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**Article**

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## DEVELOPMENT ECONOMICS | RESEARCH ARTICLE

# Spatial effects of foreign direct investment on wage inequality in Vietnam

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**Abstract:** This study analyzes the effects of foreign direct investment (FDI) on wage inequality in Vietnam by utilizing panel data from 63 provinces over the period 2010–2018. The spatial autocorrelation model is used in the study. Empirical results from the spatial econometric model reveal that FDI tends to increase wage inequality in localities and has direct and spatial effects. Economic growth has led to a reduction in the wage inequality between skilled and unskilled labor. The increase in the proportion of the skilled labor force reduces wage inequality in provinces with high human capital and developed education systems. The study results imply that the policy on attracting and utilizing FDI needs to be aligned with training and human capital development to ensure sustainable development. It is also necessary to emphasize professional training for the workforce to attract FDI.

**Subjects:** Rural Development; Urban Development; Economics and Development; Sustainable Development; Urban Economics

**Keywords:** foreign direct investment; wage inequality; spatial econometrics; Vietnam

## 1. Introduction

Over the past 20 years, the issue of Foreign Direct Investment (FDI) versus social equality has been more prevalent in studies where the results indicate that FDI can bring many benefits to the host country's economy. However, not all citizens in that country can benefit from it equally. The issue of social equality is often analyzed in terms of income inequality or wage inequality. The relationship between the increase in FDI inflows and wage inequality has become a subject of interest for researchers and policymakers—theoretically and empirically—and various theories have been developed to explain the origin of this disparity (Aghion et al., 1998; Feenstra & Hanson, 1997; Figini & Görg, 1999; Markusen & Venables, 1999; Taylor & Driffield, 2005; Te Velde & Morrissey, 2004). These studies also provide the essential foundation for empirical research conducted globally. However, the inconsistencies detected in this study highlight the urgent need to undertake further empirical studies to draw a more precise conclusion.

Empirical studies can be divided into four groups: firstly, the relationship between FDI and wage inequality, including FDI effects of reducing wage inequality in host countries (Bhandari, 2007; Jensen & Rosas, 2007; Mugeni, 2015; Nguyen et al., 2019); secondly, the FDI deepening effects on wage inequality (Bogliaccini & Egan, 2017; Choi, 2006; Gopinath & Chen, 2003; Jaumotte et al., 2013; Reuveny & Li, 2003; Te Velde & Morrissey, 2004); thirdly, the fact that FDI has nonlinear effects on wage inequality (Aghion et al., 1998; Figini & Görg, 1999; Taylor & Driffield, 2005); and fourthly, the FDI has the spatial effects on wage inequality (Wang et al., 2021).

Evidence suggests an increase in wage inequality between skilled and unskilled labor in developed and developing countries (Johansson & Liu, 2020; Taylor & Driffield, 2005; Te Velde & Morrissey, 2004). Wages are the primary source of income for most laborers, and therefore the distribution of wages has an essential impact on income inequality. In general, previous studies have not come to a unified conclusion on the impact of FDI on the wage gap between skilled and unskilled laborers; the proposed theoretical frameworks are diverse, which leads to different explanations for this disparity. Moreover, many empirical studies globally have estimated the effect of FDI on the wage gap between skilled and unskilled laborers; however, none of these studies has examined the spatial effects of FDI on wage inequality.

In Vietnam, it is noteworthy that although the Gini coefficient is not high, the absolute income inequality is increasing. The per capita income of the top 20% of households was 9.2 times higher than that of the lowest 20% of households in 2010. This difference increased to 9.86 times in 2018. Besides, regarding the wage difference between skilled and unskilled workers, from 2010–2018, wage inequality between these two groups increased from 1,433 times in 2010 to 1,874 times in 2018. Significantly, 2015 and 2016 witnessed a very high difference of 2,471 times and 1,928 times, respectively. In the context of Vietnam—a developing country—the FDI sector is one of the critical growth drivers of the economy and is having an increasing impact on the socio-economic status of its citizens. Nevertheless, studies on the impact of FDI on wage inequality are still scarce, and none of the researchers has utilized the wage gap between skilled and unskilled laborers to represent the wage inequality issue in Vietnam. In addition, the spatial effect of FDI on wage inequality is a new research approach adopted worldwide and has not been analyzed in Vietnam. Moreover, it is indicated that the general conclusions in prior researches are inconsistent, motivating this study. Last but not least, this study's results are likely to apply to other developing countries.

