act was passed by the Congress which acted as the most dramatic policy to increase global silver price artificially. The act aimed at increasing the

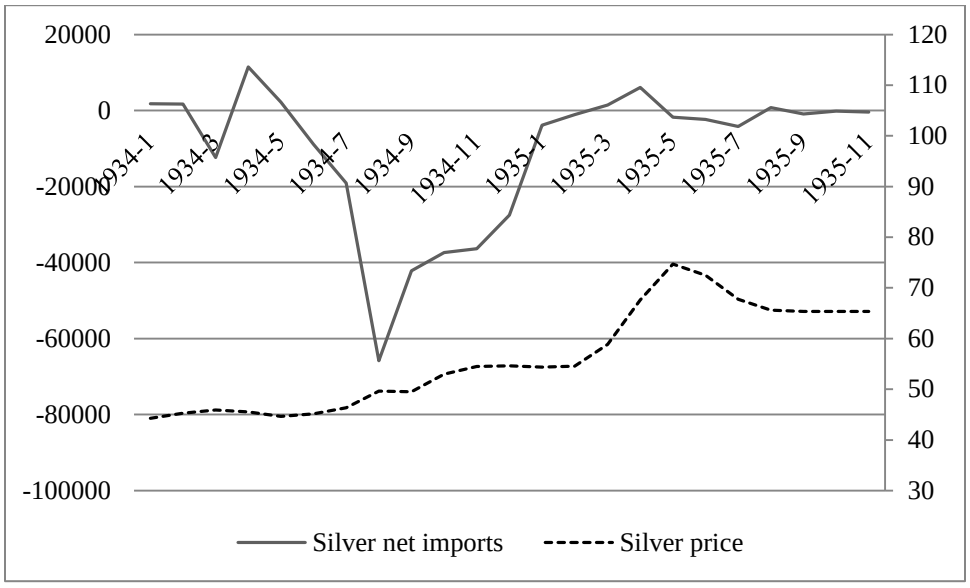

Figure 4.2 Recorded monetary net imports of silver to China, 1934-1935

Source: Nankai annual statistics. 46-47 (Dec. 1936)

U.S. silver stock until the ratio between silver and gold stocks reached one-fourth. When the silver price climbed over 1.29 dollar per ounce, the act also allowed the Treasury to sell silver. silver price in the New York market responded instantly to the policy. From 46.3 cents per ounce in June 1934 to 49.5 cents in August, in October the silver price rose up to more than 55 cents per ounce. The Price on the London silver market followed the growth pattern in the New York market as well. In fiscal year 1934, the amounts of silver purchased by the United Stated equaled to 32,068,495 ounces. The figure soared 13.6 times in 1935 which means 437,501,808 ounces (Leavens, 1935).

The sudden rise in silver price caused by U.S. purchases act induced a massive flow of silver out of China and unset the silver-standard Chinese economy. Figure 4.2 illustrated the situation of China's silver exports from 1934 to 1935. The massive outflow of silver started from August 1934, which reached to 19.06 million yuan. The next month witnessed 65.85 million yuan exports. Until the December 1934, total silver exports reached up to 228.33 million yuan, which equaled to twice the total silver exports in 1933. The situation maintained in the first half year of 1935. It was until the November of 1935 that the Chinese government conducted currency reform which finally removed Chinese economy away from the silver standard and cut off the link between international silver price and domestic exchange rate.

There are several explanations for the vast increase in silver exports. First, as illustrated in sector 4.2.1, depression in agriculture and industries drained silver stock from interior areas

and gathered in major treaty ports. Individuals and companies transferred their funds to big native banks or foreign banks and waited for chance to transfer their fortune out of China. Foreign banks acted as the major intermediary to export silver abroad during these two years. Silver stock in foreign banks decreased from 275,660 (1933) to 54,672 thousand yuan (1934), which shrunk 80.15 percent merely in one year. The contemporary silver stock figure for native banks increased from 271,786 to 280,325 thousand yuan. Meanwhile native banks' component in total silver stock in China increased from 49.6 percent to 83.7 percent. In 1935 another 18513 thousand yuan and 40882 thousand yuan of silver was exported by foreign banks and native banks respectively. Wealthy Chinese purchased foreign exchange from foreign banks and they prefer to hoard foreign currency because of their clear appreciative expectation. They also remitted surplus founds aboard in fear of Chinese government suspended on silver conversion or export embargo.

