

An analysis of China's regional capital flow: based on the perspective of the relationship between investment and savings

Chong Li^{a*}, *Jingyuan Di*^b

^aSchool of Economics, Sichuan University, China

^bBusiness School, Durham University, The United Kingdom

*Corresponding author: Chong Li, Ph.D. candidate, sculichong@foxmail.com

Abstract

This paper analyses China's regional capital flow based on the relationship between investment and savings. We make panel data analysis of China's 29 provinces (Considering the completeness and availability of data, we remove the data of Chongqing and Tibet) from 1979 to 2015 using fixed effect model, then make correlation and mean difference analysis. We conclude as follows. Firstly, the capital mobility of eastern and western regions is strong, while central region is weak. Secondly, most of the eastern provinces are capital outflow areas, while western provinces are capital inflow areas.

Key words: *capital flow; regional economy; investment rate; saving rate; fixed effect model*

1 Introduction

As China's 2017 government work report has pointed out, there are still many difficulties and problems in China's economic and social development. Regional economic development differentiation is one of them. The inflow and accumulation of capital is indispensable to the economic development of poverty-stricken areas. Adam Smith, David Ricardo, Keynes and Harold all pointed out the importance of capital accumulation in their research on economic growth. It can be seen that capital flow is the key factor to explain the differences in regional economic development. Therefore, it is of great significance to study the capital flow among regions in China, which can help to promote the coordinated development of China's regional economy, maintain social stability and enhance quality of people's life.

2 Literature review

The issue of capital flows from the perspective of investment and savings was initially proposed by Feldstein and Horioka in 1980¹. They had empirical analysis of the data between

21 OECD countries from 1960 to 1974 and proposed a savings reserve factor to measure the degree of capital flows in a country. Since then, more and more studies have been made. In terms of capital flows within a country, Sinn (1992), Bayoumi et al. (1993) and Thomas (1993) analyzed the panel data of the savings and investment on the United States, the United Kingdom and Canada respectively. The results show that in the long term, the conversion coefficients of savings to the investment are negative²⁻⁴. Ang (2007) applied the hysteresis autoregressive distribution detection method to explore the relationship between domestic savings rate and domestic investment rate in Malaysia. The results show that there is a stable cointegration relationship between Malaysia's domestic savings rate and investment rate from 1965 to 2003⁵. In terms of international capital flows, Sinha (2002) studied the relationship between savings rates and investment rates in 11 Asian countries and found that savings growth in Malaysia, Sri Lanka and Thailand will lead to an increase in their investment rates, while Hong Kong, Burma and Singapore are opposite⁶. In terms of China's capital flows, Hu Yongping (2004), Mai Yong (2006) and Feng Fuyu (2010) used ARDL-ECM model, fixed effect model and panel cointegration method to study the flow of capital between China's eastern and western regions. Their findings are the same, and the conclusion is that the eastern region is the capital inflow region, the western region is the capital out of the region and the capital of the central region does not flow⁷⁻⁹. Yu Chunhai (2007) found that there was a significant difference between the long and short term. In the long run, there is a strong correlation between investment and savings, while in the short term the fact is opposite¹⁰. In summary, there's a certain number of study on capital flow, but the methods and conclusions are not uniform, and there are few studies on China's capital flow. Based on the guidance of "make up the weak point" in the structural reform of the supply side, this paper will use the latest data from 1979 to 2015 to study the characteristic of regional capital flows in China to provide some suggestions for the balanced development of regional economy.

3 Empirical analysis of China's regional capital flow

3.1 Theoretical model

Savings in one province will increase as the output increases, but if all the savings are used for investment in that province, the capital marginal productivity of the province will gradually decrease, resulting in the movement of capital from that province to other provinces. We transfer Feldstein and Horioka's savings and investment relationship model into the analysis of China's capital flow, and the model is represented as Eq.(1):

$$(I/Y)_{it} = \alpha + \beta(S/Y)_{it} + \mu_{it} \quad (1)$$

$(I/Y)_{it}$ is the investment rate of province i at t , $(S/Y)_{it}$ is the savings rate of province i at t , α is the intercept term. β is called the savings retention coefficient, which is mainly used to measure the extent that the savings is converted into investment. If β gets closer to 0, the savings of the province is rarely converted into its investment, that is, the capital liquidity gets stronger. If β is closer to 1, the situation is opposite. μ_{it} is the error term.

