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Role of human capital on regional distribution of FDI in China: New evidences

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ABSTRACT

This paper investigates the regional distribution of FDI in China with a focus on human capital from completely different and unique measurement. The novelty is the use of a set of six human capital indices: endowment, utilization, demography, productivity, support and health. It uses panel data estimation for 31 regions of China for 2002–2013 with the consideration of usual determinant variables in FDI study. The results suggest that foreign investors value the availability of human resources, both in terms of present (endowment) and future (demography) supply, as the most important factor in making their investment decisions. Health of labor force and quality of people working in scientific and technical fields were also found to be significant. Furthermore, local market size, infrastructure and location (being in coastal region) are significant determinants with western region, compared to central and northeastern regions, losing out the most to eastern region.

1. Introduction

Human capital as one of the determinants of foreign direct investment (FDI) has been an area of interest for international economists. There are several country studies to reflect this importance and concluded that human capital of the host economies does exert significant influence on determining foreign capital inflow in the country. In this paper, the role of human capital has been specifically looked into from Chinese perspective. We would like to delve into why human capital could be important for different regions in China.

China has experienced very high levels of economic growth during the last four decades. One of the areas where China has been so successful is in opening up in the international economic front, both in trade and investment. This was supported both by the accelerating growth of domestic demand and foreign investment; especially long term greenfield investment. China has been the world's second largest host of FDI, after the United States, since 1994. In 2002, the annual inward FDI in China was US$ 52 billion which reached US$ 114 billion in 2010, an increase of nearly 120%. In 2014, the corresponding number rose to US$ 128 billion and China overtook US as the top FDI destination for the first time since 2003 (UNCTAD statistics).

The rapid growth of foreign investment in China is strongly associated with government policies and laws. Sun, Tong, and Yu (2002) analyzed the FDI phenomenon in China in three stages of development. The first stage began in 1979 with the enactment of the "Law of the People's Republic of China (PRC) on Joint Ventures Using Chinese and Foreign Investment", which permitted the partnership between foreign and Chinese enterprises. It was also the same year that China opened its economy to the outside world. Special economic zones (SEZs) were set up in the early 1980s and coastal cities and districts were made open to foreign investors. Foreign investment increased in the following years because of the improved investment environment and supporting policies. The second stage started in 1986 when foreign investors were entitled to set up wholly owned foreign enterprises

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1043-951X/

according to the 'PRC Law on Foreign Enterprises'. Wholly owned foreign firms expanded rapidly and accounted for 40% of total FDI by 1996. Restrictions for foreign investors were also relaxed after the amendment of joint venture laws. The third stage began in 1991 as the environment for the foreign capital was further improved with a series of policies such as the passing of the 'Income Tax Law for Enterprises with Foreign Capital and Foreign Enterprises, granting more freedom for foreign enterprises and the further relaxing of restrictions on tax for foreign investment. The inward FDI more than doubled, from US$ 4 billion in 1991 to US$ 11 billion in 1992 and further to US$ 27 billion in 1993.

There are several characteristics of China's inward FDI distribution. In terms of the categories, secondary industries like manufacturing are the emphasis of foreign investors. In 2010, the FDI value for manufacturing was US$ 49 billion, which was nearly 46% of the total value. Considering the source of investment, the flow to China is mainly from Asia, which takes up more than 80%. Naughton (1996) highlights that Hong Kong and Taiwan have played a crucial role on the FDI in China, especially in Guangdong and Fujian regions due to geographic and cultural links. Before 1991, the share of total amount of inward FDI in GDP never exceeded 1%, while the corresponding proportion is about 40% and 10% in Guangdong and Fujian respectively in regional GDP. With respect to the direction of the FDI flow, it is unevenly distributed across the eastern region (the coastal region) which holds most of the foreign invested capital.

However, in recent times, there has been pressure for China in maintaining its advantage as a favorite FDI destination. The main reason for this being the rising labor cost across the country. There have been multinationals who are either taking their investments out of China or not choosing China as their next investment destination. Most of these investments now seem to be moving to other cheap labor countries. Another trend is looking at the inward regions of China. This trend already seems to have begun although questions remain as to what advantages these inland regions have. This presents an interesting challenge for China on how to remain competitive in FDI markets. One of the areas where China could focus is on upgrading the quality of FDI. Rather than relying on the labor intensive industries, China could focus on technologically advanced investments. If so, then the role of human capital would become even more important. Given the vast population in China and relative high literacy rate, China could upgrade its human capital to attract multinationals in higher end industries.

Keeping in mind the significant difference in FDI performance of different regions and the challenges that China now faces, this paper examines the determinants of regional level FDI in China with a special focus on the role of human capital in the region. The available literature of human capital studies has used the single proxy, mostly the education enrollment. The contribution of the paper lies on the treatment of human capital with the introduction of six human capital indices: endowment, utilization, demography, productivity, support and health, thereby looking into deeper quality aspects of human capital. The rest of the paper is organized as follows. Section 2 provides a brief background of FDI in China and also review of the relevant literature. Section 3 makes further analysis of regional distribution of FDI in China from the perspective of "Inward FDI Performance Index". Section 4 outlines the data collections methods and methodology. Section 5 presents the results and analysis. Section 6 concludes.

2. Background and literature review

2.1. Background

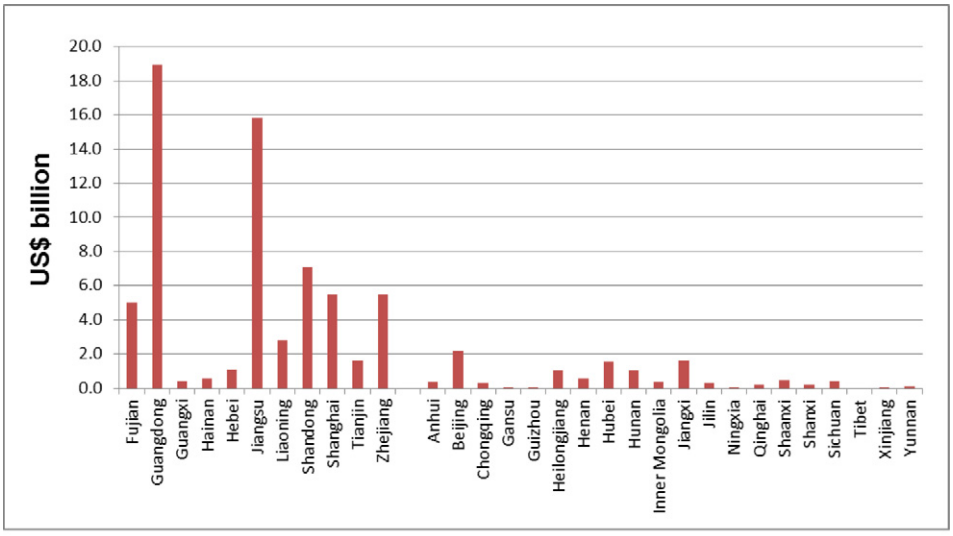
FDI is defined by Organisation for Economic Co-operation and Development (OECD) as the acquisition of at least ten percent of the ordinary shares or voting power in a public or private enterprise by nonresident investors (OECD, 1996). Direct investment involves a lasting interest in the management of an enterprise and includes reinvestment of profits. The recipient economy benefits through inflow of much needed capital as well as the technology. FDI is also believed to have a spillover effect on improvement of the quality of human capital resources.

The regional distribution of FDI in China is reflected in the difference between the FDI clustering in coastal (eastern) regions and rest of China.[1] Fig. 2.1 compares the regional distribution of FDI in China in 2003 and 2013, a space distinguishing between the coastal (first 11 regions) and rest of the regions. In both the figures, it is evident that eight regions in particular; Fujian, Guangdong, Jiangsu, Liaoning, Shandong, Shanghai, Tianjin and Zhejiang absorbed the largest amount of FDI. In 2003, Guangdong received the highest amount of FDI amounting to almost US$ 19 billion. By 2013, Jiangsu overtook Guangdong to become the largest FDI attracting region amounting to over US$ 33 billion, followed by Guangdong and Liaoning. Meanwhile, some of the coastal regions (Shanghai, Zhejiang, Fujian, Shandong and in particular Tianjin) also attracted an extraordinary amount of foreign capital in later years. However, there is little investment into inland regions. Ningxia, for instance, had only US$ 148 million of inward FDI in 2013. Nevertheless, FDI has been increasing in some specific inland regions over the years, for example in Henan, Sichuan, Anhui, Beijing, Hunan and Jiangxi, as evident in Fig. 2.1(b).

