doi: 10.36689/uhk/hed/2022-01-068 HED Hradec Economic Days

Research on the Impact of FDI on China's Urban-Rural Economic Integration

Liting SONG

School of Economics and Management, Northwest University, Xi'an, China; songliting02@163.com

Abstract: Under the background of economic globalization, FDI is becoming more and more important. It is important to explore the influence of FDI on China's urban-rural economic integration. Using the full sample province data of China from 2008 to 2019, the regression results indicate that the impact of FDI on Chinese urban-rural economic integration is significantly negative, that is, FDI significantly hinders the process of urban-rural economic integration. After grouping 30 provinces in China into northeast, East, central and West, it is found that the effect of FDI on Chinese urban-rural economic integration index in all regions is negative, but only the coefficient of FDI in western provinces on urban-rural economic integration is significant. Only by bringing FDI more to rural areas and providing services to improve rural life and production can we help contribute to the growth of the integration of urban and rural economies.

Keywords: FDI; urban and rural economic integration; inter provincial panel

JEL Classification: R0; R11; F01

1. Introduction

Economic globalization has greatly promoted China's economic growth. While China's urban-rural gap is widening, not only in the income and consumption gap between urban and rural residents, but also in the multiple gaps between urban and rural fixed investment, financial investment and urban and rural technicians. Foreign Direct Investment (FDI) plays an important role in accelerating China's capital accumulation, technological innovation and upgrading and market expansion of products and services. Urban-rural economic integration aims to narrow the gap between urban and rural areas at all levels of economy and achieve integrated development. Urban-rural economic integration is an important part of urban-rural integration and development. Most of the papers on urban-rural economic integration focus on the evaluation of its development level. Many literatures have proved that FDI has a significant impact on the income gap between urban and rural areas. However, there is a lack of literature on how FDI affects urban-rural economic integration.

The introduction of FDI may hinder the progress of urban-rural economic integration, because FDI is mainly acts on cities, few rural areas benefit. At the same time, FDI expands the economic gap between urban and rural areas through international trade (Chen, 2016). There is also evidence that FDI intensifies the income gap between urban and rural areas (Ho, 2017; Jin & Lee, 2017; Kim & Kang, 2020; Song et al., 2021). In addition, FDI inflows in the first sector have a slight negative impact on urban-rural income inequality (Wang & Luo, 2021).

Quantitative analysis of the influence of FDI on urban-rural economic integration is key to understand the role of FDI.

2. Research Design

2.1. Model Construction

Based on previous studies, the basic regression equation of the impact of FDI on urban-rural economic integration is constructed as follows:

$$lnureco_{it} = a_0 + a_1 \ln fdi_{it} + a_2 X_{it} + u_i + v_t + \varepsilon_{it} \quad (1)$$

where, $lnureco_{it}$ represents the logarithm of the urban-rural economic integration level. $\ln fdi_{it}$ represents the logarithm of FDI. X_{it} is the control variable, including per capita GDP, urbanization rate, traffic network density, the comparison of the proportion of urban and rural primary school teachers, the proportion of financial expenditure on education, the ratio of urban and rural medical insurance coverage and the ratio of urban and rural medical and health care expenditure. u_i is the fixed effect of provinces, such as geographical location, climate and other factors affecting FDI investment. v_t is the time fixed effect, which can reflect the policy effect of the government. ε_{it} is a random perturbation term.

2.2. Variable Selection

How to measure urban-rural economic integration scientifically and reasonably is one main research contents of this paper. Urban-rural economic integration means the process of realizing resource sharing and rational allocation on the basis of complementarity through the free flow of factors and production factors between urban areas and rural areas under relatively equal economic policies, so as to realize the sustainable, coordinated and common development of urban-rural economy.

To measure the level of urban and rural economic integration, firstly we need to build its evaluation index system according to its meaning, comprehensively using theoretical analysis method, frequency statistics method and expert consultation method, following the principles of comprehensiveness, scientificity, comparability, representativeness and typicality, and combing with the availability of data (Ma et al., 2020; Thi et al., 2020). The evaluation index system of urban and rural economic integration built by us is described in Table 1 (see below).

