

The Regional Determinants of Inward FDI in Henan Province: In the Special Economic Development and Transitional Stage

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1. Introduction

With the development of the economy and the process of global economic integration, countries are entering each other through trade and investment. As an essential indicator of the degree of opening up to the outside world, FDI has gradually become the dominant force in the global economy since the 1960s (Mody, 2004, Ruggiero, 1996). As an inland province in China, Henan Province has experienced rapid economic development in recent years. In 2016, Henan's GDP reached 4.05 trillion Yuan, and its GDP continued to be the first in the central and western regions of China. However, the degree of economic outwardness and the level of utilization of foreign capital are relatively low. In 2016, Henan introduced foreign investment of 16.99 billion US dollars, accounting for only 6.24% of the whole country, which is extremely incompatible with the economic aggregate level of Henan Province. In order to figure out this development confuse, this paper examines the real regional reasons for attracting the foreign investment, by using the FGLS method in panel data for 18 cities from 1999-2016.

In the past empirical research, it is generally believed that market factors (Wang and Swain, 1995, Cheng and Kwan, 2000 b, Coughlin and Segev, 2000) and wage levels (Wheeler and Mody, 1992, Liu et al., 1997), labor quality (Broadman and Sun, 1997, Cheng and Kwan, 2000 b, Coughlin and Segev, 2000), aggregation (Coughlin et al., 1991, Wheeler and Mody, 1992, Braunerhjelm and Svensson, 1996, Sun et al., 2002), infrastructure (Chen, 1996, Head and Ries, 1996, Cheng and Kwan, 2000 a, Sun et al., 2002), and openness (Lu, 1997, Sun et al., 2002) are important considerations for foreign investment. In these studies, the quality of the labor is basically measured by the number of students in higher education (Lu, 1997, Sun et al., 2002, Cheng and Kwan, 2000 b) and the people engaged in scientific research (Braunerhjelm and Svensson, 1996, Sun et al., 2002, Chen, 1996) that may critically influence

the foreign investment. As for the industry, Coughlin et al. (1991) studies the US manufacturing industry and Friedman and Fung (1996) analyzes the US high-tech manufacturing industry as a research object.

The models estimated and applied in this study are based on these articles (Na and Lightfoot, 2006, Sun et al., 2002). The empirical result show that market size, market potential, openness, infrastructure, cost and aggregation have significant impacts on FDI. The effect of cost and quality of labor will change at different stage. In this study, labor quality is measured by the different educational levels, industry structure and rich labors in Henan province on foreign investment and different education levels of labor, industries and supply of labors may have the corresponding impact on attracting foreign investment. The previous articles did not cover these parts. It will be the essential content and the innovation of this study.

The paper is structured as follows: section 1 gives introduction; Section 2 introduces the literature review; Section 3 shows the factors and hypothesis; Section 4 provides research methodology; Section 5 and 6 show data analysis and the results with policy recommendations.

2. Background and literature review

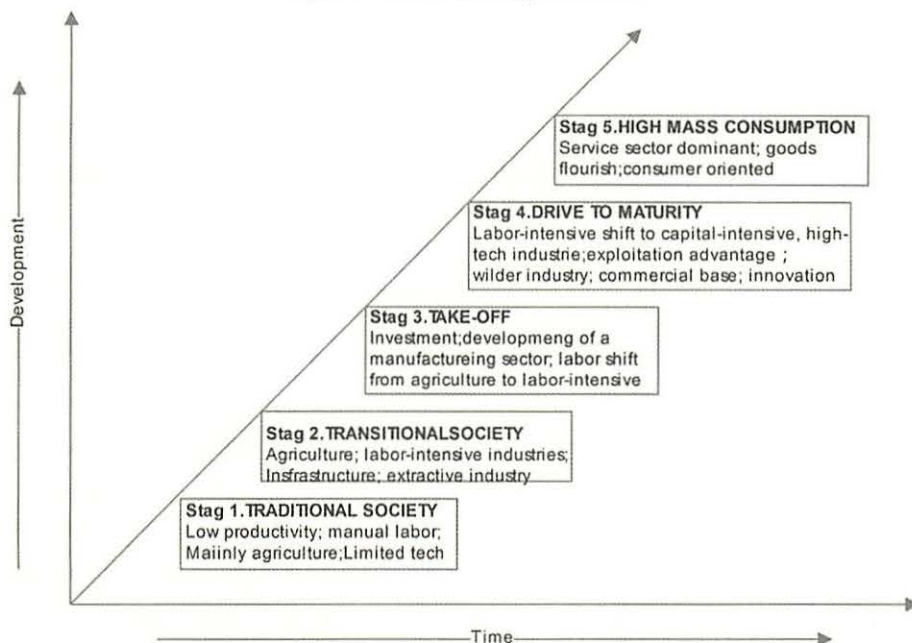
2.1. Background

IMF (1993) defines foreign direct investment¹⁾ as a category of international investment that reflects the objective of a resident in one economy (the direct investor) obtaining a lasting interest in an enterprise resident in another economy (the direct investment enterprise). The lasting interest implies the existence of a long-term relationship between the direct investor and the direct investment enterprise, and a significant degree of influence by the investor on the management of the enterprise. This paper mainly studies such FDI into Henan, namely inward FDI in Henan province.

Rostow (1960), an American economist, published the monograph "the stages of economic growth" in 1960, put forward the theory of economic growth stage, and decomposed the stage of economic growth into six stages, such as traditional society stage, preconditioned take-off stage (Transitional society), take-off stage, drive to maturity stage and high-mass consumption stage. Each stage has its unique tone. Leading industries provides the driving force for sustained economic development. The continuous growth of leading industries created new technologies and new space to prepare for the next stage, stimulating and attracting the advancement of related industries. The stages of economic development, the process of industrialization in various stages are given in Figure 1. Traditional societies are characterized by self-sufficient agriculture or hunting and gathering; almost exclusively a "primary" sector

1) Hereafter the foreign direct investment will be abbreviated as FDI.

Figure 1 Rostow's development model



Note: Made by the author according to Rostow's theory of economic growth stage (Rostow, 1960).

economy; limited technology. The leading industries in the transitional society are mainly the primary industry or labor-intensive manufacturing, and the extensive and enhanced investment in physical infrastructure is the primary task of this period. "Secondary" (goods-producing) sector expands, and the ratio of secondary vs. primary sectors in the economy shifts quickly towards secondary (Rostow, 1960). In the drive to the mature stage, industries and export products are diversified, and high value-added industries accordingly increase. The focus of investment shifts from labor-intensive to capital-intensive sectors. In the stage of mass consumption, the industry shift from manufacturing to the service sector, and consumer prefers to spend on leisure, education, healthcare, national security, and social security projects.

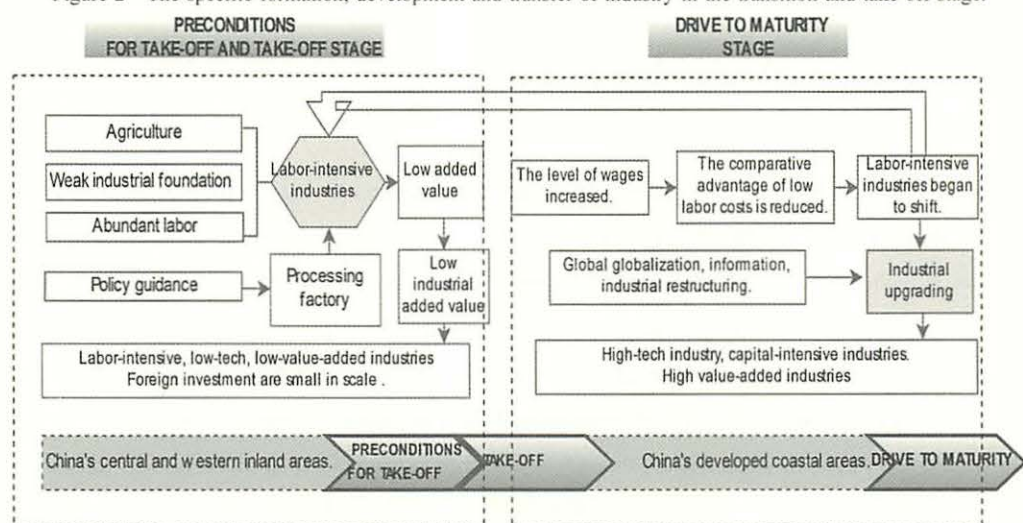
Figure 2 shows the process of the formation and transfer of the leading industries in China's territories at different stages. Most of China's central and western inland areas are either still in the stage from "transitional society" to "taking off." These areas are dominated by agriculture, with a weak industrial base, abundant labor force, and policy guidance, resulting in the emergence of labor-intensive industries. During the transition society to an advanced stage, the science and technology will play a role. Labor productivity increase and labors will shift from agriculture to labor-intensive manufacturing. At the same time, the developed coastal areas gradually come into the stage of maturity. Under the influence of global globalization, informatization and the development of high-tech industries, the industry in developed regions started to transfer from low-processing, labor-intensive sectors to capital-intensive and

technology-intensive sectors.

In light of this situation and hit of the financial crisis in 2008, the governments proceeded to guide the directions of the industry. It advocated the “vacating cage to change birds” policy²⁾ in the developed regions and adopted the strategy of “rising strategy of central China”³⁾ in the central part. The enterprises in the coastal regions used to be very active in the eastern coastal areas, establishing the expansion of China’s manufacturing in the world. With the labor costs rise and policy squeeze the living space, cost-sensitive labor-intensive sectors have to run away and turn to central and western inland areas.

Henan Province is located in the central and inland regions in China. It is a mostly agricultural province with abundant labors and cheap labor costs. At 2017, Henan Province’s grain output reached 59.73 million tons, ranking second, the population reached 108,528,500 ranking third, the per capita disposable income is 20170.03 Yuan (RMB), ranking 24th in the whole China and agriculture, labor-

Figure 2 The specific formation, development and transfer of industry in the transition and take off stage.



Made by the author according to the Rostow's theory of economic growth stage (Rostow, 1960).

