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A Spatial Analysis of Inward FDI and Rural-Urban Wage Inequality: Evidence from China

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Abstract

When investigating the relationship between inward FDI and rural-urban inequality, previous studies overlook the inter-regional interactions. Building on the literature that highlights the significant role of rural-urban migration in inequality, this article investigates spatial spillover effect of inward FDI on the rural-urban wage inequality by utilizing the Spatial Durbin Model (SDM) both in the short run and long run. In particular, we carefully consider the heterogeneity of inward FDI and categorize it with respect to entry modes and sectoral distribution. On the basis of a panel dataset covering 30 provinces in China from 2000 to 2016, our results show that overall the inward FDI should not be blamed for the exacerbation of rural-urban wage inequality. We do not find significant relationship between inward FDI in secondary and tertiary sector while the FDI in primary sector has a slight negative effect. When we separate the FDI according to entry modes, we find that WFE is shown to have a negative effect on the rural-urban wage inequality and this effect is more pronounced in the long run when we conduct a period average estimation. This change also similarly applies to the equity joint ventures.

JEL-Codes: C210, F210, O190.

Keywords: spatial spillovers, foreign direct investment, rural-urban wage inequality, SDM.

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1. Introduction

The burgeoning globalization has ensured that foreign direct investment (FDI) and its effects remain one of the most heated topics in academic and popular discussions alike. There has been by far an extensive body of literature devoted to the impact of inward FDI on economic development and inequality. Although attracting inward FDI is one of the most efficient ways to boost the economy of the host countries, it is concerned with the aggravation of the inequality. However, the consensus in the literature on inward FDI and inequality is yet to be reached. For instance, Tsai (1995) uses data for 33 developed and less developed countries, showing that less developed countries report increases in income inequality in the wake of inflows of FDI. Choi (2006) supports this argument, finding that FDI increases income inequality in developing countries but not in developed countries. Basu and Guariglia (2007) obtain similar findings based on 119 developing countries and show that the inward FDI can exacerbate inequality. Taylor and Driffield (2005) investigate the case in the U.K. and find that the increase of wage inequality can be explained by the inflows of FDI. Figini and Görg (2011) provide similar result by comparing OECD and non-OECD countries. Their result suggests that income inequality first increases with inward FDI but decreases once a turning point has been reached. Herzer and Nunnenkamp (2013) show that FDI negatively affects the income inequality in most European countries whereas Asteriou et al.(2014) hold a completely opposite view, arguing that the highest contribution to inequality stems from FDI on the basis of an EU-27 analysis. Mah (2003), in contrast, reports that the inequality is unaffected by FDI inflows in Korea. Similarly, Sylwester (2005) does not find any significant relationship between inward FDI and income inequality in a sample of 29 less developed countries.

This paper investigates how inward FDI affects the inequality in China based on the fact that as one of the largest FDI recipients, it has drawn considerable attentions with its exacerbating inequality. In the context of China, one strand of studies argues that inward FDI leads to the enlarged inequality. For example, Zhang and Zhang (2003) ascribe the growing regional disparities to the effects of inward FDI and trade openness. Wan et al. (2007) argue that globalization substantially aggravates regional inequality and that this is largely due to the dramatic increase of inward FDI. Lessmann (2013), comparing China with other 54 countries, argues that inward FDI tends to raise income inequality in poorer regions. Mah (2013) adopts dynamic ordinary least squares from 1985 to 2007 to show that trade globalization and trade openness have strong and positive effects on income inequality while the impact of inward FDI is mixed. In a similar vein, Jalil (2012) shows that the relationship between openness and income inequality in China displays a pattern similar to the Kuznets curve: income inequality increases when openness grows but decreases later. From firm level perspective, Chen et al. (2011) show that inward FDI raises wage inequality because foreign invested enterprises report higher wage growth rate and discourage wage growth in domestic firms. On the contrary, some works do not show evidence that the inequality relates to the inward FDI including Yu et al. (2011) who use

simultaneous equation model and Shapley value regression-based decomposition approach. They argue that inward FDI has no impacts on income inequality. Wei et al. (2009) separate the regional data into three groups: east, west and central. They find that although income inequality climbs in the period they analyze, there are no consistent results that the inflow of foreign capital should be blamed for this because the western regions receive far less FDI but still suffer from rising income inequality. Using provincial level data from 1999 to 2013, Greaney and Li (2017) find that the entry of multinationals does not have significant effect on rural-urban wage inequality in general.

Despite the growing debate on whether the inward FDI drives the inequality, little effort has been made to consider the inter-regional interactions. As the spatial effect of inward FDI is explicitly recognized in the literature (Huang and Chand, 2015; Huang et al., 2017), inward FDI does not only affect inequality in the region where it is located, but also may have spatial effect on other regions through a major mechanism that the employment effect of inward FDI significantly drives the labor mobility from one region to another over the past years (e.g., Fosfuri et al., 2001, Xu and Sylwester, 2016; Cuadros et al., 2019). To fill this research gap, our study attempts to offer novel evidence of the relationship between inward FDI and inequality by investigating the spatial effect of inward FDI. We draw our empirical strategy on 30 provinces from 2000 to 2016 with spatial econometric techniques accounting for the total effect, direct effect and indirect effect. We focus on rural-urban wage inequality, which accounts greatly for the aggravation of income inequality in China as argued in the literature (Yang, 1999; 2002; Yao, 1999; Xie and Zhou, 2014).

Notably, inward FDI can affect inequality not only in the regional dimension, but also across sectors. As argued in Wang, (2009) and Doytch and Uctum (2011), studies that do not differentiate sectoral FDI may result in biased and ambiguous results, which especially applies to the case of China where the inward FDI has been unevenly distributed across sectors (Yu et al., 2011). Therefore, we carefully account for the sectoral distribution of FDI, namely, the flow in primary (agriculture) industry, secondary (manufacturing) industry and tertiary (service) industry to study how they may exert different spatial effects on inequality.

Additionally, recent studies reveal that the importance of ownership patterns of FDI should be considered. The loosening of restrictions on establishing wholly foreign-owned enterprises has led to changes in the structure of inward FDI (Girma et al., 2015). Ouyang and Yao (2017) further show that FDI in equity joint ventures (EJV) has a positive impact on economic growth, whereas the impact of FDI in cooperative joint venture (CJV) is negative. Therefore, we also study how the spatial effect of inward FDI may vary for FDI with different entry modes. In doing so, we divide ownership types of FDI into equity joint venture (EJV), cooperative joint venture (CJV) and wholly foreign owned enterprises (WFE).

The rest of the paper proceeds as follows. The next section provides a literature review on conceptual framework to explicate why spatial spillovers matter and outlines different types of inward FDI according to their sectors and entry modes. Section 3 introduces the methodology and describes

the data in use. Section 4 discusses the empirical results. Section 5 concludes.

2. The theoretical framework

2.1. The explanation for inward FDI's direct effect on inequality

As in one of the earliest international trade theorems (Stopler and Samuelson, 1941), a labor-intensive developing country will display higher returns to laborers with lower returns to capitalists in the context of trade liberalization, thereby leading to lower income inequality. Conversely, higher income inequality will arise in a capital-abundant developing country. However, the returns differ for two types of labor: the skilled and unskilled. The demand for skilled workers increases in a developing country with the entry of inward FDI, which leads to a higher wage for skilled workers. Consequently, income gap is widened. Feenstra and Hanson (1997) make this point in a theoretical analysis and offer empirical evidence on the case of Mexico which contrasts the predictions of Stoper and Samuelson (1941).

Based on the framework of Aghion and Howitt (1998) who consider FDI as an important tool for general purpose of technology, Figini and Görg (2011) propose a two stage model: both skilled and unskilled workers are employed when the technology starts to improve at stage 1. The wage inequality (led by high wage for skilled workers and low wage for unskilled workers) starts to expand as a result. From stage 1 to stage 2, this wage inequality keeps increasing but with a diminishing marginal rate since the productivity gap between skilled and unskilled labor is gradually narrowed and the remaining unskilled workers will be obsolete at stage 2.

The framework developed by Basu and Guarglia (2007) is also inspiring. In a dual economy, FDI enlarges the disparity between agricultural (rural) sector and the urban (modern) sector. Precluded from the FDI-based technology in the modern sector, the low productive rural workers remain lower paid. As such, the rural-urban inequality is exacerbated, which eventually leads to a deterioration of income inequality.

In the case of China, scholars also provide several theoretical frameworks to explain the skill-unskilled wage inequality from different dimensions including foreign capital (Pi and Zhou, 2014). They construct a four-sector general equilibrium model to investigate how an inflow of foreign capital influences the skilled-unskilled wage inequality in the presence of the endogenous public infrastructure provision. Given the special characteristics of China's *Hukou* system, they stand from rural-urban migration perspective to further explore such inequality (Pi and Zhang, 2016; Pi and Zhang, 2018). Following these frameworks, we discuss how rural-urban inequality and skill-unskilled wage inequality are interlinked in section 2.2.

2.2. Spatial spillovers of FDI on rural-urban wage inequality via migration

Rooted in the model of rural-urban dual economy (Lewis, 1954; Harris and Todaro, 1970), the

literature has explicitly recognized that the rural-urban inequality is crucially affected by rural-urban migration. In evidence, the rural-urban migration plays a significant role in determining the rural-urban inequality (Kanbur and Zhang, 1999; Yang, 1999; Yang and Zhou, 1999; Pi and Zhang, 2016). This effect is in general shown to reduce the rural-urban inequality as the migration improves the rural income level and reduces rural poverty (Du et al., 2005; Zhu and Luo, 2010) via higher level of remittances from migrant workers (Howell, 2017). These studies imply that the rural-urban migration serves as a major channel accounting for the relationship between inward FDI and rural-urban wage inequality.

