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How International Financial Crisis Affects Industries in Beijing, Capital City of China

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Abstract
Beijing's industrial structure is service-oriented with a high degree of economic openness, and GDP has maintained rapid growth. This paper analyzes the international financial crisis and the impact of China's anti-crisis policies on Beijing's economic development as well as its transmission mechanism. Impact Index (excluding seasonal factors) and ARMA Model are employed in the empirical study which involves the crisis affection on output and stability of Beijing's top ten industries. Such conclusions are revealed: Beijing's GDP losses more than 10% compared with its potential value; the growth rates of over 70% industries are decreasing in Beijing; shocks in financial and real estate are intensified. In the anti-crisis process, manufacturing, real estate, scientific research, technical services, geological prospecting, transportation, storage and postal industry have gained significant growing opportunities.

Key words: Financial Crisis, Beijing's Top Ten industries, Impact Index, Output Gap

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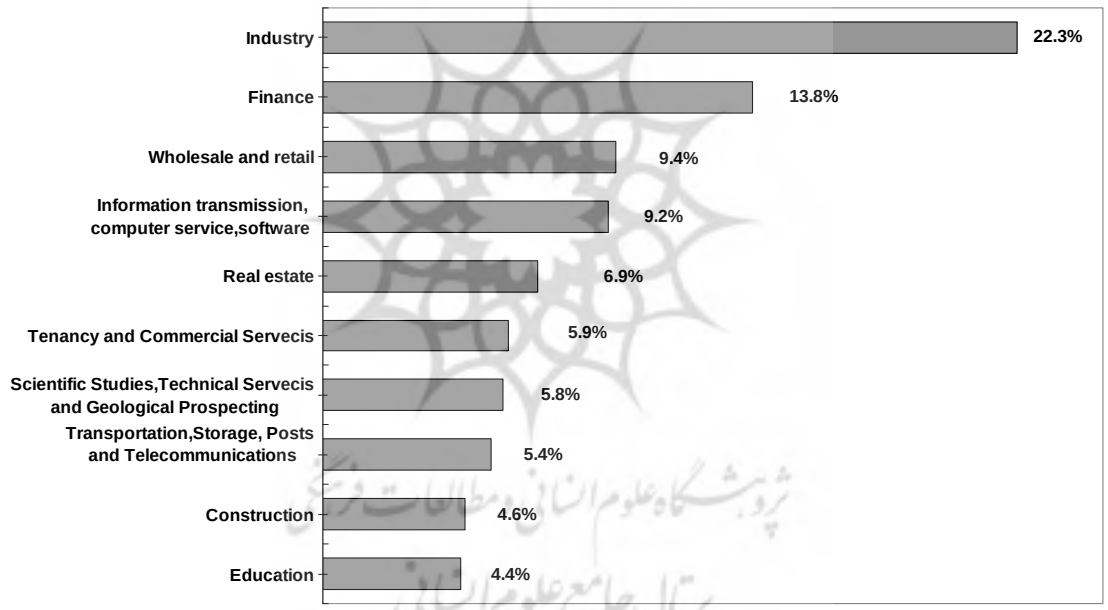
1. Introduction

As China's capital, Beijing plays a vital and special role in the development of Chinese social economy. The producing service-oriented economy of Beijing has a strong external dependence; obviously international financial crisis can bring Beijing huge impact, leading to the second lowest quarterly GDP growth rate since 1978 and a forbidding employment situation. The financial crisis has exposed the short board of Beijing's industrial structure, meanwhile highlighting the necessity of adjustment to it.

This paper analyzes the impact of the international financial crisis on Beijing's economic development as well as its transmission mechanism, especially emphasizing the impact of China's anti-crisis policies on different industries. Impact Index is employed to exclude seasonal factors, to study the direction and magnitude of industry growth rate under the crisis, and to evaluate the stability of Beijing's industrial structure. ARMA Model is also used to measure the output gap in Beijing industries, to further quantify the impact of the international financial crisis and macro-economic policy adjustment on major industries. Finally, recommendations are made towards the future of Beijing's industrial structure adjustment.