Kong Xiangxi, the minister of finance, said that "Government should take measures to safeguard China's currency from a potentially dangerous strain on the country's reserves and to place a check on the harsh deflationary forces that have been reflected in falling internal prices" (Shiroyama, 2008). To deal with serious economic situations and protected welfare of people, Chinese government imposed export duty and equalization charge on silver on October 14, which made speculators find it no profit to export silver aboard. This method would prevent a further fall in commodity prices in a short-term, but in a long-run the government faced with a dilemma: if the exchange rates moved up in together with the silver price, export goods would lose cost competitive. Export trade would be handicapped and internal deflation would continue; if the exchange rate decreased and it would increase the difference between the external and internal value of currency, which could be utilized to gain arbitrage profits.

In the spring of 1935, international silver price rose steadily while the disparity between the exchange rate and export parity of silver ascended sharply after April. Government suspended the free silver export and authorized only a few institutions conduct silver trade, the official silver exports seemed improved in 1935. However, official prohibition of silver export did not stop smuggling of silver. Silver was shipped from Shanghai to other treaty ports like Canton or Harbin, which near Hong Kong and Japan where could be used for smuggling. On November fourth 1935, Chinese government conducted currency reform which officially gave up the silver standard. The new system was a managed currency with the Chinese dollar unit no longer based on silver, but to be kept fixed in terms of foreign exchange. Four government-

controlled commercial banks were granted the right to issue notes. The notes of the government banks had been backed by a reserve of 60 percent in silver and 40 percent in securities (Leavens, 1939). A central bank was established to coordinate selling or buying of foreign currencies in global market to maintain the stability of exchange rate. From now on, the fluctuations of silver standard could hardly influence Chinese domestic economy and its wholesale price level.

The appreciation of China's silver currency also has a profound impact on Chinese trade situations. Unlike the situation in the first period, appreciation of Chinese currency deteriorated trade balance. Chinese exports penetrated into foreign markets where lower prices dominated. Ascending silver price diminished cost competitiveness of Chinese goods and decreased volume of Chinese exports. Figure 4.3 and 4.4 illustrated the export and import index of China from 1929 to 1936. With other countries went off the gold standard and conducted competitive deprecation policies, global wholesale price declined sharply. In competing with other countries, Chinese export goods had to lower its price. However, as China's domestic industries experienced depression without abundant financial credits, it was hard for factories to adopt technology to lower its cost. The decline of export quantity index from 1933 to 1935 was in concern with the breakdown of domestic industries.