Fig. 2.2 shows the picture of human capital in Chinese regions with the use of a simple measure of average number of people enrolled in higher education who entered undergraduate or specialized education during 2002–2013. It can be seen that the enrollment is not even across the country. Although there is a slight bias towards coastal regions, inland regions also have significant enrollments in university and specialized education. Clearly, Jiangsu and Shandong have highest availability of better educated human resources followed by Guangdong, Hebei and Zhejiang in the coastal region. In inland regions, the situation is better for Henan and Hubei, even better than Zhejiang. Other regions with high level of human capital seem to be Shaanxi, Sichuan,

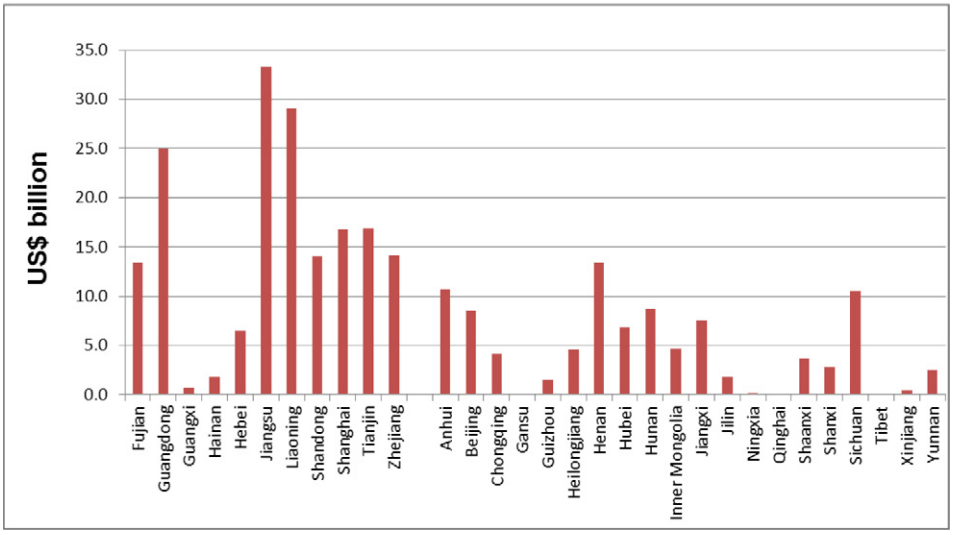
[1] The eleven coastal regions are Tianjin, Hebei, Liaoning, Shanghai, Jiangsu, Zhejiang, Fujian, Shandong, Guangdong, Guangxi and Hainan. Hong Kong, Marco and Taiwan are not included in this study.

a) Regional distribution of FDI in China(2003)



Note: FDI = Foreign Direct Investment
Source: China Statistical Yearbook (Provincial)

b) Regional distributionof FDI in China(2013)



Note: FDI = Foreign Direct Investment
Source: China Statistical Yearbook (Provincial)

Fig. 2.1. (a): Regional distribution of FDI in China (2003). (b): Regional distribution of FDI in China (2013). Note: FDI = foreign direct investment. Source: China Statistical Yearbook (Provincial).

Anhui and Jiangxi. Looking at these figures, it is clear that there is not necessarily any direct relation between human capital and FDI attractiveness.

2.2. Literature review

2.2.1. Literature related to determinants of FDI

Several studies on FDI have found that traditional determinants, like market size and labor cost, play a significant role in FDI flow. Evidence demonstrates that GDP growth rate and economic openness also have a significant, positive influence on FDI, while

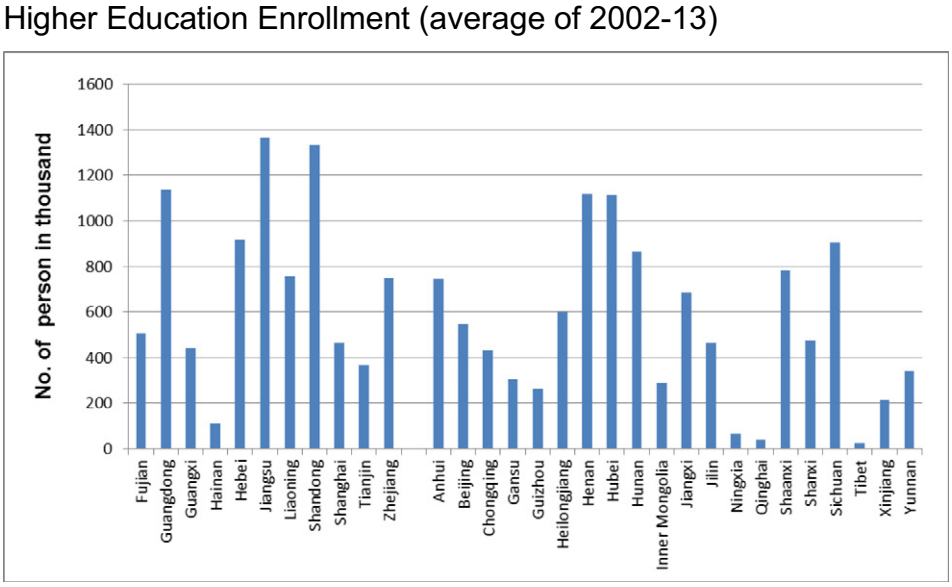


Fig. 2.2. Higher Education Enrollment (average of 2002–13). Source: CEIC database, various years.

trade deficit as well as tax rate, exert a negative impact on foreign investment. Some other factors like industrial agglomeration and infrastructure are also shown to be significant.[2] Chakrabarti (2001) found strong support for the significance of market size, he also drew the inference that the relations between FDI and other variables have a high sensitivity in terms of small alterations in the conditioning information set. Urata and Kawai (2000) and Wheeler and Mody (1992) found that the agglomeration of industries and economy as well as a high-quality infrastructure exert higher importance than human capital. Salike (2010) applied dynamic panel model, primarily to investigate the crowding out of Japanese FDI by China from other Asian economies. In doing so, he found that the domestic market and openness of the host economy plays a significant role in attracting Japanese FDI in Asia. Singh and Jun (1995) noted that except for business operation conditions, political risk can also influence investment to developing countries.

2.2.2. Literature related to regional FDI in China

Several studies focused on regional FDI in China looking into various aspects of the economy. Wei, Liu, Parker, and Vaidya (1999) looked into the determinants of the regional distribution of both pledged and realized FDI within China. Their results indicated that regions with the following characteristics tended to attract relatively more FDI: higher level of international trade, lower wage rates, more R&D manpower, higher GDP growth rates, quicker improvement in infrastructure, more rapid advances in agglomeration and more preferential policies. The authors argue that because of their long commercial and industrial tradition, the coastal areas have attracted more FDI compared to inland areas. Fleisher, Li, and Zhao (2010) showed that regional growth patterns in China depend on regional differences in physical, human and infrastructure capital and also on differences in FDI flows. Using provincial aggregate production function, the authors concluded that FDI inflows had a much larger effect on total factor productivity (TFP) growth before 1994; however this affect becomes negligible after 1994. They also found that infrastructure investment generates higher return in the eastern region than in inner regions where in investment in human capital generates slightly or comparable returns.

Ran, Voon, and Li (2007) investigated the spillover effect in China and the difference among industries and regions affecting FDI in China. They found that relatively small magnitudes of FDI coefficients and negative influence contrast to the reported benefits. Other research examined the regional determinants of FDI in China. Cheng and Kwan (2000) found that bigger domestic market proxied by regional income, good infrastructure proxied by density of roads, and preferential policy played a significant role in attracting FDI whereas labor costs turned out to be negative. They did not find any significance for education variables. Boermans, Hein, and Zhang (2011) investigated the uneven distribution of FDI across the regions of China. They also found that provinces with a large market size and good institutions are crucial for FDI inflow. Moreover, they also found low labor cost to be statistically significant. Lin and Kwan (2011) found that the profit seeking nature of multinationals and their ownership advantages are key in investing decisions. Further, they also found that FDI tended to be lower in the sectors where state owned enterprises are active. Cassidy and Andreosso (2004) and Sun et al. (2002) showed that labor quality (tertiary education) is one of

[2] See for example, Root and Ahmed (1979); Lipsey (2001); Schneider and Frey (1985); Wheeler and Mody (1992); Lucas (1993); Chakrabarti (2001); Kamaly (2003); Mercereau (2005); Eichengreen and Tong (2005).

the most essential determinants of FDI in China. Xu, Liu, and Qiu (2008) found that factors like economy agglomeration and infrastructure also tend to be significant.

