Government size, institutional quality, and capital flows across regions in China: a specific exploration on the failure of capital flows across Shanhai Pass

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Abstract:

Using panel data of 31 provinces during 1997-2014 in China, this paper fills the void of examining the determinants of capital flows across regions within China specific attention is given to the role of government size in capital flows across Shanhai Pass. Based on the fixed-effect model, the impactors of classical capital flows are tested. While government size is the main hinder impeding capital flows, capital return, institutional quality, human capital is conducive to capital inflow. However, when the components of the aggregate government expenditures is divided into two parts of productive expenditures on physical infrastructure and on education, it is proved that productive expenditures on physical infrastructure negatively correlate with capital inflows. In particular, there is strong impact of Lucas paradox that is the negative correlation of TFP and GDP growth with capital inflows; more importantly, lagged saving rate has a significantly positive impact on capital inflows namely the Feldstein-Horioka puzzle indicates the severe capital market segmentation. Overall, the main findings are that oversized government, especially government expenditures on physical infrastructure are major impediments to china's capital inflows among regions. Therefore, it is urgent to let market play a fundamental role in resource allocation, especially capital allocation.

JEL Codes: E62, E66

#1370

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Key words: Government size; institutional arrangements; capital flows; Lucas paradox
JEL classification E21 E22 E62 E66 H54

1 Introduction

The pattern of international capital flows is a long-standing issue puzzling researchers in the World. Although standard neoclassical theory believes that capital will flow from rich to poor countries to pursue higher benefits under the assumptions of identical production technology, it is noted that large amount of capital flows into developed countries instead of underdeveloped countries. Lucas (1990) first ponders why capital does not flow from developed countries to developing countries even though it is scarcer and commands a higher rate of return in the latter. He believes that both human capital, backward technology, and low quality of institutions may limit the realization of the potential high return. The uphill capital flowing from poor to rich countries. The surging capital flows since the early 1990s have created renewed interests in their determinants (Kalemli-Ozcan et al., 2010), it is noted as Lucas paradox (Kalemli-Ozcan, 2010).

Researchers try to find out the mechanism of uphill capital flowing from both theoretical and empirical perspectives (Barro,1990; Bergh and Henrekson, 2011; Boyreau-Debray and Wei, 2004). Considerable theoretical research efforts have been devoted to explain these patterns (Mendoza et al., 2009; Song et al., 2011; Aguiar and Amador, 2011), it is proved that human capital, institution quality, development of financial institution, incompletion of capital market, and expropriation risk play an important role in attracting capital flows. However, the "allocation puzzle" has attracted little concern (Gourinch and Jeanne, 2013; Prasad et al., 2007), the Feldstein–Horioka puzzle of why investment remains linked to domestic savings remains unresolved (Park, 2013), the investment wedge cannot by itself explain the allocation puzzle (Gourinchas and Jeanne, 2013). Data deficiencies prevent firm

conclusions (Naughton, 2003). While the volume of cross-border capital flows has increased substantially since the mid-1990s, the paradox that articulates the inconsistency between the direction of capital flows predicted by the theory and what actually occur remains largely unresolved (Alfaro et al., 2008).

A vast body of empirical literature has emerged on market integration, unfortunately no consensus on the extent or even the treads on interregional integration, few researches focus on the integration of China's capital market (Li, 2010). So far, little evidence about the patterns of intranational capital flows in China is available (Cudré and Hoffmann, 2017); one notable exception is the work of Boyreau-Debray and Wei (2004), which has addressed the capital mobility across regions in China, they believe that two drawbacks of non-performing bank loans and regional segmentation of capital markets in China might have prevented capital and savings from being used in the most efficient areas. In contrast to the non-performing loans, capital market segmentation within China has not received any formal investigation. Alfaro et al. (2008) prove that Lucas Paradox is related to the major puzzles in international macroeconomics and finance, including the high correlation between savings and investment of the Feldstein-Horioka puzzle, the home bias puzzle of the lack of overseas investment by the home country residents, and the risk-sharing puzzle of the low correlations of consumption growth across countries. All these puzzles are believed to stem from the lack of capital flows, but we still do not know what is more important in explaining the Lucas Paradox: fundamental economic variables or market failures (Alfaro et al., 2008). There is not a full framework to distinguish which factors matter most in capital flows (Chen et al., 2011). China's enormous size means that its market integration cannot be as smooth as that of smaller export-oriented developing economies. There are a series of inter-related questions that need to be addressed. How has capital mobility evolved over time? How common is it for savings generated in one part of the country to be channeled to another part? What are the relationship between Lucas paradox and Feldstein-Horioka result? What are the determinants of interprovincial capital flows in China? We attempt to fill this void in this paper by empirically examining the determinants of capital flows at the level of Chinese provinces.

This paper explores the determinants of regional capital flows in China, and investigates in depth the reasons why capital doesn't flow to underdeveloped regions, especially to the Shanhai Pass. These basic economic questions take on particular importance in the Chinese context. By studying possible determinants on the segmentation of the internal capital market in China, the current paper, complements the literature on the segmentation of the goods market inside China. It is proved there is a strong positive relationship between capital inflows and lagged saving rate, capital market segmentation does hinder capital flows across provinces in China; institution quality plays a role in driving capital flows, and difference in institution quality contributes to the capital flows unevenly. In particular, this paper proves the role of government size as a key explanatory factor of capital flows. Specifically, productive expenditures on physical infrastructure do promote capital inflows while a large administrative expense and a more proportion administrative service charges suffer capital outflows dramatically. Capital return, human capital and institution quality play an important positive role in attracting capital flows as well.