In this study, the focus is on analyzing the impact of FDI on wage inequality in Vietnam. Firstly, we built an empirical model to examine the impact of FDI on wage inequality, in which the variable representing wage inequality is the wage gap between skilled and unskilled laborers. Subsequently, we utilized a spatial econometric model with panel data from 63 provinces in Vietnam over the period 2010–2018; to analyze the impact of FDI on wage inequality. Based on the spatial econometric model, the study focused on answering the following questions: (1) How does FDI affect wage inequality in Vietnam?; and (2) Is there a spatial effect of FDI on wage inequality in localities?

The study has a five-part structure: (1) Introduction; (2) Research overview; (3) Research methodology; (4) Results; and (5) Conclusions.

## 2. Literature review

The impact of FDI on wage inequality is attracting the attention of researchers around the globe. However, these studies have not reached a unified conclusion on the impact of FDI on wage inequality. The theoretical and empirical research on the relationship between FDI and wage inequality can be divided into four groups as follows:

### 2.1. FDI has a nonlinear relationship with wage inequality

Theoretically, the endogenous growth model of Aghion et al. (1998) suggests that technological development was the cause of the income gap between unskilled and skilled laborers. Based on the said economic model, the authors demonstrated two stages of development to import a new technology from multinational enterprises (MNEs) into the host country. The demand for skills in the early stages led to an increase in the demand for skilled laborers who were in short supply; this led to increasing wage inequality during this period. After that, wage inequality decreased as the supply of necessary skills improved, and the companies transitioned to the new technological model. In addition, the previously unskilled workers had been upgrading themselves with the required skills, thus joining the middle-income class society; and naturally reducing the pre-existing wage inequalities. The endogenous growth model of Aghion et al. (1998) hypothesizes

the nonlinear relationship between FDI and wage inequality. At the same time, using the General Purpose Technology (GPT) model, Aghion et al. (1998) also supported the nonlinear effect of FDI on wage inequality.

Subsequent empirical studies by Figini and Görg (1999, 2011) also showed a nonlinear relationship between FDI and wage inequality. In 1999 they discovered an inverted U-shaped relationship in the context of Ireland, while, in another study conducted in 2011 with a large sample of more than 100 developed and developing countries covering the period 1980–2002, they also found a nonlinear effect of FDI on wage inequality in developing countries. In particular, when studying the effects of FDI on wage inequality in OECD countries versus non-OECD developing countries, a clear distinction was made between the two. In the case of non-OECD developing countries, the study showed that the impact of FDI on wage inequality was nonlinear in an inverted U-shape. Specifically, FDI initially increases wage inequality, but subsequent increases in FDI reduce wage inequality in these countries. However, no such evidence was found in developed countries.

## **2.2. FDI has the effect of increasing wage inequality**

The positive effect of FDI on wage inequality is also theoretically explained according to the northern and southern country model of Feenstra and Hanson (1996). This theory assumes that the countries in the north are developed with abundant skilled laborers, and the countries in the south are less developed, with most laborers being unskilled. Businesses in the northern countries with mainly skilled laborers would hire businesses in the southern countries with unskilled laborers to produce inputs. The availability and low labor cost in these less-developed southern countries could attract FDI from the northern developed countries, where labor is considered scarce and expensive. However, from the perspective of northern countries, production jobs transferred to southern countries could be seen as unskilled ones, while in southern countries, these jobs could be seen as skilled ones. This implies that some jobs may be considered either low-skilled in one country or high-skilled in another. Therefore, this type of FDI can increase the demand and wages for skilled workers in more and less-developed countries.

Several empirical studies (Aitken et al., 1996; Feenstra & Hanson, 1996; Gopinath & Chen, 2003; Lipsey & Sjöholm, 2004; Mah, 2002; McLaren, 2000; Taylor & Driffield, 2005; Te Velde, 2003) supported the hypothesis derived from the North–South model, which proposed that FDI hurts wage inequality by increasing the demand and wages of skilled workers in the host countries. These studies discovered that FDI inflows were mainly through the activities of MNEs, which often have a higher demand for skilled laborers than domestic enterprises. This led to wage differences for laborers in the latter (Le, 2020; Taylor & Driffield, 2005), widening the income gap between skilled and unskilled laborers. In addition, these studies revealed evidence of inequality in human capital, especially in developing countries. Moreover, FDI enterprises often set certain specification standards. Therefore, the opportunities for employment and income levels offered by FDI enterprises were also unequal among the labor groups with varied qualifications. This further contributed to the increase in wage inequality.