In China, the bulk of rural-urban migration occurs between different provinces, primarily with workers moving from inland and less developed regions to developed provinces on the coast. The large cities with more job opportunities such as Beijing, Tianjin, Shanghai, Hangzhou, Guangzhou and Shenzhen are all on the coast. However, most previous research only focuses on rural-urban migration at the intra-provincial level and does not consider this labor mobility at the interprovincial level, except a few studies that recognize the importance of inland-coastal interplay (Kanbur and Zhang, 1999; Ouyang and Yao, 2017). Nonetheless, they do not account for the overall interplay between regions. In this article, we adopt a proper spatial model to capture the not only the inland-coastal interaction but also a general interprovincial interaction between regions.

In the previous section, we discuss several FDI-inequality explanations with more focus on the skilled-unskilled wage inequality. However, these explanations still principally apply to the rural-urban wage inequality in China based on two major reasons. First, Chinese rural workers are largely unskilled. Compared to the urban education system, the rural education remains at a much lower level (see de Brauw and Rozelle, 2008; Yi et al., 2012 and many others). This rural-urban gap in the quality of education and the lack of modern industrial-skill training means also that the rural migrants struggle to get fully integrated in the industrial sector in urban areas. Even if rural-urban migrants are mostly skilled workers, they are often treated as unskilled workers in the urban areas because of the household registration system (*Hukou*). Although the reform in 1984 liberalizes rural labor mobility, the essence of the *Hukou* system has not been changed. The rural migrants suffer severe discriminations in the urban job market: they are excluded from certain jobs (Chan and Buckingham, 2008), face employment barriers (Shi et al., 2011) and receive far less social welfare such as health insurance and pensions (Yang, 1999; Ha et al., 2016). The *Hukou* system has segmented the urban laborers into two different groups (Shi et al., 2011): without the urban *Hukou*, the rural migrants are less likely to be employed as skilled-workers even if they are skilled.

2.3. The effects of different types of FDI in China

2.3.1. Sectoral distribution of inward FDI

Most of the literature focuses on the impact of FDI on the manufacturing sector. Secondary (manufacturing) sector FDI contributes to productivity improvement mainly by technology transfers (Wang, 2009; Newman et al. 2015; Lu et al. 2017). In China, manufacturing FDI takes the form of both high-tech FDI and low-tech FDI. Yet, they have different direct and spillover effects on productivity, with some studies arguing that the effect is U-shaped (Liu et al., 2014; Anwar and Sun, 2014). Another major benefit the host countries can obtain from manufacturing FDI is the promotion of exports, given that manufacturing FDI is the most export-oriented among sectoral FDI (Zhu and Fu, 2013; Tang and Zhang, 2016; Latorre et al. 2018).

As one of the few studies focusing on the foreign capital in tertiary sector (service), Fernandes and Paunov, (2012) find that inflow of FDI in service sector fosters innovation and promotes productivity in the manufacturing industry. Similarly, Latorre et al. (2018) analyze the link between sectoral FDI and Chinese economy by adopting computable general equilibrium (CGE) model. They suggest that service FDI benefits the host country welfare. Doytch (2015) applies system GMM to examine the effects of FDI in different sectors on business cycle in several Asian countries. She shows that the financial service FDI can play a significantly positive role with respect to the host country business cycle while FDI in other sectors do not seem to be influential. This influence can extend to inequality since the service industries in China are still under-developed and rely heavily on low-cost migrant workers. Therefore, the inequality gap can be reduced as the tertiary FDI pulls up the lower quantile income.

There is limited research on the impact of FDI on the primary sector. Chaudhuri and Banerjee (2010) develop a three-sector general equilibrium model to show that flow of FDI into agriculture improves the social welfare by mitigating unemployment. Agricultural production and food security can be promoted the spillovers of know-how, diffusion of R&D and technology transfer of the FDI flowing in primary sector (Slimane et al., 2016) and this effect is particularly salient for the inward FDI from developed countries (Santangelo, 2018). These studies highlight the importance of primary FDI and ascribe China's success in both economic growth and poverty mitigation to improvements in agriculture. As for its effect on income inequality, it can be expected that there should be a negative relationship between income inequality and the primary FDI as the rural workers are attracted by the higher wages that the multinationals offer (Xu and Sylwester, 2016), thus enabling them to catch up with the better paid urban workers.

As shown in Fig. 1a. and Fig. 1b., sectoral FDI in China displays a noticeably uneven distribution. As a traditionally agricultural country, China has achieved remarkable agricultural growth since the rural reforms in 1978. However, primary-sector FDI into China has remained the lowest among the three sectors. It reached its highest point in 2002 at close to 2% of the total. The

secondary-sector FDI has grown gradually from 34.79 billion USD in 2001 to 53.26 billion USD in 2008, only to fall again to 40.21 billion USD in 2016. As a share of the total, it has fallen steadily, from 74.23% to less than 32% over the same period. However, the service FDI has increased rapidly both in terms of volume and share. It was 24% of total FDI in 2001 and has risen to more than 65% in 2016.

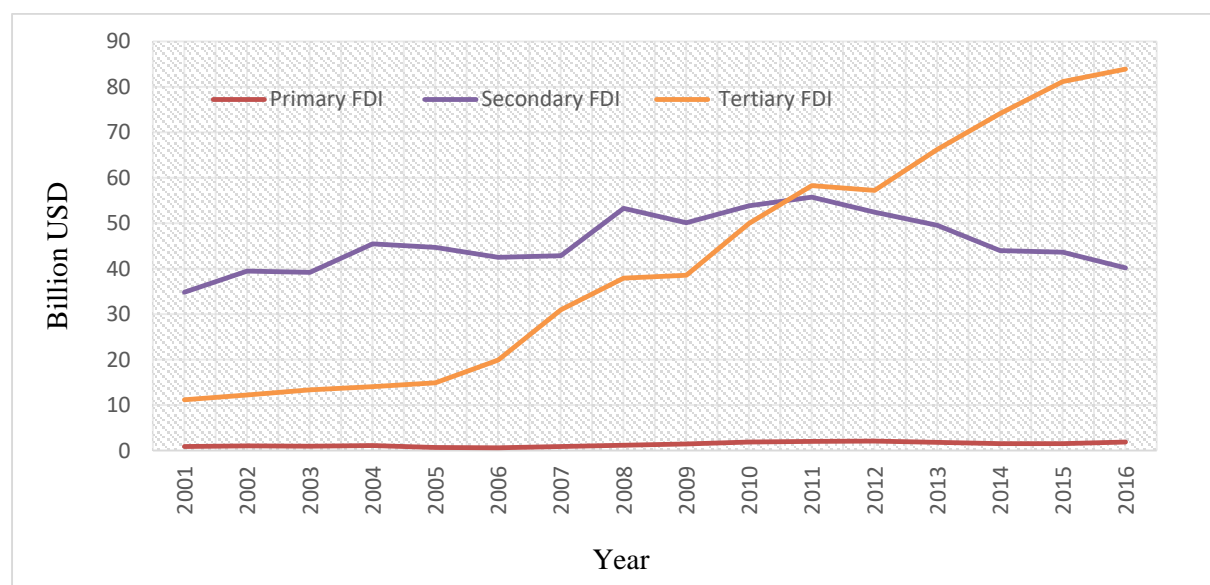


Fig. 1a. The trend of inward sectoral FDI flows as volume from 2001 to 2016.
Source: The authors' calculations according to NBSC.

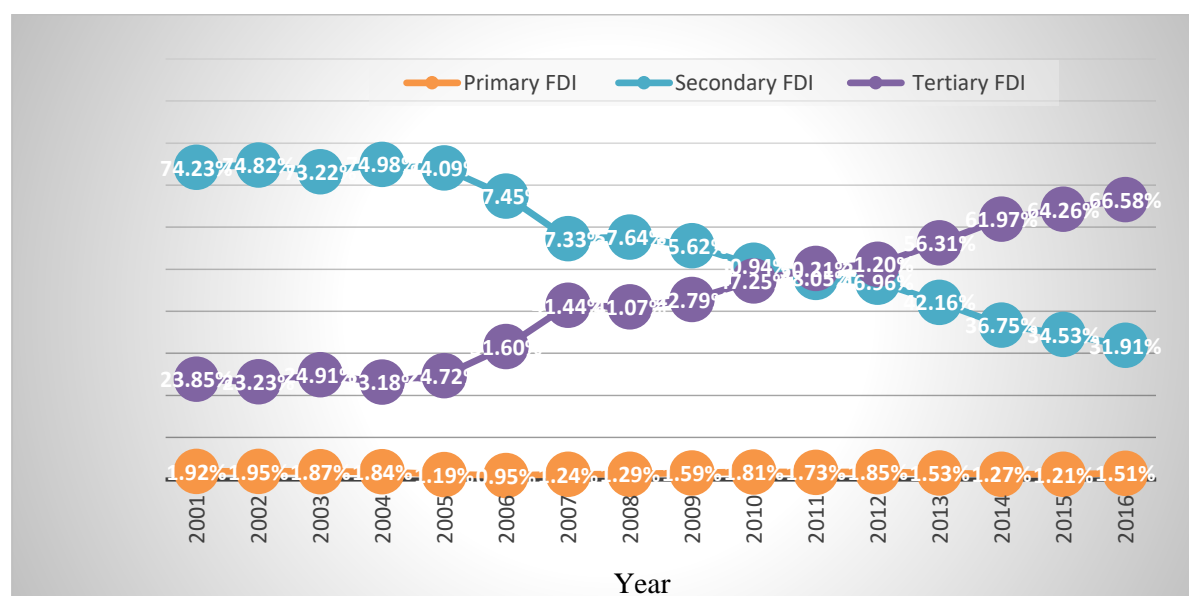


Fig. 1b. The trend of inward sectoral FDI flows as percentage from 2001 to 2016.
Source: The authors' calculations according to NBSC.