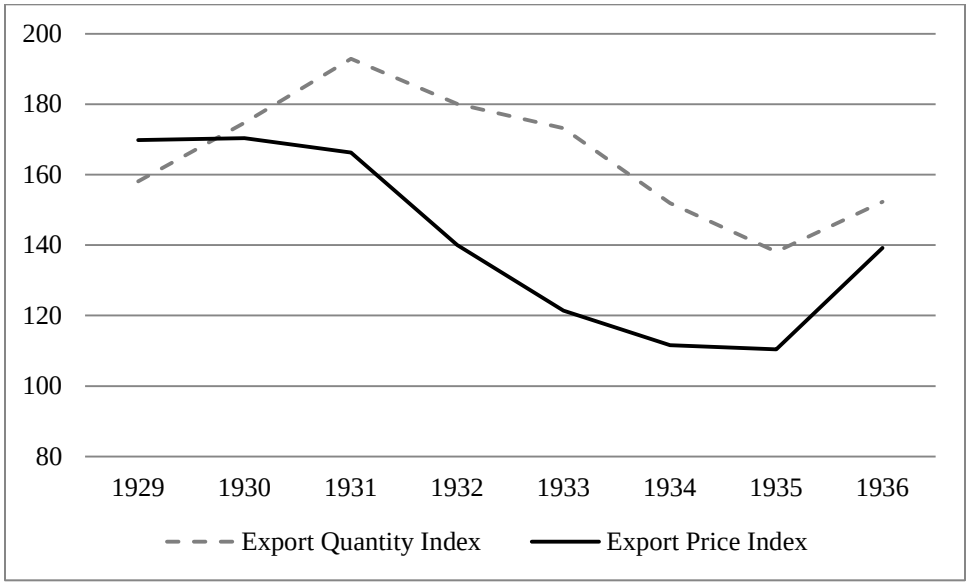

Figure 4.3 Export Index of China, 1929-1936

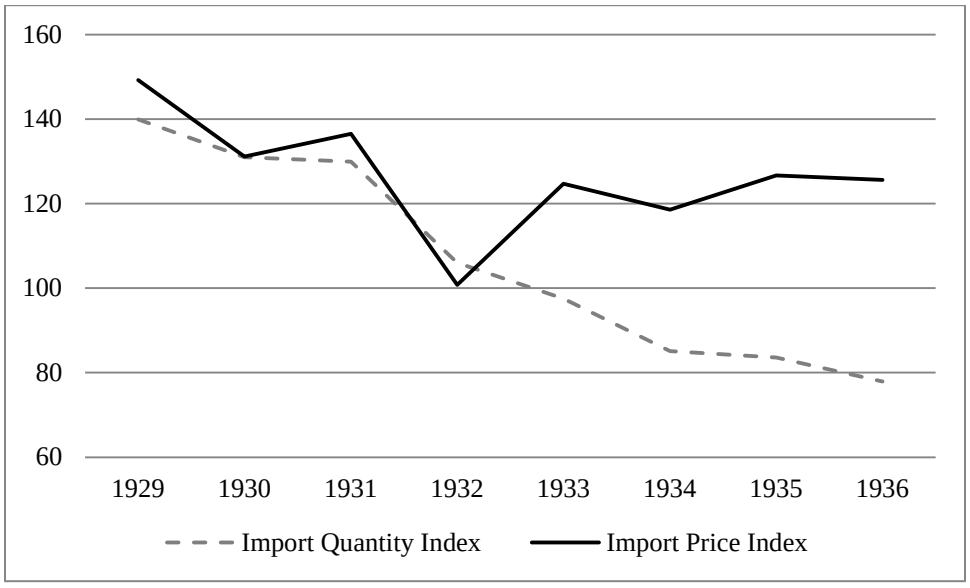

Figure 4.4 Import Index of China, 1929-1936

Source: Nan-k'ai chih shu tzu liao hui pien, 1913-1952 [Compendium of Nan-k'ai index number materials](Peking: China Social Sciences Press, 1988):555.

The Figure 4.4 showed import situation of China from 1929 to 1936. Silver price started to increase in 1932. The pressure of appreciative exchange rate was transmitted to the price of import goods. The federal government issued several acts to protect interests of domestic agriculture producers through increasing price level. Hence the year of 1933 witnessed an increase trend in import price index of China which followed the international pattern. However, due to the recession in exports, the domestic industries had no motivation to import raw material (Shiroyama, 2008).

In a sum from February 1933 to December 1935, depressed rural economy and domestic industries suffered from currency scarcity. Silver flowed out of interior areas and gathered in banks located in treaty ports, especially in Shanghai which acted as financial center of China. Artificially increased silver price in the global market left huge space for speculating. Massive amounts of silver were exported in 1934 and 1935. China's economy experienced wide-spread deflation due to silver reserves scarcity, together with deterioration in trade deficits. Hence monetary channel which based on price-specie-flow mechanism worked more significantly in the second period.