This paper uses the Time Series Global Principal Component Method to determine the weight of each index, and calculates the urban-rural economic integration index according to this method. The Time Series Global Principal Component Method can process panel data, and achieve the purpose of objective weighting and dimensionality reduction by linear transformation of the covariance matrix of the data.

We measured the level of urban-rural economic integration in 30 provinces of China (Tibet was excluded due to serious lack of data) from 2008 to 2019. Among them, the original data comes from China Statistical Yearbook, China urban and Rural Construction Statistical Yearbook, China Science and technology statistical yearbook, China Rural Statistical

Yearbook, as well as the statistical yearbooks of various provinces and CNKI China Economic and social development statistical database.

Table 1. Evaluation index system of urban and rural economic integration

Target Indicators	**Dimension Indicators**	**Basic Indicators**	**Index Attribute**	**Index Meaning or Algorithm**
Urban-Rural Economic Integration	Urban-Rural Capital Formation	Urban-Rural Per Capita Fixed Asset Investment Ratio	Backward	Urban / rural per capita fixed asset investment
		Per Capita Financial Support for Agriculture	Forward	Per capita expenditure of local agriculture, forestry and water affairs / per capita expenditure of local general public budget
	Urban-Rural Technological Progress	Proportion Ratio of Urban and Rural Technicians	Backward	Proportion of non-agricultural technicians in public economic enterprises and institutions in urban population / that in rural population
		Agricultural Mechanization Level	Forward	Total power of agricultural machinery / regional cultivated land area
	Urban-Rural Industrial Structure	The Ratio of Non-agricultural Industry to Agricultural Output Value	Forward	(output value of secondary industry + output value of tertiary industry) / output value of primary industry
		Dual Contrast Coefficient	Forward	(proportion of output value of primary industry / proportion of employees in primary industry) / (proportion of output value of non primary industry / proportion of employees in non primary industry)
		Dual Contrast Factor	Backward	|Proportion of output value of non-agricultural industries - proportion of employees in non-agricultural industries|
	Urban-Rural Employment Structure	Ratio of Non-agricultural Employees to Agricultural Employees	Forward	Non primary industry employees / primary industry employees
		Proportion of Rural Employees Engaged in Non-agricultural Industries	Forward	1 - primary industry employees / rural employees
	Urban-Rural Residents' Income and Consumption	Per Capita Income Ratio of Urban and Rural Residents	Backward	Annual disposable income per capita of urban households / annual net income per capita of rural households
		Per Capita Consumption Ratio of Urban and Rural Households	Backward	Per capita consumption of urban households / per capita consumption of rural households
		Urban-rural Engel Coefficient Ratio	Forward	Urban Engel coefficient / rural Engel coefficient

Before substituting the data into SPSS for principal component analysis, forward processing and dimensionless processing are needed. In this paper, the inverse index is taken to realize the forward of the backward index, and the dimensionless processing is realized by the mean method. The selection of principal components number follows the principle that the cumulative variance contribution rate is at least 85%. Using the above methods, we measure the level of urban-rural economic integration from 2008 to 2019 (see Table 2). This is the explanatory variable of this paper.