2. A Brief View of Economy Structure in Beijing:

Beijing has driven in a faster lane since 2000 with a double-digit rate GDP growth. Its per capita reached 9075 U.S. dollars in 2008, the second largest one in China. Eighty-seven percent of Beijing's GDP comes from ten industries; especially from service industries (see Figure 1)



Source: **Authors**

Figure 1: Beijing top 10 industries and their GDP proportions, 2007

In the past five years, Beijing has been accelerating industrial restructuring, vigorously developing the financial, technology and high-tech industries to build the headquarters economy.

Beijing enjoys a high level of opening and internationalization. The total amount of trade was over $200 billion in 2008, which accounted for 150% of its GDP, much higher than the national average level of 66%. Beijing had huge trade deficit, almost 3% of its GDP.

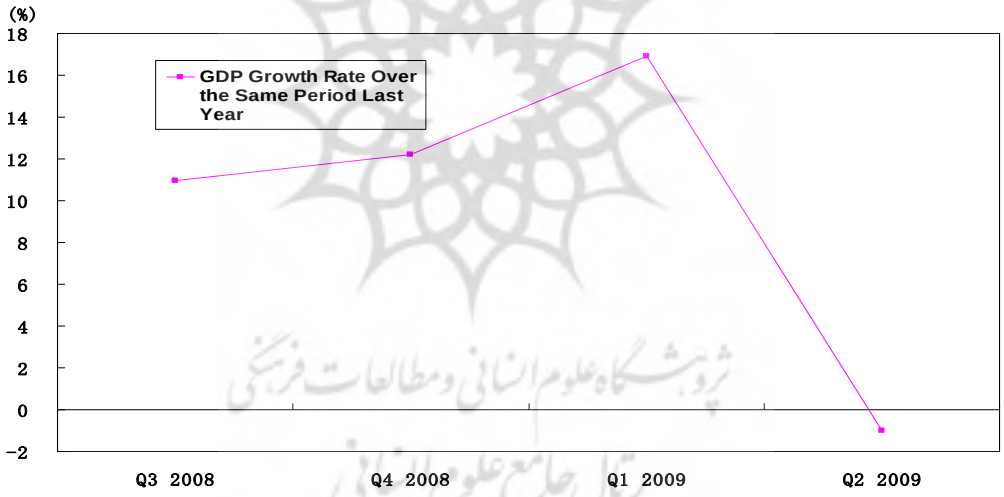
3. The Contagion Mechanism of Financial Crisis

Financial liberalization, key currency exchange rate fluctuations and large-scale international capital flows contribute to the frequent outbreaks of international financial crisis since 1990s. Fernandez-Arias (1994) and Goldfajn and Valdes (1997) points out that short-term capital flows exacerbate the lack of liquidity in the financial crisis countries, resulting in the existence of exchange rate crisis and currency crisis as well as the cross-border crisis

transmission. Moreover, Masson (1998) raises that market expectations lead to different conduction paths; Kodres and Pritsker (1999) indicates that hedging across markets accelerates the cross-infection of financial crisis; Bing (2000) emphasizes the portfolios of hedge funds are the main channels of international currency risk transmission. Kaminsky and Reinhart (1999) believe that in financial globalization, internal fund transfer within a multinational financial group can easily lead to of international transmission of financial crisis; Calvo and Mendoza (2000) analyze the herd effect in financial market, and state that crisis in one country often arouse the fear of financial institutions and investors of other countries, and bring about credit contraction or dumping, which induces the fast and cross-border spread of crisis. Escaith and Gonguet (2009) apply the input-output model and note the channels through which credit contraction of financial institutions impact on global production network, indicating that there's obvious amplification effect between economic bodies that are highly dependent on production-distribution chain.

China puts control on its capital flow, China's financial institutions bought little toxic bonds and had very small loss of assets. However, the loss of financial confident is so great that it led to the financial stocks slumping by 60% in only one month. International trade becomes the main channel of crisis transmission to China. In the first quarter of 2009 the industrial export value fell by 26% compared with the same period of last year. The decreasing of export not only hit the industries heavily, but also affected transportation, finance and business service and storage industry in China.