2.3.2 Entry strategies of inward FDI

There are three types of foreign capital in China with respect to entry strategies (or ownership types), namely cooperative joint ventures (CJV), equity joint ventures (EJV), and wholly foreign owned enterprises (WFE). The main differences between these three ownership types are as follows: WFE is the FDI that is fully owned by the foreign investor. CJV and EJV are both Sino-foreign co-operations, with the former based on a cooperation contract and the latter based on a joint investment. The CJV accounts for the smallest portion among the three forms, and its importance has been falling over time. In Fig. 2a and Fig. 2b, CJV can be seen going from 6.21 billion USD and 13% of all FDI in 2001 to 0.83 billion USD, less than 1%, by the end of 2016. Unlike CJV, the amount of EJV has increased from 15.74 billion USD in 2001 to 30.20 billion USD in 2016, while its share has fallen from 33.57% to 23.97% as presented in Fig. 1a and Fig. 1b. As the most popular format of FDI, WFE has grown from 23.87 billion USD and 53.17% of the total in 2001 to 86.13 billion USD or 75.37% in 2016 as shown in Fig.2a and Fig.2b.

The association between wage inequality and inward FDI regarding to entry modes starts from the General-Purpose-Technology (GPT) model introduced by Aghion and Howitt (1998). The higher capacity of technology innovation the foreign invested enterprise has, the more likely the wage inequality will increase in the short run (Figini and Görg, 2011) as more skilled workers are used to implement the new technology (Ucal et al., 2016). As they argue, in the long run the when the domestic firms follow up the inequality can be reduced.

Therefore, it is of essential importance to control for the entry modes of inward FDI as they are associated with diverse R&D capabilities and different level of technology innovations. In contrast to Asiedu and Esfahani (2001) and Javorick and Saggi (2010) who show that WFE is with the highest level technology rather than the joint ventures (CJV and EJV), Girma et al. (2015) find that foreign invested enterprises with minority (with more than 25% but less than 50% foreign capital) experience higher likelihood of R&D and conclude the joint ventures can positively contribute to the technology innovation. In line with this finding, Ouyang and Yao (2017) further argue that the joint ventures mentioned in Girma et al. (2015) as the EJV employs political elites while the CJV is lower cost labor driven, more open to the rural migrant workers without *Hukou*. Building on these studies, we examine how the rural-urban wage inequality responds to joint ventures and wholly foreign owed enterprises both in the short run and long run.

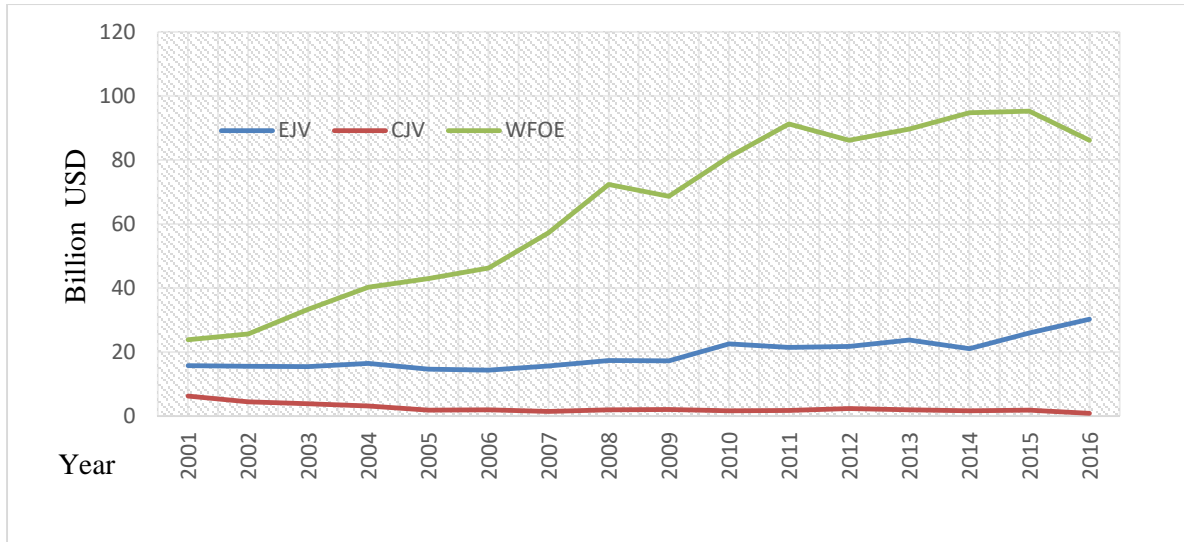


Fig. 2a. The trend of inward FDI flows by ownership type as volume from 2001 to 2016.
Source: The authors' calculations according to NBSC.

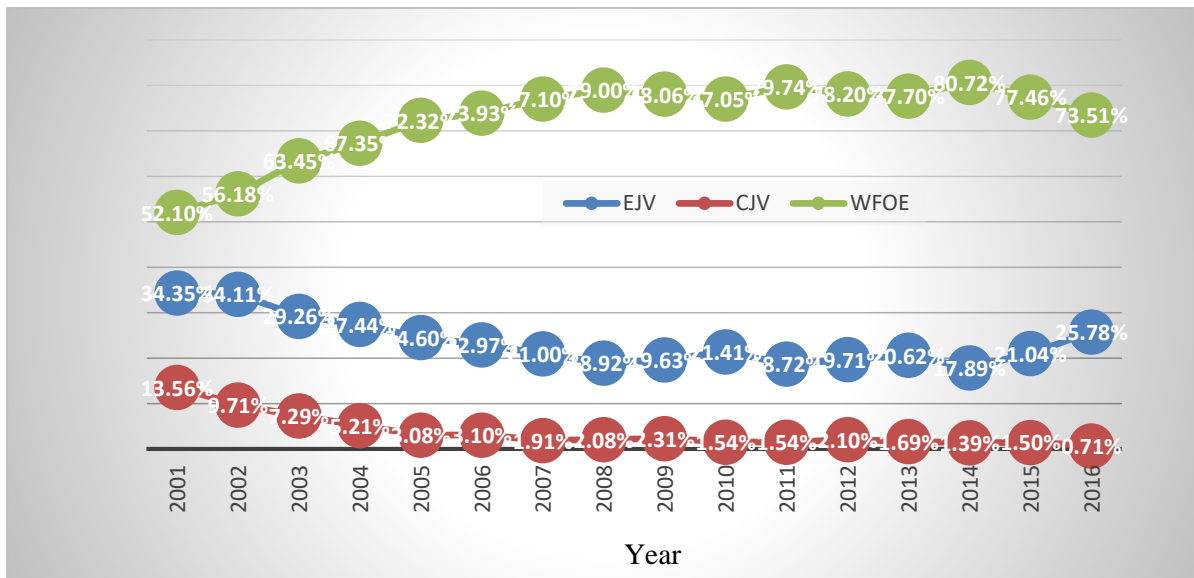


Fig. 2b. The trend of inward FDI by ownerships type as percentage from 2001 to 2016.
Source: The authors' calculations based on NBSC.

2.3.3 Regional distribution of inward FDI in China

The regional disparities in economic development and inequality are caused by the uneven distribution of inward FDI (Madariaga and Poncet, 2007; Ouyang and Yao, 2017). The regions that have higher level of international trade, lower wages, more favorable environment for R&D, higher GDP growth rates, better infrastructure, higher returns on physical and human capitals, larger market size, better labor force and more beneficial policies have higher absorptive capacity for FDI (Wei et al., 1999; Cheng and Kwan, 2000; Sun et al., 2002; Cassidy and Andreosso, 2006; Salike, 2016). Moreover, the Special Economic Zones (SEZ) program has played a significant role in attracting foreign capital and shaping the relationship between the FDI and the local economies, which reveals

the fact that the coastal regions receive the largest portion of inward FDI, whereas the western regions receive the smallest share (Wang, 2013). This uneven distribution of inward FDI can lead to spatial spillovers, especially from the coastal regions to inland areas (Kanbur and Zhang, 1999; Ouyang and Yao, 2017). Our consideration not only falls within inland-coastal spillovers but also goes towards the overall picture of inter-regional interactions.

3. Methodology and Data

3.1. Data

Our empirical strategy is on the basis of a panel dataset that comprises 30 provinces in mainland China over the period of 2000 to 2016. The data sources include the national and provincial statistical yearbooks of the National Bureau of Statistics of China (NBSC, multiple years). The descriptive statistics of the variables in use are presented in Table 1. The rural-urban wage inequality and the inward FDI in different entry modes and sectors are presented in Fig. 3.

Table 1
Descriptive statistics.

Variable	Description	Obs.	Mean	SD
<i>WI</i>	Rural-urban wage inequality as rural to urban wage ratio	510	1.44	0.730
<i>CJV</i>	Inward FDI as CJV to GDP ratio (%)	510	0.15	0.003
<i>EJV</i>	Inward FDI as EJV to GDP ratio (%)	510	0.75	0.007
<i>WFE</i>	Inward FDI as WFE to GDP ratio (%)	510	1.81	0.023
<i>PRI</i>	Inward FDI in primary sector to GDP (%)	510	0.08	0.001
<i>SEC</i>	Inward FDI in secondary sector to GDP (%)	510	1.62	0.014
<i>TER</i>	Inward FDI in tertiary sector to GDP ratio (%)	510	1.07	0.012
<i>AGG</i>	Aggregate level inward FDI to GDP (%)	510	2.77	0.023
<i>LR</i>	Urban rural labor ratio	510	72.42	142.85
<i>KR</i>	Urban rural domestic investment ratio	510	2.74	4.51
<i>PGDP</i>	Per capita GDP (yuan /person)	510	29312.14	23124.4
<i>EDU</i>	University level graduates to total population (%)	510	0.35	0.0021
<i>TRD</i>	Trade to GDP ratio (%)	510	5.89	7.15

Notes: The primary sector consists of farming, forestry and fishing; the secondary sector consists of manufacturing, mining, production and distribution of electricity, gas and water, and construction; the tertiary sector consists of wholesale and retail, trade, transportation, storage and post, hotel and catering, information, transmission, software and information technology, financial services, intermediation, real estate leasing and business service, scientific research and technical services, water management, environment and public facility service, household service, repair and other service, education, health and social services, culture, sports entertainment, public management, social security and organization services.