Table 2. Level of urban-rural economic integration in China from 2008 to 2019

Province	**2008**	**2009**	**2010**	**2011**	**2012**	**2013**	**2014**	**2015**	**2016**	**2017**	**2018**	**2019**
Beijing	10.484	9.522	9.522	8.893	9.684	9.101	9.412	9.408	9.429	9.919	10.441	10.716
Tianjin	5.109	5.379	5.379	5.094	4.605	5.397	5.768	5.784	5.571	5.324	5.157	5.604
Hebei	1.636	1.364	1.364	1.376	1.367	1.130	1.131	1.077	1.016	0.875	0.831	0.833
Shanxi	1.758	1.792	1.792	1.385	1.472	1.327	1.340	1.258	1.126	0.988	0.956	1.011
Inner Mongolia	1.189	1.123	1.123	1.055	1.181	1.173	1.170	1.105	1.053	0.901	0.862	0.751
Liaoning	2.072	1.757	1.757	1.537	1.675	1.486	1.497	1.460	1.367	1.108	0.900	0.878
Jilin	1.389	1.187	1.187	1.076	1.200	1.039	1.048	1.017	0.970	0.851	0.789	0.734
Heilongjiang	1.475	1.219	1.219	1.072	1.297	1.052	1.011	0.906	0.935	0.739	0.766	0.752
Shanghai	12.426	12.346	12.346	11.160	14.902	13.468	12.074	11.967	13.033	13.057	13.213	12.803
Jiangsu	2.758	2.492	2.492	2.624	2.954	2.043	2.056	1.997	1.930	1.788	1.771	1.842
Zhejiang	3.589	3.370	3.370	3.452	4.053	2.843	2.833	2.743	2.598	2.408	2.284	1.934
Anhui	1.285	1.161	1.161	1.171	1.198	1.010	1.044	1.024	0.997	0.876	0.841	0.852
Fujian	1.774	1.682	1.682	1.685	1.780	1.575	1.600	1.559	1.499	1.381	1.314	1.331
Jiangxi	1.472	1.256	1.256	1.250	1.321	1.164	1.175	1.117	1.077	0.951	0.922	0.944
Shandong	2.055	1.663	1.663	1.700	1.730	1.321	1.319	1.272	1.218	1.096	1.077	1.086
Henan	1.250	1.115	1.115	1.150	1.195	0.936	0.929	0.892	0.831	0.750	0.708	0.718
Hubei	1.264	1.067	1.067	1.067	1.107	0.932	0.931	0.895	0.871	0.783	0.763	0.789
Hunan	1.310	1.154	1.154	1.130	1.111	0.964	0.939	0.890	0.844	0.720	0.671	0.684
Guangdong	2.736	2.472	2.472	2.490	1.957	1.880	1.854	1.814	1.727	1.588	1.522	1.538
Guangxi	1.016	0.853	0.853	0.831	0.870	0.726	0.700	0.650	0.625	0.532	0.508	0.489
Hainan	1.048	0.899	0.899	0.861	0.954	0.853	0.821	0.841	0.802	0.671	0.607	0.981
Chongqing	1.382	1.203	1.203	1.148	1.286	1.160	1.191	1.172	1.139	1.062	1.069	1.094
Sichuan	1.114	1.009	1.009	1.156	1.155	0.937	0.938	0.888	0.846	0.736	0.717	0.716
Guizhou	0.779	0.684	0.684	0.719	0.972	0.628	0.634	0.610	0.560	0.461	0.453	0.463
Yunnan	0.815	0.721	0.721	0.678	0.780	0.675	0.685	0.634	0.607	0.503	0.489	0.494
Shaanxi	1.262	1.158	1.158	1.070	1.164	1.078	0.923	0.888	0.857	0.748	0.736	0.745
Gansu	0.890	0.779	0.779	0.736	0.809	0.685	0.693	0.651	0.618	0.505	0.488	0.490
Qinghai	1.279	1.194	1.194	1.177	1.405	1.130	1.140	1.050	1.001	0.879	0.848	0.788
Ningxia	1.434	1.226	1.226	1.225	1.403	1.052	1.054	0.997	0.951	0.790	0.815	0.794
Xinjiang	1.151	0.983	0.983	0.898	1.031	0.854	0.812	0.771	0.741	0.625	0.591	0.617

The core explanatory variable is FDI, that is, foreign direct investment. This paper uses the inter provincial annual FDI data published in China Statistical Yearbook. The control variables include economic development level, urbanization rate, traffic situation, urban-rural education gap, education expenditure, medical insurance gap between urban and rural residents. The gap between urban and rural residents' medical expenditure. The variables used in the empirical part of this paper are defined in Table 3.