2.2.3. Literature related to human capital

Theoretically, it has been shown by several authors that human capital could be an important determinant in attracting FDI in a host economy. However, from an empirical perspective, it is not always true. There is contrasting literature on the role of human capital in attracting FDI.[3] Noorbakhsh, Paloni, and Youssef (2001) tested the effects of human capital levels in host countries that can result in geographical distribution of FDI. The proxy for the human capital used in the paper is the secondary school enrollment ratio; number of accumulated years of secondary education present in the working age population; and number of accumulated years of secondary and tertiary education. They found human capital to be an important determinant of FDI inflows and its importance has been increasing over time. Furthermore, the growth of domestic markets, a stable macroeconomic environment, liberalization policies, the availability of energy and a generally supportive business environment are significant determinants.

Kim, Lin, and Suen (2013) looked at the effect of social capability of trade and FDI on domestic investment. One of their social capability variables is human capital measured as years of schooling in the initial year. The authors concluded that trade adversely affects investment in low human capital areas whereas FDI has a positive effect on investment with low human capital. Reiter and Steensma (2010) also found that FDI inflows and human development are strongly, positively related. On the studies focusing on China, Todo, Zhang, and Zhou (2009) examined knowledge spillovers from MNEs to domestic firms focusing on the role of MNEs employment of educated workers. By using firm level panel data from high-tech cluster in China, they concluded that spillovers takes place in the firms with highly educated workers with graduate-level or overseas education, citing the importance of human capital in high-tech industries. Fu and Li (2009) looked into the absorptive capacity of human capital for FDI technology spillovers employing threshold regression. They found that as the threshold of human capital increases, the spillover effect of FDI increases. Teixeira and Heyuan (2012) investigated the impact of human capital on innovative FDI into China. In this micro level study, they concluded that human capital is not a direct factor in attracting FDI however human capital constitutes a positive indirect factor through firms' R&D efforts.

In a different study, Goldberg, Heinkel, and Maurice (2005) argue that the human dimension could improve investment in two ways—reduction in information asymmetry between foreign and domestic investments and reduction in moral hazards. One of the key concerns in the human capital literature is that various studies have used various proxies to represent human capital. For instance: years of schooling, literacy, school enrollment, availability of technical and professional workers, secondary education, job trainings, etc. There has not been an agreed variable which could truly represent the correct human capital level of host economies. This could be one of the reasons that results of the empirical studies have been mixed. The present study specifically tries to address this issue.

3. Analysis of UNCTAD 'Inward FDI Performance Index'

In this section, we analyze the performance of regions in China using "Inward FDI Performance Index". The index, initially used for country-level analysis, was introduced by UNCTAD to evaluate how successful countries are, when considering the size of their economy, in attracting FDI.[4] It is the ratio of a country's share in global FDI inflows to its share in global GDP. In its original form, the Inward FDI Performance Index captures a country's relative success in attracting global FDI. If a country's share of global inward FDI matches its relative share in global GDP, the country's Inward FDI Performance Index is equal to one. A value greater than one indicates a larger share of FDI relative to GDP; a value less than one indicates a smaller share of FDI relative to GDP. A negative value means that foreign investors disinvested in that period.

Following the definition of the index above, we analyze how different regions in China are performing in attracting FDI. Therefore, the index is "Inward FDI Performance Index for regions in China" and is calculated as the ratio of a region's share in FDI inflows in China to region's share in Chinese GDP. This provides us with a framework on the region's relative success in attracting FDI.[5] The equation is specified as follows:

$$IND_i = \frac{FDI_i / FDI_c}{GRP_i / GDP_c}$$

where

INDi = The inward FDI Performance Index of the ith region of China.
FDIi = FDI flow in the ith region of China.
FDIc = FDI flows in China.
GRPi = Gross regional product of ith region of China.
GDPc = GDP of China.

[3] Noorbakhsh et al. (2001) has detailed these studies in their paper.
[4] Refer UNCTAD (2002) for detailed methodology on the index.
[5] We developed this idea during Ximeng Yang's thesis work at XJTLU.

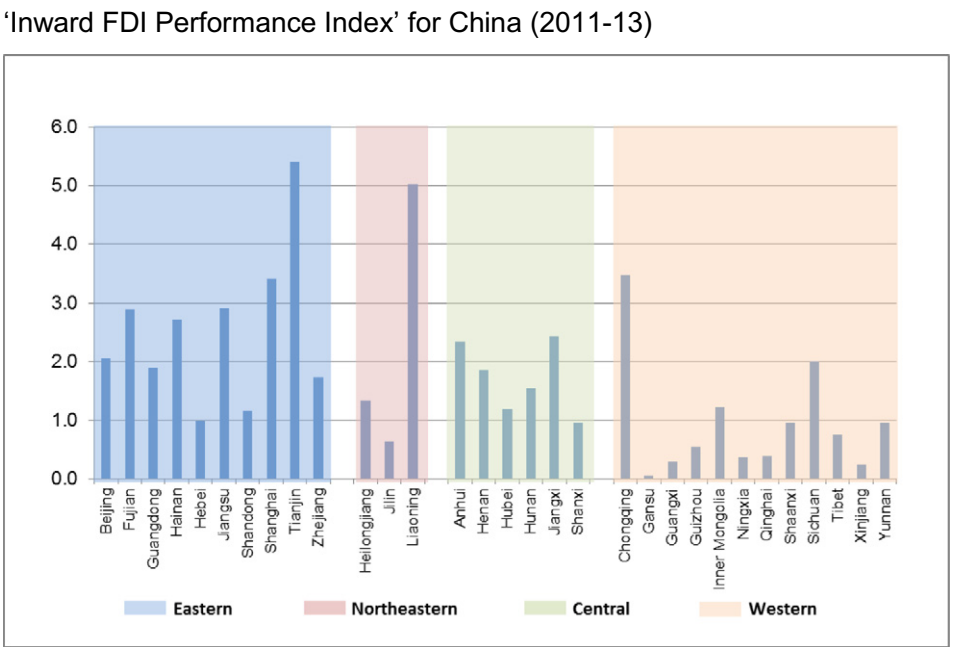


Fig. 3.1. 'Inward FDI Performance Index' for China (2011–13) Note: FDI = foreign direct investment. Inward FDI Performance Index = Ratio of a region's share in FDI inflows in China to region's share in Chinese GDP. If a region's share of Chinese inward FDI matches its relative share in Chinese GDP, the region's Inward FDI Performance Index is equal to one. A value greater than one indicates a larger share of FDI relative to GDP; a value less than one indicates a smaller share of FDI relative to GDP. Eastern = Beijing, Fujian, Guangdong, Hainan, Hebei, Jiangsu, Shandong Shanghai, Tianjin, Zhejiang. Northeastern = Heilongjiang, Jilin, Liaoning. Central = Anhui, Henan, Hubei, Hunan, Jiangxi, Shanxi. Western = Chongqing, Gansu, Guangxi, Guizhou, Inner Mongolia, Ningxia, Qinghai, Shaanxi, Sichuan, Tibet, Xinjiang, Yunnan. Source: Author's calculation.

The FDI, GRP and GDP data are for 31 regions of China from 2002 to 2013. As in the original form, the index is calculated using three-year averages to offset annual fluctuations in the data for two periods. Fig. 3.1 shows the Inward Performance Index for these 31 regions being segregated into regional groups for 2011–13.[6] Clearly, all over the years eastern region is the most attractive for foreign investors, with the index well above 1, especially in Tianjin, Jiangsu, Fujian, Shanghai and Hainan. These figures show that these regions are receiving much higher FDI than respective relative GRP. The Western region is the lowest performer per this index measure, except Chongqing, although Sichuan and Inner Mongolia also went past 1. Among the Northeastern regions, Liaoning performed very well as it lies in the coastal area. Heilongjiang also scored above 1 during this time period. In the central region, Jiangxi, Anhui, Henan, Hunana and Hubei are relatively well. One observation is clear from this figure that as we move on to inland areas of China from East to West, the FDI performance becomes weaker and weaker. Historically, the performance of Guizhou, Gansu, Tibet and Xinjiang has been low.

However, regardless of being in coastal or inland areas, the indices have improved over the years, especially the growth rate of FDI performance has increased in inland areas over the years as could be seen in Fig. 3.2. It shows that FDI performance in China is growing over the years indicating its capacity of absorbing foreign investment.[7] In fact, the northeastern region crossed the index number 1 during 2005–07 period where as central region crossed the mark during 2008–10 period.