5. Conclusion

The main contribution of this paper is to check out the monetary transmission mechanism via which the exogenous price pressure generated in international silver markets was transmitted to China's domestic economy. Adhered to the silver standard, silver was more than a commodity but served as currency in China. Silver price changed dramatically from 1929 to 1935. Initially, silver price in the New York market experienced downturn growth trend when the whole world suffered from the Great Depression. Then it started to increase due to competitive depreciation policies and a series of acts issued by the federal government. Silver price was not controlled by Chinese government. Its fluctuations were mostly due to the relative relationship between demand and supply of silver in international markets. Without sound monetary and centralized financial institutions, Chinese government lacked ability to conduct independent monetary policies to defend domestic economy from external shocks. The Chinese economic situation was closely linked to international silver markets.

The monetary transmission channel discussed in this paper could be clarified into two categories- exchange channel and monetary channel. Based on the discussion above, exchange channel performed more significantly in the first period ranging from January 1929 to January 1933. Ralph G. Hawtrey and Gustav Cassel advocated that quantity of money circulated in one economic entity could adjust endogenously as a reaction to the exogenous price changes in global markets. Given an internationally determined value of gold or silver, a country's exchange rate is just dictated by the conversion rate of its national currency into gold. Through exchange channel, changes in exchange rate in one country do not necessarily influence a country's trade situation which further modify its currency reserves and wholesale price level. Wholesale price directly responses to changes in exchange rate. Appreciation of one country's currency would lead to deflation while depreciation would result in inflationary situation.

The influence of exchange channel could be seen in the first period. Based on Spearman rank-order correlation, the testing result of the New York silver price and Chinese exchange rate equals to 0.884, which means one unit of decrease in New York silver price went together with 88.4 percent depreciation of Chinese exchange rate. They both negatively correlated with wholesale price index in Shanghai at over 40 percent, which means fluctuations in New York market would transmit via influencing Chinese exchange rates and profoundly changing domestic price level. On contrary, one unit decrease of silver stock merely went together with 4.5

percent inflation in Shanghai market. Comparing with 40.1 percent correlation value between exchange rate and wholesale price index, silver stock obviously showed less influence on domestic inflation during the early 1930s. Besides, one unit appreciation of silver in New York merely accompanied with 1.3 percent increase of silver stock. Hence, from January 1929 to January 1933, inflation in Chinese market was transmitted from descending price in the New York market through exchange channel. Then according to the variance decompostition of Shanghai WPI and its response to shocks based on Structural VAR model, the driving force of inflation in Shanghai WPI is the devalutation of New York silver price. Nearly 50 percent of changes in Shanghai WPI generated from New York silver price. Besides, in the first month, one standard devationation of depreciation in New York silver price will lead to 1.5 percent change in Shanghai wholesale price. This situation lasted for three months and then its influence faded out. Combined with the analysis of the response of Shanghai WPI to shock in exchange rate, one unit depreciation in exchange rates lead to 0.5 percent infaltion. The econometric findings proved that exchange channl worked better compared to monetary channel.

Historical analysis further verifty the previous finding. Decline in silver price from January 1929 to January 1933 did not bring in dramatic change in trade situation as expected. The Great Depression weakened purchasing power of other countries and lowered international commodities' price levels. Sharply reduced demand for Chinese good from aboard could hardly be stimulated by cost competitiveness due to currency depreciation. Lowered commodities price further diluted price disadvantages of import goods. Although Chinese trade situation performed better compared to other countries stuck to the mire of the depression, it did not call for an increase in silver net inflow in exchange for Chinese goods. Moreover, China's domestic silver movement worked well at the beginning stage of the Great Depression. Rural areas experienced net silver inflow. Interest rates in Shanghai peaked twice a year, from April to June when silk, tea and wheat were on the market, and from August to October, when rice and cotton were harvested. Buyers in rural areas needed cash to pay for goods, hence Shanghai financial institutions experienced tight silver flows as money was moved to rural areas. In the rest of year, farmers had to buy daily necessities in rural markets, and the flow of silver reversed. Hence Shanghai silver stock was not dramatic changed from 1929 to 1933, if compared with massive amount of silver exports in the second period. Inflation in Chinese market was a reaction to exchange rate change through exchange channel.