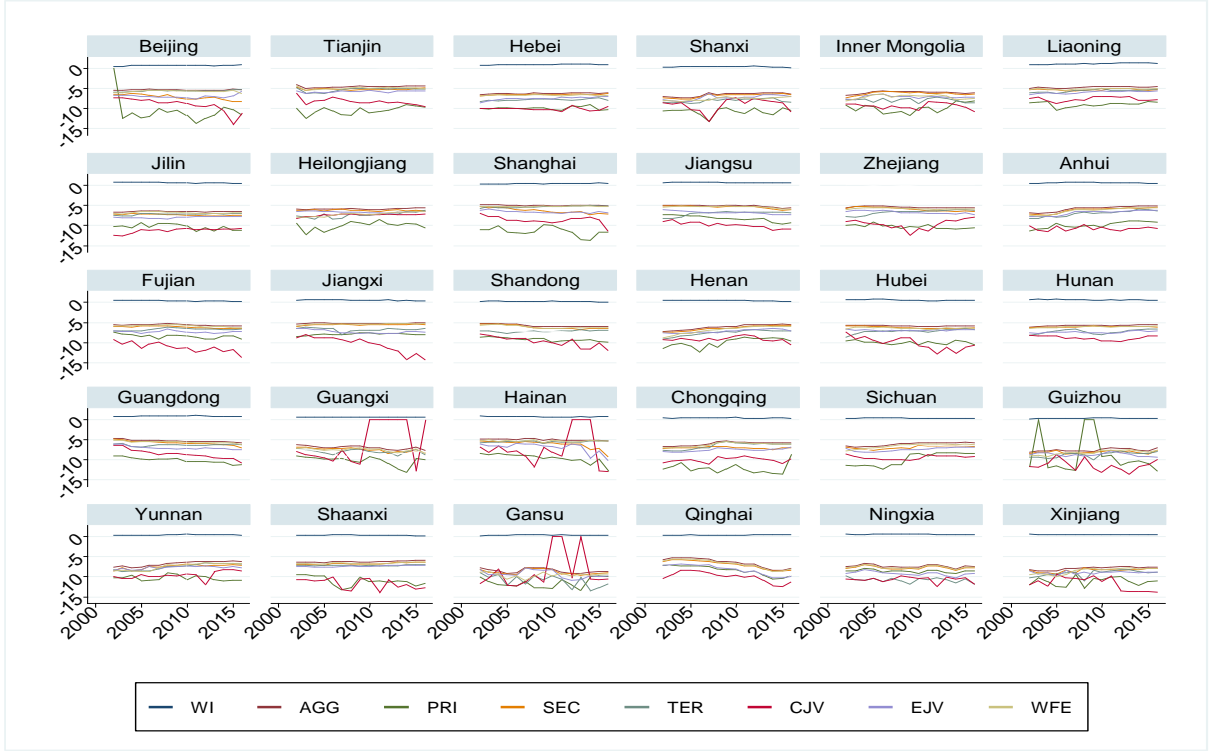


Fig. 3. Rural-urban wage inequality and inward FDI intensity, 2000-2016.

3.2. The empirical model

To study the effect of inward FDI on rural-urban wage inequality as well as capture the spatial effect we employ the general form of spatial econometric model, the general nesting spatial (GNS) model as follows subject to the spatial correlation tests:

$$Y_{it} = \alpha \sum_{j=1}^N w_{ij} Y_{jt} + \beta_1 FDI_{it} + \theta_1 \sum_{j=1}^N FDI_{jt} + \beta_2 X_{it} + \theta_2 \sum_{j=1}^N w_{ij} X_{jt} + \sigma_i + \mu_t + \varepsilon_{it} \quad (1)$$

Where Y_{it} is rural-urban wage inequality in region i at time t , X is a vector of control variables; FDI is a vector of different types of FDI intensity measured by FDI to GDP ratio in region i at time t ; j represents another region ($j \neq i$) which can be the source of the spillover; α is the spatial autocorrelation. β and θ are coefficients to be estimated; w_{ij} are elements in the spatial weight matrix; σ_i is the unobserved region fixed effect that is constant over time, μ_t is the unobserved time effect, and ε_{it} an error term. We break down FDI in two ways: according to ownership types into CJV, EJV and WFE, and by sector into primary, secondary and tertiary FDI. The control variables include the overall provincial per capita GDP and its square term to account for the relationship between economic development and income equality (Kuznets, 1955; Li and Zou, 1998; Forbes, 2000; Rubin and Segal, 2015); proxy for human capital (Figini and Görg, 2011; Yang and Qiu, 2016; Campos et al., 2016); and the rural urban capital and labor ratios (Zhang and Zhang, 2003; Molero-Simarro, 2017).

3.3. Spatial econometric model selection

As for the spatial spillover effect of FDI on income inequality, the spatial dependence of FDI should be first identified by the Moran's I test (Moran, 1950), which is the most widely used test for the spatial interdependence. If the outcome of Moran's I test rejects the null hypothesis that there is no spatial dependence, the Lagrange multiplier (LM) test developed by Anselin et al. (1996) for the spatial autoregressive pattern is applied. The LM test provides suggestions for spatial model selections. If the test results reject the null hypothesis that there is neither spatial nor error dependence, Spatial Durbin Model (SDM) is superior to other spatial models. Then, Wald spatial lagged test and Wald spatial error test should be conducted for the proper form of SDM since it is the general form of spatial autoregressive model (SAR), Spatial Lagged variables (SLX) and Spatial Error Model (SEM) in Fig. 4 (Vega and Elhorst, 2015). If the Wald spatial lagged statistic rejects the null hypothesis, $H_0: \theta = 0$ and the Wald error statistic rejects the null hypothesis, $H_0: \theta = -\rho\beta$ at the same time, the original form of SDM most properly captures the spatial issue in terms of data (Elhorst, 2014).

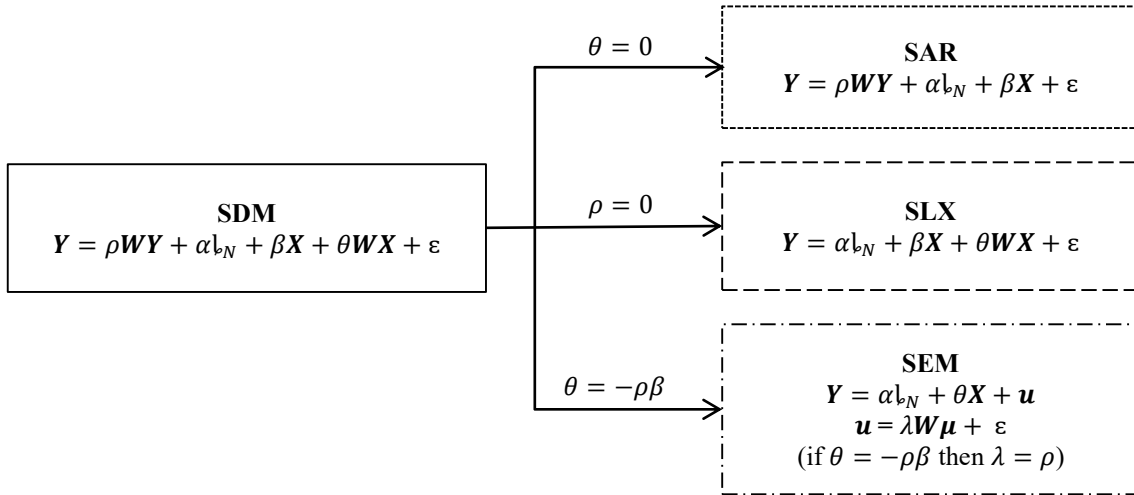


Fig. 4. Comparison of different spatial econometric model specifications originated from SDM.

4. Empirical results

4.1 Spatial correlation test

Both the results of the Moran's I test and Geary's C test (Geary, 1954) shown in Table 2 reject the null hypotheses that the inward FDI and rural-urban wage inequality in different regions are spatially independent at the 1% statistical significance level. Therefore, a spatial econometric model is required to capture the inward FDI spillovers on rural urban wage inequality. Further, the results of the LM and robust LM tests both reject the null hypotheses, which support the adoption of the SDM model.¹ Besides, both the results of the Wald spatial error test and Wald spatial lag test reject the null

¹ See detailed explanations in both theoretical and practical ways in Elhorst (2014), Huang and Chand (2015).

hypothesis at 1% statistical significance level suggesting that the original form of SDM should be selected as we previously discussed in section 3.3.

Table 2
Tests for spatial issues.

		Inward FDI by sector		Inward FDI by entry modes	
		Statistic	P-value	Statistic	P-value
Spatial dependence test	Moran's I	0.2885	0.0000	0.3702	0.0000
	Geary's C	0.7314	0.0000	0.6410	0.0000
	Wald	787.6164	0.0000	1006.9035	0.0000
Spatial error test	LM (B)	278.7285	0.0000	458.8209	0.0000
	Robust LM	353.2603	0.0000	512.7190	0.0000
Spatial lag test	LM (A)	22.4012	0.0000	8.8928	0.0029
	Robust LM	96.9330	0.0000	62.7909	0.0000

Notes: 1. LM, Lagrange multiplier test; 2. LM (A), Lagrange multiplier test (Anselin); 3. LM (B), Lagrange multiplier test (Burridge).

The prerequisite for spatial models is that the elements in the spatial weight matrix have to be exogenous, or the validity of the empirical models cannot be guaranteed (Anselin and Bera, 1998; Keller, 2002). The spatial weight matrix used for the spatial tests and the SDM model relies uniquely on the geographic distance between provinces. We use the actual geographic distance for the construction of the matrix as proposed by Madariaga and Poncet (2007) instead of contiguity (Lesage, 1999; Kelejian et al., 2013; Huang and Chand, 2015). The spatial weight matrix is constructed as $W_{ij} = 1/D_{ij}$ where D_{ij} is the geographic distance between province i and province j .