2 Capital flows: what is going on in China?

Market integration is the process in which resources increasingly flows to its best users in a larger market. Accompanying the economic structural transformations, China has not only seamlessly integrated into the global markets, but also experienced increasingly integrated domestic goods, labor,

and capital markets. While having achieved great progress in its market-oriented institutional transformation and economic development, China has been suffering significant and even growing problem of regional disparity (Fan et al., 2001). Capital markets, though still dominated by the force of the state, have been improving over time, and informal mechanisms have emerged to compensate the inadequacy of the state-dominated financial system. China's growth is extensive, in which the main contribution to growth was the addition of capital and labor (Young, 2003). China's geographic expanse and rugged topography means there are significant physical barriers to inter-regional trade. This has led to the under specialization of China's economy and low level of inter-regional trade. "Some have even argued that China's provinces are becoming less integrated, and are devolving into separate protected regional economies" (Naughton, 2003 p.4). What are the factors facilitating or hindering capital flows in China?

Few researches have estimated China's capital inflows. Deng (2016) used the cumulative difference between regional investment and saving to calculate china's capital inflows. Cudré and Hoffmann (2017), built an economic model to measured regional capital inflows by the difference between provincial investment and saving. Due to the lack of statistical data of provincial saving, it is not possible to measure the difference between the investment and saving. Wang (2004) use the difference between net export of goods and services and net export trade value as capital inflows. As a part of GDP account calculated by expenditure approach, regional capital flows are measured by the "net export of goods and services" in his paper. According to China Statistical Yearbook, the "net export of goods and services refers to the export of goods and services subtracting the import of goods and services. The exports and imports of goods are calculated at free on board prices (FOB)."

Considering limitation of data availability, we do adopt above-mentioned "net export of goods and services" to calculate provincial capital flows. All of the data are taken from China Statistical Yearbook. Due to the limitation of provincial data, we choose 1997-2014 as our study period. Figure 1 shows the pattern of capital flows across regions during 1997–2014. According to the regional division of the National Bureau of Statistics, the east region includes provinces of Tianjin, Hebei, Shanghai, Jiangsu, Zhejiang, Fujian, Shandong and Guangdong; the middle includes provinces of Shanxi, Anhui, Jiangxi, Henan, Hubei and Hunan; the west includes provinces of Guangxi, Chongqing, Sichuan, Guizhou, Yunan, Gansu and Shanxi; the Northeast includes provinces of Heilongjiang, Jilin and Liaoning. As illustrated in Figure 1, the east is the only one where has always been capital inflows and the west has always suffered capital outflows. The central and northeast have turned to be capital outflowing regions since 2007.
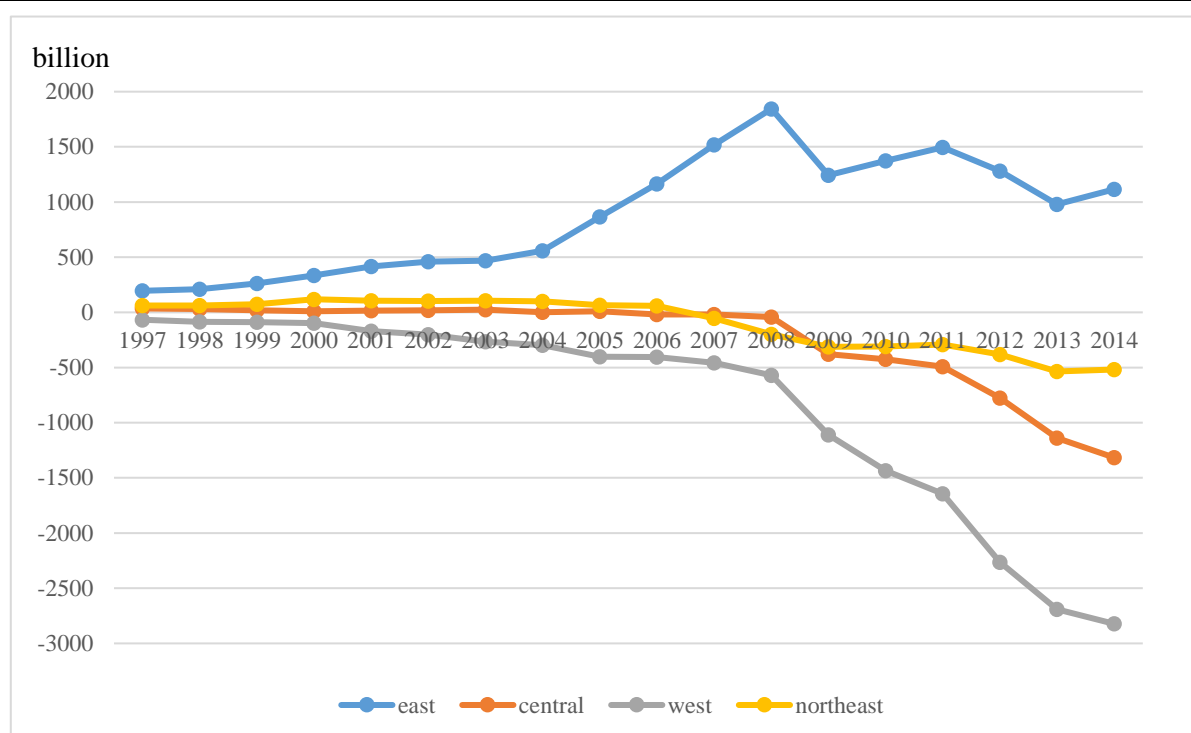
Figure1 Regional capital inflows within China

Figure 1 shows that the unbalanced development across regions is associated with the capital inflows. Capital inflows is measured by net export of goods and services. A region's export of goods and services means residents from other provinces pay money for their goods and services to the region which signifies capital inflows. Similarly, a region's import of goods and services means pay money to residents in other provinces which represents capital outflows. The whole picture presents the trend that capital inflows and output are higher where areas are richer. The east covers over 50% of total GDP and is the only one region which has capital inflows, while the west only covers less than 20% of the total GDP which has the largest capital outflows during 1997-2014.