4. Data and methodology

4.1. Data source and description

In this paper, panel data is being adopted to analyze regional level FDI determinants in China. The sample includes data of 31 regions of China[8] over 12 years, from 2002 to 2013. Inward FDI data of regions in China, as the dependent variable, is collected from statistical yearbooks at regional levels. Other variables considered were: gross regional product[9] (GRP); average wage; economic openness; inflation; infrastructure and industrial agglomeration. FDI, GRP, and average wage are scaled with a natural log. Inflation is measured as annual growth rate in consumer price index of individual regions. Openness is measured as the total trade

[6] These regional groups were adopted from Li and Xu (2008) which in turn came from Eleventh Five-Year Plan for National Economic and Social Development of China.

[7] Detailed figures of Inward FDI Performance Index for all regions and for all years are available upon request.

[8] Hong Kong, Macau and Taiwan are not included.

[9] Gross regional product (GRP), conceptually equivalent to gross domestic product (GDP), measures newly created value through production by regional production units (or regional residents in short) in the regional economy, be it a state, region or a district. (Viet, 2010).

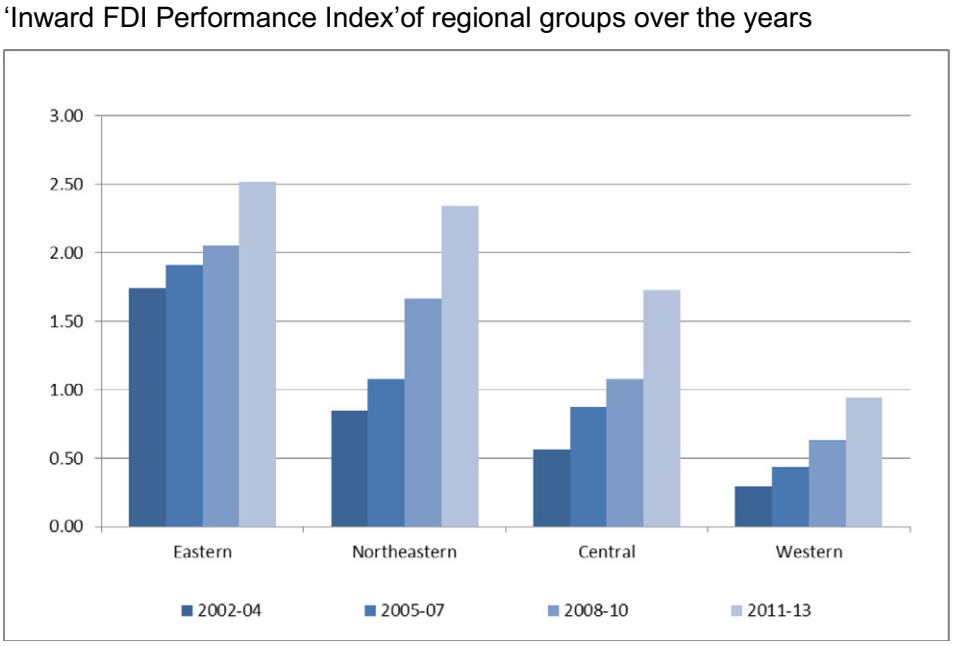


Fig. 3.2. 'Inward FDI Performance Index' of regional groups over the years Note: FDI = foreign direct investment. Inward FDI Performance Index = Ratio of a region's share in FDI inflows in China to region's share in Chinese GDP. If a region's share of Chinese inward FDI matches its relative share in Chinese GDP, the region's Inward FDI Performance Index is equal to one. A value greater than one indicates a larger share of FDI relative to GDP; a value less than one indicates a smaller share of FDI relative to GDP. Eastern = Beijing, Fujian, Guangdong, Hainan, Hebei, Jiangsu, Shandong Shanghai, Tianjin, Zhejiang. Northeastern = Heilongjiang, Jilin, Liaoning. Central = Anhui, Henan, Hubei, Hunan, Jiangxi, Shanxi. Western = Chongqing, Gansu, Guangxi, Guizhou, Inner Mongolia, Ningxia, Qinghai, Shaanxi, Sichuan, Tibet, Xinjiang, Yunnan. Source: Author's calculation.

(export and import) divided by respective GRP. Infrastructure index measures the physical infrastructure situation of each region. Industrial agglomeration is number of industrial enterprise in region scaled by GRP. A dummy of regions being in coastal region is also included.

Further, a set of human capital indices were constructed using the regional level data. They are endowment index, utilization index, demography index, productivity index, support index and health index. Data were collected from various sources, China statistical yearbook, CEIC database system, Asian Development Bank-Key indicators.[10]

4.2. Research model

Several possible determinant variables were chosen as explanatory variables based on a literature review of FDI determinants. A general regression model is specified as

$$lnfdi_{it} = \beta_0 + \beta_1 lngrp_{it-2} + \beta_2 lnawg_{it-2} + \beta_3 op_{it-2} + \beta_4 inf_{it-2} + \beta_5 infr_{it-2} + \beta_6 agg_{it-2} + \beta_8 coa_i + \beta_9 hci_{it-2} + \varepsilon_{it}$$

where,

lnfdi = natural log of foreign direct investment.
lngrp = natural log of gross regional product.
lnawg = natural log of average wage employed persons in urban units.
op = openness measured as sum of export and import divided by GRP.
inf = inflation measured as consumer price index annual change of region.
infr = infrastructure index measured as composite index of number of fixed telephone subscribers, number of internet subscribers and length of paved road.
agg = agglomeration calculated as no. of industrial enterprises per GRP.
coa = dummy variable where in region in coastal area taking value 1, 0 otherwise.

[10] Other variables like, consumption spending, disposable income and innovation were also considered but later on dropped either because of multicollinearity or insignificance.

hci stands for human capital indices for following set of variables:

hce = human capital endowment index.
hcu = human capital utilization index.
hcd = human capital demography index.
hcp = human capital productivity index.
hcs = human capital support index.
hch = human capital health index.

All of the explanatory variables are lagged by 2 periods in order to reflect the time lag involved in decision making by multinationals after considering the current data, in particular related to human capital.[11] The panel of 31 regions and 12 periods would theoretically provide us 372 observations. However, there were some missing observations due to unavailability of data (3 FDI values in the case of Tibet, 2 each for industrial output and scientific & technical personnel). After taking into account the lagged component, the final number of observations is 309. As the data is panel in nature, the appropriate estimation technique was employed with the choice between random effects and fixed effects model.[12]

4.3. Description of explanatory variables and hypothesis

4.3.1. Human capital index variables

Our main variable of interest is human capital. Human capital is critical in modern economic activities. It is involved in a various components of business issues such as management, innovation, efficiency as well as cost associated with it. The originality of this research is how the human capital is being measured. Until now, papers that focused on the human capital only used some specific variables as proxy to represent human capital, mostly school enrollment. The construction of human capital indices in this paper is a novel approach that has not, as far as we are aware, been utilized before. More importantly, the depth of the measurement, with six different indices, captures the essence of measuring the influence of human capital.

The key to the construction of human capital index variables are two papers: Ederer (2006) and HDR (2011). Ederer (2006) identified the most scientific approach to measure human capital introducing four human capital factors. They are human capital endowment, human capital utilization, human capital productivity and demography.[13] This paper further includes two more factors from the perspective of Chinese context, human capital support and human capital health. The construction of index for these six factors is adopted from HDR (2011) where in human development index (HDI) was constructed using certain steps. HDI is a composite index that starts by identifying the dimension of the factor, followed by identifying indicators (life expectancy, education and income). Then the dimension index is constructed using the following formula for each indicator.

$$\text{Dimension index} = \frac{\text{actual value} - \text{minimum value}}{\text{maximum value} - \text{minimum value}}$$

Finally, the HDI index is the geometric mean of these dimensions.

$$\left(I_{Life}^{1/3}.I_{Education}^{1/3}.I_{Income}^{1/3}\right)$$

In the construction of human capital indices for this paper, the above mechanism of HDI was employed using the parameters in Table 4.1.

Human capital endowment index measures how much human capital is available in the regions of China. It is a geometric mean of composite indices: number of higher education graduates, number of higher education enrollment and number of higher education schools. Our assumption is that multinationals seem to prefer those regions with the higher number of available facilities with higher education. The second index, the human capital utilization index is composite index of number of scientific and technical personnel in working population, which measures how much of working population is being used in relatively high level work. However, given the nature of FDI that China enjoys, i.e. labor intensive, we are not yet sure how this variable could turn up. Nevertheless, we presume that there has been some shift of labor intensive manufacturing from China to other low labor cost countries, leaving space for higher end products inside China. If that is the case then multinational companies would be interested in having a higher level work force.

The human capital demography index is measured as geometric mean of the composite indices of working population growth rate and number of new entrants in universities. This index captures the availability of human capital in near future i.e. in medium run. We predict that FDI is concentrated in the regions with higher possibility of future growth. Human capital productivity index is the composite index of gross industrial output per working population. Keeping other things constant, multinational companies would be interested in investing in the regions with higher per capita industrial output, therefore FDI is positively associated with higher productivity.