4.2 Rural urban wage inequality and inward FDI in different sectors.

Table 3 presents the estimation results for the effect of inward FDI in different sectors on rural-urban wage inequality. Model 1 includes three different types of inward FDI with respect to sectors in one regression while model 2, 3, and 4 separate them into different regressions.² In model 5, we introduce total FDI aggregated across all three sectors. The coefficients of FDI are mostly insignificant except that the FDI in primary sector is negative at 10% significance level in model 1 and 5% significance level in model 2. In terms of spatially lagged FDI, only FDI in aggregate level has a weakly significant and negative effect on the rural urban wage inequality. Table 3 provides us with an overview of interaction among regions for the FDI's impact on rural urban wage inequality. However, solely reliance on these spatial estimators can lead to incomplete and even biased conclusions due to two reasons. First, the spatial estimators do not present the marginal effect of variations in independent variables. Second, the spatial estimators may cause divergences in different specifications of spatial regression models (Lesage and Pace, 2009; Huang and Chand, 2015; Huang et al., 2017). Therefore, in Table 4, we also report the partial derivative summary indicators introduced by Lesage and Pace (2009), distinguishing the direct³, indirect and total effect of the

² Some studies include all types of FDI in one regression (for example, see Girma et al., 2015; Ouyang & Yao, 2017) while some others separate them in different regressions (for example, see Huang et al., 2017; Wang et al., 2018). Here, we include both as a comparison.

³ The direct effect captures the endogenous interplay between the host regions and its neighbour regions that triggers feedback effects.

explanatory variables. Note that the direct effect refers to the feedback effects to the neighboring regions and back to the host region, the indirect effect is the difference between total effect and direct effect to capture the spillover effect.

Table 3
Impact of inward FDI by sector on rural-urban wage inequality, SDM.

Variables	Model (1)		Model (2)		Model (3)		Model (4)		Model (5)	
<i>PRI</i>	-0.007**	(-2.38)	-0.006**	(-2.38)						
<i>SEC</i>	0.008	(0.90)			-0.001	(-0.12)				
<i>TER</i>	-0.007	(-0.96)					-0.006	(-1.03)		
<i>AGG</i>									0.011	(1.13)
<i>EDU</i>	-0.027	(-0.93)	-0.027	(-0.91)	-0.026	(-0.89)	-0.024	(-0.82)	-0.034	(-1.15)
<i>TRD</i>	-0.017	(-1.00)	-0.019	(-1.19)	-0.017	(-1.04)	-0.016	(-0.97)	-0.019	(-1.15)
<i>LR</i>	0.014	(0.39)	0.009	(0.25)	-0.001	(-0.05)	0.010	(0.29)	-0.001	(0.25)
<i>KR</i>	0.027***	(2.76)	0.026***	(2.69)	0.025**	(2.56)	0.024**	(2.53)	0.026***	(2.66)
<i>PGDP</i>	-0.052	(-0.26)	0.008	(0.04)	-0.097	(-0.48)	-0.067	(-0.35)	-0.159	(-0.38)
<i>PGDP</i>	-0.005	(-0.48)	-0.008	(-0.82)	-0.003	(-0.27)	-0.004	(-0.45)	0.001	(0.08)
<i>W × PRI</i>	-0.020	(-1.60)	-0.022*	(-1.79)						
<i>W × SEC</i>	-0.004	(-0.05)			-0.055	(-0.94)				
<i>W × TER</i>	-0.001	(-0.04)					-0.020	(-1.03)		
<i>W × AGG</i>									-0.110*	(-1.74)
<i>W × EDU</i>	0.358***	(4.21)	0.367***	(4.68)	0.418***	(5.10)	0.402***	(4.97)	0.414***	(5.26)
<i>W × TRD</i>	0.057	(0.61)	0.017	(0.29)	0.058	(1.06)	0.064	(1.19)	0.055	(1.00)
<i>W × LR</i>	-0.446**	(-2.53)	-0.477***	(-2.87)	-0.545***	(-3.21)	-0.477***	(-2.81)	-0.483***	(-2.83)
<i>W × KR</i>	0.051	(1.13)	0.053	(1.20)	0.051	(1.11)	0.047	(1.04)	0.045	(1.01)
<i>W × PGDP</i>	-1.361	(-1.53)	-1.531*	(-1.76)	-1.864**	(-0.90)	-1.899**	(-2.21)	-1.575*	(-1.80)
<i>W × PGDP²</i>	0.070	(1.60)	0.078*	(1.84)	0.946**	(2.20)	0.096**	(2.28)	0.079*	(1.85)
Fixed effect	Yes		Yes		Yes		Yes		Yes	
Observations	510		510		510		510		510	
R-squared	0.2527		0.2093		0.2000		0.2137		0.2054	

Notes: 1. Independent variable is urban rural wage ratio; 2. All variables are in logarithms; 3. Significant at *10 percent, **5 percent, ***1 percent; 4. Robust z-values are in parentheses; 4. W is the distance weight matrix.

Table 4 shows that the total effect of FDI in the primary sector is negative at 5% significance level. This indicates that 1% increase in primary sector FDI reduces rural-urban wage inequality by 2.1%. Out of this, 1.5% is due to the spatial spillover effect. Although such effect is small given the small share of the primary sector in overall FDI, this confirms our finding that the inward FDI in the traditional sector such as agriculture and forestry is beneficial for the rural workers in terms of offering higher wage and better opportunities. However, there is no significant relationship between inward FDI in other sectors and the rural urban wage inequality. This is in line with Yu et al. (2011) and Greaney and Li (2017) who find no evidence that rural urban wage gap links to the activities of multinationals.

Table 4

Direct, indirect and total effect: Impact of inward FDI by sector on rural-urban wage inequality.

Variables	Model (1)		Model (2)		Model (3)		Model (4)		Model (5)	
Panel A: Direct effect										
PRI	-0.006**	(-2.16)	-0.006**	(-2.14)						
SEC	0.008	(0.89)			0.000	(0.01)				
TER	-0.006	(-0.88)					-0.006	(-0.91)		
AGG									0.013	(1.27)
EDU	-0.034	(-1.17)	-0.034	(-1.21)	-0.033	(-1.19)	-0.031	(-1.11)	-0.042	(-1.46)
TRD	-0.017	(-1.05)	-0.018	(-1.13)	-0.016	(-1.00)	-0.015	(-0.95)	-0.018	(-1.12)
LR	0.023	(0.63)	0.016	(0.48)	0.006	(0.17)	0.016	(0.48)	0.006	(0.17)
KR	0.026***	(2.60)	0.025***	(2.73)	0.024**	(2.59)	0.023**	(2.57)	0.025***	(2.70)
PGDP	-0.032	(-0.15)	0.041	(0.22)	-0.066	(-0.34)	-0.032	(-0.18)	-0.131	(-0.68)
PGDP ²	-0.006	(-0.55)	-0.010	(-1.00)	-0.004	(-0.42)	-0.006	(-0.64)	-0.001	(-0.18)
Panel B: Indirect effect										
PRI	-0.014	(-1.43)	-0.015*	(-1.71)						
SEC	-0.008	(-0.17)			-0.045	(-1.00)				
TER	0.002	(0.06)					-0.015	(-0.66)		
AGG									-0.091*	(-1.87)
EDU	0.279***	(5.11)	0.292***	(5.76)	0.342***	(5.99)	0.328***	(5.98)	0.338***	(6.33)
TRD	0.018	(0.40)	0.017	(0.37)	0.049	(1.08)	0.054	(1.21)	0.047	(1.04)
LR	-0.354***	(-2.71)	-0.376***	(-3.09)	-0.440***	(-3.35)	-0.387***	(-3.07)	-0.387***	(-3.08)
KR	0.032	(0.90)	0.035	(1.03)	0.035	(0.99)	0.032	(0.92)	0.031	(0.87)
PGDP	-0.973	(-1.58)	-1.239*	(-1.92)	-1.518**	(-2.29)	-1.558**	(-2.41)	-1.261*	(-1.92)
PGDP ²	0.052*	(1.71)	0.065**	(2.06)	0.078**	(2.38)	0.081**	(2.51)	0.065**	(2.00)
Panel C: Total effect										
PRI	-0.020**	(-2.03)	-0.021**	(-2.32)						
SEC	-0.001	(-0.01)			-0.046	(-1.01)				
TER	-0.004	(-0.15)					-0.021	(-0.97)		
AGG									-0.078	(-1.59)
EDU	0.245***	(4.39)	0.257***	(4.98)	0.308***	(5.44)	0.296***	(5.47)	0.295***	(5.61)
TRD	0.001	(0.03)	-0.001	(-0.02)	0.033	(0.78)	0.039	(0.94)	0.028	(0.69)
LR	-0.331***	(-2.63)	-0.360***	(-3.13)	-0.434***	(-3.50)	-0.371***	(-3.06)	-0.382***	(-3.19)
KR	0.058	(1.56)	0.061	(1.05)	0.060	(1.57)	0.056	(1.50)	0.056	(1.50)
PGDP	-1.005*	(-1.67)	-1.199*	(-1.88)	-1.584**	(-2.46)	-1.591**	(-2.49)	-1.391***	(-2.17)
PGDP ²	0.046	(1.56)	0.056*	(1.78)	0.074**	(2.34)	0.074**	(2.36)	0.064**	(2.04)

Notes: 1. All variables are in logarithms; 2. Significant at *10 percent, **5 percent, ***1 percent; 3. Robust z-values are in parentheses.