3.2 Description of variables and data

Considering that before the reform and opening up, China's regional capital flow is very limited, this paper selected the provincial annual data since the reform and opening up from 1979 to 2015. The total savings is the difference of provincial GDP and the final consumption. The total investment is the amount of provincial capital formation. The provincial GDP is calculated by expenditure method. All the data are derived from China Economy Information NET Statistics Database. The descriptive statistics is shown in Table 1.

Table 1 – Descriptive statistics

Variable	Mean	Std.Err.	Minimum	Maximum	Number of obs
investmentrate	46.28023	14.9997	14.0414	139.5954	N = 1073
savingrate	41.84721	11.90951	1.797176	75.09339	N = 1073
province	15	8.370502	1	29	N = 1073

3.3 Panel data regression analysis

Firstly, we do panel stability test and find that the first order differential sequences of the two variables are both stable, then we do cointegration test and find that there is a cointegration relationship between two variables. Due to space constraints, we omit the test results above. Then we can make panel data regression analysis. We believe that there are heterogeneous factors that cannot be observed, so we choose the fixed effect method. To further verify this idea, the panel data is tested with Hausman test, and the result of Hausman test also supports that the fixed effect method should be used.

According to the regression method of Mai Yong et al. (2006)⁸, we get the provincial savings retention coefficient β . The results are shown in Table 2.

It can be seen from Table 2 that the capital flow among provinces does not show obvious regional characteristics as described in many previous literatures, but there exists some

characteristics. The provinces with 0-0.2 β value are mainly eastern provinces and a certain number of western provinces which have strong capital flow. The provinces with 0.2-0.4 β value have a little capital flow, but do not show significant regional concentration. The provinces with 0.4 or more β value are mainly concentrated in the western and central regions whose capital flows are the weakest.

Table 2 – Savings retention coefficient β regression results

province	β	province	β	province	β
Ningxia	0.0823 (0.1350)	Gansu	0.2462** (0.1210)	Shandong	0.3930*** (0.0990)
Shanghai	0.0835 (0.1016)	Xinjiang	0.2583* (0.1714)	Guangxi	0.4218*** (0.1530)
Guizhou	0.0945 (0.0902)	Beijing	0.2611* (0.1690)	Fujian	0.4536*** (0.0990)
Hubei	0.1138 (0.1156)	Hainan	0.2881** (0.1323)	Hunan	0.5866*** (0.1582)
Yunnan	0.1405 (0.1628)	Inner Mongolia	0.3085*** (0.1222)	Anhui	0.6361*** (0.1306)
Heilongjiang	0.1431 (0.1537)	Henan	0.3550*** (0.0994)	Qinghai	0.6489*** (0.2279)
Guangdong	0.1520** (0.0761)	Shanxi	0.3561*** (0.1223)	Jiangxi	0.6792*** (0.0868)
Hebei	0.1985** (0.0992)	Shaanxi	0.3607*** (0.1160)	Sichuan	0.9092*** (0.0972)
Zhejiang	0.2017*** (0.0808)	Jiangsu	0.3682** (0.1733)	Liaoning	1.3661*** (0.1969)
Tianjin	0.2186 (0.2389)	Jilin	0.3699*** (0.1372)		

Standard errors in parentheses *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$

3.4 Robust check

In order to ensure that the savings retention coefficient β reflects the validity of the degree of capital flow, the correlation coefficient between savings rate and investment rate of each province is discussed and shown in Table 3.

Table 3 – Correlation analysis results

Province	Correlation Coefficient	Province	Correlation Coefficient	Province	Correlation Coefficient
Shanghai	-0.5065***	Zhejiang	0.7272***	Inner Mongolia	0.9078***
Beijing	-0.1244	Gansu	0.7332***	Jilin	0.9360***
Heilongjiang	0.1913	Guizhou	0.7391***	Shandong	0.9507***
Tianjin	0.2303*	Hubei	0.7443***	Liaoning	0.9634***
Yunnan	0.4967***	Henan	0.8100***	Anhui	0.9676***
Xinjiang	0.6319***	Hainan	0.8402***	Hunan	0.9724***
Guangdong	0.6333***	Hebei	0.8407***	Jiangxi	0.9739***
Shanxi	0.6421***	Jiangsu	0.8751***	Fujian	0.9760***
Ningxia	0.6454***	Guangxi	0.8848***	Sichuan	0.9940***
Qinghai	0.6953***	Shaanxi	0.9044***		

*** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$

From Table 3, we find that the order of correlation coefficient is similar to the order of the savings retention coefficient β . Therefore, we can ensure that the savings retention coefficient β can effectively measure a province's capital flows and the characteristics are valid.