[11] We also ran estimations with 1 period lag. However, 2 periods lags were found to be more statistically sound.
[12] Descriptive statistics of the variables is provided in Appendix 1.
[13] For details on the measures used to calculate these 4 factors, refer to Ederer (2006).

Table 4.1
Human capital index variables.

	Indicators	Dimension index	Human capital index
Human capital endowment	No. of graduates in higher education	Graduate index	Geometric mean of graduate, enrollment and school indices
	No. of enrollment in higher education	Enrollment index	
	No of schools in higher education	School index	
Human capital utilization	No. of scientific and technical personnel per working population	Personnel index	Personnel index
Human capital demography	Growth rate of working population	Working population index	Geometric mean of working population and entrant indices
	New university entrants	Entrant index	
Human capital productivity	Gross industrial output per working population	Output index	Output index
Human capital support	Per capita annual education expenditure	Education expenditure index	Geometric mean of education expenditure and education fund indices
	Educational fund spent	Education fund index	
Human capital health	No. of medical insured people	Insurance index	Geometric mean of insurance and medical expenditure indices
	Per capita annual health care and medical services expenditure	Medical expenditure index	

Note:
Higher education refers to university undergraduate and specialized courses.
Working population refers to age 15–64.

Another index, human capital support index, measures how the making of human capital is being supported by government and personal level. It is geometric mean of composite indices of per capita education expenditure and educational fund. We assume that higher support for the human capital correlates with positive and significant link to higher FDI.

The last index, human capital health index, is related to the health related factors of individuals. Apart from education, health is another important aspect for labor force to be productive. It is measured as geometric mean of composite indices of people with insurance facility and per capita expenditure in health care and medical services.[14] Therefore, regions with better health population are believed to attract higher FDI.

4.3.2. Other independent variables

4.3.2.1. Market size. Market size is considered to be the most crucial determinant in most papers of FDI determinants. A large market is thought to attract more foreign investment due to the high expected return in investments. In cross-country studies, the influence of market size will be bilateral. In this paper, we introduce regional level gross regional product (GRP) as the proxy of market size for respective regions. Besides, in order to deduce the variance, we introduce ln GRP which is the natural logarithm of GRP in the regression. We hypothesize that market size will have positive significance with FDI.

4.3.2.2. Average wage. Labor cost is also deemed to be important element in FDI determinants. The availability of a larger workforce and relatively cheaper wages is considered to attract more investment, while a higher cost of labor may dissuade investors. Average wage cost is also an indication of the purchasing power of the market. This would in turn attract the investors to capture the potential of the local market. This means that as long as the influence of the local market is larger than the rising cost, investors would continue to invest in the region. Therefore, the effect of labor cost could be ambiguous. In this paper, average wage of each region for each separate year is used to measure the cost of the workforce.

4.3.2.3. Openness. Evidences in previous papers suggest the degree of economic openness has a considerable effect on attracting FDI. However, this measure is especially true for cross-sectional studies where in more open country tend to attract higher FDI. It would be interesting to see if the same is true in this intra region case for one single country. We try to use openness to measure the economic connection between regions in China and foreign countries. The proxy that we use is the sum of import and export divided by GRP. We also take natural logarithm for this variable. We hypothesize that openness is significant with a positive coefficient.

4.3.2.4. Inflation. Inflation would measure the macroeconomic situation of the region. We hypothesize that multinationals would be attracted to the region with better economic conditions. As in the case of openness, inflation caters to national measures and we are not sure of the significance of this in a single country framework. Inflation is measured as annual growth rate of consumer price index of respective regions. We expect negative influence of high inflation in inflow of FDI.

4.3.2.5. Infrastructure. The level of infrastructure also determines the choice of destination for FDI. For multinationals, it would be cost effective to choose such destination where they don't need to invest further in terms of communication, information technology and transport. Regions with higher levels of infrastructural bases tend to have higher FDI, especially given the importance of

[14] The inclusion of health care expenditure could be tricky. On the one hand, it could be indication that the higher health care expenditure is associated with the ability of people to spend higher on these services thereby helping in their health to be higher. On the other hand, it could also be true that because the people were less healthy in that region, they tend to spend more on these services. In this paper, the former case is being assumed.

information and communication in today's world. The infrastructure index is constructed as a composite index of three factors: number of fixed telephone subscription, number of internet subscription and length of paved road. We expect positive influence of infrastructure in FDI inflow.

4.3.2.6. Agglomeration. Multinational companies prefer to be located in and around the area where the clustering of industry activities is taking place. They tend to move into the locations with a higher number of industries where they find it convenient to do business thereby giving rise to an agglomeration effect. Therefore, a higher concentration of industries gives rise to higher FDI, therefore positive relationship. We measure agglomeration of industries as number of industrial enterprises in the region per corresponding GRP.

4.3.2.7. Coastal region. Traditionally, coastal regions have attracted a remarkable amount of foreign investment because of the proximity of shipping and other economic activities. In China, this practice seems to be more noticeable. In the regression, coastal is designed as a dummy variable where in it takes value 1 if the region lies in coastal area, zero otherwise. We hypothesize that coastal is significant with a positive coefficient.

Further, in order to take a deeper look into the regional disparity of the FDI distribution, we divided the whole country into four economic regions based on the eleventh five-year plan, as described in Li and Xu (2008). This classification are as follows:

Eastern. Beijing, Fujian, Guangdong, Hainan, Hebei, Jiangsu, Shandong Shanghai, Tianjin, Zhejiang.

Northeastern. Heilongjiang, Jilin, Liaoning.

Central. Anhui, Henan, Hubei, Hunan, Jiangxi, Shanxi.

Western. Chongqing, Gansu, Guangxi, Guizhou, Inner Mongolia, Ningxia, Qinghai, Shaanxi, Sichuan, Tibet, Xinjiang, Yunnan.

5. Empirical results and analysis

5.1. Results and analysis

Tables 5.1 and 5.2 present the estimation results for 2 different models where different variables are being considered in these two models. These models are developed with different variables since we could not include all the variables in one single model owing to the problem of multicollinearity.[15] The first model includes gross regional product (GRP), openness and agglomeration along with coastal region as independent variables, whereas the second model includes average wage, inflation and infrastructure along with coastal region as independent variables. Further, for each model, the six human capital indices have been tested separately resulting in 6 specifications for each model. Each column (from 1 to 6) is used to represent separate human capital indices[16].

The estimations are based on random effects model. Since the data was panel in nature, simple OLS could be inappropriate as it does not take into account the changes across entity and over time.[17] Therefore, we decided to adopt more appropriate estimator for panel data estimations. Meanwhile, Hausman test was conducted on all specifications to determine the appropriateness of fixed effect versus random effects model. It is found that random effect model is preferred in all specifications for both the models[18]. For the comparison purpose, fixed effect results for both the models are included in Appendices 3 and 4.

Our main variables of interest, the six human capital indices, produce interesting results. Both the models exert similar results for all human capital variables, in terms of signs of the coefficient and statistical significance. Four out of six human capital variables: endowment, utilization, demography and health showed significant positive relationship with FDI. It showed that whereas multinationals value the availability of human resources at the same time, it is important on how they are being utilized and their health. The most important among these is human capital endowment, for which the coefficient ranges from 1.31 to 1.58, significant at 10% and 5% respectively, depending upon the models. Secondly, health factor also seemed to be important with coefficients ranging from 1.21 to 1.49, significant at 5% and 1% respectively. The coefficient of human capital utilization stood at 0.69 to 0.73, both of which are significant at 5%. The demography index, which indicates the future availability of human resources is significant at 10%, with magnitude of 0.56 to 0.59. The support index is found to be not significant however; the productivity index is significant with negative sign, as opposed to our expectation.

In Table 5.1, GRP and dummy of coastal region are significant in all the specifications. Sign of both of these variables are in line of our expectation. Whereas openness is significant only in 3 specifications with very low magnitude, agglomeration is found to be not significant. In Table 5.2, the most important variable is found to be infrastructure, which is significant at 1% in all the specifications. The coefficient of infrastructure index is found to be high ranging from 5.18 to 7.31, depending upon the specifications.

[15] Refer Appendix 2 for correlation matrix.

[16] Again, owing to the problem of multicollinearity, all of these human capital variables could not be included in the same regression. Refer Appendix 2 for correlation among these variables.

[17] As benchmark estimation, we ran OLS and found that GRP, coastal region, wage and infrastructure are significant determinants for FDI inflow in the region but the human capital variables did not produce desired results.