2) “Vacating cage to change birds” was formally proposed by the secretary of Guangdong provincial Party committee Wang Yang in May 29, 2008, with the decision of the Guangdong provincial Party committee and the Guangdong Provincial People’s Government on promoting industrial transfer and labor transfer, also known as the “double transfer strategy”. According to the national industrial policy, the government will carry out the policy of differential treatment of industry admittance, raise the standard of land use, energy consumption, water consumption and pollutant emission, improve the entry threshold of labor intensive industries, and actively shift some low value-added labor intensive industries to less developed areas.

3) The rise strategy of central China is a central policy to promote the rise of the 6 provinces of China’s Central Economic Zone — Shanxi, Henan, Hubei, Hunan, Anhui and Jiangxi. It was first put forward by Premier Wen Jiabao in March 5, 2004. The plan for the rise of the central region will be implemented in the Eleventh Five Year Plan period. The development of this period is based on existing foundations, upgrading industrial level, promoting industrialization and urbanization

intensive industries dominated (Bureau, 2017). Based on the Rostow's theory, it is in the stage of transition society to the take-off stage and will be an absolute rational region that attracts the relevant leading industrial transfer and investment that are well-suited to this stage from the developed coastal areas. Therefore, regarding attracting investment in Henan at these stages, the supply of labor, the quality of labor, the cost of labor, and the industrial structure would be the key factors that investors will consider.

2.2. Literature review

The theories that can explain the determinants of FDI are mainly Competitive advantage theory (Ownership benefits (product differentiation), economies of scale, government incentives) (Hymer, 1960, Caves, 1971, Kindleberger, 1969), Product life cycle theory (Vernon, 1966), Internalization theory (Market failures / inefficiencies) (Hennart, 1982, Buckley and Casson, 1976), Location advantage theory (labor, energy, materials, components, semi-finished products, commercial, legal, educational, transport, and communications, ideology, language, culture, business practice, and political systems, economies resulting from centralization of research and development (R&D), production, marketing, economic systems and governmental strategies) (Dunning, 1993, Krugman, 1991 a, Porter, 1990, Coughlin et al., 1991), Marginal industry expand theory (Capital, technology, operation and management) (Kojima, 1973), Eclectic paradigm theory (OLI – Ownership, location, internalization) (Dunning and Buckley, 1977, Dunning, 1979) and new theory of trade (market size, transport cost, labor endowments) (Dixit and Grossman, 1982, Helpman, 1984).

Scholars have found statistically significant relations to the locational determinants in China (e.g., GDP, Wage, and Labor, population, highway, innovation, politics, agglomeration, economics, geography, education, telecommunication, economic openness market, and infrastructure). Cheng and Kwan (2000 a) used panel data from 29 provinces and cities in China during 1985~1995. The results show that market size, infrastructure, policy preferences, and labor costs are significant factors that attract FDI inflow, and education levels on FDI are not significant. Jinjin (2001) analyzed the regional distribution of foreign direct investment in China, using correlation analysis and principal component analysis. The result shows that the economic level, infrastructure, and geographical location are the main factors affecting China's foreign investment. Hsiao and Hsiao (2004) argued that language and cultural similarities, geographic proximity, as well as historical and cultural ties, all these have a strong influence on FDI's entry into China. He used a panel analysis method to analyze the factors influencing the distribution of FDI in China and found China 60% FDI from Hong Kong and Taiwan, and it is mainly distributed in the coastal areas.

Naohiko (2006) used data from 1997 to 2003 to analyze the determinants of location choice of Japanese enterprises in 28 provinces (autonomous regions and municipalities directly under the central government) by the gravity model. The results demonstrate that the scale of economies and labor pro-

ductivity is the main factors that affect Japanese investment. The distance from Japan impedes investment. Japanese companies are more willing to invest in the eastern coastal areas, such as the nearest Shandong Province, Liaoning Province, and Jiangsu province. Cheng (2007) used nested logit model to analyze the location selection factors of 764 Japanese companies in 25 provinces (autonomous regions and municipalities directly under the central government) in China from 1997 to 2002 and found significant factors attracting Japanese investors are agglomerations of Japanese enterprises, preferential policy, good living conditions, and outstanding supporting capacity. The labor quality and the highly centralized traditional state-owned enterprises will affect the Japanese enterprise investment. Traditional factors, such as market potential, wages, and land costs, have little impact on Japanese investment.

Wen and Minghai (2008) use the DIF-GMM method to study the interprovincial location and decision mechanisms of FDI in China with the interprovincial panel data from 1988 to 2004. The results show that there are significant positive correlations between the degree of opening up, the market capacity, the degree of marketization and preferential policies and FDI, while the wage rate level is negatively related to FDI. Liu et al. (2013) purposed market size holds priority for FDI inflows into the coastal region and northeast regions; the degree of openness is the most important determinant for FDI inflows in the central region; the labor quality has no effect in central region but has a positive impact on FDI inflows into coastal and northeast regions. Belkhouja et al. (2016) believed the protection of intellectual rights, agglomeration economies; investments in education and gross regional product affect the location choice of FDI in China. In the past empirical studies, as the study progressed in depth, the factors used to analyze the FDI inflows into China were: market, agglomeration, human capital, labor cost, openness, politics, incentives, culture, and geographic distances. Some studies made breakthroughs, such as the intellectual rights, living standards, and state-owned enterprises.

As FDI increase, research has started to discuss the reasons attracting FDI in different regions of China. Of all the empirical papers, most of them are concentrated in coastal areas or the analysis in prominent regions, such as the west region, the middle region and the eastern region. The analysis data, primarily adopt national and provincial level data (Laijun et al., 2008, Anjing Qi 1, 2011, Chunlay, 2003, Liu et al., 2012). And they emphasized the expansion and in-depth study of relevant regional factors, or adopt different perspectives and methodology to explore, but there is basically no research combined with local economic and industrial transformation. FDI inflow has been quite low in Henan province compared with other regions in China. Henan has unique regional characteristics that are entirely different in other areas, and it is in a critical process of economic transformation and industrial upgrading. On the background of the economic stage in Henan, FDI inflows flow with the transfer of industries and the factors closely related to the leading industries at each stage will undoubtedly have a significant impact on the investment introduced. I will integrate the theories of FDI and empirical research with Rostow's economic growth theory to go for in-depth analysis

So far, FDI theory is not based on the strict theoretical framework, so the determinants of FDI theory in reality are not very clear.⁴⁾ The factor of FDI is only studied through several isolated theories, and an integrative perspective has not evolved (Sethi et al., 2009). FDI has been discussed through several research streams, but no holistic conceptual framework synthesizes diverse perspectives (Sethi et al., 2009). For this reason, empirical analysis using statistical data on direct investment began in the 1970s.⁵⁾ Based on the previous literature review, I will especially use Dunning's "OLI" eclectic paradigm theory, the comparative advantages of location determinants are analyzed in detail. I combined these factors in particular periods to summarize the determinants that seem to be indispensable to the FDI inflow and based on which the hypothesis of this study are obtained.

3. Determinants of FDI and Hypothesis development

3.1. Market factor

Wheeler and Mody (1992) analyzed direct investment by the United States to 42 countries from 1982 to 1988, and shows that expansion of the market size of the investee country promotes FDI in the United States. In the 20th century, Canfei and Jinshe (1999) began to use GDP, per capita GDP to measure the market size. Most scholars have shown that the size of the market and FDI positively related (Xueqiang and Shengxue, 1995), (Wei and Bingyun, 2004), (Cheng and Kwan, 2000 b), (Minghong and Zhen, 2002), (Changchun, 2002), (Li and Yuchi, 2002). Since the 1990s, the market potential has gradually become an important variable affecting foreign investment (Minghong, 1999). The faster the economy grows, the more likely it is the fact that it will induce more investment (Tingzhan, 2013, Houkai, 2001). Thus, the hypothesis on FDI inflow is proposed to have a positive link between market size and market growth potential.

Hypothesis 1.1: Market size positively influences FDI inflow in Henan Province.

Hypothesis 1.2: Market growth potential positively influences FDI inflow in Henan Province.

4) BUCKLEY, P. J. & CASSON, M. C. 1998. Analyzing foreign market entry strategies: Extending the internalization approach. *Journal of international business studies*, 29, 539-561. Toshiyuki M. 2015. "New trend of theoretical and empirical research on Foreign direct investment", *Mitsubishi Research Institute*. This point is mentioned in both of researches.

5) BUCKLEY, P. J. & CASSON, M. C. 1998. Analyzing foreign market entry strategies: Extending the internalization approach. *Journal of international business studies*, 29, 539-561, CHAKRABARTI, A. 2001. The determinants of foreign direct investments: Sensitivity analyses of cross-country regressions. *kyklos*, 54, 89-114, DUNNING, J. H. & LUNDAN, S. M. 2008. *Multinational enterprises and the global economy*. Edward Elgar Publishing. It was mentioned in these articles.

3.2. Infrastructure

The relationship between the infrastructure and the FDI inflow is positively correlated (Chen, 1996, Broadman and Sun, 1997). Wheeler and Mody (1992) found that US direct investment in developing countries requires consummate infrastructures. Coughlin et al. (1991) found that there is a significant positive correlation between FDI and the length of the highway in every square mile, the length of the railway in every square mile and the number of airports in the United States. Houkai (2001) also show that infrastructure is one of the main locational factors of FDI, which has been validated empirically both in many countries, such as the United States (Shaver, 1998), as well as in developing economies like China (Gong, 1995, Head and Ries, 1996, Wei et al., 1999).

A hypothesis regarding the effect of the infrastructure factor on FDI inflow would be proposed as follows:

Hypothesis 2: The relationship between the infrastructure and the attractive FDI is expected to be positive.