Table 3. Variable definition

Variable Name	Code	Explain
Urban-Rural Economic Integration Index	ureco	Measured by global principal component method
Logarithm of Urban-Rural Economic Integration Index	lnureco	Logarithm of Urban-Rural Economic Integration Index
Foreign Direct Investment	FDI	Foreign Direct Investment
	lnFDI	FDI logarithm
Per Capita GDP	pgdp	GDP / population of each province
	lnpgdp	logarithm of Per Capita GDP
Urbanization Rate	urb	Urbanization Rate
Traffic Network Density	tra	(highway operating mileage + railway operating mileage) / regional land area
Ratio of primary school students to teachers in urban to that in rural areas	tsr	(number of students / number of full-time teachers in urban primary schools) / (number of students / number of full-time teachers in rural primary schools)
Proportion of fiscal expenditure on Education	edu	Education expenditure / fiscal expenditure in Finance
Urban and rural medical insurance coverage ratio	insur	(number of urban residents and employees participating in basic medical insurance / urban population) / (number of participants in NCMS / rural population)
Proportion of urban and rural health care expenditure	healex	Proportion of medical and health care expenditure of urban residents in consumer expenditure / proportion of medical and health care expenditure of rural residents in consumer expenditure
Ratio of non-agricultural industry to agricultural output value	fnb	Ratio of non-agricultural industry to agricultural output value (output value of secondary industry + output value of tertiary industry) / output value of primary industry
Dual Contrast Factor	eyf	|Proportion of output value of non-agricultural industries - proportion of employees in non-agricultural industries|
Ratio of urban and rural per capita investment in fixed assets	gdzc	(urban fixed asset investment / urban population) / (rural fixed asset investment / rural population)

2.3. Variable Descriptive Statistics

Table 4. Statistical description of main variables

Variable name	Observed Value	Mean	Standard Deviation	Minimum	Maximum
ureco	360	1.995	2.670	0.453	14.902
lnureco	360	0.293	0.740	-0.792	2.702
FDI	360	113,327	183,704	2,000	1,762,227
lnFDI	360	10.728	1.406	7.601	14.382
pgdp	360	40,582	23,959	5,750	128,994
lnpgdp	360	10.443	0.593	8.657	11.768
urb	360	0.534	0.137	0.275	0.896
tra	360	0.914	0.512	0.069	2.377
tsr	360	1.283	0.274	0.674	2.100
insur	360	0.827	2.000	0.093	16.365
healex	360	0.904	0.212	0.343	1.746
edu	360	0.165	0.026	0.099	0.260

3. Empirical Test and Result Analysis

3.1. Whole Sample Analysis

Using the whole sample, we first analyze the influence of China's FDI on urban-rural economic integration. Table 5 reports the estimation results of various models. Among them, the first column shows the fixed effect model, and the second column reports the results of the random effect model as a comparison. The P value obtained by Hausmann test is 0.000, which strongly rejects the original hypothesis and believes the fixed effect model should be used. Taking the logarithm of urban-rural economic integration index as the explanatory variable and the logarithm of FDI as the core explanatory variable, and controlling the level of economic development, urbanization rate, transportation, urban-rural education gap, education expenditure, medical insurance gap between urban and rural residents and medical expenditure gap between urban and rural residents, it is found that the coefficient of lnFDI is significantly negative and -0.108 under the fixed effect model, In other words, the introduction of FDI hinders the process of urban-rural economic integration.

Table 5. Impact analysis of FDI on urban-rural economic integration (whole sample)

lnureco	**Fixed Effect Model**	**Random Effect Model**	**Differential GMM**	**System GMM**
	(1)	**(2)**	**(3)**	**(4)**
lnFDI	-0.108***	-0.0869***	-0.0716***	-0.184***
	(0.0230)	(0.0303)	(0.0165)	(0.0168)
lnpgdp	-0.125***	-0.358***	0.372***	-0.0237
	(0.0408)	(0.0541)	(0.0459)	(0.0258)
urb	-0.967***	1.782***	-5.549***	-0.770
	(0.267)	(0.334)	(0.589)	(0.549)
tra	0.326***	0.580***	0.0792	0.0482
	(0.102)	(0.0970)	(0.193)	(0.126)
tsr	-0.133**	-0.246***	0.159***	0.00224
	(0.0542)	(0.0768)	(0.0326)	(0.0372)
insur	-0.00459	-0.00697	-0.00342	0.00247
	(0.00424)	(0.00625)	(0.00494)	(0.00968)
healex	0.127***	0.295***	0.256***	0.187***
	(0.0487)	(0.0706)	(0.0172)	(0.0210)
edu	-0.495	-0.607	1.361***	-0.139
	(0.408)	(0.590)	(0.159)	(0.212)
Constant	3.123***	3.633***	-0.465	2.721***
	(0.314)	(0.447)	(0.406)	(0.218)
Sargan Test			0.9986	0.9993
Observations	360	360	360	360
Number of id	30	30	30	30