[18] For the first model, the respective p-values for 6 specifications are: 0.92; 0.53; 0.93; 0.51; 0.88 and 0.31. For the second model, the respective p-values for 6 specifications are: 0.80; 0.31; 0.38; 0.14; 0.34 and 0.42. Therefore, we could not reject the null of using random effect estimation method for both the models.

Table 5.1
Random effects regression result (1).

	(1)	(2)	(3)	(4)	(5)	(6)
Dependent variable:						
Regional FDI inflow						
	0.95***	1.17***	1.11***	1.30***	1.23***	0.89***
Gross regional product	(8.36)	(18.80)	(17.92)	(15.86)	(12.81)	(7.47)
	0.00	0.00*	0.00	0.00*	0.00*	0.00
Openness	(1.63)	(1.77)	(1.55)	(1.74)	(1.81)	(1.61)
	0.01	0.01	0.01	0.01	0.01	0.01
Agglomeration	(0.68)	(1.26)	(1.10)	(0.97)	(1.20)	(1.03)
	0.77**	0.69**	0.70**	0.75**	0.69**	0.85**
Coastal region	(2.31)	(2.10)	(2.11)	(2.27)	(2.06)	(2.50)
	1.31*					
Human capital endowment	(1.94)					
		0.69**				
Human capital utilization		(2.09)				
			0.56*			
Human capital demography			(1.77)			
				−1.07***		
Human capital productivity				(−2.94)		
					−0.70	
Human capital support					(−1.29)	
						1.21**
Human capital health						(2.32)
	−5.68**	−10.92***	−9.41***	−14.10***	−12.06***	−4.07
Constant	(−2.10)	(−6.26)	(−5.58)	(−6.39)	(−5.00)	(−1.37)
No. of obs	309	309	309	308	309	309

Note:
FDI = foreign direct investment.
Openness = sum of import and export divided by gross regional product.
Agglomeration = number of industrial enterprises in the region.
Coastal region = dummy variable taking value of 1 for Tianjin, Hebei, Liaoning, Shanghai, Jiangsu, Zhejiang, Fujian, Shandong, Guangdong, Guangxi and Hainan.
Human capital endowment = geometric mean of graduate, enrollment and school indices.
Human capital utilization = personnel index.
Human capital demography = geometric mean of working population and entrant indices.
Human capital productivity = output index.
Human capital support = geometric mean of education expenditure and education fund indices.
Human capital health = geometric mean of insurance and medical expenditure indices.
Numbers in parentheses indicate t-statistics.
* Statistically significant at 10%.
** Statistically significant at 5%.
*** Statistically significant at 1%.

It is also evident from the table that average wage is highly significant but the magnitude is very low. Being in coastal region is again found to be highly significant in this model.

Given that coastal region has strong influence on FDI attractiveness and is highly significant in both the models and all specifications, we deepened the analysis further into regional aspect. In particular, we examine which specific regions are losing out in attracting FDI to coastal regions. In order to do so, we categorized the whole country into four separate broad regions and regressed with eastern region as a base using the two models as developed above. The results are presented in Table 5.3 and 5.4. The negative coefficients of rest of the region clearly suggest that other regions are receiving less FDI compared to eastern region. However, the coefficients of central region and northeastern region are not significant, whereas western region seems to be having largest negative impact with largest coefficients which are significant at 1% in both the models and all specifications. The magnitude of western region ranges from negative 1.12 to negative 1.59. This shows that western region is getting considerably less FDI than other regions.

The results of other variables are similar to Table 5.1 and 5.2. Four of the human capital variables (endowment, utilization, demography and health) showed up with positive significant coefficients whereas support index was not significant and productivity index being negative. With regard to other control variables, gross regional product, average wage and infrastructure are significant and rest is not.

5.2. Discussion

In this research, we examine the degree that human capital affects in attracting FDI in Chinese regions. The assumption is that human capital is one of the most important determinants in FDI allocation as a high labor quality brings up efficiency and thus boosts the return of a firm. In another case, human capital is strongly linked with economic situation of regions and market demand. Relatively developed regions tend to provide higher quality of education and better services thereby resulting in more professional development. However, high labor quality always accompanies high labor cost, thus reducing the attractiveness for

Table 5.2
Random effects regression result (2).

	(1)	(2)	(3)	(4)	(5)	(6)
Dependent variable: Regional FDI inflow						
Average wage	0.00*** (5.20)	0.00*** (6.07)	0.00*** (5.51)	0.00*** (5.77)	0.00*** (5.65)	0.00*** (2.79)
Inflation	0.00 (−0.62)	0.00 (−0.29)	0.00 (−0.63)	0.00 (−0.12)	0.00 (−0.55)	0.00 (−0.21)
Infrastructure	5.18*** (5.38)	6.68*** (10.94)	6.67*** (10.84)	7.09*** (11.38)	7.31*** (9.68)	5.34*** (6.60)
Coastal region	0.99*** (3.01)	0.96*** (2.94)	0.89*** (2.72)	1.01*** (3.00)	0.91*** (2.73)	1.05*** (3.08)
Human capital endowment	1.58** (2.23)					
Human capital utilization		0.73** (2.10)				
Human capital demography			0.59* (1.84)			
Human capital productivity				−0.90** (−2.19)		
Human capital support					−0.59 (−1.08)	
Human capital health						1.49*** (2.80)
Constant	16.15*** (45.92)	16.05*** (44.88)	16.04*** (44.03)	16.01*** (43.67)	16.21*** (45.57)	16.42*** (45.43)
No. of obs	309	309	309	308	309	309

Note:
FDI = foreign direct investment.
Infrastructure: composite index of number of fixed telephone subscription, number of internet subscription and length of paved road.
Coastal region = dummy variable taking value of 1 for Tianjin, Hebei, Liaoning, Shanghai, Jiangsu, Zhejiang, Fujian, Shandong, Guangdong, Guangxi and Hainan.
Human capital endowment = geometric mean of graduate, enrollment and school indices.
Human capital utilization = personnel index.
Human capital demography = geometric mean of working population and entrant indices.
Human capital productivity = output index.
Human capital support = geometric mean of education expenditure and education fund indices.
Human capital health = geometric mean of insurance and medical expenditure indices.
Numbers in parentheses indicate t-statistics.
* Statistically significant at 10%.
** Statistically significant at 5%.
*** Statistically significant at 1%.

foreign capital. In China, number of regular institutions of higher education has reached to 2358 in 2010 from the corresponding number of 1041 in 2000, according to National Bureau of Statistics of China. With the increase in education opportunities, the quality of qualified labor will also experience an enhancement in their performance.

The main contribution of this paper lies on analyzing qualities of human capital in attracting FDI. Unlike previous studies which have used just a single proxy variable to indicate human capital, this paper looks into deeper level of human capital by creating six human capital variables. They are endowment, utilization, demography, productivity, support and health. The results show interesting evidence on how multinationals view human capital in China when they make investment decisions.

Firstly, the most important factor is the availability of the human capital, both as present and future supply. The present supply of human resource is captured by human capital endowment index whereas the future supply of human resource is captured by human capital demography index. Both of these variables were found to be statistically significant. Therefore, it is clear that as with the nature of FDI, the smooth supply of human capital is integral component to attract FDI. Secondly, the health condition of human resource also has a significant impact in attracting FDI. Whereas being educated is an integral aspect of human capital, remaining healthy is also crucial in order to reap the benefits of educated labor force which is directly related with the efficiency of labor. Multinationals seemed to have shown importance to this factor. We also found the evidence to show that multinationals tend to favor human resources working in scientific and technical fields. This is of particular importance for China as it is trying to upgrade its manufacturing capabilities. Another index human capital support, which we expected to have also positive influence, is found to be non-significant.

Surprisingly, human capital productivity appears to have negative influence upon FDI inflow which is contrary to our expectation. This could be due to the problem in the model arising from simultaneous causality effect. In this paper, we hypothesize that multinationals would be interested in more productive labor force, thereby increasing FDI. However, the effect could be reverse causality as the increase in FDI could give rise to labor productivity. This is because of the spillover effects in domestic industries especially through technology transfer and management knowhow. Several papers (e.g. Aitken, Hanson, & Harrison, 1997; Gorg & Greenaway, 2004; Javorcik, 2004) and in particular with Chinese experience (e.g. Buckley, Clegg, & Wang, 2006;

Table 5.3
Random effects regression result (3).