In addition, FDI enterprises created disparities in labor groups' qualifications and skill levels through their training activities. As skills training activities became more frequent in FDI enterprises, laborers' qualifications increased. This widened the qualification and income gap between labor groups in FDI and non-FDI enterprises (Te Velde, 2003).

Apart from that, Te Velde (2003) exposed the difference in status between skilled and unskilled laborers. The former often possessed a higher status due to the shortage of this group in the labor market, which put them in an advantageous position with the ability to negotiate a higher salary with their employers. In addition, FDI enterprises tend to select areas that utilize skilled laborers to carry out

their investment activities (Feenstra & Hanson, 1996). Thus, the status of the skilled labor groups was relatively improved, increasing income inequality between the skilled and unskilled labor groups.

Te Velde (2003) conducted a study in the context of Latin America, which examined the degree of influence of FDI on the wage distribution of skilled and unskilled laborers. The results showed that FDI had no effect on reducing wage inequality in Latin America and even suggested that FDI might increase wage inequality in Bolivia and Chile. FDI could have a negative effect on income distribution. For example, when foreign companies introduced new skill-demanding technologies, such as electronics companies in Costa Rica, that increased demand for skilled laborers and wage inequality. Using the same approach, Gopinath and Chen (2003) selected 11 developing countries and proved that FDI widened the wage gap between skilled and unskilled laborers.

Johansson and Liu (2020) studied the impact of FDI on wage inequality in China and found a link between FDI and the demand for skilled laborers. There was evidence that wage inequality is higher in cities that attract more FDI. In addition, through analyses at the enterprise level, the study revealed that FDI not only increased the relative demand for skilled labor but also created a significant wage gap effect. In particular, FDI enterprises paid higher-than-average salaries for positions requiring skills. However, FDI had a positive wage spatial effect on both skilled and unskilled laborers in state-owned enterprises, but the level of the spatial effect was much higher for the former group.

### **2.3. The positive effects of FDI**

Many neoclassical economists have also shown that FDI affects economic growth positively and reduces wage inequality (Mundell, 1957). They argued that FDI not only helped to fill the shortage of resources; but also created better economic growth through the spread of new technology, the development of human capital, management skills, and access to export markets (Pan-Long, 1995). The trend of capital flow from regions with abundant resources to regions with scarce resources (to exploit low-income labor resources) caused the shift of labor and technology to these areas. As a result, the income inequality in different regions had decreased.

Other studies also opined that FDI reduced wage inequality in the host country. The study by Jensen and Rosas (2007) showed that FDI in Mexico in the period 1990–2000 reduced wage inequality at the state level. In addition, Bhandari (2006) revealed that FDI had a beneficial distributive effect in the United States, with significant variations across regions over different periods. A similar conclusion was suggested by Chintrakarn et al. (2012), who argued that FDI in the United States reduced wage inequality, but the level of spatial effects varied across the regions.

Mugeni (2015) utilized panel data from 153 developed and developing countries from 1995–2010, revealing that inward FDI, along with a degree of democracy, reduces wage inequality. In addition, the results were consistent with the assumption that FDI reduces wage inequality in countries with a higher degree of democracy.

To summarize, there have been numerous studies on the effects of FDI on wage inequality using large datasets across many countries or across a single country. However, the conclusions differ because FDI affects these regions according to the mechanisms applied. The variances in research results were caused by the differences in capital absorption capacity and development strategy of each host country. In addition, the choice of the proxies of wage inequality, the dependent variables, the control variables, and the different estimation techniques also contributed to the differences in the research results. Therefore, the relationship between FDI and wage inequality cannot be generalized across all countries or regions, necessitating further investigation in the context of Vietnam.