In the second period ranging from February 1933 to December 1935, monetary channel acted as primary transmission channel where exogenous shocks to silver price resulted in drainage of silver reserves. Through monetary channel a country's price level is determined by the amount of money held by central banks or circulated within an economic entity. Less money controlled by central banks generally could be interpreted as less bank credits. Currency scarcity leads to deflation which enhances declining expectation of commodities' price level and further decreases wholesale price index. The amount of money held by central banks under the silver standard could be influenced by the difference between exchange rate and silver price in global market. If the price of silver in Shanghai was higher than those in other parts of the world, speculators would gain profits through importing silver to China. Similarly, if the global silver price was far above price parity, traders would be stimulated to export silver abroad in exchange for appreciating foreign currency.

According to Spearman rank-order correlation, Now York silver price and exchange rate also have roughly the same correlation values against other variables. Their mutual correlation coefficient decreased from 88.4 percent in the first period to 58.7 percent in the second period. The growth pattern of exchange rates seemed less coordinate with that of New York silver price. Besides, their impact on domestic wholesale price declined from over 40 percent to 4.7 percent in Shanghai treaty port. Comparatively, absolute values of correlation between silver stock and wholesale price increased from 4.5 percent to 38.1 percent in Shanghai market. From February 1933 to December 1935, silver stock values showed stronger correlation with wholesale price index which means monetary channel played a more important role in transmitting silver price pressure from abroad. Then the variance decompostition of Shanghai WPI and its response to shocks showed that from February 1933 to Decemeber 1935, influeces from silver price went weaken, together with the impact from exchange rate. On contrary, silve stock this time played a relative more important role in promoting Shanghai WPI deflation. In the first month, one shock in silver stock would result in 1 percent decrease in Shanghai WPI. The forth month witnessed 0.5 percent decrases and then its impact disappeared.

Historical archieve also illustrated that banks in treaty ports gathered silver stocks and exported it abroad in large quantity. Domestic silver flowed from interior areas to coastline treaty ports and from rural areas to big cities. Depressed rural economy and unprofitable industries did not attract silver flow back into real economic sectors. Holding massive amount of silver stock on hand, bankers turned to invest money to real asset markets and government bonds. However,

as more countries depreciating their currencies and increasing silver price, inevitable downturn trend of real asset price threatened the stability of Chinese banking system. Silver was gathered in treaty ports and waited for being exported aboard the moment of high speculative space existed. Artificially increased silver price in global markets left huge space for speculating. Massive amount of silver was exported in 1934 and 1935. China's economy experienced wide-spread deflation due to silver reserves scarcity, together with deterioration in trade deficits. Hence monetary channel which based on price-specie-flow mechanism worked more significantly in the second period.

In a sum, exchange channel worked better in the first period while monetary channel played a more significant role in the second period. The currency's close linkage to silver price limited the government's ability to manipulate economy and conduct independent monetary policies. Meanwhile, currency reserves were scattered without centralized control over note issuance or credit expansion. When the money was abundant in the market, financial institutions would operate well because of sufficient credits. Once booming silver price stimulated speculators to export silver which made the silver reserves tight, a disastrous scramble for cash existed and it further worsen deflation. Adhered one country's currency to a commodity whose price is determined exogenously would be a threat to economic stability. Hence, it was essential for China to leave the silver standard for the sake of financial recovery and economic independence.

References

Primary sources

Zhongwai shangye jinrong huibian (1935), Volume 25, No.12

Nankai annual statistics (Dec. 1936)

Zhongwai shangye jingrong huibian (1937), Volume 7, No. 50

Nan-k'ai chih shu tzu liao hui pien, 1913-1952 [Compendium of Nan-k'ai index number materials] (1988), China Social Sciences Press

Published sources

Asteriou, D., G. Hall Stephen (2011), *Applied econometrics,* Palgrave, McMillan

Bachmann, R. et al (2011), Confidence and the transmission of government spending shocks, NBER Working Paper Series

Blum, John M. (1959), *From The Morgenthau Diaries: Years of Crisis, 1928-1938*, Riberside Press, Cambridge

Bratter, Herbert M. (1930), The monetary use of silver in 1933, *The Currency system of Japan. U. S. Bureau of Foreign and Domestic commerce, Trade Information Bulletin*, No. 673.