Shocked by the financial crisis, Beijing experienced serious trade decline, financial market contract and investment decrease. Beijing had to face the second lowest output growth in the past thirty years. Beijing's GDP growth decrease 18% compared with the previous year to a level at 6.1%. (See Figure 2)



Source: **Authors**

Figure 2: Output growth of Beijing after the financial crisis

The growth rate of Beijing's GDP sank sharply, while the export is declining and import increasing. In the first quarter of 2009 the industrial export value fell by 26% compared with the same period of last year. The decreasing of export not only hit the industries heavily, but also affected transportation, finance and business service and storage industry in China. The severe international economy environment intensified the anxieties about the future uncertainties. And the consumption and non-trade field had a significant slowdown. Except for education, the growth rate of other industries dropped sharply, especially for industry, finance, the real estate, transportation and culture industry. Owing to the difference features, the reaction to the financial crisis for these industries was not the same. But all of them fell to the bottom in the second quarter of 2009, the real estate, the information transformation, PC and software, leasing and business service, transportation, storage presented negative growth compared with last year.

4. The Influence of Stimulating Policies

Exports contribute more than 1/3 to the growth of China' GDP. Current exports plunge caused thousands of companies in China's coastal regions like Guangdong and Zhejiang to close, leaving millions of farmers without jobs and forcing them return to their home villages. China government made timely and resolute adjustments to macroeconomic policies, adopted an appropriately easy fiscal and monetary policy, boosted domestic demand, in order to minimize the harm to China from the financial crisis. Specific measures are as follows:

1. Increase bank credit. The People's Bank of China, the central bank, lower the benchmark interest rates several times, money supply increased 29%.
2. Introduce a 4 trillion economic stimulus plan. China's government has pledged 1.18 trillion Yuan and would stimulate 2.82 trillion private capitals. Government funds focused on projects such as people's lives, technological upgrading, ecological and environmental conservation and major infrastructure developments, in parallel with the adjustment of industrial structure promoting the transition from "Made in China" to "Create in China."
3. Formulate policies for the stabilization of export, such as offering more trade finance to export companies, fixing RMB rate to reduce exchange rate risks.
4. Expand consumer spending through multiple channels. Local governments have expended transfer payment by issuing shopping vouchers and tourism coupons to boost domestic demand. Insurances of medical care, retirement and unemployment have been improved. Farmers were first covered in the social safety net.

Beijing local government focused on the long-term competitive ambition. From January to August in 2009, Beijing completed 297.36 billion Yuan social investment in fixed assets, increasing by 44.3% with last year, among which 90% capital was invested towards service industry. The real estate was the most influenced industry, at the same time the investment on real estate is 147.84 billion Yuan, taking up 50% of investment. In addition, according to the investment, the order is transportation and storage, manufacturing, public facilities, electricity and gas, culture industry and entertainment, geological prospecting and education. The government of Beijing regarded manufacturing and hi-tech as the key projects, and enacted plans to make Beijing an information junction and Internet centre.

5. Impact of International Financial Crisis on Beijing's Industries

In section two of this paper, we utilize the increase of output value to roughly describe the changes in ten major industries and the GDP of Beijing during six months after the outbreak of international financial crisis, and we can get a preliminary impression of the impact borne by different industries. In this section, we use more strict statistical methods, eliminate the impact of seasonal fluctuation, and make a deeper analysis of the impact of the crisis, as well as government policies followed, on different industries in Beijing. At the same time, we build an ARMA model to predict output value gaps of the ten industries individually and Beijing city as a whole, and make a comparison of the benefits and losses of each industry. Based on our analysis, we assess the stability of Beijing's industry structure, thus providing scientific evidence for further improvement.

5.1. Model and Data

In order to accurately measure the impact of the financial crisis and the macroeconomic policies on Beijing's economy and industry development, we need to eliminate the interference of seasonal factors. In this paper, we compute impact index to achieve this goal. The underlying logic is that if the seasonal factors affecting Beijing's economic growth are relatively stable, external shocks will lead to a change of output value growth rate in that particular quarter, for example, if the shock has a positive effect, the growth rate increases; if the shock has a negative effect, the growth rate decreases.