There have been very few studies on the impact of FDI on wage inequality in Vietnam, with each yielding a different result. Studies conducted by Ho et al. (2020) showed that FDI had the potential to increase wage inequality. In contrast, Nguyen (2016) opined that FDI helped to reduce wage inequality in localities. This conclusion was derived after analyzing provincial panel data over the period 2002–2012. Similar conclusions were found by Chu and Le (2016), who argued that FDI reduced wage inequality since this sector had created a significant number of jobs for unskilled laborers. In addition, FDI inflows into Vietnam were influenced by factors such as geographical distance and trade openness, which originated mainly from East Asian countries with the main motive of seeking low-cost labor.

#### **2.4. The spatial effects of FDI on wage inequality**

Wang et al. (2021) studied the spatial effect of inward FDI on urban-rural wage inequality in the short and long run. Based on a panel dataset covering 30 provinces and cities in China from 2000 to 2016, the study showed that wholly foreign-owned enterprises have a negative spatial effect on urban-rural wage inequality in the short and long run, while equity joint ventures reduce urban-rural wage inequality in the long run only.

Theoretically, FDI could have a spatial effect on wage inequality in a developing country through two channels: knowledge spillovers between regions and inter-regional mobility.

Due to the advantage of ownership, FDI created a positive spatial effect of knowledge across regions, contributing to the economic growth in other regions. Firstly, by stimulating labor migration between regions, FDI helped to spread inter-regional knowledge in a positive way to boost economic growth in other regions. In addition, employees whom FDI enterprises trained returned to their homelands or migrated to other localities and took knowledge from local firms there (Du et al., 2005; Fosfuri et al., 2001). Secondly, through forward and backward industrial linkages with firms in other provinces, FDI offered firms in other provinces the opportunity to expand their production scale and improve productivity through linkages in the supply chain (Chen et al., 2013; Kugler, 2006). Thirdly, the innovation and research and development (R&D) activities of MNEs created knowledge spillovers across regions through technology transfer, which was also a factor by which FDI reduced wage inequality (Bronzini & Piselli, 2009). Fourthly, from a macroeconomic perspective, the increase in market demand for products from other regions was caused by the increase in wages in FDI sectors (Brun et al., 2002; Pham & Ho, 2021; Zhang & Felmingham, 2002). In these cases, FDI had a positive spatial effect on economic growth, which led to a reduction in wage inequality in other provinces. However, FDI firms also competed with the local firms in other provinces, for example, by pushing them out of the market and competing with them in labor and resource markets (Aitken & Harrison, 1999; Fu, 2011). Such competition led to bankruptcy among local businesses, causing a reduction in jobs for unskilled laborers. Thus, in this case, FDI had a negative spatial effect on wage inequality in other regions.

Regarding inter-regional migration and income transfer, FDI promoted migration from surplus labor regions to other regions with scarce labor. In Vietnam, FDI inflows into cities had attracted dozens of millions of rural migrant workers from other regions. On the one hand, inter-regional migration of rural workers from less-developed regions caused a loss of income in those regions, which is the opportunity cost of inter-regional migration. On the other hand, migrant rural workers from less-developed regions would remit money to their homeland. Therefore, if the remittances of rural migrant workers were higher than the loss of income in their homeland, the overall income of households in the home country would increase, thereby reducing wage inequality in such regions and vice-versa. However, in addition to income transfer, FDI had a spatial effect on wage inequality through the migration channel via another dimension. From a skills perspective, the labor transfer between regions attracted skilled laborers from other provinces and caused more scarcity of such labor groups in those localities. Hence, the shortage of skills increased wage inequality in these localities.



### 3. Empirical model and data

#### 3.1. Empirical model

Based on the studies by Te Velde (2003) and Taylor and Driffield (2005), the impact of FDI on wage inequality in Vietnam is estimated by using the following empirical model:

$$WI_{it} = \beta_0 + \beta_1 FDI_{it} + \beta_2 \ln PGDP_{it} + \beta_3 HC_{it} + \beta_4 TRADE_{it} + \beta_5 RSS_{it} + \beta_6 TS_{it} + \mu_i + \varepsilon_{it} \quad (1)$$

In this model:

$\mu_i$  is a fixed effect that does not change over time, representing the specificity of each locality, and  $\varepsilon_{it}$  is an unobserved random component.