Similarly, Table 5 and Table 6 report the effect of inward FDI according to different entry modes on the rural-urban wage inequality. There is no significant relationship between CJV and rural-urban wage inequality. EJV has a positive direct effect on the rural urban wage inequality. This indicates that the EJV causes a significant interplay between the host region and nearby regions. 1% increase in the EJV increases rural urban wage inequality by 2.3%. This is in line with Girma et al. (2015) and Ouyang and Yao (2017) who argue that EJV has the highest capability for technology innovation and increases the rural urban wage inequality in the short run. Yet, the indirect effect and total effect are insignificant. Among the three ownership types of inward FDI, WFE is found to have a negative indirect effect and total effect on the rural urban wage inequality at 5% significance level. Note that the total effect is mainly driven by the spatial spillover effect, which indicates that the WFE help reduce the rural urban wage inequality. A possible explanation is that the wholly foreign owned enterprises are to some extent lower labor cost driven. They create more job opportunities with less restriction on *Hukou* than the Chinese owned joint ventures. As they are located primarily in the coastal developed provinces, they cause the spatial spillover effects via the rural migrant workers from inland regions.

Table 5

Impact of inward FDI by entry mode on rural-urban wage inequality, SDM.

Variables	Model (1)		Model (2)		Model (3)		Model (4)		Model (5)	
<i>CJV</i>	0.003	(1.37)	0.003	(1.38)						
<i>EJV</i>	0.023***	(2.78)			0.017**	(2.20)				
<i>WFOE</i>	-0.014	(-1.51)					-0.002	(-0.24)		
<i>AGG</i>									0.011	(1.13)
<i>EDU</i>	-0.025	(-0.87)	-0.021	(-0.73)	-0.028	(-0.95)	-0.028	(-0.97)	-0.034	(-1.15)
<i>TRD</i>	-0.009	(-0.52)	-0.016	(-0.96)	-0.017	(-1.01)	-0.016	(-0.98)	-0.019	(-1.15)
<i>LR</i>	0.013	(0.37)	0.001	(0.03)	0.003	(0.09)	0.003	(0.10)	-0.001	(0.25)
<i>KR</i>	0.023**	(2.43)	0.023**	(2.36)	0.027***	(2.78)	0.022**	(2.30)	0.026***	(2.66)
<i>PGDP</i>	-0.199	(-0.99)	-0.109	(-0.57)	-0.142	(-0.74)	-0.124	(-0.62)	-0.159	(-0.38)
<i>PGDP</i>	0.003	(0.27)	-0.002	(-0.23)	-0.001	(-0.01)	-0.001	(-0.09)	0.001	(0.08)
<i>W</i> × <i>CJV</i>	0.019	(1.57)	0.010	(0.84)						
<i>W</i> × <i>EJV</i>	-0.019	(-0.42)			-0.041	(-0.94)				
<i>W</i> × <i>WFE</i>	-0.134***	(-2.69)					-0.110**	(-2.30)		
<i>W</i> × <i>AGG</i>									-0.110*	(-1.74)
<i>W</i> × <i>EDU</i>	0.556***	(5.96)	0.434***	(5.16)	0.396***	(5.09)	0.472***	(5.56)	0.414***	(5.26)
<i>W</i> × <i>TRD</i>	0.064	(1.16)	0.069	(1.29)	0.062	(1.13)	0.064	(1.17)	0.055	(1.00)
<i>W</i> × <i>LR</i>	-0.491***	(-2.83)	-0.479***	(-2.78)	-0.542***	(-3.25)	-0.529***	(-3.80)	-0.483***	(-2.83)
<i>W</i> × <i>KR</i>	0.013	(0.30)	0.039	(0.86)	0.039	(0.87)	0.032	(0.72)	0.045	(1.01)
<i>W</i> × <i>PGDP</i>	-2.248**	(-2.48)	-2.322**	(-2.54)	-1.820**	(-2.12)	-1.789**	(-2.08)	-1.575*	(-1.80)
<i>W</i> × <i>PGDP</i> ²	0.108**	(2.46)	0.116***	(2.61)	0.093**	(2.21)	0.089**	(2.10)	0.079*	(1.85)
Year fixed	Yes		Yes		Yes		Yes		Yes	
Region fixed	Yes		Yes		Yes		Yes		Yes	
Observations	510		510		510		510		510	
R-squared	0.2194		0.2110		0.2075		0.2047		0.2054	

Notes: 1. Independent variable is urban rural wage ratio; 2. All variables are in logarithms; 3. Significant at *10 percent, **5 percent, ***1 percent; 4. Robust z-values are in parentheses. 4. *W* is the distance weight matrix.

Table 6

Direct, indirect and total effect: Impact of inward FDI by entry mode on rural-urban wage inequality.

Variables	Model (1)		Model (2)		Model (3)		Model (4)		Model (5)	
Panel A: Direct effect										
<i>CJV</i>	0.003	(1.22)	0.003	(1.31)						
<i>EJV</i>	0.023***	(2.84)			0.017**	(2.22)				
<i>WFOE</i>	-0.012	(-1.21)					-0.001	(-0.01)		
<i>AGG</i>									0.013	(1.27)
<i>EDU</i>	-0.036	(-1.28)	-0.029	(-1.05)	-0.035	(-1.24)	-0.037	(-1.32)	-0.042	(-1.46)
<i>TRD</i>	-0.010	(-0.61)	-0.016	(-0.94)	-0.016	(-0.98)	-0.016	(-0.96)	-0.018	(-1.12)
<i>LR</i>	0.023	(0.66)	0.008	(0.24)	0.011	(0.32)	0.011	(0.33)	0.006	(0.17)
<i>KR</i>	0.024**	(2.32)	0.023**	(2.40)	0.027***	(2.81)	0.022**	(2.34)	0.025***	(2.70)
<i>PGDP</i>	-0.169	(-0.81)	-0.066	(-0.36)	-0.109	(-0.59)	-0.091	(-0.48)	-0.131	(-0.68)
<i>PGDP</i> ²	0.002	(0.11)	-0.004	(-0.45)	-0.002	(-0.23)	-0.003	(-0.25)	-0.001	(-0.16)
Panel B: Indirect effect										
<i>CJV</i>	0.013	(1.45)	0.006	(0.72)						
<i>EJV</i>	-0.022	(-0.66)			-0.034	(-1.13)				
<i>WFE</i>	-0.094**	(-2.30)					-0.087**	(-2.38)		
<i>AGG</i>									-0.091*	(-1.87)
<i>EDU</i>	0.414***	(7.19)	0.344***	(6.36)	0.322***	(6.15)	0.378***	(6.57)	0.338***	(6.33)
<i>TRD</i>	0.049	(1.18)	0.057	(1.31)	0.052	(1.15)	0.053	(1.20)	0.047	(1.04)
<i>LR</i>	-0.367***	(-2.90)	-0.379***	(-2.85)	-0.435***	(-3.43)	-0.421***	(-3.36)	-0.387***	(-3.08)
<i>KR</i>	0.003	(0.08)	0.025	(0.72)	0.025	(0.71)	0.021	(0.59)	0.031	(0.87)
<i>PGDP</i>	-1.549**	(-2.58)	-1.892***	(-2.76)	-1.464**	(-2.27)	-1.423**	(-2.22)	-1.261*	(-1.92)
<i>PGDP</i> ²	0.076**	(2.59)	0.093***	(2.87)	0.077**	(2.39)	0.073**	(2.27)	0.065**	(2.00)
Panel C: Total effect										
<i>CJV</i>	0.016*	(1.87)	0.009	(1.12)						
<i>EJV</i>	0.002	(0.06)			-0.021	(-0.63)				
<i>WFE</i>	-0.105**	(-2.51)					-0.087**	(-2.00)		
<i>AGG</i>									-0.078	(-1.59)
<i>EDU</i>	0.378***	(6.50)	0.314***	(5.80)	0.287***	(5.50)	0.341***	(5.99)	0.295***	(5.61)
<i>TRD</i>	0.039	(1.00)	0.042	(1.04)	0.036	(0.86)	0.037	(0.91)	0.028	(0.69)
<i>LR</i>	-0.343***	(-2.89)	-0.371***	(-2.99)	-0.424***	(-3.35)	-0.409***	(-3.48)	-0.382***	(-3.19)
<i>KR</i>	0.008	(0.17)	0.047	(1.29)	0.052	(1.39)	0.043	(1.15)	0.056	(1.15)
<i>PGDP</i>	-1.718***	(-2.99)	-1.892***	(-2.91)	-1.573**	(-2.48)	-1.515**	(-2.43)	-1.391***	(-2.17)
<i>PGDP</i> ²	0.078***	(2.78)	0.088***	(2.78)	0.075**	(2.37)	0.070**	(2.27)	0.064**	(2.04)

Notes: 1. All variables are in logarithms; 2. Significant at *10 percent, **5 percent, ***1 percent; 3. Robust z-values are in parentheses.

4.3 The impact of inward FDI over longer periods.

So far, we presented results obtained with annual data. This has the advantage of capturing the short-term fluctuations in the data as well as having a large number of degrees of freedom. However, the downside is that while FDI flows can fluctuate considerably from one year to another, wage inequality tends to be rather persistent and changes only slowly. Therefore, we re-estimate the analysis also with longer periods. It is common in the literature to work with average values over five-year periods. Since our data covers the period from 2000 to 2016, we construct three sub-periods, namely, 2000 to 2005 (six years), 2006 to 2011 (six years) and 2012 to 2016 (five years). The purpose of this analysis is to confirm whether the pattern obtained with annual data holds also in longer term.

Table 7 shows that in the estimation with period averages, the coefficient of inward FDI in the primary sector and tertiary sector is statistically negative while the coefficient of inward FDI in the secondary sector is statistically significant and positive. Yet, in terms of spatially lagged inward FDI, there is no significant relationship. The results in Table 8 further confirms that there is neither significant total effect nor spillover effect, which is broadly consistent with the previous results in the short term.