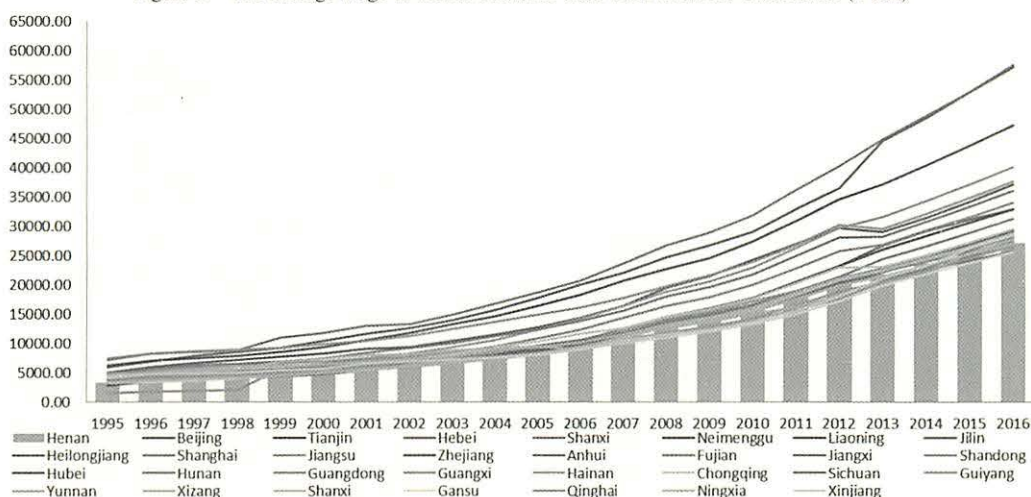
3.3. Cost factor

Scholars shows that the average wages of workers and the inflow of FDI are generally negatively correlated (Wei et al., 1999). Jing and Huixin (2007), McKinlay and Little (1978) argues that the primary factor of the location choice of foreign investment is the minimum cost. Wei and Xiaoqin (2009) proposed that China's overall salary level is very low in the whole world, so the average wage caused the inflow of FDI in China. While Cheng and Kwan (2000 b), Broadman and Sun (1997), Chen (1996), Head and Ries (1996) believes the impact of the labor cost on the distribution of FDI is not significant. And some scholars believe that FDI is positively correlated with labor costs (Coughlin and Segev, 2000, Chen, 1996, Broadman and Sun, 1997, Head and Ries, 1996). Labor costs are an indirect measurement of labor quality. The higher the cost, the higher the quality of labor will be. High-wage workers often can create more wealth.

Based on the previous analysis of China's industrial upgrading and transfer, we can see the labor-intensive industries in the coastal developed regions that entered the mature stage are facing the disappearance of cost comparative advantage and have to turn to the inland. Henan is a vast province with the massive population in China. It has abundant labors and quite cheap wage (See Figure 3). Henan becomes the ideal destination of the labor-intensive industry. Foreign companies can more easily recruit the cheap workers they need in Henan province. Foxconn's production line was moved to Zhengzhou, Zhoukou, Hebi and Jiyuan in Henan Province in 2012.⁶⁾ The labor cost is one of the factors that cannot

6) Hon Hai Precision Industry Co., Ltd., trading as Foxconn Technology Group, is a multinational electronics contract manufacturing company headquartered in Tucheng, New Taipei, Republic of China (Taiwan) (Strikes ↗

Figure 3 The average wage in Henan Province from 1995 to 2016. Unit: RMB (Yuan)



Note: Made by the author.

Source: Henan Statistical Yearbook 2017.

be ignored for the regions in transition society and take off stage. For this period's leading industry, low-input, high-labor-intensive investment projects, sufficient and cheap labor will be indispensable.

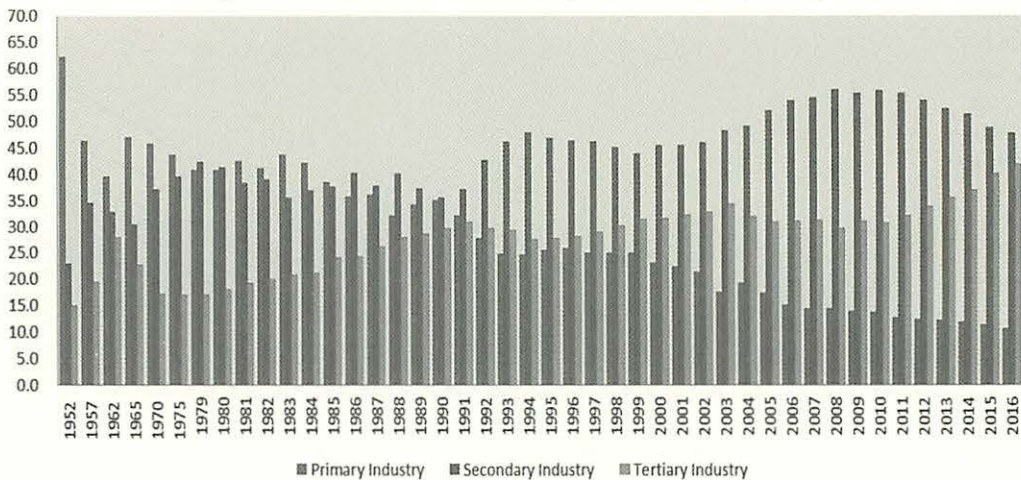
As shown in Figure 4, since 1984, the proportion of the secondary industry surpassed that of the primary sector and continued to strengthen. It indicates that Henan provinces just come from the traditional society stage into the transitional stage, agriculture and low-tech, labor-intensive sectors dominate during this period. With the further development of the manufacturing industry driving Henan into the take-off stage, the proportion of the secondary sector has gradually declined, and the proportion of the tertiary industry as the primary indicator of the optimization and upgrading of the industrial structure (Liu et al., 2010) has been increasingly rising from 2008. Investors will gradually demand the high quality of the labor. Labor cost is an indirect measure of the quality of the worker. Considering the cost factor in the previous studies and the actual situation in Henan Province, the hypothesis regarding the effect of the cost factor on FDI inflow can be proposed as follows:

Hypothesis 3.1: In the stage of transition society, labor costs have a negative effect on FDI inflow.

Hypothesis 3.1: With industrial optimization and upgrading and entering the take-off stage, labor

end at two Chinese automotive suppliers (<https://www.reuters.com/article/us-china-labour/strikes-end-at-two-chinese-automotive-suppliers-idUSTRE66L0A220100722>) Foxconn is the world's largest contract electronics manufacturer and the fourth-largest information technology company by revenue. (<https://www.worldatlas.com/articles/which-are-the-world-s-largest-technology-companies.html>) The company is the largest private employer in China and one of the largest employers worldwide. (BARBOZA, D. 2016. "How China Build 'iPhone City' With Billions in Perks for Apple's Partner". *The New York Times*.) It now has more than 1.2 million employees and is a typical labor-intensive industry company.

Figure 4 Industrial Sectors Distribution. (From 1952 to 2016, units %)



Note: Made by the author.

Source: Henan Statistical Yearbook 2017. Note: All data during 1952-2016 is too large relative to the page, so data from pre-1979 was set to once every five years. This period was dominated by agriculture.

costs as a measure of labor quality began to have a positive effect on FDI inflow.

3.4. Agglomeration

Agglomeration refers to the positive externalities (Marshall, 1890, Pigou and Todd, 1934) formed by the regional concentration of economic activities and related production facilities, as well as the economies of scale and scope (Smith and Florida, 1994, Na and Lightfoot, 2006). Marshall (1890), Weber (1929) and Hirschman (1958) all demonstrated the importance of the agglomeration effect to the FDI. The traditional view of location is based on agglomeration economies that have been broadly applied in economics and economic geography (Krugman, 1991 b, Porter, 1998). The existence of agglomeration can enhance the attraction of regional foreign capital. And it is closely related to the quality of infrastructure, professional services, labor market and industrial clusters.

Various studies have shown that there is a positive correlation between agglomeration, and foreign direct investment (Coughlin et al., 1991, Wheeler and Mody, 1992, Braunerhjelm and Svensson, 1996). The relation between agglomeration and FDI inflow in Henan province is hypothesized as follows:

Hypothesis 4: The agglomeration positively influences FDI in Henan Province.

3.5. Openness

Openness is a dominant driving force in the development of the regional economy. Nguyen⁷⁾ ex-

7) Joseph Nguyen <http://www.investopedia.com/articles/economics/11/economic-benefits-country-liberalization.asp>

plains that the primary goals of economic liberalization are the free flow of capital between nations and the efficient allocation of resources and competitive advantages. The close relationship between local economic development and the international market, especially the import and export trade and the utilization of foreign capital, is an integral part of the marketization and capital elements. The higher the degree of openness in an area, the more perfect the supporting conditions of the market and the policy system, and the higher the opportunities for contacts and cooperation of transnational corporations, the more opportunities for attracting FDI. The proportion of FDI in the more open eastern coastal areas has been maintained at about 90% from 2001 to 2012, accounting for the vast majority of China's FDI (Yu, 2007). Scholars have confirmed that openness is closely related to FDI inflow and has a positive effect (Kerr and Peter, 2001, Cusi and Resmini, 2010). Thus, a hypothesis regarding the openness factor is proposed:

Hypothesis 5: The openness factor positively influences FDI inflow in Henan Province.

3.6. Labor supply

There is very little research on the impact of labor market supply on FDI. Billington (1999) is the first author to consider population as a variable; she uses population density as a determinant of FDI (AKIN, 2009). Population density implies a more concentrated consumer and labor market as well as a more integrated infrastructure (Billington, 1999). Labor supply should be a particular and crucial factor, especially in Henan province with the massive population in China. In densely populated areas, no matter where the investors are located, investors can get sufficient information and better supply of factors, have convenient transportation support and pay less for short-distance transportation costs, which is to form a regional homogeneous investment environment.

Henan Province is a populous province with ample labor and low labor costs. Foxconn chose to settle in Zhengzhou, Henan Province. It took only one month to negotiate, sign contracts and go into production (Zhai, 2010). The first condition negotiated with the local government at the time was that the government must be able to ensure adequate labor (Zhai, 2010). "Bloomberg Industry"⁸⁾ pointed out that Foxconn Technology Group and other electronics manufacturers have moved to factories in inland China to build factories, mainly because of "workers shortage" rather than wages. In this study, labor supply is expected to be positively related to FDI inflows into Henan province.

Hypothesis 6: Abundant labor resources have a positive effect on attracting FDI inflows in Henan province.

8) Bloomberg Industry (2013) <https://www.bloomberg.com/news/articles/2013-03-03/foxconn-inland-china-push-spurred-by-labor-bi-says>

3.7. Human capital

Foreign investors are naturally inclined to those areas with higher labor quality. If the local human capital quality is high, the companies can quickly recruit the available employees, and reduce the time of staff training, costs and increase profits for enterprises. Wheeler and Mody (1992) found that in the 1980s, multinational corporations in Japan and the United States were drawn by high-quality labor, and investment locations were mostly located in developed countries and regions. Scholars such as Cheng and Kwan (2000 b), Na and Lightfoot (2006), Xu et al. (2009), Liu et al. (2013) sustain that education becomes an increasingly important determinant. It is confirmed that the increase in human capital will help increase the overall level and the average level of FDI in the region. In comparison, the labor with higher education means higher cost. Kongrong and Yan (2002) made an econometric analysis to study the impact of human capital on the location selection and investment scale of FDI. The quantitative analysis shows that there is a significant negative relationship between the regional human capital and the amount of FDI, the size of the project because of the cost.