The WI is a variable representing wage inequality, the ratio calculated as the average wage of skilled laborers compared with the average wage of unskilled laborers in province  $i$  in year  $t$ . The wage differential coefficient between skilled and unskilled laborers is used to assess the impact of FDI on wage inequality based on the change in supply and demand for skills. In this study, skilled laborers have been trained at a school or a professional training institution under the National Education System for three months or more. They have graduated and been awarded a degree or certificate proving they attained a particular professional or technical competency. On the other hand, unskilled labor refers to those who does not possess any formal professional or technical qualifications.

The FDI variable is the ratio of realized FDI to current GDP in province  $i$  in year  $t$ , and it denotes the effect of FDI inflows into province  $i$  in year  $t$ .

$\ln PGDP$ ,  $HC$ ,  $TRADE$ ,  $RSS$ , and  $TS$  are other explanatory variables. According to the theory of supply and demand for skills, five basic control variables are included in the equation: trade openness ( $TRADE$ ); level of economic development ( $\ln PGDP$ ); human capital ( $HC$ ); skills scarcity ( $RSS$ ); and labor training costs incurred by enterprises ( $TS$ ).

Feenstra and Hanson (1996) and Blonigen and Slaughter (2001) showed that trade openness also affected wage inequality. As to whether outsourcing actually leads to wage inequality depends on the skill levels of the outsourcing-related jobs. However, for developing countries, the researchers predicted higher usage of unskilled labor compared to skilled labor in outsourced activities through international trade (Wood, 1995). As a result, outsourced activities would lead to an increase in wage inequality. Whilst examining the role of exports in wage inequality, Bernard and Jensen (1997) found that an increase in exports from the factories in the United States strongly affected wage inequality. However, Machin and Van Reenen (1998) could not find a role for trade openness in explaining the variation in wage inequality across OECD countries. Despite the lack of empirical evidence, it was anticipated that trade openness would positively affect wage inequality. In this study, the trade variable is the percentage of total trade (both imports and exports) to the GDP of province  $i$  in year  $t$ , reflecting the trade openness from the macro perspective.

Te Velde (2003) and Taylor and Driffield (2005) utilized GDP per capita to represent the level of economic development. This variable is the most common proxy for economic growth as it leads to an increase in a country's wage inequality if it leads to an increase in the demand for skills. On the other hand, economic growth can lead to a reduction in wage inequality if there are policies aimed at increasing the supply of skills or establishing an imperfect wage competition mechanism (minimum wage regulations, effective wage models, etc.). The  $PGDP$  variable is the GDP per capita of the province  $i$  in year  $t$  at fixed prices in 2010.



The human capital (HC) variable used in this model is represented by the percentage of trained labor force of province  $i$  in year  $t$ . As analyzed earlier, the supply and demand for skills determines the level of wage inequality. Therefore, when the supply of skilled labor increases, the wage gap between skilled and unskilled laborers decreases and improves the wage inequality. However, high-quality localities often attract FDI enterprises that utilize new technologies and as such have the need to recruit skilled laborers. This in turn increases the demand for skilled labor in those localities and widens the wage inequality. Thus, it is proposed that HC has a mixed effect on wage inequality.

Skills scarcity, as represented by the RSS variable, also has an impact on wage inequality. Te Velde and Morrissey (2001) compared the unemployment rates of skilled and the unemployment rate of unskilled laborers to measure the scarcity of skills. The lower the ratio, the scarcer are skills, which may push up wages of skilled workers and ultimately widens the wage inequality gap.

The authors added the cost variable into the model that represented labor training costs in enterprises. Based on the model of relative supply and demand for skilled laborers by Te Velde (2003), it was possible that training policies in enterprises could affect unemployment inequality since high technology FDI enterprises and those in the service sector tend to train more workers. Businesses invest in training their employees because that not only benefits the employees, but also benefits the entire business through increased labor productivity. Although training can upgrade laborers' skills, it is uncertain whether these training programs would be conducted for all workers because they would aim to train either unskilled or skilled laborers. In the event that the enterprises only provided additional training for skilled laborers, wage inequality would increase. The TS variable representing labor training costs in enterprises is calculated as a percentage of the total business expenses in province  $i$  in year  $t$ .