Eastern regions account for the biggest share of total capital inflows during the research period. Interestingly, the capital inflows gap between the east and other region has not shrunk but enlarged during 1997-2014 which suggests that capital doesn't flow to where capital is scarce. These empirical patterns are at odds with theoretical benchmarks of neoclassical theories. More importantly, since 1997, the net capital flows in the east had increased from 75.62 billion in 1997 to 1114.43 billion in 2014, increasing by an annual rate of 17.15%; in particular, the speeds of capital flows were different, capital flew fast out of the west, and capital had flowed out of northeast relatively slowest while with a modest speed in central region. In china, capital tends to flow to the developed eastern region although the government has carried out West Development Strategy since 2001. Underdeveloped Western provinces seem always suffer from capital outflows, and the Northeast old industry bases counter the same unfavorable situation. In sum, no conclusion is reached with regard to determinants of capital flows international regions.

The impression persists that significant barriers still exist to the movement of factors of production, and to trade in services and intermediate goods (Naughton, 2003). It is conceivable that in its future economic development China might have to rely more on the expansion of its internal market than has been the case in the recent past. Those lead us to think, what are the key factors which drive regional capital flows and why capital doesn't flow to less developed provinces in China?

3 The model

3.1 Definitions of variables

When there is a fully integrated capital market, it is believed that capital will flow from capital-rich areas to capital-poor areas to pursue economic efficiency, both technical and allocative efficiency. While technical efficiency aims to minimize inputs, and allocative efficiency could be achieved at a point where the marginal products of input factors equal their marginal costs (Farrell, 1957). By contrast, allocative inefficiency is a result of inadequate information, risk aversion, capital constraints, institutional constraints, and failures in factor markets (Ali and Byerlee, 2002).

To examine the determinants of regional capital flows in China, following regression equation is employed in our study:

$$Y_{it} = \beta_0 + \beta_1 govsize_{it} + \beta_2 insti_{it} + \beta_3 X_{it} + \mu_{it} + \varepsilon_{it} \tag{1}$$

Where Y_{it} is the ratio of net capital flows to GDP in province i at time period t. Data on province-level current accounts is not available, but income flows between provinces reflect past net investment flows. Net regional capital flows could be measured by "net export of goods and services", which is a part of GDP calculated by expenditure approach.

Here, *govsize* denotes government size, which is calculated as the ratio of sum of all government public expenditure to GDP following a series of the pioneering studies (Barro, 1990; Bergh and Karlsson, 2010; Colombier, 2009).

Economic theories have suggested several mechanisms by which government activities can affect capital inflows. Government spending which provides services such as infrastructure, basic health care and education, is more likely to exert a positive rather than negative impact on capital inflows and economic growth. Secondly, government makes transparent rules, rule of law and well-defined property rights which is necessary to attract capital inflows and promote economic growth. In order to figure out different impacts of different government expenditure, we divide government spending into administrative and productive government expenditure. Similarly, variables of components government expenditures are measured by component government expenditure divided by local GDP. Due to the non-availability of data, variables of components government expenditures only cover period of 1997-2006.

Government administrative expenditure contains administrative expenses, outlay subsidies of parties and groups, expenditures for foreign affairs, public security expenditures, judicial expenses on courts and procrastinates, expenses and subsidies on case handing.

Productive government expenditure includes government construction expenditure and government education expenditure. Government expenditure for capital construction refers to the non-gratuitous use and appropriation of funds for capital construction in the range of capital construction, outlay of capital as well as the loans on capital construction approved by the government for special purpose or policy purpose and the expenditure with discount paid in an overall way within the amount of the funds appropriated to the departments for capital construction. Government education expenditure refers to the spending of government on education, including the expenses on the administration of education, pre-school, primary education, junior high school education, senior high school education, general higher education, primary vocational education, secondary vocational education, technical school education, vocational senior high school education and higher vocational education, radio and television education, overseas student education, special education, continuing education for management personnel, and services for education authorities, etc.

insti denotes institutional quality which is measured by index of institutional quality. Institutional

quality is measured by the "index of market intermediary organization development and legal system environment", obtained from Fan and Wang's report of "Marketization Index of China's Province" from 2011 to 2016. In their report, a comprehensive survey conducted in China 31 provinces was developed to depict a whole picture of china's situation about marketization and institutional quality. It is a composite index of intermediary organization development, protection of producers and consumers, and intellectual property protection. Development of intermediary organization is the proportion of lawyers and accountants to local population, which suggests the degree of protection for citizens against expropriation. Protection of producers and consumers is measured by the settlement rate of economic cases among producers, and settlement rate of complaint cases among consumers is used to imply degree of a legal system supporting contract enforcement. Because the index data is discontinuous, we use rank data issued by the report to measure the provincial institutional quality. We assign the smallest value 1 and the biggest value 31. Province ranking the first will be assigned 31 score, and the province ranking 31 will be assigned 1 score.