The focus in this study is not on workers with a high level of education, but more on the needs and verification of workers at different educational levels during particular periods. In the transition society phase, labor-intensive industries need workers with lower education quality. The FDI projects in this stage are mostly about labor-intensive, low-tech, and low-value-added sectors. Although investors still have requirements on the quality of labor, the conditions are not as high as that of the capital-intensive, high-tech and high-value-added sectors in the eastern developed regions. With the upgrading of industries, the investors will start to demand the higher education level of workers, the low education level workers cannot meet the requirements of quality, and negative effects begin to appear. The labor with higher education will have the positive impact on the FDI inflow. The hypothesis regarding the effect of the human capital on FDI can be proposed as follows:

Hypothesis 7.1: The labor with the lower secondary education level has a positive effect on FDI inflow at the initial stage, and it will become negative at the later stage with the upgrading of industries.

Hypothesis 7.2: The labor with the upper secondary education level has a positive effect on FDI inflow at the initial stage, and it will become negative at the later stage with the upgrading of industries.

Hypothesis 7.3: The labor with the tertiary education level has a negative effect on FDI inflow at the initial stage, and it will become positive at the later stage with the upgrading of industries.

3.8. Industry structure⁹⁾

When the foreign investors decide to invest in a region, they often choose an industry with the comparative advantages and the most needed production factors for related industries in the area. It could enable capital to obtain higher returns than investments in other sectors. Regions with distinct industrial structures have the different attraction to foreign capital. If the willingness of foreign investors to devote in the second industry is higher than that of investing in agriculture, then a region with a comparative advantage in agriculture will be less attractive to foreign investment than a part with second industrial comparative advantages. Sun and Yamori (2009) examined the impact of the industrial structure on the choice of location in China and concluded that the industrial structure of a region plays a significant role in the level of attraction in the area. Some articles used the ratio of the tertiary industry to GDP as an indicator of industrial optimization (Chen, 2005, Chen, 2012). Few previous studies have analyzed the impact of industrial structure on FDI.

Henan was a typical traditional society stage in the early time. At this stage, the economy was in backward. Production was mainly through manual labor. It was characterized by low technology, static society, and agriculture. As shown in Figure 4 above, it can also be seen that until 1990, the leading industry in Henan is still the primary industry. Since the 1990s, Henan has gradually begun to transfer to the transitional society and take-off stage. The transitional society is triggered by external influence, interest and market. The leading industry in this period is the primary industry and labor-intensive manufacturing sector. In the takeoff stage, it is the transition from the backward stage to the advanced stage, the production efficiency begins to improve, the science and technology play a role, and the agricultural productivity also increases accordingly. A large number of workers transferred from primary industries to manufacturing. Henan province with abundant and cheap population became the best ideal investment place for labor-intensive industries transferred from the developed eastern regions. It is more attractive for the investors to invest in agriculture-related primary sectors and labor-intensive secondary sectors. As for the tertiary sector, Henan has not reached the stages of maturity and mass consumption, and the level of industrial optimization is still far from enough. Therefore, it does not have a comparative advantage during this period, and thus it is not attractive to investors. Then, the hypothesis can be set as:

Hypothesis 8.1: As an agricultural province, the primary industry has a positive effect on the FDI inflow.

Hypothesis 8.2: As a province with lots of labor-intensive industries, the secondary industry has a

9) In the previous analysis of human capital, I will conduct different period's review and comparison. However, there is no way to compare the industrial structure in just 16 years (In the subsequent analysis, I have only 16 years of relevant data). Industry structure as the macroeconomic indicator in the national economy, its change is bound to have a certain lag and inertia. 16 years is too short, and it does not have enough material to support the observation in different phases.

positive effect on the FDI inflow.

Hypothesis 8.3: Due to tertiary industry with no comparative advantage, the tertiary industry has a negative effect on the FDI inflow.

4. The methodology

4.1. Data source

The data are from: "The Chinese City Statistical Yearbook", "Henan Statistical Yearbook", "Zhengzhou Statistical Yearbook", "Kaifeng Statistical Yearbook", "Luoyang Statistical Yearbook", "Anyang Statistical Yearbook", "Xinxiang Statistical Yearbook", "Hebi Statistical Yearbook", "Puyang Statistical Yearbook", "Jiyuan Statistical Yearbook", "Jiaozuo Statistical Yearbook", "Luohe Statistical Yearbook", "Sanmenxia Statistical Yearbook", "Pingdingshan Statistical Yearbook", "Shangqiu Statistical Yearbook", "Zhoukou Statistical Yearbook", "Xuchang Statistical Yearbook", "Zhumadian Statistical Yearbook", "Xinyang Statistical Yearbook" and the local statistical bulletin and the Bureau of statistics website. According to the original data of the above statistical materials, the data for 18 cities from 1999 to 2016 were obtained by sorting and calculation.

The reason for the selection of data after 1999 is that the utilization of foreign capital in some cities is relatively late and has a short history compared with other cities. To ensure consistency of statistical caliber, I will select the data after 1999 and try to ensure the accuracy of the original data in the process of integration. GDP and average wage are calculated in RMB unit. The amount of FDI inflow is also denominated in RMB unit. According to the average exchange rate between the United States dollar and the RMB in the past years, the amount of FDI inflow is converted from US dollar unit to RMB unit.

4.2. The specification of model

I intend to adopt panel data to study the regional influence factors of FDI in 18 cities of Henan province based on the Sun (1998) and Na and Lightfoot (2006)'s model that used the market, labor cost, infrastructure, agglomeration and openness. The time span is from 1999 to 2016, and the research object is 18 cities in Henan province. I will examine the impact of market factors, cost factors, FDI agglomeration effects, infrastructure, labor supply factors, and openness factors on FDI inflow and the following models are established:

$$FDI_j = f(GDP_j, GDPrate_j, WAGE_j, CFDI_j, FIXI_j, POPdensity_j, OPENNESS_j) \quad (1)$$

FDI_j denotes the total amount of FDI in the j^{th} region; GDP_j denote the market size in the j^{th} region;

Table 1 Description of the variables

Variables	Variable Name	Proxy Variable	+ / -
Dependent variable	FDI	Amount of actual used FDI inflow	
Independent variables			
Market size	GDP	GDP	+
Market potential (%)	GDPrate	GDP growth rate	+
Physical infrastructure	FIXI	Fixed investment	+
Labor cost	WAGE	Annual wage per employee	-
Agglomeration	CFDI	The stock of FDI inflows in the previous years	+
Labor supply	POPdensity	Population density	+
Degree of openness (%)	OPENNESS	Total import and export trade as a share of GDP	+
Dummy 2008	dummy 2008	Time dummy variable, if the year is 2008, it takes the value 1, otherwise it takes 0	
Labor quality (1)	SECLS	Number of enrolled students in the lower secondary school	+ / -
Labor quality (2)	SECUS	Number of enrolled students in the upper secondary school	+ / -
Labor quality (3)	TERS	Number of enrolled students in universities and colleges	- / +
Industry structure (1)	PRI	Proportion of the primary industry to GDP	+
Industry structure (2)	SEC	Proportion of the secondary industry to GDP	+
Industry structure (3)	TER	Proportion of the tertiary industry to GDP	-

Data sources: Statistical Yearbook of Henan province and Statistics Bulletin of the National Economic and Social Development of Henan province, during the time period (1999-2017).

GDPrate_j denotes market potential in the j^{th} region; WAGE_j denotes the cost of labor in the j^{th} region; CFDI_j denotes the degree of aggregation of FDI in the j^{th} region; FIXI_j denotes infrastructure in the j^{th} region; POPdensity_j denotes labor supply in the j^{th} region. The dependent variable is the amount of foreign direct investment (FDI)¹⁰. I intend to use GDP and GDP growth rate to measure the level of local economic development and market potential; the average wage to measure labor costs; total investment in fixed assets to measure the level of infrastructure¹¹; the cumulative stock of FDI inflow to measure the agglomeration effect; total import and export trade as a share of GDP to measure the openness; population density to measure the labor supply; number of enrolled students in the lower secondary

10) FDI data published in China include the amount of the agreed investment, the actual use of the amount of investment and the number of the agreed items. Compared with the actual amount of investment, the amount of the agreed investment is indeterminate in whether the fund is in place and the scales of the items are different. Given the availability and authenticity of the data, this article selects the actual amount of foreign investment (unit: \$10000) to represent the FDI, so that it can more accurately reflect the changes in the investment. All data are from the yearbooks of Henan statistical yearbook during 1999-2017.

11) Qianshan use railway density and road density QINGSHAN, W. & RENFEI, W. 2005. The location choice of infrastructure and foreign direct investment. *Journal of the Graduate School of the Chinese Academy of Social Sciences*, 27-33. Guoming measured infrastructure by road density, etc GUOMING, X. & CHANGZHI, Y. 2009. Location decision of foreign direct investment in China — spatial econometric analysis based on regional data. *World economic research*, 2009, 60-64. However, these data are not fully available at the city level. The national statistics department only provides data at the provincial level. Based on the principle of data availability, I finally took Henan Province's total investment in fixed assets to express the level of infrastructure in Henan.

school, the upper secondary school and tertiary school to measure the level of labor quality¹²); proportion of the primary, secondary and tertiary industry to GDP to measure the Industrial advantages; and the 2008 financial crisis to be tested as a time dummy variable (See table 1).