### 3.2. Spatial econometric model

Previous studies on economic growth, poverty or income inequality between provinces within a country (or a number of countries within the same geographical location) often used panel data regression methods. Although they take into account individual characteristics between countries or between provinces within the same country, they ignore the spatial relationship between them. Tobler (1970) opined that sample data collected from geographically close regions are not independent but spatially correlated, which means that nearby observations will tend to be similar when compared to distant observations. In spatial econometrics, observations that are geographically adjacent to each other can have interactions with each other, resulting in spatial autocorrelation (LeSage & Pace, 2009).

Anderson and Van Wincoop (2003) also argued that localities within the same country were often closely linked because they operate under the same policy enforced by their government; it is more convenient to conduct trade transactions within a country compared to farther regions. Baumont et al. (2003) opined that measuring economic relationships by omitting correlation would lead to unreliable estimates. There are many special features of neighboring provinces that cannot be observed or tested through the model.

Theoretical models often recognize the existence of spatial influences, which decreased as the distance between units increased. In experiments conducted over the last few years, the panel data model has gradually returned to being a popular tool for measuring spatial effects due to the interpretation of both space and time for such studies where there is spatial dependence between observations (Anselin et al., 2004; Elhorst, 2017). A spatial panel data is the field characteristic of a panel data in which data is observed through two dimensions: spatially and temporally. Therefore, this study utilized a spatial economic model to examine the impact of FDI on wage inequality to take into account the spatial factor.

Spatial regression models include Spatial Autocorrelation Model (SAC), Spatial Durbin Model (SDM), Spatial Autoregressive Model (SAR), the Spatial Error Model (SEM), and the Generalized Spatial Panel Random Effects Model (GSPRE).

According to Yu et al. (2008) and Belotti et al. (2017), SAR which is known as Spatial Autoregressive Model has the basic equation as following:

$$y_t = \rho W y_t + X_t \beta + \mu + \epsilon_t \quad t = 1, \dots, T \quad (2)$$

Belotti et al. (2017) denoted by  $W$  the  $n \times n$  matrix of spatial weights and, for each period  $t = 1, \dots, T$ , by  $y_t$  the  $n \times 1$  column vector of the dependent variable and by  $X_t$  the  $n \times k$  matrix of regressors. For each cross-section,  $W$  describes the spatial arrangement of the  $n$  units, and each entry  $w_{ij}$  of  $W$  is greater than zero if units  $i$  and  $j$  can be considered as neighbors. In order to exclude self-neighbors, the diagonal elements  $w_{ii}$  are conventionally set equal to zero.

It is assumed that  $\mu \sim N(0, \sigma_\mu^2)$  in the random-effects case, while the  $\mu$  is a vector of parameters to be estimated in the fixed-effects variant. The standard assumptions that  $\epsilon_{it} \sim N(0, \sigma_\epsilon^2)$  and  $E(\epsilon_{it} \epsilon_{js}) = 0$  for  $i \neq j$  and/or  $t \neq s$  apply in this case.

SDM is the Spatial Durbin Model, which is a generalization of the SAR model also including spatially weighted independent variables as explanatory variables.

$$y_t = \rho W y_t + X_t \beta + W Z_t \theta + \mu + \epsilon_t \quad (3)$$

The model can be generalized by using different spatial weights for the spatially-lagged dependent variable ( $W y$ ) and the spatially-weighted regressors ( $W Z$ ) or by using  $Z_t \neq X_t$ .

SAC, which is the Spatial Autocorrelation Model (alternatively referred to as the spatial autoregressive with spatially autocorrelated errors, SARAR), combines the SAR with a spatial autoregressive error:

$$y_t = \rho W y_t + X_t \beta + \mu + \nu_t, \quad (4)$$

$$V_t = \lambda M \nu_t + \epsilon_t \quad (5)$$

where  $M$  is a matrix of spatial weights that may or may not be equal to  $W$ . The literature focuses on the fixed-effects variant of this specification as the random-effects variant can be written as a special case of the SAR specification.

SEM is the Spatial Error Model focusing on spatial auto-correlation in the error term as in:

$$y_t = X_t \beta + \mu + \nu_t, \quad (6)$$

$$V_t = \lambda M \nu_t + \epsilon_t \quad (7)$$

It is obvious that this is a special case not only of the SAC model but also of the SDM.