X denotes control variables.

(1) Financial institution. Financial institution is a non-negligible impactor as for capital inflows. Imperfection of capital market is proxied by index of financial market development, developed by Fan and Wang's China Marketization Index report in 2011 and 2016. Financial market development index during 1997-2009 reflects the situation of financial market competition, and credit funds distribution between state owned and non-state owned organs is used to proxy capital market imperfection. If financial market competition is fierce, accessed by deposit absorbed by state owned and non-state owned organizations, the information will be more transparent for investors to get more information about lenders with more monitoring opportunities and less cost. In addition, credit funds distribution between state owned and non-state owned organizations can reflect degree of availability to loans of investors' with fewer political power. The report has not issued financial market development index during 2010-2014, the factor market development index is used to make up missing data. Factor market development index is a composite index which reflects the development of financial market, labor market and technology market. It is the same with property protection index that province which financial market development rank the first will be assigned 31 score and province which rank the last will be assigned 1 score.

(2) Capital return. The net capital flows across regions is determined by relative productivity levels, and relative savings do not play any role in determining relative investment, as indicated by Kalemli-Ozcan et al. (2010), capital have flowed to fast growing states from slow-growing states due to the frictions associated with incomplete financial markets. We take advantage of average capital return to reflect productive performance of capital. The average capital return is given as follows:

$$average\ capital\ return = \frac{Y_{it}}{K_{it}} \tag{2}$$

Chosen 1997 as the base year, where Y is real GDP in 1997 price, and K is capital stock in 1997 price. We construct capital stock series by perpetual inventory method, and the initial capital stock K_0 is calculated as below:

$$K_0 = \frac{I_0}{\delta + g_t} \tag{3}$$

Where I_0 is investment in 1997, and data of investment is denoted by "Gross fixed capital formation", and g denotes the average GDP growth rate, and δ is depreciation rate.

$$K_t = K_{t-1}(1-\delta) + I_t \tag{4}$$

Where *K* is capital stock in different period, and *I* denotes investment. δ is the depreciation rate. Following most researchers (Wang 2012; Chow 2002), we choose gross fixed capital formation in national account to denote investment *I*. Investment should be deflated into 1997 price by fixed asset investment price index. As for depreciation rate δ, Chen (2014) summarize the approaches to evaluate capital depreciation rate systematically and suggest that the changeable depreciation rate is 5.63% through method of Maximum Likelihood Estimation of production function. Therefore, 5.63% is chosen as the depreciation rate in this study. All of the data related to calculate capital stock is obtained from 1997-2014 National Statistics Website.

(3) Human capital. The difference of capital return will be removed between rich and poor countries when take efficiency and externality of human capital into consideration in neoclassical economic model in Lucas's study. Salike (2016) finds that the availability of higher quality of human capital, availability of labor force in near future, health of labor force and quality of people working in scientific and technical fields play a significant role in attracting investors. Human capital is measured by weighted average schooling years.

$$\mu=E_0P_0+E_1P_1+E_2P_2+E_3P_3+E_4P_4+E_5P_5+E_6P_6 \tag{5}$$

Where μ is provincial human capital, E_0, E_1, E_2, E_3, E_4, E_5, E_6 denotes different education degree which is illiteracy, elementary, junior, senior, college, university, postgraduate, respectively. And each education degree E_0, E_1, E_2, E_3, E_4, E_5, E_6 is assigned to values of 0, 5, 8, 11, 15, 16, 19, respectively. P_0, P_1, P_2, P_3, P_4, P_5, P_6 denotes proportion of employed population of each education degree.

(4) Tax policy. Tax policy is measured by share of government's all kinds of tax revenue to GDP, including value-added tax, business tax, corporate income tax, individual income tax, resource tax, urban maintenance and construction tax, house property tax, stamp tax, urban land use tax, land appreciation tax, tax on vehicles and boat operation, farm land occupation tax, deed tax, etc. Government policies can be another potential factor which holds back the convergence of capital returns and intervenes capital flows. Distortive government policies served the function that governments tax capital's return at a rate **(**Alfaro and Kalemli-Ozcan, 2008). Thus, the degree of tax burden reflects the relative policy distortive degrees across regions. Higher tax rate reduces incentives of investors and cause a decrease in investment. Data can be obtained from China Statistical Yearbook.

(5) Trade openness. Trade openness is measured by total value of imports and exports to GDP in current year. According to Chinn and Prasad (2003), the degree of trade openness could reflect policy choices. Related data is taken from China Statistical Yearbook.

(6) Saving rate. Lagged saving rate is an important factor. Saving rate is denoted by the ratio of the saving to provincial GDP, calculated by the difference between disposable income and consumption,

(7) The ownership structure is designed to measure the ownership structure of the economy. Transition from the initial state of public ownership domination, it is safe to measure progress in marketization by the increase of share of non-state sectors, in terms of contributions to the industrial value-added, investment, and urban employment. The ownership is measured by share of "fixed asset investment of state-owned enterprise" to "total fixed assets investment". All of the data is obtained from China fixed asset investment yearbook.

(8) Resource curse. Resource can be a blessing or a curse for countries, and countries which rich in natural resources can both realize economic growth take off or more slowly which turn out to be growth loser. Thus resource abundance can be a potential impactor of capital flows. The term *resource*

curse was used to describe how countries rich in mineral resources were unable to use that wealth to boost their economies. In this paper, the role of resource curse is defined as by ratio of "mining industry fixed asset investment" to "total fixed asset investment".