The small variance in the data is required to obtain more correct and consistent results from the regression model (Sattarov, 2012). Therefore, the issue of variance needs to be concerned first. The basic model is extended to a log-linear model to reduce the variance in the data over the years, to eliminate the influence of different units of the variables and to transform a likely nonlinear relationship between the FDI inflows and the explanatory variables into a linear relationship; some of the variables are taken into natural logarithm form. All location determinants are lagged by one (1) period. It was due to two reasons: Firstly, decisions to undertake FDI in a current year will not be realized in the sense that actual FDI flows do not eventuate until a year later, in other words, multinationals FDI activities in a given year are based on information gathered from the previous year (Liu et al., 2013). Secondly, for the possible interrelationship between FDI and explanatory variables, for example, larger market may attract more FDI, and more FDI causes further expansion of market scale, which can result in endogenous causality. The lag explanatory variables will be to purge their estimates of endogeneity (Bellemare et al., 2017, Greene, 2000, Elango et al., 2008). In this way, I get a basic model (1). The empirical strategy was to establish a benchmark model for determinants of FDI inflows and then apply the same model with more detailed factors. Henan is an essential agricultural province with the massive population in China. Therefore, the study will conduct an in-depth review of labor quality and industrial structure in addition to the basic model (1). Thus, I establish the following equation to test the determinants of FDI inflows into Henan province, and the basic model takes the following form:

$$\ln FDI_{it} = \beta_0 + \beta_1 \ln GDP_{it-1} + \beta_2 GDPrate_{it-1} + \beta_3 \ln FIXI_{it-1} + \beta_4 \ln WAGE_{it-1} + \beta_5 \ln CFDI_{it-1} + \beta_6 \ln popdensity_{it-1} + \beta_7 OPENESS_{it-1} + \mu_{it} \quad (\text{Model 1})$$

Where, $\ln FDI$ is the dependent variable which refers to the amount of FDI inflow of 18 cities; $\ln GDP$, $GDPrate$ (percent), $\ln FIXI$, $\ln WAGE$, $\ln CFDI$, $\ln POPdensity$ and $OPENESS$ (percent) are independent variables, which refers to the GDP, GDP growth rate, average wages, fixed investment, the cumulative stock of FDI inflows in the previous year, Population density, total export and import trade as

12) Both primary education and lower secondary school education belong to the nine-year compulsory education stage and are enforceable by law. Therefore, it is meaningless to test the labors with primary school education level. The registration rate of nine-year compulsory education in recent years is basically 99% BUREAU, H. P. S. 2017. Henan Provincial Statistical Yearbook of 1986. Beijing: China Statistics Press.. In other words, the labors can basically reach the lower high school education level and it is why China's legal minimum working age is 16 years old.¹² Therefore, I will selected lower secondary school, upper secondary school and higher education workers conduct further in-depth studies to identify the level of the main labors to attract FDI.

a share of GDP. β_0 is a constant term. $\beta_1, \beta_2, \beta_3, \dots, \beta_8$ are the coefficient of independent variables; i refers to ($i = 1, 2, 3, 4 \dots 18$) a city; t refers to year from 1999-2016, ($t = 1, 2, 3, 4 \dots 20$); μ_{it} is an error term.

Explored labor quality mode 2:

$$\ln FDI_{it} = \beta_0 + \beta_1 \ln GDP_{it-1} + \beta_2 GDPrate_{it-1} + \beta_3 \ln FIXI_{it-1} + \beta_4 \ln WAGE_{it-1} + \beta_5 \ln CFDI_{it-1} + \beta_6 \ln popdensity_{it-1} + \beta_7 OPENESS_{it-1} + \beta_8 \ln SECLS_{it-1} + \mu_{it} \quad (\text{Model 2.1})$$

$$\ln FDI_{it} = \beta_0 + \beta_1 \ln GDP_{it-1} + \beta_2 GDPrate_{it-1} + \beta_3 \ln FIXI_{it-1} + \beta_4 \ln WAGE_{it-1} + \beta_5 \ln CFDI_{it-1} + \beta_6 \ln popdensity_{it-1} + \beta_7 OPENESS_{it-1} + \beta_8 \ln SECUS_{it-1} + \mu_{it} \quad (\text{Model 2.2})$$

$$\ln FDI_{it} = \beta_0 + \beta_1 \ln GDP_{it-1} + \beta_2 GDPrate_{it-1} + \beta_3 \ln FIXI_{it-1} + \beta_4 \ln WAGE_{it-1} + \beta_5 \ln FDI1_{it-1} + \beta_6 \ln popdensity_{it-1} + \beta_7 OPENESS_{it-1} + \beta_8 \ln TERS_{it-1} + \mu_{it} \quad (\text{Model 2.3})$$

Explored industry structure model 3:

$$\ln FDI_{it} = \beta_0 + \beta_1 \ln GDP_{it-1} + \beta_2 GDPrate_{it-1} + \beta_3 \ln FIXI_{it-1} + \beta_4 \ln WAGE_{it-1} + \beta_5 \ln FDI1_{it-1} + \beta_6 \ln popdensity_{it-1} + \beta_7 OPENESS_{it-1} + \beta_8 PRI_{it-1} + \mu_{it} \quad (\text{Model 3.1})$$

$$\ln FDI_{it} = \beta_0 + \beta_1 \ln GDP_{it-1} + \beta_2 GDPrate_{it-1} + \beta_3 \ln FIXI_{it-1} + \beta_4 \ln WAGE_{it-1} + \beta_5 \ln FDI1_{it-1} + \beta_6 \ln popdensity_{it-1} + \beta_7 OPENESS_{it-1} + \beta_8 SEC_{it-1} + \mu_{it} \quad (\text{Model 3.2})$$

$$\ln FDI_{it} = \beta_0 + \beta_1 \ln GDP_{it-1} + \beta_2 GDPrate_{it-1} + \beta_3 \ln FIXI_{it-1} + \beta_4 \ln WAGE_{it-1} + \beta_5 \ln FDI1_{it-1} + \beta_6 \ln popdensity_{it-1} + \beta_7 OPENESS_{it-1} + \beta_8 TER_{it-1} + \mu_{it} \quad (\text{Model 3.3})$$

5. Empirical results

5.1. Descriptive data analysis

First, make descriptive statistical analysis of panel data to understand the basic information of the data. The sample size, mean, standard deviation, maximum and minimum values of all variables are shown in table 2. According to the data in the table, this paper adopts the panel data of 18 cities in 20 years, and the sample size is 324. The observed variables are $\ln FDI$, $\ln GDP$, $GDPrate$, $\ln FIXI$, $\ln WAGE$, $\ln CFDI$, $\ln POPdensity$ and $OPENESS$. $\ln FDI$ is the explanatory variable. There are no abnormal data.

Table 2 Descriptive Statistics of Variables, 1999-2016

Variable	Obs	Mean	Std. Dev.	Min	Max
LnFDI	324	11.42	1.501	7.284	14.82
lnGDP	324	6.551	0.923	3.965	9.001
GDPrate (%)	324	11.52	3.029	1.700	21.90
lnFIXI	324	5.853	1.345	2.194	8.853
lnWAGE	324	9.754	0.706	8.406	11.01
lnCFDI	324	12.98	1.355	10.10	16.72
lnpopdensity	324	6.462	0.424	5.323	7.175
OPENESS (%)	324	5.854	7.877	0.248	48.58
lnSECLS	324	12.31	0.738	10.08	13.45
lnSECUS	324	11.72	0.731	9.656	13.24
lnTERS	324	0.880	1.389	-2.303	4.488
PRI (%)	324	17.10	9.338	1.930	45.60
SEC (%)	324	53.43	10.38	28.10	76.70
TER (%)	324	29.41	6.659	0.305	51.28
Dummy 2008	324	0.055	0.229	0	1

5.2. Correlation analysis of variables

The analysis of the correlation between variables is shown in table 4. From the Pearson correlation coefficient matrix among the variables in the table, it can be seen that there is a significant correlation between lnFDI and other variables. Half of the correlation coefficients are above 0.5, indicating that the selected variables are linearly related to the explanatory variables and linear regression analysis can be performed. Although some variables have a weaker correlation with lnFDI, we cannot think that it has no effect without considering other factors.

The coefficients between lnGDP, lnFIXI, lnWAGE and lnCFDI are 0.9689, 0.811 and 0.8844; the coefficients between lnFIXI, lnWAGE and lnCFDI are 0.9037 and 0.9147 and the coefficients between lnWAGE AND lnCFDI is 0.8753. The variables with high correlation are mainly lnGDP, lnFIXI, lnWAGE and lnCFDI. The remaining correlations are all well below 0.80, the point beyond which the threat of multicollinearity becomes a real concern (Judge et al., 1988). In the subsequent regression analysis, so in the following panel data analysis, I will do a respective regression using these variables to avoid serious multicollinearity problems and ensure the accuracy of the estimation results. Apart from this, under normal circumstances, there was no serious multicollinearity problem.

5.3. Model estimation

5.3.1. Diagnoses of the model

The test step of model selection based on the method of Xiangguang and Xuanhua (2009). There are usually three choices for the estimation of the econometric model of Panel data: the pooled OLS model, the fixed effect model and the random effects model. The model's selection needs to be tested that is the F test to determine the pooled OLS model and fixed effect model, Breusch and Pagan LM

test to determine and the pooled OLS model and random effect model, the Housman test to determine the fixed effect model and the random effects model. In the previous multicollinearity among variables, I will first perform a diagnosis based on the basic model (1) of the exclusion variable $\ln GDP$, $\ln FIXI$, $\ln WAGE$ and $\ln CFDI$. After determining the estimation of the basic model, other estimates based on the basic model will also be more accurate and effective under this diagnostic result.

Pooled OLS model and fixed effect model. I use the F test to verify that if the null hypothesis is rejected (Pooled OLS model). I perform the F-test to decide on whether to keep the pooled OLS or fixed effect model in STATA. With the xtreg command in STATA we can calculate F statistic and the corresponding P value: $F(17, 339) = 27.03$ and $\text{Prob} > F = 0.0000 < 0.05$. It shows that the fixed effect is very significant, that is, the fixed effect model is better than the pooled OLS model. As can be seen from table 3, the results of the model F test reject the null hypothesis, that is, the Pooled OLS model. Then the fixed effect model is more explanatory and more accurate.

Pooled OLS model and random effect model. Breusch and Pagan (1980) construct LM statistics based on the residuals estimated by OLS. If the null hypothesis is rejected, there exists the random effect. Use the xttest 0 command in STATA to perform the Breusch and Pagan LM test, and the corresponding LM statistic is 25.52, P value is 0.0000 (See table 5). It can be seen that the random effects model is superior to the pooled OLS model. As to which of the fixed effect model and the random effects model is better, then we next use the Hausman to test.