Let the impact index:

$$F = (T_{ij} - A_j) / \left|A_j\right| \times 100 \qquad (1)$$

where F is the impact index; T_{ij} is the output value growth rate of *jth* quarter of *ith* year, compared with the same period last year; A_j is the average of *jth* quarter growth rates of previous n years (n=3 , year 2006 to 2008), which is measured by the following equation:

$$A_j = \left(\sum_{k=i-1}^{i-n} T_{kj}\right) / n \qquad (2)$$

The absolute value of impact index shows the impact of external shocks on output value after eliminating the influence of seasonal factors. The average value of impact index shows the impact of external shocks on growth

rates of different industries during a certain period; and the variance of impact index shows the deviation of a certain industry's output value growth rates from the average growth rates, caused by the external shock. We obtain quarterly GDP data from Q1 2006 to Q2 2009 and output value data of ten major industries from Statistics Bureau of Beijing. Then we compute growth rate of Q4 2008, Q1 2009 and Q2 2009, and divide them by respective average quarterly growth rates during previous 3 years, finally we get a rough description of the influence of external shock on Beijing's economy since the outbreak of the financial crisis.

If there were no international financial crisis, GDP of Beijing and output value of the city's ten major industries should have developed smoothly according to their own paths. To measure the losses brought to Beijing by this international financial crisis, we collect GDP data from 2003 to 2008 and quarterly output value data of ten major industries from Beijing Statistical Yearbook, and build an ARMA model to predict possible GDP of Beijing and output value of ten industries in Q4 2008, Q1 2009 and Q2 2009. Then we analyze the gap between predict value and actual data, thus quantify the losses brought by financial crisis. Before establishing the ARMA model, we need to adjust each time series for seasonal factors, and test for stationary. We can use stationary data to build ARMA model, while for non-stationary data, we adjust by using first-difference. Figure 7 shows the characteristics of Beijing's GDP series. From examining autocorrelations and partial autocorrelations plot, autocorrelations are significant for lags 1 and 2, while partial autocorrelations are significant for lag 1 indicating an ARMA (1, 2) model may be appropriate. Thus, using an ARMA (1, 2) model to fit GDP time series after adjusting for seasonal factors can give us predictions of GDP value.

Following the same method described above, we obtain output value gaps of ten industries. Grouping these industries according to size of the gap, then we compare actual and predicted output value, compute absolute value and gap rate of actual-predicted output value difference in each group. The results are reported in table 4. If the actual-predicted output value gap is positive, means actual value is larger and the crisis brings growth opportunity; if we get negative gap, then actual value is smaller and crisis slows down growth.

5.2. Empirical Results

The empirical results show that Beijing's overall GDP is negatively affected by this financial crisis[1]. Among ten industries, finance, real estate, wholesale and retail trade are three ones enjoying positive impact index, indicating little correlation with international trade in these industries,. Another possible explanation is that they can get positive stimulus from easy monetary policy more quickly and directly. However, increase of credit is limited by inflation, business cycle and other demand factors, and the tremendous slowing down and tardily recovering of real economy lead to large volatility in finance and real estate industries. We can see from the standard deviation of these two industries here, they are the top two largest in our sample. Meanwhile, traffic, transport, storage and post, mining, manufacturing, production and distribution of electricity, gas and water, education, tenancy and business services are industries suffering from relatively deeper negative impact index, indicating more severe disadvantageous impact borne by these industries.

After eliminating the impact of seasonal factors, the international financial crisis slows down the increase of GDP of Beijing as a whole, and slows down the growth rate of seven out of top-ten industries. According to the deviation from average growth rate during previous three years, we can assess the stability of different industries in the financial crisis. Industries focusing on domestic market, such as wholesale and retail trading, education, scientific research, technical service and geologic perambulation, exhibit strong stability; other seven industries are all hit hard by this crisis. Because transmission mechanism and time lag of government policies are different, deviation directions and ranges of output value are different among different quarters in each industry[2].

The results of ARMA model show that the negative impacts of financial crisis on Beijing start at 2009, and the degree of impact is quite deep. In Q1 and Q2 of 2009, actual GDP are less than predicted GDP by 18.6% and 10.43% respectively.

Among top-ten industries in Beijing, finance, information transfer, computer services and software, construction have the top-three largest predicted-actual output value gap, and face most quickly decreasing output value. All of the three industries have output value cuts

[1] Appendix 1, Table (A.1)
[2] Appendix 1, Table (A.2)

exceed 20%. And other severely affected industries include wholesale and retail trading, tenancy and business services, the gap rates are 18.09% and 10.29% respectively. The five industries mentioned above are all focusing on providing services to production, so when production is negatively affected, losses in these industries are unavoidable. Gap rates in mining, manufacturing, production and distribution of electricity, gas and water, real estate, scientific research, technical service and geologic perambulation, traffic, transport, storage and post are positive, indicating that the financial crisis brings growth opportunities to these industries. The crisis strikes heavy blows at low value-adding export industry in China, causing thousands of firms in coastal cities fall into bankruptcy. The government's 4 trillion stimulus package aims at infrastructure projects and improving people's livelihoods, and encourages innovation and the development of high value-adding industries. Scientific research, technical service and geologic perambulation, real estate, traffic, transport, storage and post, modern manufacturing industries in Beijing already enjoy comparative advantage countrywide, with the help of support from government; these industries achieved obvious positive results (See Table 1).