(9) Macro-economic variables. In order to control the macro economic development environment, we introduce "other control variables proposed by Gruber and Kamin (2007) and Chinn and Prasad (2003), these variables include per capita income, GDP growth rate, population growth.

(10) Labor cost. We use provincial wage of urban employees to measure labor cost, which is available directly from the provincial Statistical Yearbook. Cheap human resource can decrease enterprises' production cost and gain more profit, thus will play an imperative role in attracting investment. According to research of Salike (2016), availability of labor force is an essential consideration for investors. We use the change of proportion of working age population of15-64 years old to total population to reflect the degree of labor availability.

(11) TFP. According to Alfaro and Kalemli-Ozcan (2008), institution is understood to provide favorable protection of property right will promote adoption of new technology input which improve TFP and attract more capital flows into. In order to eliminate the possibility that institution is a proxy variable of productivity, we include TFP variable. TFP is obtained from a simple CD production function: $Y=AK^aL^b$, where Y is real GDP in 1997 price, K is capital in 1997 price, and L is labor. L is total labor force of each province.

3.2 Descriptive statistics of variables

The raw data series were obtained from National Bureau of Statistics of the People's Republic of China(NBSC), unless otherwise stated. All data are obtained from national statistical website.

<center>Table 1 descriptive statistics</center>

variable	Region	mean	min	max	sd
Capital flows ratio	East	0.0370	-0.245	0.199	0.0700
	Central	-0.0170	-0.262	0.0580	0.0590
	West	-0.188	-0.806	0.0960	0.180
	Northeast	-0.00400	-0.248	0.185	0.111
Saving rate	East	0.319	0.114	0.642	0.113
	Central	0.471	0.304	0.569	0.0680
	West	0.409	0.0920	0.615	0.0970
	Northeast	0.495	0.354	0.630	0.0780
Government size	East	0.128	0.0540	0.322	0.0500
	Central	0.146	0.0660	0.269	0.0460
	West	0.285	0.0750	1.291	0.213
	Northeast	0.159	0.0880	0.234	0.0370
Government expenditure for capital construction	East	0.0130	0.00200	0.0400	0.00900
	Central	0.0100	0.00300	0.0190	0.00400
	West	0.0390	0.00600	0.337	0.0550
	Northeast	0.0110	0.00500	0.0160	0.00300
Government education expenditure	East	0.0170	0.0110	0.0270	0.00300
	Central	0.0190	0.0120	0.0260	0.00400
	West	0.0310	0.0120	0.0820	0.0130

	Northeast	0.0180	0.0130	0.0220	0.00300
Government administration expenditure	East	0.00800	0.00400	0.0170	0.00300
	Central	0.0120	0.00700	0.0170	0.00300
	West	0.0260	0.00800	0.115	0.0230
	Northeast	0.0100	0.00600	0.0140	0.00200
Ownership	East	0.319	0.114	0.642	0.113
	Central	0.385	0.119	0.744	0.138
	West	0.504	0.230	0.959	0.157
	Northeast	0.398	0.178	0.793	0.162
institutional quality	East	23.71	1	31	7.134
	Central	13.22	1	25	5.452
	West	9.779	1	25	6.979
	Northeast	19.57	8	26	4.114
Capital return	East	0.332	0.215	0.514	0.0560
	Central	0.371	0.220	0.466	0.0560
	West	0.308	0.130	0.510	0.0760
	Northeast	0.375	0.211	0.461	0.0670
Human capital	East	8.565	6.194	13.00	1.450
	Central	7.652	5.965	9.410	0.847
	West	6.802	1.756	9.735	1.430
	Northeast	8.211	7.326	9.299	0.455
Tax policy	East	0.0850	0.0320	0.181	0.0350
	Central	0.0590	0.0310	0.118	0.0140
	West	0.0690	0.0340	0.111	0.0150
	Northeast	0.0630	0.0420	0.0930	0.0130
Trade openness	East	0.709	0.0820	1.721	0.469
	Central	0.0900	0.0320	0.182	0.0350
	West	0.104	0.0360	0.411	0.0590
	Northeast	0.196	0.0590	0.427	0.105
Capital market imperfection	East	20.36	1	31	7.613
	Central	17.67	3	29	7.304
	West	11.32	1	29	8.026
	Northeast	15.37	2	31	10.36
Per capita income	East	3.401	0.549	10.37	2.427
	Central	1.578	0.401	4.940	1.143
	West	1.536	0.224	7.094	1.308
	Northeast	2.286	0.559	6.519	1.627
GDP growth	East	0.114	0.0650	0.174	0.0230
	Central	0.111	0.0490	0.159	0.0230
	West	0.115	0.0660	0.238	0.0250
	Northeast	0.108	0.0560	0.161	0.0250
Population growth	East	0.0170	-0.0150	0.190	0.0200
	Central	0.00300	-0.0560	0.0430	0.0110
	West	0.00500	-0.262	0.0420	0.0220