Fixed effect model and random effect model. The fixed effect model will be chosen if the null hypothesis

Table 3 The relationship between FDI and variables that are used in this study during 1999-2016

	$\ln FDI$	$\ln GDP_{t-1}$	$GDP_{Prate,t-1}$	$\ln FIXI_{t-1}$	$\ln WAGE_{t-1}$	$\ln CFDI_{t-1}$	$\ln openness_{t-1}$	$\ln SECLSt_{t-1}$	$\ln SECUSt_{t-1}$	$\ln TERS_{t-1}$	$PRIt_{t-1}$	$SECI_{t-1}$	TER_{t-1}	Dummy 2008
$\ln FDI$	1													
$\ln GDP_{t-1}$	0.851	1												
$GDP_{Prate,t-1}$	-0.0579	-0.1339	1											
$\ln FIXI_{t-1}$	0.9037	0.9689	-0.1194	1										
$\ln WAGE_{t-1}$	0.893	0.811	-0.1181	0.9037	1									
$\ln CFDI_{t-1}$	0.9386	0.8844	-0.1736	0.9141	0.8753	1								
$\ln openness_{t-1}$	0.1732	0.2414	-0.0156	0.1716	0.1073	0.1927	1							
$\ln SECLSt_{t-1}$	0.2563	0.1697	0.2141	0.1843	0.2361	0.2693	0.0603	1						
$\ln SECUSt_{t-1}$	-0.1025	0.2927	-0.1095	0.1358	-0.2216	-0.0502	0.2602	-0.3728	1					
$\ln TERS_{t-1}$	0.4512	0.7568	0.0362	0.6471	0.3252	0.4865	0.288	0.7601	0.7828	1				
$PRIt_{t-1}$	0.6896	0.8473	0.0036	0.7765	0.5706	0.7285	0.3201	0.3466	0.3258	0.1315	-0.2985	1		
$SECI_{t-1}$	-0.5357	-0.3096	-0.1366	-0.3741	-0.5232	-0.5422	0.0547	0.5962	-0.3752	-0.0602	-0.7938	-0.4271	1	
TER_{t-1}	0.32	0.0402	0.3128	0.1388	0.3686	0.2629	-0.0468	0.3813	-0.7232	0.4027	-0.185	-0.4271	-0.185	1
Dummy 2008	0.2688	0.3801	-0.2881	0.3138	0.1745	0.37	0.0128	0.1406	0.2786	0.5226	-0.0427	0.1035	-0.0991	1
	-0.0321	0.0618	0.1238	0.0606	0.0452	0.0053	-0.0126	0.0423	-0.0148	0.0868	0.0719	-0.0427	0.1035	-0.0991

Table 4 The result of F-test of basic model (1).

F test for Pooled OLS model and fixed effect model
H_0 = Pooled OLS model H_1 = Fixed effect model
$F(17, 302) = 27.03$
$\text{Prob} > F = 0.0000 < 0.05$

Table 5 The result of Breusch and Pagan LM test of basic model (1)

Breusch and Pagan LM test for Pooled OLS model and Random effect model
H_0 = Pooled OLS model H_1 = Random effect model
$\text{Chibar } 2(01) = 25.52$
$\text{Prob} > \text{chibar } 2 = 0.0000$

Table 6 The result of Housman test of basic model (1)

Housman Test for Fixed effect model and Random effect model
H_0 = Pooled OLS model H_1 = Random effect model
$\text{chi } 2(4) = 158.44$
$\text{Prob} > \text{chi } 2 = 0.0000$

was rejected through the Housman Test. We have reported all $\text{Prob} > \text{chi } 2 = 0.0000 < 0.05$, meaning that all the null hypotheses can be rejected, RE model is not appropriate; rather FE model should be accepted (See table 6). Therefore, we should choose the fixed effect model to estimate.

5.3.2. Robustness check for fixed effect model

In general, there are very strict requirements for the fixed effect model. Although heteroscedasticity is always a potential problem, autocorrelation may be more critical in some applications (Wooldridge, 2010). When performing FE model to estimate, it may have a very strong sequence correlation, and the standard errors obtained can lead to severe errors. The Woodridge test can be used to test the autocorrelation. Further modified Ward tests can be used to test the heteroscedasticity. If there is a first-order autocorrelation or heteroscedasticity, both should be corrected to ensure the accuracy and validity of the model.

First-order autocorrelation test.

Null hypothesis: H_0 : There is no first-order autocorrelation.

Wooldridge test reveals first order autocorrelation in the panel, The F statistic value of the Wooldridge test is $F(1,17) = 53.554$ and P-value is $0.0000 < 0.05$, which indicate that the null hypothesis are rejected at the significance level of 95%, and there exists the first-order autocorrelation. (See table 7).

Heteroscedasticity test. The results of Modified Wald test show that the P value is well below 0.05. (See table 8). Therefore, it rejects the null hypothesis that there is no homoscedasticity and the model exists groupwise heteroskedasticity.

Table 7 The result of auto-correlation test of basic model (1)

Wooldridge test for autocorrelation in panel data
H_0 : no first-order autocorrelation $F(1,17) = 53.554$ $\text{Prob} > F = 0.0001$

Table 8 The result of heteroskedasticity test of basic model (1)

Modified Wald test for groupwise heteroskedasticity
H_0 : homoscedasticity $\chi^2(18) = 208.83$ $\text{Prob} > \chi^2 = 0.0000$

If heteroskedasticity or autocorrelation occurs during model estimation, FGLS is more effective under heteroskedasticity or autocorrelation (Chen, 2015).

5.4. Estimated results

5.4.1. Basic model analysis

I use the FGLS model to estimate. In Panel Data analysis, the fitting effect of model regression is mainly based on the t-test value (t-stat) and its probabilistic P value (Prob 1). The larger the t-test value, the smaller the value of P, and the higher the confidence of the parameter estimation; conversely, the t-test value is lower and the P value is larger, indicating that the endogenous variable is not significant. Observe the P value of each model variable in Table 9, and the overall fitting effects of the model are good. Therefore, the regression results are suitable for analysis. To avoid the severe multicollinearity, I respectively regressed the variables with the correlation coefficients of more than 0.8: $\ln\text{GDP}$, $\ln\text{WAGE}$, $\ln\text{CFDI}$, and $\ln\text{FIXI}$. From Table 9 we can see: the models bring no more changes; coefficients, signs, standard errors and significant levels stay nearly the same, which indicates the model is robust.

FGLS model obviously explained more significantly. The results of the FGLS models show that GDP reflecting the market size, the GDP growth rate reflecting the market growth potential, population density reflecting the labor supply, the wage reflecting the labor cost, the stock of FDI showing the aggregation effect, the fixed investment reflecting the infrastructure and the openness reflecting the degree of openness are all significant at the less than 1% level, which means that the above-mentioned influencing factors have significantly affected FDI inflow in Henan Province. Some coefficients of the variables have the expected sign, but there are also still the coefficients of factors are not as expected.

Market potential. The market potential has a positive correlation with FDI inflow and statistically significant at less than 1%, which is consistent with the prior literature and hypothesis. Although GDP in some cities is relatively low, GDP growth has been rapid in recent years, and the actual use of FDI growth has ranked at the forefront of the province, such as Jiyuan. It shows that foreign direct investors

Table 9 Regression results summary

	Dependent variables: lnFDI				
	FGLS model (1)	FGLS model (2)	FGLS model (3)	FGLS model (4)	FGLS model (5)
GDPrate _{t-1}	0.0462*** (0.00128)	0.0304*** (0.00109)	0.0216*** (0.00201)	0.0418*** (0.00113)	0.0472*** (0.00214)
OPENESS _{t-1}	-0.0200*** (0.000297)	-0.0222*** (0.000373)	-0.0123*** (0.000724)	-0.0185*** (0.000378)	-0.0195*** (0.000591)
lnpopdensity _{t-1}	1.741*** (0.0448)	1.720*** (0.0335)	1.184*** (0.0669)	1.830*** (0.0541)	1.738*** (0.0962)
Dummy 2008	-0.314*** (0.0112)	-0.407*** (0.0129)	-0.419*** (0.0347)	-0.364*** (0.0127)	-0.278*** (0.0221)
lnFIXL _{t-1}		0.765*** (0.0172)			
lnGDP _{t-1}			1.068*** (0.0570)		
lnWAGE _{t-1}				0.831*** (0.0499)	
lnCFDI _{t-1}					0.216*** (0.0264)
Constant	-471.2*** (2.836)	-130.5*** (10.17)	-186.9*** (16.04)	-259.0*** (11.19)	-376.7*** (9.964)
Observations	324	324	324	324	324
Number of regions	18	18	18	18	18

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

also emphasize the market potential of a region. The higher the market potential, the higher the rates of return on investment, the more willing foreign investors are to invest in the area.

Openness. Table 9 shows that the openness has statistically significant and negative effect on FDI inflow. It is not in line with expectation and hypothesis. In general, openness has a positive effect on attracting FDI (Majocchi and Strange, 2007). There are two explanations. First, like Wheeler and Mody (1992)’s studies on Brazil, FDI will consciously choose to enter the region for investment in order to avoid trade barriers. So the more closed the area, the more investors choose to invest to get around the tariff, which basically happens in areas with heavy tariff protection or local protection. Compared to making investments, enterprises are more likely to enter that region in the form of trade. In regions where the degree of openness is lower, local protection is more serious. In order to enter the local market to get the exclusive monopoly interest in the region; investment will become a better choice. Henan is relatively closed, economically backward, and local protection is also serious. Second, the foreign export scale in Henan Province is small. The products exported are mainly resource-intensive and labor-intensive products, accounting for more than 80% of the total exports in 2006 (Yang, 2010). Because of the large proportion of resource products and Labor-intensive products in the export of Henan, the export of resource and labor-intensive-based products will reduce the attraction capacity of the resource and labor resources advantages to FDI. However, if the analysis scope is placed in the whole China re-

gion, the effects of openness are basically consistent with the previous expectations, and the openness is positively correlated with FDI inflow (Kerr and Peter, 2001, Cusi and Resmini, 2010). Only when the analysis area is placed in a specific small area, the result will be utterly contrary to expectation. In another central province near Henan, Shanxi, a large province of exporting resources, has also had the same situation. Openness is negatively related to FDI, and this area is located in the interior of China. The economy is also backward, not very open, local protection is serious and resource exports have reduced its comparative advantage (Hanjun, 2011). In Rongtian Liu (2005)'s article, he studied the geographical distribution of FDI, and conducted a comparative analysis of China's western, central and eastern regions. He also found that there was a negative correlation between openness and FDI in the central region.