Table 1: Output Loss Rates in Beijing causing by the Financial Crisis

Industry	Average Gap Rate %	Industry	Average Gap Rate %
mining, manufacturing, production and distribution of electricity, gas and water	4.00	Scientific Research, Technical Service and Geologic Perambulation	27.67
Real Estate	35.00	Education	-5.28
Tenancy and business services	-10.29	Wholesale and retail trade	-18.09
Traffic, Transport, Storage and Post	0.27	Information Transfer, Computer Services and Software	-22.07
Construction	-20.09	Finance	-30.53

***Source*: Authors**

6. Conclusion

1. Beijing's economic structure is service-oriented, of which financial, technological and high-tech industries are vigorously emphasized to build the headquarters economy. Beijing has high economic external dependence because of its degree of globalization and high consumption level; 3% of GDP is contributed by external transfer payments under trade deficit.

2. The mainly direct transmission mechanism of the international financial crisis is capital flows. But for Beijing, GDP growth defers and enormous impacts have been brought in by the decline of international trade. Anti-crisis policies made by the government also led to the fluctuations of Beijing's industry, and accelerated the adjustment of Beijing's industrial structure.

3. This paper employs Impact Index to exclude seasonal factors, analyzes international financial crisis in depth as well as the impact of subsequent macro-policy changes on the development Beijing's industries. Over 70% of industrial growth rate has been decreased. Industries like education, scientific-technical services, geological prospecting, wholesale and retail trade display higher stabilizing increase. Shocks from financial crisis are severe when it comes to financial and real estate industries, which suffer greatly from policy changes.

4. There is a time lag of about half a year from international financial crisis to Beijing's economy suffered. Financial crisis interrupted normal growth path of some industries in Beijing like financial sector, information transmission, software, computer services and construction, making great production value decline in such producing service industries. However, affected by China's economic restructure and economic stimulus plans, Beijing's industries, such as real estate, scientific research, technical services, geological prospecting, transportation, storage and postal industry have gained new growing opportunities from this round of financial crisis.

5. As the industries of financial sector, information transmission, computer services and software are the most influential, fast growing ones as well as less stable under external economic shocks in Beijing, it is recommended that Beijing Municipal Government should increase the supporting intensity of these industries while making industrial adjustment policies.

Appendix1:

Table (A.1): Impact of Financial Crisis on Growth of Ten Industries

	Q4 2008-Q2 2009	
Impact Index	Mean	Standard Deviation
Total GDP	-30	55.90
Mining, Manufacturing, Production and distribution of electricity, gas and water	-94	20.62
Finance	149	154.09
Wholesale and Retail Trade	16	74.71
Information transfer, Computer services and Software	-45	79.67
Real Estate	570	982.89
Tenancy and Business services	-66	84.65
Scientific research, Technical service and Geologic perambulation	-36	74.49
Traffic, Transport, Storage and post	-199	87.12
Construction	-23	40.83
Education	-72	28.46

***Source*: Authors**

Table (A.2): Overall Performance of Ten Industries in Financial Crisis

Industry	Stability	Degree of	Deviation
		Impact	direction
Mining, Manufacturing, Production and distribution of electricity, gas and water	unstable	Strong	positive
Finance	extremely unstable	Strong	negative
Wholesale and Retail Trade	stable	very weak	positive
Information transfer, Computer services and Software	unstable	Strong	negative
Real estate	extremely unstable	very strong	positive
Tenancy and Business services	Unstable	Strong	positive
Scientific research, Technical service and Geologic perambulation	Stable	Weak	not obvious
Traffic, Transport, Storage and post	Unstable	Strong	positive
Construction	Unstable	Strong	negative
Education	Stable	Weak	not obvious

***Source*: Authors**

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