	Northeast	0.00300	-0.00100	0.0120	0.00300
Resource curse	East	0.0210	0	0.213	0.0330
	Central	0.0470	0.00200	0.202	0.0450
	West	0.0630	0	0.333	0.0600
	Northeast	0.0790	0.00600	0.259	0.0510
Labor cost	East	2.939	0.566	10.23	2.065
	Central	2.045	0.509	5.089	1.379
	West	2.315	0.512	6.123	1.510
	Northeast	2.054	0.489	4.819	1.312
Working population change	East	0.005	-0.051	0.055	0.013
	Central	0.003	-0.039	0.031	0.011
	West	0.003	-0.044	0.035	0.012
	Northeast	0.003	-0.018	0.019	0.008
TFP	East	8.506	6.990	9.677	0.635
	Central	8.423	7.350	9.581	0.588
	West	8.087	6.333	9.401	0.672
	Northeast	8.317	7.350	9.448	0.587

Table 1 shows descriptive statistics on different variables during 1997-2014. In terms of average capital inflows, the east is the only region which has positive ratio with a mean of 0.037 with a standard deviation of 0.07 and signifies capital inflow, while the other three regions have negative ratios, which indicate net capital outflows. In particular, the West suffers the most capital outflows. As an ambitious effort to steer state investment, outside expertise, foreign loans and private capital into the regions, the Great Western Development Strategy launched in January 2000 channeled $45.5 billion to develop the west, which has not offset the capital outflows.

In aspect of government size, the west has the biggest government size, government expenditures for construction and government admiration expenditures while the east has the smallest government size and sub component government size. In the light of other variables, quality of institution and human capital is highest in east regions, by contrast, is lowest in west regions. To summarize, there are some striking patterns about capital flows. First, government size and institutional quality often move in the opposite directions. In particular, regions with larger government size tend to have a relative lower level of institutional quality. Second, a decrease in capital inflows is associated with bigger government size, lower quality of institution and human capital. Do these phenomena suggest the potential reasons which lead to capital flight of the west? The rest of the paper aims to provide an explanation to the above questions.

4 Determinants of Regional Capital flows in China

4.1 Methods and regression results

In this research, fixed effect model is employed which can solve endogenous problem of omitted variable of culture, custom which remain stable during a long-time period and is difficult to measure in reality but may exert an impaction on capital inflows.

One side effect of the features of fixed-effects models is that they cannot be used to investigate time-invariant causes of the dependent variables. Technically, time-invariant characteristics of the individuals are perfectly collinear with the person. Explanatory variables which suffer from one or more of these issues in the context of a regression are sometimes referred to as endogenous. In this

situation, ordinary least squares might produce biased and inconsistent estimates. We also use Feasible Generalized Least Squares (FGLS) method to estimate the model. The FGLS estimator is a weighted least squares estimator. And the main findings maintain the same.

Table 2 shows descriptive statistics on different variables during 1997-2014. Generally speaking, our regression results provide strong evidence that government productive outlay for" physical infrastructure exerts a damming effect on capital inflows and for education brings about positive and significant influence on capital inflows. Table 2 reports the results of our regression analysis. Column (1) and (2) are our baseline setting. Table 2 columns (2) and (4) show the results of the FGLS regression.

Table 2 Regression results

VARIABLES	(1) Fixed effect	(2)	(3) FGLS estimation	(4)
Saving rate	0.683***	0.454***	0.608***	0.525***
	(0.149)	(0.121)	(0.0732)	(0.0647)
Government size	-0.318**		-0.295***	
	(0.144)		(0.0666)	
Government expenditure for construction		-0.389		-1.042***
		(0.468)		(0.320)
Government education expenditure		3.648		-0.529
		(2.429)		(1.216)
Government administration expenditure		-4.312		1.662
		(4.900)		(1.181)
Ownership	-0.0805	-0.150	-0.0349	-0.0649
	(0.0862)	(0.111)	(0.0367)	(0.0453)
Institutional quality	0.00102*	0.000340	0.00138***	0.000168
	(0.000598)	(0.000937)	(0.000458)	(0.000446)
Capital return	0.783**	0.786	1.280***	0.941***
	(0.291)	(0.782)	(0.0923)	(0.0840)
Human capital	0.0247*	-0.00228	0.00107	0.00690
	(0.0140)	(0.0212)	(0.00506)	(0.00512)
Tax policy	-0.215	-0.299	0.516**	-0.692**
	(0.446)	(0.810)	(0.204)	(0.322)
Trade openness	0.0337	-0.0214	0.0439***	0.00338
	(0.0460)	(0.0460)	(0.0129)	(0.0171)
Capital market imperfection	0.000274	-4.78e-05	0.00145***	-0.000427
	(0.000686)	(0.000678)	(0.000306)	(0.000289)
Per capita income	0.0239	0.142***	-0.00216	0.0778***
	(0.0161)	(0.0487)	(0.00581)	(0.0149)
GDP growth	-0.860***	-0.635*	-0.711***	-0.803***
	(0.278)	(0.324)	(0.118)	(0.188)
Population growth	-0.0349	-0.131	-0.110	-0.00451
	(0.133)	(0.152)	(0.118)	(0.0919)

Resource curse	0.351***	0.120	0.0833	0.0122
	(0.114)	(0.0809)	(0.0552)	(0.0569)
Labor cost	0.00426	-0.141	0.000246	-0.0731***
	(0.0227)	(0.120)	(0.00944)	(0.0277)
Working population change	0.334	0.339	0.415*	0.0352
	(0.298)	(0.203)	(0.231)	(0.113)
TFP	-0.795***	-0.838	-0.0164	0.0188
	(0.254)	(0.697)	(0.0116)	(0.0204)
Constant	5.253**	5.976	-0.589***	-0.622***
	(1.970)	(5.570)	(0.0995)	(0.156)
Observations	545	274	545	274
Number of id	31	31	31	31
R-squared	0.642	0.613		