	(1)	(2)	(3)	(4)	(5)	(6)
Dependent variable:						
Regional FDI inflow						
Gross regional product	0.95***	1.14***	1.09***	1.27***	1.21***	0.83***
	(8.40)	(18.22)	(17.47)	(15.27)	(12.55)	(6.84)
Openness	0.00	0.00	0.00	0.00	0.00	0.00
	(1.16)	(1.36)	(1.12)	(1.24)	(1.36)	(1.15)
Agglomeration	0.00	0.01	0.01	0.01	0.01	0.01
	(0.48)	(0.96)	(0.82)	(0.70)	(0.90)	(0.70)
Central region	−0.54	−0.34	−0.42	−0.56	−0.43	−0.37
	(−1.23)	(−0.80)	(−0.98)	(−1.32)	(−1.00)	(−0.86)
Northeastern region	−0.33	−0.25	−0.24	−0.33	−0.25	−0.38
	(−0.63)	(−0.48)	(−0.46)	(−0.63)	(−0.47)	(−0.71)
Western region	−1.19***	−1.12***	−1.15***	−1.19***	−1.16***	−1.39***
	(−3.11)	(−2.99)	(−3.00)	(−3.13)	(−3.03)	(−3.54)
Human capital endowment	1.14**					
	(1.67)					
Human capital utilization		0.62*				
		(1.91)				
Human capital demography			0.53*			
			(1.67)			
Human capital productivity				−1.00***		
				(−2.75)		
Human capital support					−0.70**	
					(−1.29)	
Human capital health						1.41
						(2.69)
Constant	−4.68*	−9.34***	−7.92***	−12.27***	−10.50***	−1.38
	(−1.68)	(−5.03)	(−4.42)	(−5.36)	(−4.23)	(−0.44)
No. of obs	309	309	309	308	309	309

Note:
FDI = foreign direct investment.
Openness = sum of import and export divided by gross regional product.
Agglomeration = number of industrial enterprises in the region.
Central region = dummy variable taking value of 1 for Anhui, Henan, Hubei, Hunan, Jiangxi, Shanxi.
Northeastern region = dummy variable taking value of 1 for Heilongjiang, Jilin, Liaoning.
Western region = dummy variable taking value of 1 for Chongqing, Gansu, Guangxi, Guizhou, Inner Mongolia, Ningxia, Qinghai, Shaanxi, Sichuan, Tibet, Xinjiang, Yunnan
Human capital endowment = geometric mean of graduate, enrollment and school indices.
Human capital utilization = personnel index.
Human capital demography = geometric mean of working population and entrant indices.
Human capital productivity = output index.
Human capital support = geometric mean of education expenditure and education fund indices.
Human capital health = geometric mean of insurance and medical expenditure indices.
Numbers in parentheses indicate t-statistics.
* Statistically significant at 10%.
** Statistically significant at 5%.
*** Statistically significant at 1%.

Cheung & Ping, 2004; Hale & Long, 2011) have looked into this issue. Unlike other human capital variables considered in this paper, this problem is specifically true for the productivity variable. If such is the case, then there could be simultaneous causality bias affecting the magnitude of the coefficients. Therefore, this result needs to be dealt with caution.

Apart from looking into the human capital aspect, we also examine the regional distribution of FDI in deeper level. The coastal region of China has been traditionally successful in attracting FDI compared to inland regions. By segregating the whole country into 4 different broader regions, we found that western region is the most impacted by eastern region in attracting FDI. The provinces in western region, in particular, Gansu, Guangxi, Guizhou, Ningxia, Qinghai, Tibet and Xinjiang are the ones which have seen very low level of FDI inflow. This could be due to both economic reasons, like lower purchasing power and also the geographical difficulties. Although central and northeastern regions have also received less FDI compared to eastern region, the results are not statistically significant. This makes sense as some of the recent FDI are now allocated to these regions, like Anhui, Henan, Hubei, Hunan, Jiangxi, Shanxi and Heilongjiang.

With regard to other variables, some of the traditional variables continue to have impact on attracting FDI. Market size, indicated by gross regional product, is the single most important variable in conjunction to previous studies. Infrastructure level, measured as the situation of communication, information technology and transportation, also exerts high significance for multinationals. Although average wage is important and significant the magnitude is very low. Both Openness and macroeconomic condition of region seem to have no impact which is understandable as openness and inflation of country as a whole would make much sense than the regional status. Agglomeration of industries also is found to be not significant although with positive sign.

Table 5.4
Random effects regression result (4).

	(1)	(2)	(3)	(4)	(5)	(6)
Dependent variable: Regional FDI inflow						
Average wage	0.00*** (5.48)	0.00*** (6.43)	0.00*** (5.83)	0.00*** (6.08)	0.00*** (6.01)	0.00*** (2.98)
Inflation	0.00 (−0.65)	0.00 (−0.33)	0.00 (−0.67)	0.00 (−0.15)	0.00 (−0.59)	0.00 (−0.22)
Infrastructure	4.95*** (5.17)	6.30*** (10.19)	6.33*** (10.00)	6.73*** (10.58)	6.96*** (9.11)	4.80*** (5.81)
Central region	−0.69 (−1.58)	−0.48 (−1.19)	−0.55 (−1.27)	−0.66 (−1.54)	−0.58 (−1.36)	−0.51 (−1.19)
Northeastern region	−0.55 (−1.00)	−0.50 (−0.98)	−0.47 (−0.86)	−0.55 (−1.01)	−0.51 (−0.93)	−0.61 (−1.12)
Western region	−1.44*** (−3.86)	−1.44*** (−4.05)	−1.36*** (−3.63)	−1.50*** (−4.01)	−1.41*** (−3.78)	−1.59*** (−4.19)
Human capital endowment	1.48** (2.09)					
Human capital utilization		0.72** (2.09)				
Human capital demography			0.55* (1.72)			
Human capital productivity				−0.91** (−2.23)		
Human capital support					−0.62 (−1.14)	
Human capital health						1.64*** (3.08)
Constant	17.43*** (37.98)	17.29*** (38.33)	17.24*** (36.39)	17.32*** (37.60)	17.43*** (37.93)	17.79*** (37.58)
No. of obs	309	309	309	308	309	309

Note:
FDI = foreign direct investment.
Infrastructure: composite index of number of fixed telephone subscription, number of internet subscription and length of paved road.
Central region = dummy variable taking value of 1 for Anhui, Henan, Hubei, Hunan, Jiangxi, Shanxi.
Northeastern region = dummy variable taking value of 1 for Heilongjiang, Jilin, Liaoning.
Western region = dummy variable taking value of 1 for Chongqing, Gansu, Guangxi, Guizhou, Inner Mongolia, Ningxia, Qinghai, Shaanxi, Sichuan, Tibet, Xinjiang, Yunnan
Human capital endowment = geometric mean of graduate, enrollment and school indices.
Human capital utilization = personnel index.
Human capital demography = geometric mean of working population and entrant indices.
Human capital productivity = output index.
Human capital support = geometric mean of education expenditure and education fund indices.
Human capital health = geometric mean of insurance and medical expenditure indices.
Numbers in parentheses indicate t-statistics.
* Statistically significant at 10%.
** Statistically significant at 5%.
*** Statistically significant at 1%.

6. Conclusion

In the past four decades, China attracted enormous amount of foreign investment but the distribution of FDI inflow has been uneven with positive bias towards coastal (eastern) region. At the same time, due to the rising cost, especially that of labor, there is a tendency in recent time for alternative destinations from both host and home perspectives. The rising labor cost is related with the quality of the human capital which is one of the important determinants for successful FDI attraction. One of the alternatives is to just look at the inland regions of China where labor cost is still relatively low. However, it also seems that these investments are moving to new destinations in Asia where they can still enjoy cheap labor. Moreover, another set of arguments is that China could move from cheap labor FDI destination to relatively higher end industries. Given this situation, the human capital in China has been one of the most important factors in attracting FDI. In this paper, the role of human capital is being investigated in regional distribution of FDI in China with using the novel approach by introducing a set of six human capital indices. These indices were constructed using a scientific approach of Ederer (2006) and HDR (2011) but further inputs were also included. The six human capital indices are:

Human capital endowment index: indicates the present availability of human resources.
Human capital utilization index: indicates the quality of labor force working in scientific and technical fields.
Human capital demography index: indicates the future supply of human resources.
Human capital productivity index: indicates the efficiency of labor force.

Human capital support index: indicates the support human resources get to be better educated.

Human capital health index: indicates the health condition of the human resources.