3.5 Analysis of capital flow trend

After analyzing the degree of regional capital flow, it is necessary to explore the trend of capital flow. According to the definition of savings rate and investment rate, regions with high savings rates and low investment rates are capital outflow regions while regions with low savings rates and high investment rates are capital inflow regions. According to this definition, we calculate the mean difference between investment rate and the savings rate to determine whether the province is a capital inflow region or a capital outflow region, and to infer the trend of capital flows in China. The results are shown in Table 4.

Table 4 – Mean difference analysis results

Province	Mean Difference	Province	Mean Difference	Province	Mean Difference
Shanghai	-0.1351	Hunan	-0.0001	Guangxi	0.1052
Liaoning	-0.0886	Anhui	0.0062	Shaanxi	0.1112
Jiangsu	-0.0802	Henan	0.0076	Gansu	0.1159
Hebei	-0.0786	Fujian	0.0081	Inner Mongolia	0.1312
Guangdong	-0.0596	Sichuan	0.0090	Yunnan	0.1443
Shandong	-0.0522	Jiangxi	0.0227	Guizhou	0.1850
Heilongjiang	-0.0475	Shanxi	0.0282	Xinjiang	0.1867
Zhejiang	-0.0409	Beijing	0.0455	Qinghai	0.3280
Hubei	-0.0393	Hainan	0.0648	Ningxia	0.3740
Tianjin	-0.0323	Jilin	0.0664		

From Table 4, it can be seen that the provinces with large absolute value are mostly eastern provinces and western provinces, while the provinces with absolute value close to 0 are mostly central provinces. The mean difference of most eastern provinces are negative and of most western provinces are positive, which means that the majority of eastern provinces are capital outflow regions and western provinces are capital inflow regions.

4 Conclusions

Based on the above analysis, we draw the following conclusions. Firstly, the savings retention coefficient β value can effectively measure the degree of capital flow. Most of China's eastern

provinces and western provinces have small β value and strong capital liquidity, while central provinces have larger β value and weak capital liquidity. Secondly, since the reform and opening up in 1978, the mean differences between the investment rate and savings rate of eastern provinces are negative, indicating that the eastern provinces are capital outflow regions. While the mean differences of western provinces are positive, indicating that western provinces are capital inflow regions. The mean differences of central provinces are close to 0, once again showing that central provinces almost have no capital mobility. This conclusion seems to be inconsistent with the conclusions of most articles, but according to the law of diminishing capital marginal productivity, we believe that the surplus capital flows from the east to the west is in line with the principles of economics. Although eastern provinces are capital outflow regions and western provinces are capital inflow regions, the economic development of eastern provinces is still better than that of western provinces. We believe that the reason of this is that the quantity of capital in the east is much larger than that in the west, and it is difficult to change the economic gap between the two regions. We should further increase the intensity of capital's flowing from the east to the west.

Acknowledgement

Thanks Chinese Scholar Council for *Jingyuan Di's* financial support.

References

1. *M.Feldstein, C.Horioka*, Domestic Saving and International Capital Flows, *The Economic Journal*, 90(358), (1980)314-329.
2. *S.Sinn*, Saving-investment correlations and capital mobility: On the evidence from annual data, *The Economic Journal*, 102(414), (1992)1162-1170.
3. *T. A.Bayoumi, A. K. Rose*, Domestic savings and intra-national capital flows, *European Economic Review*, 37(6), (1993)1197-1202.
4. *A. H.Thomas*, Saving, Investment and the Regional Current Account; An Analysis of Canadian, British, and German Regions, No. 93/62. International Monetary Fund (1993).
5. *J. B.Ang*, Are saving and investment cointegrated? The case of Malaysia (1965–2003), *Applied Economics*, 39(17), (2007)2167-2174.
6. *D.Sinha*, Saving-investment relationships for Japan and other Asian countries, *Japan and the World Economy*, 14(1), (2002)1-23.
7. *Y.Hu, Z.Zhang, J.Zhu*, Analysis of Chinese regional capital flow, based on the relationship between savings and investment (in Chinese), *China soft science*, (5), (2004)130-134.

8. *Y.Mai, Y.Li*, The analysis of the difference of provincial capital flow in China during 1982-2005 (in Chinese), *China soft science*, (12), (2006)79-86.
9. *F.Feng*, Savings, investment and capital flows of China: A panel cointegration analysis (in Chinese), *Statistical and information forum*, 25 (3), (2010)60-64.
10. *C.Yu*, China's empirical analysis of Feldstein-Horioka puzzle (in Chinese), *The world economy*, 30 (1), (2007)39-48.