4.2 Regression result analysis

4.2.1 Government size and capital flows

The coefficients on government size are significantly negative, which illustrate that larger government size blocks capital inflows at 1% significance level. In detail, one percentage increase of government size yields about 0.318 percentage decline in capital flows. Optimally, government outlays should complement private investment and should not crowd out private capital. Otherwise, they could cause a reduction in capital inflows. As Bergh and Henrekson (2011) have contested, there is a negative relationship between government size and growth. Capital allocation is heavily influenced by the government intervention in China (Boyreau-Debray et al., 2004). Appropriate government size is conducive to capital inflows and economic growth. Whereas, there appears an additional mechanism that government size negatively correlates with capital inflows: with the expansion of government size, if productive government expenditures are subject to diminishing returns, the benefit effect of promote private production will shrink while the negative impact on economic growth and saving rate that due to the need to increase taxation to finance public expenditure dominates (Barro, 1990). Our finding is consistent with Barro (1990), who concludes that high government expenditure rate hinders investment due to high tax rates and crowding-out impact on private sector.

4.2.2 Government administrative spending and capital flows

As two of important government duties have been stressed are to provide productive services and ensure high judicial efficiency and well organized public regulation, this paper put an emphasis on two categories of government expenditures: government productive spending and government administration spending. Nevertheless, it is challenging to unbundle government expenditure: there is a big adjustment in government expenditure categories before and after 2007, the categories of government spending data are incomparable during period of 1997-2006 and 2007-2014. Our base model shows that public administrative spending has insignificant but negative impact on capital inflows. Hines (1988) reports that one percentage increase of a US state's tax rate will lead to seven to nine percentage decrease in foreign investment. China's government is big enough to regulate and control many aspects of economic, and the government should streamline administration and delegate power to the lower levels.

4.2.3 Government productive spending and capital flows

The coefficient of government size on capital construction is negative and statistically insignificant in column (2) but significantly in column (4), this is inconsistent with the notion that public productive investment can contribute to capital inflows. In contrast, some researchers have shown that the financial, social, and environmental performance of infrastructure investments is strikingly poor (Flyvbjerg et al., 2009; Flyvbjerg and Budzier, 2011; Ansar et al., 2014) because poor project-level outcomes will translate into accumulating debt and non-performing loans, distortionary monetary expansion, and lost alternative investment opportunities. Seventy-five per cent of transport projects suffered a cost overrun in constant local currency terms (Ansar et al., 2016) due to the quality and safety issues in China's infrastructure projects (Zou et al., 2007) in large part arising from poor technical design and road quality issues (Ameratunga et al., 2006).

Over-sized government may lead to a greater diversion of resources into unproductive use (Buchanan, 1980). "Another issue concerns the allocation of investment within China- whether China has invested too much in certain sectors or certain regions and too little in other sectors" (Bai et al., 2007 p.61). "Less tangible, but perhaps even more damaging, are the opportunities forgone to build the right infrastructure" (Ansar et al, 2016 p.379). China's investment boom has coincided with a rapid build-up of debt (Roxburgh, 2012). The consequences of this build-up of debt and monetary expansion in China might lead to volatile movements in interest, exchange, and inflation rates, unpredictable movements in asset prices, and lack of capital to finance productive investments (Rogoff and Reinhart, 2010); several of these negative consequences are already materializing in China.

Apart from government expenditures on productive physical capital, government education expenditure is an important part of government productive expenditure. Coefficient on education is insignificantly positively related to capital inflows in column (2), which supports the classic conclusion: government educational investment can be accumulated and formed into human capital which creates a good environment for investors and brings more capital inflow. Public education expenditure can contribute to the stock of human capital and raise economic growth.

4.2.4 Saving rate and capital flows

There is a positive impact of the lagged saving rate on capital inflows in China. One percentage increase of saving rate will bring in capital inflow with 0.683 percentage of GDP. This is consistent with previous studies. The initial capital stock will enhance the incremental capital (Feldstein and Horioka, 1980). Capital is still the scarcest factor in China because of the difficulty in getting financial support as a result of asymmetric information and transaction costs. There is a relationship between saving rate with economic growth by taking place through capital accumulation. The intermarriage between financial power and local authorities is primarily responsible for China's low capital mobility (Li, 2010), local government protectionism is a factor that weakens nationwide interregional capital mobility (Wang, 2016). In addition, financial frictions are limiting the amount of resources that can be channeled towards productive investment, which are portrayed as an excessive supply of assets that has channeled too many resources towards unproductive investment. Higher ratios of private credit to gross domestic product are accompanied by protection of creditor through legal systems and information sharing. A complete financial market is crucial to a region to make the investment attractive to the lenders. In the case of global imbalances, financial frictions have been invoked to account for the large and persistent capital flows from Asia to the United States and other developed economies (Caballero et al. 2008) Meanwhile, the lack of insurance markets in developing economies

fosters precautionary savings and the consequent capital outflows (Mendoza et al., 2009).

4.2.5 Institutional quality and capital flows

Inconsistent with the view of Okada (2013) that institution has no significant impact on international capital flows individually, institution quality enters with a significant positive coefficient, which suggests that well-established institutional environment is beneficial to capital inflows. Specifically, one rank improvement of property protection will increase capital flows by 0.00102 percentage of GDP. Abdiweli (2003) empirically confirmed that judicial efficiency, low levels of corruption, a well-organized public bureaucracy, and well-defined property rights co-vary positively with high levels of growth. Investment in governance infrastructure consists of political, institutional and legal environment can attract capital flows. One of the major factors behind the economic disparities could be the difference in the institutions and economic policies that might significantly determine the economic performance (Fan et al., 2001).