GSPRE is the Generalized Spatial Random-Effects model represented as:

$$y_t = X_t \beta + \mu + \nu_t, \quad (8)$$

$$V_t = \lambda M \nu_t + \epsilon_t \quad (9)$$

$$\mu = \phi W \mu + \eta \quad (10)$$

This is a generalization of the spatial error model in which the panel effects, represented by the vector  $\mu$ , are spatially correlated. It is assumed that the vectors  $\mu$  and  $\epsilon_t$  are independent normally distributed errors, so the model is necessarily a random-effects specification with  $\mu = (I - \phi W)^{-1} \eta$  and  $\nu_t = (I - W)^{-1} \epsilon_t$ . There are numerous special cases of the general specification with (a)  $\phi \neq 0$ , (b)  $\phi = 0$ , (c)  $\phi = 0$ , (d)  $\phi = \phi$ .

According to LeSage and Pace (2009) and Elhorst (2010), in the process of building the spatial econometric model, the SDM model was selected as the starting point. However, in these studies, tests were performed on the various models to determine the most appropriate one.

According to LeSage and Pace (2009) and Elhorst (2010), in the process of building the spatial econometric model, the SDM model was selected as the starting model. However, our study needs to perform tests between the models to choose the appropriate one.

The steps are shown below:

- Building spatial matrix based on Geoda software;
- Estimating the SDM model;

Model selection procedure:

- Hausman test is used to choose a fixed effect or random effect model;
- Spatial model selection procedure: This model selection procedure can be easily implemented using xsmle command in Stata14. For instance, one may be interested in testing if the SAR model or the SEM is the most appropriate. Since the SDM may be easily derived starting from an SEM, it is easily shown that if  $\theta = 0$  and  $\rho \neq 0$ , the model is a SAR, while if  $\theta = -\beta\rho$  the model is a SEM. After the estimation of the SDM, these tests can be easily performed by exploiting the xsmle “equation-labeled” vector of estimated coefficients and the official test and testnl commands. Finally, for these models are non-nested, information criteria (AIC and BIC) can be used to test and find the most appropriate model;
- Estimate the selected spatial model.

The authors build a spatial matrix based on Geoda software by taking the provinces as spatial units. In Vietnam, there are 63 provinces with different characteristics. The authors selected the provinces as spatial units, with their administrative unit being the Provincial People’s Committee.

### 3.3. Research data

This study utilized panel data covering 63 provinces in Vietnam over the period 2010–2018 from the following sources:

- Annual statistical yearbooks of the General Statistics Office of Vietnam (2010–2018) to obtain data on realized FDI, GDP per capita and the rate of training of laborers;
- The Labor and Employment Survey was used to calculate the ratio of average wages of skilled laborers to those of unskilled laborers, and also the ratio of the unemployment rates of skilled to unskilled laborers in each province;
- Import and export reports issued annually by the Import and Export Department under the Ministry of Industry and Trade, which were used to collect export and import data for each locality in Vietnam;

**Table 1. List of variables, measures, and data sources**

Variables	Symbol	Measure	Source
Wage inequality	WI	the average wages of skilled laborers compared with the average wages of unskilled laborers in each province	General Statistics Office of Vietnam
Foreign direct investment	FDI	FDI of each province (% GDP)	General Statistics Office of Vietnam
GDP	PGDP	GDP per capita of each province	General Statistics Office of Vietnam
Trade openness	TRADE	Export + Import of each province (% GDP)	General Statistics Office of Vietnam
Human capital	HC	the proportion of trained labor force in each province	General Statistics Office of Vietnam
Skills scarcity	RSS	the unemployment rate of skilled and unskilled laborers compared in each province	General Statistics Office of Vietnam
Cost of labor training	TS	the percentage of total business expenses for labor training in enterprises for each province	General Statistics Office of Vietnam

**Table 2. Descriptive statistics**

No	Variables	Observation	Mean	Std. Dev	Min	Max
1	WI	567	1.777611	0.670248	0.670425	6.87166
2	FDI	567	5.111963	11.01735	0	124.5034
3	PGDP	567	3.28926	0.5202286	2.37931	5.488951
4	HC	567	16.35397	6.974318	5.1	46.7
5	TRADE	567	104.9125	268.9078	0.0255907	4.053,993
6	RSS	567	0.1657138	0.0892709	0.0368543	0.5086727
7	TS	567	5,43153	1,076699	1,1995796	7,99

- PCI dataset researched annually by the Vietnam Chamber of Commerce and Industry (VCCI) and the United States Agency for International Development (USAID) were used to collect data on training costs of laborers as a percentage of total business costs for enterprises in each province.