Bratter, Herbert M. (1933), *Silver market dictionary*, The University of California.

Cassel, Gustav (1920), *Crisis in the world's monetary system*, the Clarendon Press, Oxford

Chang, Pang (1983), Commodity Price Shocks and International Finance, Ph.D. dissertation, Massachusetts Institute of Technology

Cho, Tsum-Hung, (2009), *A history of the monetary system reform in modern China, 1887-1939*, Academia Hisorica, Taipai

Friedman, Milton (1992), Franklin D.Roosevelt, Silver and China., *Journal of Political Economy* ,100, pp.62-83

Friedman, Milton and Anna J. Schwartz.(1963) *Monetary History of the United States, 1867-1960* . Princeton Univ. Press, Princeton

Ho, Tai-kuang, Lai, Cheng-chung (2013), Silver fetter? The rise and fall of the Chinese price level 1928-1934, *Economic History* ,50, pp.446-462

Hsiao, Liang-lin (1974), *China's Foreign Trade Statistics, 1864–1949*, Harvard University Press

Hu, Jing (2013) The silver standard in Prewar China: a blessing or a curse?, Lund university

James, Harold (2001), *The end of Globalization: Lesson from the Great Depression*, MA: Harvard University Press, Cambridge

Kilian, L. et al (2011), Does the fed respond to oil price shocks? *Economic Journal*, 121, pp.1047-1072.

Kindleberger, Charles P.,Manias, Panics, and Crashes (2000), *A History of Financial Crises,* John Wiley & Sons, New York

Leavens, Dickson H (1935), *American Silver Policy and China*, Harvard Business Review

Leavens, Dickson H. (1939), *Silver Money*, Bloomington, Ind.:Principia

Mattesini,F. , B. Quintieri (1997), *Italy and the Great Depression: an analysis of the Italian economy, 1929-1936*, Explorations in Economic History

Rawski, Thomas G. (1989), *Economic growth in prewar China,* University of California Press, California

Shiroyama, Tomoko (2008), *China during the great depression: market, state, and the world economy,1929-1937*, Harvard University Asia Center

Sims, Christopher A., Zha, Tao (2006), Does monetary policy generate recessions? *Macroeconomic Dynamics*, 10, pp.231-272

Taylor, Alan M. ,Mark P. Taylor (2004), The Purchasing Power Parity Debate, *Journal of Economic Perspective*,18, pp.135-158

T'ang, Leang-Li (1936), *Chinese's new currency system*, Chinese United Press

Verbook, Marno (2013), *A guide to modern econometrics*, Ajohn Wiley & Sons, Ltd

Yan, Zhongpin (1963), *Zhongguo Mian Fangzhi Shigo:1928-1937*, Kexue Chubanshe, Beijing

Yang, Yinpu (1933), *Zhongguo deshi jinrong yu nongcun jinrong(Chinese urban banking and rural banking*. Xin Zhonghua

Appendix A: Data sources

SP_t : New York silver price, cents per ounce. Source: *Statistics Monthly* (*tongji yuebao*),1932-6.

E_t : Chinese exchange rate, US dollars per 1000 Chinese dollars. Source: *Statistics Monthly* (*tongji yuebao*),1932-6.

SS_t: Silver stock in Shanghai, thousand yuan. Source: Nan-k'ai chih shu tzu liao hui pien, 1913-1952 [Compendium of Nan-k'ai index number materials] (1988), China Social Sciences Press, pp. 486-490.

P_t: Shanghai wholesale price index, 1926=100. Source: *Statistics Monthly* (*tongji yuebao*), 1932-6.

P_t-tj: Tianjing wholesale price index, 1926=100. Source: Nan-k'ai chih shu tzu liao hui pien, 1913-1952 [Compendium of Nan-k'ai index number materials] (1988), China Social Sciences Press, pp. 13-18.