Using inter provincial panel data analysis will inevitably produce endogenous problems. Therefore, we use differential GMM and systematic GMM estimation, and select the distance from the region to the nearest port as the exogenous tool variable. The distance between each province and the nearest port is calculated by using Baidu map to calculate the highway mileage between the provincial capital city and the nearest port. The instrumental variable satisfies two properties of exogenous instrumental variables: one is exogenous, the second is correlation, the introduction of FDI is naturally related to the transportation cost, so it is

highly correlated with the distance from the port. It should be noted that although the tool variable meets these two conditions, it still has certain limitations because there is no time change.

The third and fourth columns in Table 5 report the regression results of differential GMM and System GMM respectively. The results show that the logarithm of FDI is still significantly negative to the logarithm of urban-rural economic integration index. However, the coefficient is -0.0716 in differential GMM Estimation and -0.184 in System GMM estimation. However, no matter which regression method is adopted, it shows that FDI has a negative impact on urban-rural economic integration, that is, the introduction of FDI will expand the urban-rural economic gap.

3.2. Subregional Analysis

According to the general practice, we divide the 30 provinces into Northeast, Eastern, Central and Western regions. The results show that the logarithm of FDI in each region is negative to the logarithm of urban-rural economic integration, but only the coefficient in the western region is significant, and the coefficient in the northeast, East and central regions is not significant.

Table 6. Impact of FDI on Urban-Rural Economic Integration Analyzed by Subregion

lnureco	**Northeast**	**Eastern**	**Central**	**Western**
	(5)	**(6)**	**(7)**	**(8)**
lnFDI	-0.168	-0.0302	-0.0978	-0.0905**
	(0.136)	(0.0412)	(0.0640)	(0.0373)
lnpgdp	-0.00953	-0.254***	0.0956	0.152*
	(0.0909)	(0.0945)	(0.0954)	(0.0820)
urb	1.967	-0.397	-2.307**	-4.694***
	(2.149)	(0.342)	(0.940)	(0.832)
tra	-3.558***	0.338*	0.0859	0.677***
	(0.837)	(0.193)	(0.173)	(0.175)
tsr	-0.528***	0.0653	-0.0491	-0.00859
	(0.152)	(0.110)	(0.0958)	(0.100)
insur	-0.0781	-0.0104*	-0.0314	0.0141
	(0.149)	(0.00532)	(0.0512)	(0.0316)
healex	-0.167	0.159*	0.256***	-0.0133
	(0.192)	(0.0871)	(0.0845)	(0.0714)
edu	-1.063	-1.064	-0.350	-1.044*
	(0.769)	(0.905)	(0.710)	(0.612)
Constant	4.041***	3.899***	0.994	1.101*
	(1.180)	(0.694)	(0.796)	(0.633)
Observations	36	120	72	132
Number of id	3	10	6	11
R-squared	0.880	0.551	0.875	0.787

4. Robust Test

To test the robustness of the equation and coefficient, we change the urban-rural economic integration index into the ratio of non-agricultural industry to agricultural output value, binary contrast factor and urban-rural per capita fixed asset investment ratio. To make it consistent with the change direction of urban-rural economic integration, firstly, the binary

contrast factor which is a backward index and the per capita fixed asset investment in urban and rural areas are compared as a positive treatment. In this paper, the reciprocal method is used to forward. Then, we use the fixed effect model to estimate the impact of FDI on them respectively. The results show that the results obtained by using these three replacement indicators are the same as the regression results of urban and rural economic integration index (see Table 7). The logarithm of FDI has a significant negative impact on the three, and has the greatest impact on the ratio of non-agricultural industry to agricultural output value, with a coefficient of -1.490.