4.2.6 Human capital and capital flows

Human capital enters with a significantly positive effect on capital inflows which in accordance with Lucas (1990). Human capital is treated not only as an input, but also as a potential source of increasing returns to scale. Higher levels of human capital should increase the productivity of activities related to the marketing of goods, and should facilitate the speed and accuracy of information flows within the market. Both effects serve to lower transactions costs.

4.2.7 Capital returns and capital flows

The return to capital is the sum of capital gains. Capital return plays an essential positive role in driving capital flows, which is in accordance with the economic theory and reality. The rate of return to capital is actually lower rather than higher in developing economies because of a savings glut. There are three main predictions. First, positive productivity shocks raise the return and trigger capital inflows, and vice versa. Second, the scale of capital inflows is decreasing in productivity. Lastly, the gain from capital inflows in terms of output per worker is increasing in productivity (Chatterjee and Naknoi, 2010). Capital flows to poor countries are low because these countries are not very productive and face domestic distortions in the return to capital (Gourinchas and Jeanne, 2013).

4.2.8 Economic growth, Per capita income, and capital flows

There is positive impact of per capita income on capital inflows. Our analysis indicates that there is Lucas paradox, there is instead uphill capital flows from less developed regions to developed regions. There is positive impact of per capita income on capital inflows. Deaton and Paxon (2000) reassess the association between saving and growth using household data and find that the observed correlation between both variables can be explained largely as the effect of income growth on saving if individual household members determine their consumption plans on the basis of their respective lifetime income profiles. As shown by Blomstrom et al. (1996), the accumulation might be a consequence of the growth process, ignited by the growth-based saving change. "Furthermore, higher growth can enhance future growth expectations and returns on investment". Provided that saving is not a limiting factor, the accumulation of physical capital will finally take place.

GDP growth correlates with capital inflows negatively which suggests an allocation puzzle and echoes previous study of Gourinchas and Jeanne (2013) to some degree. One potential reason behind this phenomenon can be economic regime, the allocation puzzle is less announced with transformation

from central pan economic to market economic (Deng, 2016). Less government participation in economic activities contributes to capital inflows and our analysis of government administrative size provide empirical proof for the explanation to some degree.

4.2.9 Total factor productivity and capital flows

TFP correlates with capital inflows negatively. Our finding is different from Rozelle and Huang (2006), who believe that the increase in total factor productivity (TFP) has made a big contribution to economic growth as a result of technical progress and institutional improvement. A substantial share of the differences in output per worker can be attributed to productivity**.** High productivity growth in countries like Korea increases the marginal product of capital, which stimulates investment (Gourinchas and Jeanne, 2013). It is argued that countries enjoying higher productivity growth should receive more net capital inflows. Gourinch and Jeanne(2013) find that there is a negative correlation between TFP and net capital inflows. Our finding is consistent with theirs, it can be seen as a response to Deng's (2016) study to some degree.

4.2.10 Resource curse and capital flows

Mispricing of resources is inducing capital to flow into resource abundant regions. The resource curse refers to the paradox that countries with an abundance of natural resources tend to have less economic growth and worse development outcomes than countries with fewer natural resources. Resource curse has a positive effect on capital flows which means that capital flows to where resource is abundant. The misallocation of resources and the barriers to factor mobility have retarded the economic growth.

5 Conclusions

This paper studies the determinants of china's capital inflow with panel data of 31 provinces during 1997-2014, "trying to shed light to the Lucas (1990) paradox on "why doesn't (bank) capital flows from rich to poor countries". Aside from the small size of net capital flows relative to gross flows, it is the uphill flowing of the capital from poor to rich countries. Great efforts have been devoted to the determinants of capital flows, some conclusions have been drawn, including human capital, institution quality, financial institution, the incompletion of capital market, expropriation risk. However, the role of government size in the determination of capital flows has been neglected.

This paper tries to fill the void by examining the determinants of capital flows across regions within China. Based on data of 31 provinces during 1997-2014 in China, impactors of classical capital flows are tested. Preliminary results show that China's government has exceeded optimal size and inhibited capital inflow. In further, the components of the aggregate government expenditures is divided into two parts of productive expenditures on physical infrastructure and productive expenditures on education, it is believed that productive expenditures on physical infrastructure feature negatively correlate with capital inflows. Moreover, administrative expenditures show a strong negative relation with capital flows. These results provide proof for china's government to shrink its government size appropriated and optimize its government spending structure for the purpose of bring more capital inflow.

Besides, capital return, institutional quality, human capital is conducive to capital inflows. Capital return is the most powerful drivers for capital inflow. Institutional quality and abundant resource play a nonnegligible role in capital inflow as well. In particular, there is strong impact of Lucas paradox which implies the negative impacts of TFP and GDP growth; more importantly, there exist the Feldstein-Horioka puzzle which lagged saving rate has a significantly positive impact on capital

inflows and indicates the severe capital market segmentation. The combined effect of two puzzles has hindered capital free flows in China.

Overall, the main findings are that oversized government, especially government expenditures on physical infrastructure are major impediments to china's capital inflows among regions. Therefore, it is urgent to let market play a fundamental role in resource allocation, the development of integrated capital market is urgently needed to enhance efficient capital allocation in China.

Highlights:

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