The results in table 9 and 10 show that in the longer period the WFE also has a negative total and indirect effect on the rural urban wage inequality (mainly from the spatial spillover effect), consistent with the previous results. 1% increases of WFE decreases the rural-urban wage inequality by 17.5%/20.9% in model 1 and 17.5%/18.2% in model 3 from the spillover/total effect. Comparatively, this effect is stronger when estimated with period averages than in the short run estimation in Tables 5 and 6. In addition, EJVI, which does not have any significant effects in the short run, turns to be negatively related to the rural urban wage inequality in the longer period. These results in the longer period are theoretically and empirically consistent with (Aghion and Howitt, 1998; Figini and Görg, 2011; Ucal et al., 2016) in the sense that in a longer period when domestic firms manage to mitigate and learn the know-how via the technology spillovers of multinationals, the wage inequality decreases. These results are also in line with Wei and Wu (2001) who argue that the globalization has helped reduce, rather than increase the rural urban wage income inequality and with Jalil (2012) who finds that income inequality rises with the increase of openness and falls after a certain point, which suggests that China has passed the early stage of hosting inward FDI. Further, we lend credence to the existence of the inward FDI's spatial impacts. Huang and Chand (2015) and Huang et al. (2017) examine the spatial effect of inward FDI and find it significantly relates to the economic growth, environmental pollution and wage rates. In turn, our results complement these studies in the sense that inward FDI can also have a spatial effect on the rural-urban wage inequality.

Table 7

SDM: Impact of inward FDI in different sectors on rural-urban wage inequality: averages.

Variables	Model (1)		Model (2)		Model (3)		Model (4)		Model (5)	
<i>PRI</i> _{Average}	-0.021***	(-4.72)	-0.011***	(-2.75)						
<i>SEC</i> _{Average}	0.078***	(7.25)			0.013*	(1.77)				
<i>TER</i> _{Average}	-0.065***	(-6.63)					-0.026***	(-3.42)		
<i>AGG</i> _{Average}									0.012	(1.36)
<i>EDU</i> _{Average}	0.017	(0.027)	0.037	(1.32)	0.017	(0.62)	0.028	(1.09)	0.011	(0.41)
<i>TRD</i> _{Average}	0.051***	(7.59)	0.033***	(5.12)	0.037***	(6.04)	0.042***	(6.48)	0.036***	(5.98)
<i>LR</i> _{Average}	-0.027	(-0.88)	-0.090***	(-3.21)	-0.099***	(-3.57)	-0.065**	(-2.23)	-0.086***	(0.25)
<i>KR</i> _{Average}	0.004	(0.34)	-0.004	(-0.31)	-0.003	(-0.28)	-0.006	(-0.44)	-0.009	(-0.64)
<i>PGDP</i> _{Average}	-0.664***	(-3.95)	-0.418***	(-2.67)	-0.681***	(-4.26)	-0.402***	(-2.69)	-0.643***	(-4.15)
<i>PGDP</i> ² _{Average}	0.021**	(2.49)	0.008	(0.007)	0.023*	(2.84)	0.008	(1.16)	0.022***	(2.82)
<i>W</i> × <i>PRI</i> _{Average}	-0.028	(-1.04)	-0.015	(-0.66)						
<i>W</i> × <i>SEC</i> _{Average}	0.051	(0.51)			-0.215***	(-2.88)				
<i>W</i> × <i>TER</i> _{Average}	0.029	(0.54)					-0.029	(-0.55)		
<i>W</i> × <i>AGG</i> _{Average}									-0.321***	(-4.07)
<i>W</i> × <i>EDU</i> _{Average}	0.509***	(3.80)	0.754***	(7.83)	0.951***	(8.76)	0.814***	(7.20)	0.988***	(9.53)
<i>W</i> × <i>TRD</i> _{Average}	0.448***	(6.77)	0.462***	(6.61)	0.473***	(7.48)	0.482***	(7.85)	0.496***	(8.15)
<i>W</i> × <i>LR</i> _{Average}	0.363*	(1.81)	-0.217	(-1.36)	-0.332*	(-2.07)	0.041	(0.22)	-0.160	(-0.99)
<i>W</i> × <i>KR</i> _{Average}	-0.037	(-0.42)	-0.001	(-0.01)	-0.041	(-0.91)	-0.001	(0.01)	-0.088	(-0.95)
<i>W</i> × <i>PGDP</i> _{Average}	-2.230**	(-2.37)	-4.573***	(-5.38)	-4.801***	(-5.63)	-4.769***	(-5.40)	-4.935***	(-5.87)
<i>W</i> × <i>PGDP</i> ² _{Average}	0.092*	(2.10)	0.211***	(5.22)	0.215***	(5.34)	0.213***	(5.16)	0.217***	(5.47)
Year fixed	Yes		Yes		Yes		Yes		Yes	
Region fixed	Yes		Yes		Yes		Yes		Yes	
Observations	90		90		90		90		90	
R-squared	0.3613		0.2549		0.2495		0.2589		0.2550	

Notes: 1. All variables are measured as period averages. 2. All variables are in logarithms; 3. Significant at *10 percent, **5 percent, ***1 percent; 4. Robust z-values are in parentheses.

Table 8

Direct, indirect and total effect: Impact of inward FDI by sector on rural-urban wage inequality: averages.

Variables	Model (1)		Model (2)		Model (3)		Model (4)		Model (5)	
Panel A: Direct effect										
<i>PRI</i> _{Average}	-0.020***	(-4.60)	-0.010**	(-2.59)						
<i>SEC</i> _{Average}	0.079***	(7.28)			0.025***	(2.69)				
<i>TER</i> _{Average}	-0.068***	(-6.35)					-0.025***	(-2.65)		
<i>AGG</i> _{Average}									0.016	(0.69)
<i>EDU</i> _{Average}	-0.004	(-0.15)	0.003	(0.11)	-0.031	(-1.15)	-0.009	(-0.35)	-0.038	(-1.45)
<i>TRD</i> _{Average}	0.034***	(5.10)	0.015**	(2.19)	0.017***	(2.62)	0.023***	(3.18)	0.015**	(2.30)
<i>LR</i> _{Average}	-0.042	(-1.31)	-0.085***	(-2.74)	-0.089***	(-2.86)	-0.071**	(-2.30)	-0.084***	(-2.73)
<i>KR</i> _{Average}	0.006	(0.52)	-0.005	(-0.39)	-0.002	(-0.19)	0.023**	(2.57)	-0.005	(-0.43)
<i>PGDP</i> _{Average}	-0.603***	(-3.38)	-0.219	(-1.37)	-0.477***	(-2.85)	-0.189	(-0.154)	-0.430***	(-2.66)
<i>PGDP</i> ² _{Average}	0.018**	(2.05)	-0.001	(-0.17)	0.013	(0.008)	-0.001	(-0.18)	0.012	(1.49)
Panel B: Indirect effect										
<i>PRI</i> _{Average}	-0.002	(-0.18)	-0.001	(-0.15)						
<i>SEC</i> _{Average}	-0.022	(-0.47)			-0.113	(-3.26)				
<i>TER</i> _{Average}	0.052*	(1.75)					0.001	(0.01)		
<i>AGG</i> _{Average}									-0.209**	(-2.28)
<i>EDU</i> _{Average}	0.255***	(4.73)	0.361***	(10.00)	0.456***	(10.63)	0.393***	(9.28)	0.478***	(11.61)
<i>TRD</i> _{Average}	0.206***	(5.57)	0.215***	(6.04)	0.208***	(6.75)	0.217***	(6.86)	0.221***	(7.27)
<i>LR</i> _{Average}	0.196*	(1.81)	-0.056	(-0.68)	-0.100	(-1.23)	0.059	(0.68)	-0.024	(-0.30)
<i>KR</i> _{Average}	-0.021	(-0.52)	0.004	(0.11)	-0.153	(-0.41)	0.006	(0.14)	-0.036	(-0.90)
<i>PGDP</i> _{Average}	-0.757*	(-1.80)	-2.099***	(-5.43)	-1.955***	(-5.01)	-2.188***	(-5.64)	-2.040***	(-7.57)
<i>PGDP</i> ² _{Average}	0.035*	(1.72)	0.103***	(5.49)	0.092***	(4.88)	0.103***	(5.53)	0.093***	(5.08)
Panel C: Total effect										
<i>PRI</i> _{Average}	-0.022*	(-1.67)	-0.012	(-1.14)						
<i>SEC</i> _{Average}	0.057	(1.23)			-0.089***	(-2.84)				
<i>TER</i> _{Average}	-0.015	(-0.64)					-0.025	(-1.13)		
<i>AGG</i> _{Average}									-0.193**	(-2.22)
<i>EDU</i> _{Average}	0.251***	(4.43)	0.364***	(10.06)	0.426***	(10.47)	0.384***	(9.63)	0.439***	(11.38)
<i>TRD</i> _{Average}	0.240***	(6.36)	0.229***	(6.42)	0.226***	(7.36)	0.240***	(7.43)	0.236***	(6.69)
<i>LR</i> _{Average}	0.154	(1.50)	-0.142**	(-2.07)	-0.189***	(-2.91)	-0.011	(-0.14)	-0.108*	(-1.65)
<i>KR</i> _{Average}	-0.015	(-0.32)	-0.001	(-0.01)	-0.018	(-0.41)	-0.001	(-0.02)	-0.041	(-0.91)
<i>PGDP</i> _{Average}	-1.360***	(-3.39)	-2.318***	(-6.59)	-2.431***	(-7.32)	-2.377***	(-6.97)	-2.471***	(-7.57)
<i>PGDP</i> ² _{Average}	0.053***	(2.79)	0.102***	(6.02)	0.159***	(6.67)	0.102***	(6.27)	0.064**	(2.04)

Notes: 1. All variables are measured as period averages. 2. All variables are in logarithms; 3. Significant at *10 percent, **5 percent, ***1 percent; 4. Robust z-values are in parentheses.

Table 9

SDM: Impact of inward FDI by entry mode on rural-urban wage inequality: averages.