All these indices are expected to have a positive effect on inward FDI. Following conclusions were drawn based on the empirical tests:

Among the human capital indices which are our main variables of interest, human capital endowment and demography are found to have the significant effect. This shows that multinationals are not only looking into the present availability of the human resources but also the future prospect. This does make sense as most of the investments in China are in the form of green field investment that needs long term strategies. Another important conclusion is in the form of health of human resources. Whereas it is important for people to be better educated, it is equally important for them to be in good health. Multinationals also seem to value the quality of human resources who are working in the scientific and technical fields. As China is gearing up to upgrade its industrial capabilities, this factor would become even more important. There is no evidence of foreign investors giving importance to the support human capital to get better educated. What they care more is the final outcome of the human capital rather than the inputs. In contrary to our expectation, productivity is found to have negative effect.

Whereas the coastal region of the China is successful in attracting much of FDI, it is coming at the cost of western region in comparison to central and northeastern regions. With regard to other explanatory variables, local market size (measured as gross regional product) and the infrastructure level (measured as the composite index of telephone subscriptions, internet subscription and transport) were found to have a significant effect on attracting FDI.

Based on the findings, it could be recommended that the Chinese government and people put more emphasis on improving its human capital, in particular higher education and better health, in order to attract FDI. As true with the economic phenomena, China could not escape the rising labor cost with the rise in economic growth. However, in order to remain competitive in the higher end industries, China needs to invest in its human capital. It is also a fundamental factor for innovation and creativity where China desire to head towards.

One of the limitations of this study is its static nature and not being dynamic. Specifically, the study deals mostly with the present graduates in the region. However, there have been several migrations taking place within China after the students graduate. It is possible that a student could obtain education in one region but move to another for employment. This particular phenomenon is not being captured in this study due to the lack of data availability in this specific matter. Further, the contradictory result of human capital productivity on FDI should be noted with care. In the present paper, we looked into the effect of increasing labor productivity in attracting FDI however; it is also possible that increase in labor productivity could be an effect of inward FDI due to the spillover effects, causing simultaneous causality bias. Future research may need to look into these aspects to draw more concrete conclusions.

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Appendix A. Appendix

Appendix 1
Descriptive statistics of variables.

Variable	Obs	Mean	Std. Dev.	Min	Max
Regional FDI inflow (ln)	369	21.17	1.83	16.26	24.30
Gross regional product (ln)	372	27.18	1.14	23.51	29.46
Openness	372	33.19	41.59	3.60	176.50
Agglomeration	372	9.23	5.30	0.87	29.97
Average wage	372	10.13	0.52	9.12	11.44
Inflation	372	0.48	6.12	−9.20	104.00
Infrastructure	372	0.18	0.16	0.00	0.94
Human capital endowment	372	0.333	0.222	0.00	0.975
Human capital utilization	310	0.252	0.152	0.00	1.00
Human capital demography	372	0.330	0.139	0.00	0.743
Human capital productivity	329	0.185	0.195	0.00	1.00
Human capital support	310	0.217	0.138	0.00	0.749
Human capital health	372	0.178	0.122	0.00	0.750

Appendix 2
Correlation matrix.

	Regional FDI inflow	Gross regional product	Average wage	Openness	Inflation	Infrastructure	Agglomeration	Human capital endowment	Human capital utilization	Human capital demography	Human capital productivity	Human capital support	Human capital health
Regional FDI inflow	1												
Gross regional product	0.85	1											
Average wage	0.35	0.36	1										
Openness	0.53	0.38	0.46	1									
Inflation	0.08	0.06	0.17	0.05	1								
Infrastructure	0.81	0.97	0.17	0.36	0.01	1							
Agglomeration	0.35	0.25	−0.24	0.35	−0.10	0.34	1						
Human Capital Endowment	0.76	0.93	0.17	0.24	0.03	0.94	0.24	1					
Human Capital Utilization	−0.34	−0.39	0.03	0.13	−0.01	−0.39	−0.23	−0.39	1				
Human Capital Demography	0.64	0.70	0.19	0.39	0.07	0.71	0.25	0.70	−0.28	1			
Human Capital Productivity	0.65	0.60	0.72	0.65	0.24	0.49	0.21	0.42	−0.01	0.42	1		
Human Capital Support	0.78	0.86	0.46	0.58	0.06	0.84	0.31	0.79	−0.19	0.65	0.70	1	
Human Capital Health	0.63	0.71	0.65	0.40	0.09	0.61	−0.04	0.60	0.04	0.46	0.70	0.74	1

Appendix 3
Fixed effects regression result (1).

	(1)	(2)	(3)	(4)	(5)	(6)
Dependent variable:						
Regional FDI inflow						
Gross regional product	0.93***	1.15***	1.09***	1.33***	1.22***	0.70***
	(7.92)	(16.58)	(15.83)	(13.88)	(11.72)	(4.56)
	0.00	0.00	0.00	0.00	0.00	0.00
Openness	(0.92)	(1.34)	(0.94)	(0.87)	(1.09)	(0.99)
	0.01	0.01	0.01	0.01	0.01	0.00
Agglomeration	(0.48)	(0.89)	(0.80)	(0.92)	(0.88)	(0.07)
	0	0	0	0	0	0
Coastal region	(.)	(.)	(.)	(.)	(.)	(.)
	1.31*					
Human capital endowment	(1.84)					
		0.81**				
Human capital utilization		(2.35)				
			0.54*			
Human capital demography			(1.69)			
				−1.25***		
Human capital productivity				(−3.19)		
					−0.78	
Human capital support					(−1.39)	
						1.84***
Human capital health						(2.99)
	−4.99*	−10.18***	−8.61***	−14.59***	−11.48***	1.23
Constant	(−1.74)	(−5.15)	(−4.49)	(−5.61)	(−4.32)	(0.32)
No. of obs	309	309	309	308	309	309
adj. R-sq	0.611	0.614	0.61	0.619	0.609	0.619

Note:
FDI = foreign direct investment.
Openness = sum of import and export divided by gross regional product.
Agglomeration = number of industrial enterprises in the region.
Coastal region = dummy variable taking value of 1 for Tianjin, Hebei, Liaoning, Shanghai, Jiangsu, Zhejiang, Fujian, Shandong, Guangdong, Guangxi and Hainan.
Human capital endowment = geometric mean of graduate, enrollment and school indices.
Human capital utilization = personnel index.
Human capital demography = geometric mean of working population and entrant indices.
Human capital productivity = output index.
Human capital support = geometric mean of education expenditure and education fund indices.
Human capital health = geometric mean of insurance and medical expenditure indices.
Numbers in parentheses indicate t-statistics.
* Statistically significance at 10%.
** Statistically significance at 5%.
*** Statistically significance at 1%.

Appendix 4
Fixed effects regression result (2).

	(1)	(2)	(3)	(4)	(5)	(6)
Dependent variable:						
Regional FDI inflow						
Average wage	0.00***	0.00***	0.00***	0.00***	0.00***	0.00***
	(4.57)	(5.74)	(4.81)	(5.56)	(5.18)	(3.07)
	0.00	0.00	0.00	0.00	0.00	0.00
Inflation	(−0.68)	(−0.31)	(−0.70)	(−0.13)	(−0.61)	(−0.25)
	5.08***	5.85***	6.45***	6.86***	7.16***	4.03***
Infrastructure	(4.71)	(7.08)	(8.11)	(8.54)	(7.71)	(3.64)
	0	0	0	0	0	0
Coastal region	(.)	(.)	(.)	(.)	(.)	(.)
	1.43**					
Human capital endowment	(1.97)					
		1.03***				
Human capital utilization		(2.71)				
			0.54*			
Human capital demography			(1.69)			
				−1.04**		
Human capital productivity				(−2.50)		

Appendix 4 *(continued)*

	(1)	(2)	(3)	(4)	(5)	(6)
Human capital support					−0.74 (−1.32)	
Human capital health						1.88*** (3.20)
Constant	16.65*** (39.77)	16.73*** (40.32)	16.50*** (37.91)	16.49*** (38.64)	16.67*** (39.70)	17.34*** (37.93)
No. of obs	309	309	309	308	309	309
adj. R-sq	0.611	0.616	0.609	0.613	0.608	0.62

Note:
FDI = foreign direct investment.
Infrastructure: composite index of number of fixed telephone subscription, number of internet subscription and length of paved road.
Coastal region = dummy variable taking value of 1 for Tianjin, Hebei, Liaoning, Shanghai, Jiangsu, Zhejiang, Fujian, Shandong, Guangdong, Guangxi and Hainan.
Human capital endowment = geometric mean of graduate, enrollment and school indices.
Human capital utilization = personnel index.
Human capital demography = geometric mean of working population and entrant indices.
Human capital productivity = output index.
Human capital support = geometric mean of education expenditure and education fund indices.
Human capital health = geometric mean of insurance and medical expenditure indices.
Numbers in parentheses indicate t-statistics.
* Statistically significance at 10%.
** Statistically significance at 5%.
*** Statistically significance at 1%.

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