Table 7. Results of Changing Explained Variables

Explained Variable	**(9)**	**(10)**	**(11)**
	fnb	**eyf**	**gdzc**
lnFDI	-1.490***	-0.312***	-0.0155*
	(0.338)	(0.0681)	(0.00856)
lnpgdp	-0.0371	0.435	-0.134***
	(2.244)	(0.275)	(0.0285)
urb	136.4***	11.48***	-0.0830
	(20.97)	(2.533)	(0.190)
tra	14.89***	1.590**	0.0690*
	(4.316)	(0.638)	(0.0378)
tsr	-26.95***	-0.745***	0.111***
	(1.979)	(0.255)	(0.0323)
insur	1.184***	-0.170***	-0.0280***
	(0.326)	(0.0491)	(0.00685)
healex	-0.972	-0.924***	0.0769***
	(1.120)	(0.261)	(0.0215)
edu	-122.9***	-16.14***	-1.780***
	(14.46)	(2.103)	(0.154)
Constant	5.284	1.096	1.728***
	(12.20)	(1.976)	(0.278)
Observations	360	360	360
Number of id	30	30	30

* p-value < 0.01, ** p-value < 0.05, *** p-value < 0.01

5. Research Conclusion

This paper discusses the impact of FDI on China's urban-rural economic integration. The regression results of the whole sample show that the impact is significantly negative, that is, FDI significantly hinders the process of urban-rural economic integration. After grouping 30 provinces into northeast, East, central and West, it is found that the effect of FDI on urban-rural economic integration index in all regions is negative, but only the coefficient of FDI in western provinces on urban-rural economic integration is significant. After further replacing the explained variables, the regression results are robust.

However, this paper does not explore the specific ways and mechanisms of FDI affecting China's urban-rural economic integration, which may become the main content to be studied in the next step. But only by bringing FDI more to rural areas and providing services to improve rural life and production can we help promote the integration of urban and rural economies.

Conflict of interest: none

References

Chen, C. (2016). The impact of foreign direct investment on urban-rural income inequality Evidence from China. *China Agricultural Economic Review*, *8*(3), 480-497. https://doi.org/10.1108/caer-09-2015-0124

Ho, K. J. (2017). The Effect of Foreign Direct Investment on Urban-rural Income Disparity in China: A Comparison between Autonomous Regions and Other Provinces. *The Journal of Modern China Studies*, *19*(1), 119-147. https://doi.org/10.35820/jmcs.19.1.4

Jin, F., & Lee, K. (2017). Dynamics of the growth-inequality nexus in China: roles of surplus labor, openness, education, and technical change in province-panel analysis. *Journal of Economic Policy Reform*, *20*(1), 1-25. https://doi.org/10.1080/17487870.2016.1258311

Kim, J. H., & Kang, K. H. (2020). The interaction effect of tourism and foreign direct investment on urban-rural income disparity in China: a comparison between autonomous regions and other provinces. *Current Issues in Tourism*, *23*(1), 68-81. https://doi.org/10.1080/13683500.2019.1637826

Ma, L., Liu, S., Fang, F., Che, X., & Chen, M. (2020). Evaluation of urban-rural difference and integration based on quality of life. *Sustainable Cities and Society*, 54. 101877. https://doi.org/10.1016/j.scs.2019.101877

Song, Y., Zhang, Y., Wang, Y., Zhang, B., & Su, J. (2021). The influence of foreign direct investment on the urban-rural income gap: evidence from China. *Kybernetes*, *51*(1), 466-484. https://doi.org/10.1108/k-07-2020-0488

Thi Thanh Huyen, N., Thi Thu Hien, N., Thi Le Hang, N., & Van Cong, N. (2020). The Impact of International Integration on the Inequality of Income between Rural and Urban Areas in Vietnam. *Journal of Asian Finance Economics and Business*, *7*(3), 277-287. https://doi.org/ 10.13106/jafeb.2020. vol7.no3.277

Wang, H., Fidrmuc, J., & Luo, Q. (2021). A spatial analysis of inward FDI and urban-rural wage inequality in China. Economic Systems, *45*(3), 100902. https://doi.org/10.1016/j.ecosys.2021.100902