Variables	Model (1)		Model (2)		Model (3)		Model (4)		Model (5)	
$CJV_{Average}$	0.005	(0.76)	0.005	(0.31)						
$EJV_{Average}$	0.048**	(2.13)			0.025***	(3.34)				
$WFE_{Average}$	-0.058**	(-2.32)					-0.023	(-1.44)		
$AGG_{Average}$									0.012	(1.36)
$EDU_{Average}$	-0.027	(-1.00)	0.012	(0.43)	0.022	(0.83)	0.008	(0.30)	0.011	(0.41)
$TRD_{Average}$	0.019***	(2.96)	0.036***	(5.34)	0.032***	(5.09)	0.036***	(5.96)	0.036***	(5.98)
$LR_{Average}$	0.022	(0.73)	-0.069**	(-2.36)	-0.076***	(-2.73)	-0.076***	(-2.71)	-0.086***	(0.25)
$KR_{Average}$	0.020	(1.43)	0.007	(0.51)	-0.002	(-0.16)	-0.009	(-0.66)	-0.009	(-0.64)
$PGDP_{Average}$	-0.402**	(-2.50)	-0.461***	(-3.06)	-0.669***	(-4.45)	-0.472***	(-2.97)	-0.643***	(-4.15)
$PGDP^2_{Average}$	0.107	(1.30)	0.011	(1.41)	0.023***	(2.97)	0.014*	(1.70)	0.022***	(2.82)
$W \times CJV_{Average}$	-0.042	(-1.57)	-0.078	(-1.31)						
$W \times EJV_{Average}$	-0.097	(-1.46)			-0.231***	(-3.87)				
$W \times WFE_{Average}$	-0.409**	(-2.28)					-0.369***	(-2.45)		
$W \times AGG_{Average}$									-0.321***	(-4.07)
$W \times EDU_{Average}$	1.036***	(9.47)	0.750***	(7.60)	0.943***	(9.24)	0.978***	(9.51)	0.988***	(9.53)
$W \times TRD_{Average}$	0.451***	(6.94)	0.531***	(7.88)	0.504***	(8.27)	0.492***	(8.04)	0.496***	(8.15)
$W \times LR_{Average}$	-0.288	(-1.55)	-0.425**	(-2.54)	-0.474***	(-2.88)	-0.045	(-0.27)	-0.160	(-0.99)
$W \times KR_{Average}$	-0.040	(-0.41)	0.062	(0.68)	-0.128	(-1.31)	-0.025	(-0.28)	-0.088	(-0.95)
$W \times PGDP_{Average}$	-3.589***	(-3.68)	-4.306***	(-4.99)	-5.682***	(-6.28)	-4.483***	(-5.33)	-4.935***	(-5.87)
$W \times PGDP^2_{Average}$	0.154***	(3.30)	0.201***	(4.95)	0.261***	(6.12)	0.195***	(4.84)	0.217***	(5.47)
Year fixed	Yes		Yes		Yes		Yes		Yes	
Regions fixed	Yes		Yes		Yes		Yes		Yes	
Observations	90		90		90		90		90	
R-squared	0.3145		0.2403		0.2666		0.2844		0.2550	

Notes: 1. All variables are measured as period averages. 2. All variables are in logarithms; 3. Significant at *10 percent, **5 percent, ***1 percent; 4. Robust z-values are in parentheses.

Table 10

Direct, indirect and total effect: Impact of inward FDI by entry mode on rural-urban wage inequality: averages.

Variables	Model (1)		Model (2)		Model (3)		Model (4)		Model (5)	
Panel A: Direct effect										
$CJV_{Average}$	0.009	(1.01)	0.006	(0.76)						
$EJV_{Average}$	0.057**	(2.24)			0.022	(1.07)				
$WFE_{Average}$	-0.035	(-1.56)					-0.007	(-0.36)		
$AGG_{Average}$									0.016	(0.69)
$EDU_{Average}$	-0.065	(-1.06)	-0.027	(-1.00)	-0.023	(-0.88)	-0.041	(-1.50)	-0.038	(-1.45)
$TRD_{Average}$	-0.001	(-0.22)	0.012*	(1.75)	0.011*	(1.66)	0.015**	(2.35)	0.015**	(2.30)
$LR_{Average}$	0.039	(1.10)	-0.051	(-1.53)	-0.058*	(-1.86)	-0.079**	(-2.53)	-0.084***	(-2.73)
$KR_{Average}$	0.024*	(1.83)	0.005	(0.39)	0.004	(0.31)	-0.008	(-0.74)	-0.005	(-0.43)
$PGDP_{Average}$	-0.258	(-1.57)	-0.262*	(-1.67)	-0.428***	(-2.77)	-0.271* ^a	(-1.65)	-0.430***	(-2.66)
$PGDP^2_{Average}$	0.004	(0.52)	0.001	(0.08)	0.011	(1.39)	0.004	(0.54)	0.012	(1.49)
Panel B: Indirect effect										
$CJV_{Average}$	-0.026	(-0.90)	-0.043	(-1.36)						
$EJV_{Average}$	-0.089	(-1.23)			-0.156**	(-1.97)				
$WFE_{Average}$	-0.175*	(-1.73)					-0.175**	(-2.34)		
$AGG_{Average}$									-0.209**	(-2.28)
$EDU_{Average}$	0.514***	(11.59)	0.356***	(9.56)	0.458***	(11.22)	0.476***	(11.58)	0.478***	(11.61)
$TRD_{Average}$	0.204***	(7.07)	0.235***	(7.18)	0.231***	(7.45)	0.219***	(7.20)	0.221***	(7.27)
$LR_{Average}$	-0.157	(-1.62)	-0.164*	(-1.90)	-0.190**	(-2.21)	0.025	(0.31)	-0.024	(-0.30)
$KR_{Average}$	-0.032	(-0.81)	0.027	(0.72)	-0.061	(-1.40)	0.021	(0.59)	-0.036	(-0.90)
$PGDP_{Average}$	-1.457**	(-3.50)	-1.821***	(-4.79)	-2.455***	(-5.87)	-1.935***	(-5.09)	-2.040***	(-7.57)
$PGDP^2_{Average}$	0.066***	(3.26)	0.092***	(5.07)	0.118***	(5.86)	0.088***	(4.72)	0.093***	(5.08)
Panel C: Total effect										
$CJV_{Average}$	-0.013	(-1.17)	-0.036	(-1.25)						
$EJV_{Average}$	-0.015	(-0.55)			-0.134*	(-1.87)				
$WFE_{Average}$	-0.209**	(-1.99)					-0.182**	(-2.41)		
$AGG_{Average}$									-0.193**	(-2.22)
$EDU_{Average}$	0.433***	(9.65)	0.330***	(8.78)	0.435***	(10.75)	0.435***	(11.57)	0.439***	(11.38)
$TRD_{Average}$	0.203***	(6.98)	0.247***	(7.41)	0.242***	(7.72)	0.235***	(7.71)	0.236***	(6.69)
$LR_{Average}$	-0.117	(-1.51)	-0.215***	(-3.27)	-0.248***	(3.62)	-0.054	(-0.78)	-0.108*	(-1.65)
$KR_{Average}$	-0.009	(-0.19)	0.032	(0.74)	-0.057	(-1.19)	-0.013	(-0.30)	-0.041	(-0.91)
$PGDP_{Average}$	-1.715***	(-4.34)	-2.083**	(-6.11)	-2.883***	(-7.59)	-2.206***	(-6.79)	-2.471***	(-7.57)
$PGDP^2_{Average}$	0.071***	(3.72)	0.093***	(5.73)	0.129***	(7.13)	0.093***	(5.93)	0.064**	(2.04)

Notes: 1. All variables are measured as period averages. 2. All variables are in logarithms; 3. Significant at *10 percent, **5 percent, ***1 percent; 4. Robust z-values are in parentheses.

It is noteworthy that among the control variables, education increases the wage inequality between rural and urban areas through the spatial spillover effect. This probably reflects the fact that most college graduates are located in urban areas. This result also underscores the role of education as a determinant factor in regional rural-urban disparities in China. In addition, the per capita GDP has a negative spatial effect on the rural-urban wage inequality while its square term has positive spatial effect on the rural wage inequality, displaying an adverse Kuznets effect. Our understanding is that the rural-urban wage inequality first decreases as the economic development in the neighboring regions provides more job opportunities with higher wages and then increases when the job market is in saturation.

5. Conclusions

When investigating the relationship between inward FDI and income inequality, especially from the angle of rural-urban inequality, the literature overlooks the potential spatial spillover effects of inward FDI and fails to control for the heterogeneity of inward FDI, leaving a significant research gap. Based on a panel dataset covering 30 provinces from 2000 to 2016, this study investigates the the spatial spillover effect of inward FDI on rural-urban wage inequality in China. Besides explicitly allowing FDI to have a spatial spillover effect, we also consider the possibility that the effect of inward FDI on rural urban disparity may depend on sectoral distribution and ownership types of inward FDI.

Our results show that while there is no significant relationship between rural-urban wage inequality and inward FDI in secondary and tertiary sector in both short run and long run, the inward FDI in primary sector has a negative spillover effect on rural-urban wage inequality in the short run although this effect is relatively small when we account for the sectoral distribution. With respect to entry strategies of inward FDI, we find that WFE has a negative spillover effect on rural urban wage inequality in the short run while this effect is more pronounced in the long run. Also, the equity joint ventures reduce the rural urban wage inequality in the long run, indicating that China has gone beyond the early stage of openness and demonstrate well-developed leaning and innovation ability. Our findings corroborate Wang (2009) and Doytch and Uctum (2011) from a macro level in the sense that the heterogeneity of different types of inward FDI accounts largely for the mixed findings in the current literature, which provides further understanding on the heterogeneity of inward FDI at an aggregate level based on entry strategies and sectoral distribution.

Several policy implications may be obtained from our study. Based on the suggestions from some scholars advocating that more foreign capital should be allocated in inland provinces to address the issue of uneven development in China (Zhang and Zhang, 2003; Wan et al., 2007), more inward FDI in traditional sector such as agricultural technology-advanced FIEs should be introduced and allocated to the central and west regions to provide more opportunities for rural workers and foster rural development. Meanwhile, the policy makers may focus on the establishment of an improved and

developed rural education system so as to facilitate the rural labor to be skilled and prepared for the industrial transition at this turning point.

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