Labor supply. The regression results in table 9 show that population density has a positive effect on FDI inflow and statistically significant at less than 1%. The results are consistent with the previous expectation and hypothesis. The population density can, to a certain extent, reflect the market scale potential of the region and the labor supply capacity.

Infrastructure. The coefficient of the $\ln\text{FIXI}$ variable that infrastructure attracts FDI inflows is 0.765, and it is statistically significant at less than 1%, which means that labor cost increase by 1%, the actual use of FDI in the area will increase by 0.765%. It shows that FDI flows into Henan are affected by infrastructure and have a positive effect. Infrastructure level is positively correlated with FDI, which is consistent with the findings of Wheeler and Mody (1992), Cheng and Kwan (2000 a).

Market size. The estimation result shows that GDP has a positive effect on FDI inflow and statistically significant at less than 1% and the coefficient of $\ln\text{GDP}$ is 1.068, which indicate that if the other explanatory variables are unchanged, GDP increase by 1%, the actual use of FDI in the area will increase by 1.068%. It is consistent with the hypothesis and many kinds of literature. Tuan and Ng (1995), Head and Ries (1996), Broadman and Sun (1997), Wei et al. (1999) proved that provinces with the enormous amount of GDP, high level of per capita GDP and high growth rate of GDP would attract more FDI. Therefore, it also can explain to a certain extent that the cities such as Zhengzhou, Luoyang, and Luohe, which have the highest per capita GDP in the region, attract more FDI than other cities.

Labor cost. The result shows that the FDI inflow in Henan is very sensitive to the changes in labor costs and has a positive effect. The coefficient is 0.831, and the significant degree is within 1%, which shows that labor cost increase by 1%, the actual use of FDI in the area will increase by 0.831%. The foreign companies tend to invest in areas with high wage levels. This is a conclusion contrary to most of the prior literature. FDI inflow is generally negatively related to cost, which has been verified in many studies (Wei et al., 1999, Xueqiang and Shengxue, 1995, Fung et al., 2000, Sun et al., 2002, Belderbos and Carree, 2002). And there are also a few studies that show that FDI is positively related to labor costs (Coughlin and Segev, 2000, Chen, 1996, Broadman and Sun, 1997, Head and Ries, 1996).

One explanation for this is that labor cost is an indirect measure of labor quality. The high wage means higher quality of labor. In the process of industrial optimization and upgrading, investors began to emphasize the quality of laborers and can tolerate increases in costs.

Henan is the most populous province in China with the very abundant human resource. Labor cost has been meager compared to other regions in China (As shown the Figure 4 above). In fact, at the national level empirical analysis of China, mainly the labor costs are negatively correlated with FDI (Cheng et al., 2017, Li et al., 2017, Huang and Dennis Wei, 2016, Meisheng, 2014). In 2017, Henan's per capita income ranked 23 rd among 31 provinces, municipalities, and autonomous regions. Henan Province has already been selected as an ideal region with cheap labor costs and met the labor cost requirements of investors. Why are the results different from some expectation? As mentioned in the previous hypothesis formation analysis, it can only be said that it is a dynamic process. With the changes in industrial policies and leading industries, the effects of labor costs are also changing. Investors gradually began to demand the quality of labor. Higher-paying wages can attract better-quality workers. It involves the demand for the quality of labors in different stages, and it is better to do a comparative analysis between different stages together with human capital factors. Therefore, a more in-depth analysis of labor costs with the human capital should be carried out in the following extended model 2.

Agglomeration. Agglomeration factors have a significant and positive impact on the FDI inflow. The coefficient of $\ln\text{FIXI}$ is 0.216, which shows that if the other explanatory variables are unchanged, the stock of FDI in the past year increased by 1%, the actual use of FDI in the area will increase by 0.216%, which is the same as the hypothesis. The stock of FDI inflow has a significant positive pull effect on attracting FDI, which consistent with Long (2011), Hanmin (2008), Meisheng (2014) and Jiaojiao (2014). It indicates that FDI companies attach great importance to choosing regions where foreign enterprises are concentrated.

The financial crisis in 2008 undoubtedly has the significant and positive impact on the FDI inflow. The flow of capital is greatly affected by the international environment.

5.4.2. Model Analysis from the perspective of labor quality

In Table 10 column model 2.1 reports estimation results of basic model (1) with the variable $\ln\text{SECLS}$ accounting for the impact of the number of lower secondary school enrolled students on FDI inflow, while regressions in columns mole 2.2 and 2.3 explore the empirical impact of the indicators that refer to the labors with upper secondary school educational level and the labors with tertiary school educational level. The $\ln\text{GDP}$, $\ln\text{CFDI}$, $\ln\text{FIXI}$ and $\ln\text{WAGE}$ variables in the previously established models 2.1, 2.2, 2.3 have high coefficients of correlation; it will lead to multicollinearity and will affect the accuracy of the estimation results. Workers' wages are an irreplaceable factor in attracting FDI in transition and take-off stages in Henan Province and very close related to the human capital factor. While examining the impact of different education levels of labor on FDI, wages are bound to be a very

Table 10 Empirical results with human capital variables

Dependent variables: lnFDI			
Models	FGLS model (2.1)	FGLS model (2.2)	FGLS model (2.3)
GDPrate _{t-1}	0.0336*** (0.00126)	0.0285*** (0.00153)	0.0323*** (0.00145)
OPENESS _{t-1}	-0.00825*** (0.000329)	-0.00773*** (0.000412)	-0.00829*** (0.000465)
lnpopdensity _{t-1}	1.765*** (0.0860)	1.699*** (0.0869)	1.752*** (0.0996)
lnWAGE _{t-1}	0.698*** (0.0376)	0.621*** (0.0455)	0.657*** (0.0484)
Dummy 2008	-0.347*** (0.0192)	-0.327*** (0.0305)	-0.340*** (0.0264)
lnSECLS _{t-1}	0.120*** (0.0341)		
lnSECUS _{t-1}		0.123*** (0.0228)	
lnTERS _{t-1}			0.0277** (0.0116)
Constant	-299.7*** (8.580)	-301.5*** (11.28)	-294.6*** (12.37)
Observations	324	324	324
Number of regions	18	18	18

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

important reference factor. Therefore, lnWAGE will be selected in combination with the quality of labor to conduct a comprehensive inspection.

Table 10 shows the labors with different level of education in Henan have positive correlations to the inflow of FDI and statistically significant at less than 1%. The coefficient of the lower secondary education level is 0.120, which means that the number of lower secondary schools enrolled students is increased by 1%, the actual use of FDI in the region will increase by 0.12%. The coefficient of the upper secondary education level is 0.123, which means the number of upper secondary schools enrolled students is increased by 1%, the actual use of FDI in the region will increase by 0.123%. The coefficient of the tertiary educational level is 0.0277, which means the number of tertiary schools enrolled students is increased by 1%, the actual use of FDI in the region will increase by 0.0277%. The estimation results show that the inflow of FDI requires all education level workers. At the same time, the wages-indirect measure of the quality of the labor has positive effects on FDI inflow. Henan is in the process of rapid economic development, from the previous figure 4. In the early period of Henan, it was transferred from the agricultural society to the transitional society stage, and then it entered the take-off stage. In recent years, FDI inflows have increased tenfold compared to the past, and workers' wages have also shown accelerated growth, which in turn masks the actual impact of early labor quality and labor costs. Therefore, it is necessary to conduct a phased comparative analysis based on important time

Table 11 Empirical results with human capital variables during 1999-2007 and 2009-2016

	Dependent variables: lnFDI					
	1999-2007 FGLS Model 2.1	2009-2016 FGLS model 2.1	1999-2007 FGLS Model 2.2	2009-2016 FGLS Model 2.2	1999-2007 FGLS Model 2.3	2009-2016 FGLS Model 2.3
GDPrate _{t-1}	0.0507*** (0.00911)	0.0180*** (0.00448)	0.0478*** (0.00889)	0.0204*** (0.00461)	0.0518*** (0.00950)	0.0249*** (0.00416)
OPENESS _{t-1}	-0.0100 (0.0158)	-0.00702*** (0.00199)	-0.00912 (0.0149)	-0.00961*** (0.00291)	-0.00276 (0.0158)	-0.00786*** (0.00190)
lnpopdensity _{t-1}	2.625* (1.407)	1.303*** (0.173)	3.725*** (1.294)	1.211*** (0.188)	3.510** (1.571)	1.334*** (0.157)
lnWAGE _{t-1}	-0.185 (0.316)	0.504*** (0.0908)	-0.233 (0.315)	0.545*** (0.109)	-0.295 (0.365)	0.617*** (0.0743)
lnSECLS _{t-1}	0.236 (0.203)	-0.224** (0.0885)				
lnSECUS _{t-1}			0.407** (0.191)	-0.451*** (0.122)		
lnTERS					-0.195* (0.101)	0.0347 (0.0605)
Constant	-501.9*** (91.33)	-239.7*** (26.37)	-407.3*** (110.1)	-218.8*** (33.08)	-611.2*** (141.8)	-214.2*** (17.75)
Observations	162	144	162	144	162	144
Number of region	18	18	18	18	18	18

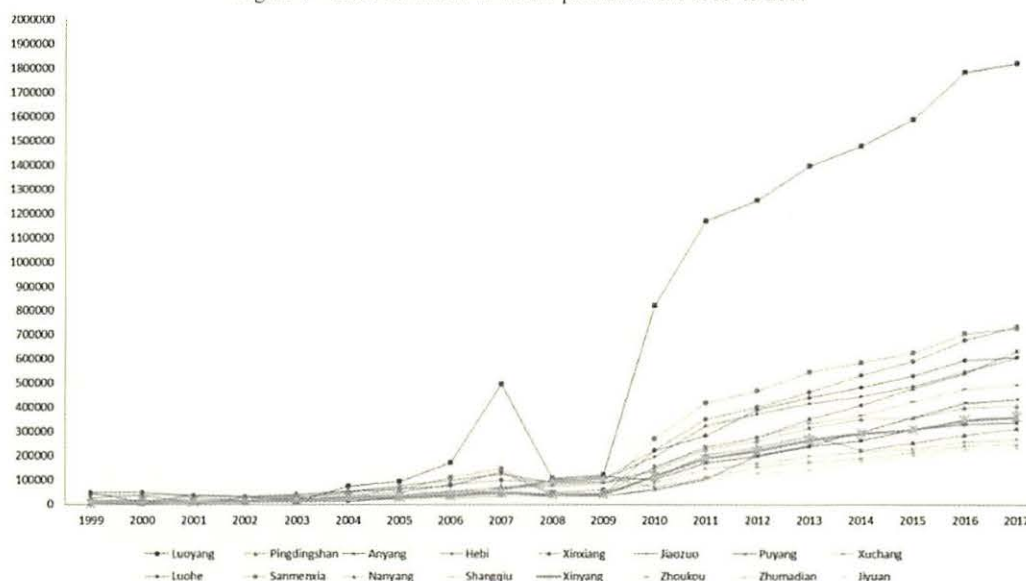
Standard errors in parentheses ***p<0.01, **p<0.05, *p<0.1

points of industrial transformation.

As shown in Table 10 and figure 9, from 1999 to 2016, due to the external factors of the 2008 world financial crisis, the foreign direct investment inflows in 2008 showed considerable fluctuations. The focus of this study is on local regional factors. If the two-stage comparative analysis is further carried out, the sample size will inevitably become smaller, and no matter which stage of the 2008 data is in, it will have an inevitable and fatal interference effect on the result. Therefore, although 2008 is the critical time node, it is necessary to eliminate the most profound external influence in 2008 and to ensure the accuracy of the two phases. In 2008, affected by the financial crisis, the Chinese government began to introduce various policies to guide industrial upgrading. From the previous figure 4, we can also see that in Henan's industrial structure, the secondary industry began to decline in 2009, and the tertiary sector began to rise. Changes in the industry will also directly lead to corresponding changes in the quality of labor demand. So the time node selection for 2008 is more appropriate.

Table 11 shows the changes in the level of education and labor cost factors affecting FDI inflows at different stages. No matter at what time, the growth rate, openness and population density of GDP have not changed, and has always had the same impact on FDI inflow. However, it is worth noting that although the supply of labor force has ever had a positive effect on FDI, its influence is gradually weakening, and the coefficient of lnpopdensity changes from 2.625 to 1.303, from 3.725 to 1.211 and from 3.510 to 1.334 respectively. It confirms that with the upgrading of industries, labor-intensive industries

Figure 5 The FDI inflow in Henan province from 1999 to 2017

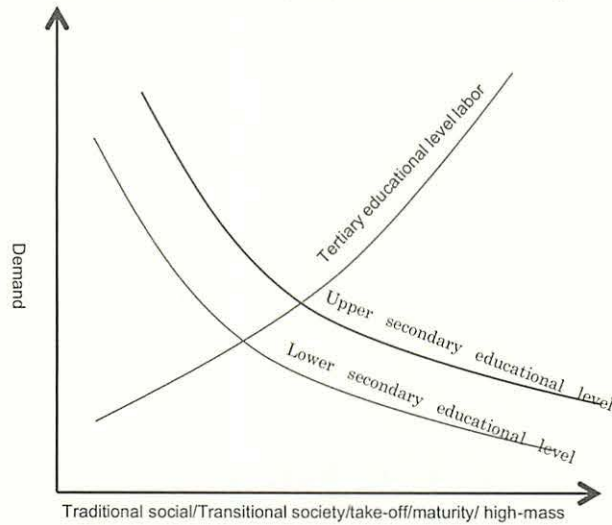


Note: Made by the author. Source: Henan Statistical Yearbook 2017

have changed since 2008, and the corresponding labor supply has reduced its effect of attracting FDI. The variables that change at different stages are only the variables of the workers - wages and education levels. The column model 2.1 shows that the variable $\ln SECIS$ have weak positive effect during 1999-2007, while it becomes the significant and negative effect on FDI inflow during 2009-2016. The column model 2.2 reveals that the variable $\ln SECUS$ has the positive impact and statistically significant at less than 5% during 1999-2007, while it becomes negative effect and statistically significant at less than 1% on FDI inflow. The column model 2.3 shows that the variable $\ln TERS$ has the statistically significant and negative effect in the first period and then becomes the positive effect on FDI inflow. At the same time, wages have also shifted from negative to positive in all the models. It indicates that in the early transitional society, the leading industries were low-tech and labor-intensive industries.

Labor-intensive sectors emphasize the costs, and low wages are easily attracted to related FDI projects, especially from the coast (see Figure 2). Low-wage, low-tech industries can only attract laborers with low educational level, which is why the estimation results show that the variables with lower education levels have a positive effect on FDI and wages have a negative effect. With the upgrading of the industry and government guidance, in preparation from the take-off to maturity stage, the technological content of the leading industries increase, the high quality of laborers will be required, and wages will rise accordingly. It is why from 2008 onwards, workers with a lower education level started to have a negative effect on FDI, and workers with a higher education level turn positive from the previous negative effects. Figure 10 illustrates the demands of labors with diverse levels of education at different stages. In the initial phase of the economy, due to the characteristics of the leading industries, there is

Figure 6 Demand for the quality of labors at different stages



Note: Made by the author

more demand for low-education labors and less demand for high-education labor, but with the upgrading of industries, economic development, and the demand for low-education labor decrease, while the demand for labors with higher education levels gradually increases.

5.4.3. Model analysis from the perspective of industry structure

In Table 12 column model 3.1 reports estimation results of basic model (1.1) with the variable PRI accounting for the impact of primary industry on FDI, while regressions in columns model 3.2 and 3.3 explore the empirical impact of the indicators that refer to secondary and tertiary industry.

It can be seen that the three industries in Henan have very significant correlations to the inflow of FDI. The coefficient of the primary industry is 1.738, and the primary industry is increased by 1%, the actual use of FDI in the region will increase by 1.738%. The coefficient of the secondary industry is 2.974, and the secondary industry is increased by 1%, the actual use of FDI in the region will increase by 2.974%. The coefficient of the tertiary industry is -2.235, and the tertiary industry is increased by 1%, the actual use of FDI in the region will decrease by 2.235%. Under the background of transitional and take of stage and the policy guidance, foreign investors, mostly invest in the secondary industry, and the secondary industries in the cities of Henan Province have a solid foundation. As a vast agriculture province, Henan has an absolute advantage in the primary sector. With the tremendous comparative advantage in labor-intensive industries and agriculture, foreign investors tend to invest in labor-intensive and agriculture industries. The increase in the proportion of the tertiary sector in Henan Province will reduce the total amount of FDI absorption, which is also confirmed in the western region and in the central area from 1986 to 1991 (Rongtian Liu, 2005). From the above figure 4, although the proportion of the tertiary industry has risen, the leading industry at this stage is still the secondary industry, and the

Table 12 Empirical results with industry structure variables

Dependent variables: lnFDI			
	FGLS model (3.1)	FGLS model (3.2)	FGLS model (3.3)
GDPrate	0.0454*** (0.000462)	0.0262*** (0.000604)	0.0340*** (0.00115)
OPENESS	-0.0188*** (0.000217)	-0.0208*** (0.000248)	-0.0206*** (0.000344)
lnpopdensity	1.699*** (0.0301)	1.912*** (0.0247)	1.703*** (0.0488)
lnWAGE	0.950*** (0.0226)	0.151*** (0.0392)	0.523*** (0.0490)
Dummy 2008	-0.364*** (0.00346)	-0.406*** (0.00873)	-0.373*** (0.0149)
PRI	1.738*** (0.0526)		
SEC		2.974*** (0.0576)	
TER			-2.235*** (0.0669)
Constant	-257.4*** (5.007)	-399.7*** (8.752)	-349.2*** (10.39)
Observations	324	324	324
Number of regions	18	18	18

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

tertiary industry has not yet formed a comparative advantage relative to the primary and second sectors. As a result, the tertiary industry played the opposite role in attracting FDI inflow.

6. Conclusion and implications

In the vast literature, the regional factors that attract FDI are: market size, market potential, openness, infrastructure, wage and agglomeration and basically have significant effect on FDI. In this light, this study analyzes the various regional factors affecting the location distribution of FDI by constructing 20-year panel data FGLS models of 18 cities in Henan province.

The empirical results clearly show that FDI in Henan province tends to flow to regions with high GDP, fast GDP growth, relatively low openness, high agglomeration, and large population density, better development of the primary and secondary industry. The openness has a significant negative effect on attracting FDI, which is contrary to the expectation. In order to obtain monopoly benefit, bypass the local protection, investing in areas with low openness would become an ideal choice.

As for the labor quality in attracting FDI inflow, unlike previous studies, many articles used only one proxy variable to represent human capital- higher education (Lu, 1997, Sun et al., 2002, Cheng and Kwan, 2000 b) (Qian and Zhaoxia, 2006). This paper examines the effect of different level labor quality

on the FDI inflow. In the transitional society and take-off stage, when the leading industry is the labor-intensive industry, low-educated workers are more popular and wages have a negative effect. When in the process of the industry optimizes and upgrades, the demand for high-education workers increases, and as an indirect measure of labor quality, wages began to have a positive effect on FDI. As for the industry structure, in the context of Henan's economic stage, the industries with comparative advantages are the primary and secondary industry and have production factors that are applicable to the development of these leading industries, which have a positive effect on FDI. The tertiary industry is a sign of industrial optimization. And the insufficient comparative advantage lead to its negative effect on FDI. As for labor supply, the coefficient has dropped significantly. With the upgrading of industries, labor-intensive industries have been adjusted, and the dependence on labor supply has also declined greatly. The policy implications from this article are very meaningful. Government policy makers should improve the tertiary school education and increase the enrollment rate of junior high school and senior high school students entering higher education schools, and encourage them to accept higher education with a view to making education sector more responsive to attract more investment. The education policy that focuses on guiding and encouraging more pupils into higher educational school, the development of the economy, infrastructure, agglomeration and openness can promote FDI inflow. And the reason for foreign investment in Henan is largely due to the stage of local economic development and the industrial economic environment of the whole country. Therefore, with the economic development and industrial upgrading and optimization, the relevant local policies should be adjusted accordingly in order to more adapt to the development and entry of foreign investment.

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