Table 1 shows list of variables, measures, and data sources.

The data on the variables used to undertake the research model for estimating the impact of FDI on wage inequality are summarized in Table 2 below.

#### 4. Empirical results and discussions

##### 4.1. Model selection procedure

The authors estimated the SDM in the form of fixed effects and random effects and performed the Hausman Test for these. The test results indicated that Prob > chi2 = 0.0447, rejecting the hypothesis H0 that random SDM was appropriate. Therefore, the fixed effect model was chosen in this case.

**Table 3. The BIC and AIC results of the models**

SDM Model		SAC Model		SAR Model		GSPRE Model	
AIC	BIC	AIC	BIC	AIC	BIC	AIC	BIC
815.4993	876.2643	808.0026	847.0659	812.4264	847.1493	983.0543	1030.798

The results of testing SAR and SDM models highlighted that  $\chi^2 = 8.95$  and  $\text{Prob} > \chi^2 = 0.1763$ , accepting the hypothesis  $H_0$  that SAR model was appropriate. Therefore, the SAR model was selected to be used in the analysis.

The test results of SEM and SDM model revealed that  $\chi^2 = 14.37$  and  $\text{Prob} > \chi^2 = 0.0258$ , thus rejecting hypothesis  $H_0$  that SEM model was appropriate. Therefore, the SDM model was selected to analyze the impact of FDI on income inequality.

The selection tests between SAC, GSPRE, SDM and SAR models were based on the Bayesian Information Criterion (BIC) and the Akaike Information Criterion (AIC) statistics (Belotti et al., 2017). If the model had an absolute value of BIC and AIC which is smaller, it would be considered as a suitable model to be used for this study.

Table 3 represents the statistical results of the AIC and BIC for the four models, namely SDM, SAC, SAR, and GSPRE, which showed that the SAC model had the smallest AIC and BIC values. Therefore, the SAC model was most suitable as compared to the other three models and was selected for analyzing the impact of FDI on wage inequality.

#### 4.2. Empirical results

Table 4 displays the estimated results of the impact of FDI on wage inequality by adopting the fixed effect regression. The Hausman test results show that the fixed effects model is appropriate.

**Table 4. Estimation results of fixed-effects regression**

	(1)
Variables	FE
FDI	0.0101*** (0.003)
PGDP	−0.2052 (0.241)
HC	−0.0245* (0.013)
RSS	−2.5593*** (0.440)
TC	0.0913*** (0.026)
TRADE	−0.0001 (0.000)
Constant	1.9412*** (0.669)
Observations	567
R-squared	0.159
Number of id	63

Standard errors in parentheses. \*\*\* $p < 0.01$ , \*\* $p < 0.05$ , \* $p < 0.1$ .

Theoretically, in the case of balanced panel data where all the cross-sectional data variables are constant and there are not any missing values, the fixed effect method is appropriate. Furthermore, the fixed effect method is also useful to control some unobserved variables (at a regional level, such as local institutions or some features that differentiate one industry from another) that do not change over time, but they may generate changes in the dependent variable.

Table 5 displays the estimated results of the SAC spatial econometric model.

Column 1 of Table 5 shows the estimated results of the SAC with spatial fixed-effects. The results show that the spatial correlation coefficients  $\rho$  and  $\lambda$  were statistically significant. Except for the economic growth variable, the results of SAC with spatial fixed-effects are similar to those analyzed in the above estimation of fixed effects when there is no spatial factor.

Firstly, the FDI variable demonstrated a positive sign and was statistically significant at 1%, which proved that FDI has the effect of increasing the income gap between skilled and unskilled labor groups, which exacerbates wage inequality in Vietnam. This result was consistent with the theoretical model. However, this does not imply that FDI is good or bad for growth and poverty reduction in Vietnam, but it does imply that most of the benefits derived from FDI were in favor of skilled laborers. This result was similar to the study by Te Velde and Morrissey (2001) based on Thailand and the research on Latin American countries by Te Velde (2003). The spatial effects of

**Table 5. Estimation results of SAC with spatial fixed-effects**

	(1)	(2)	(3)	(4)
Variables	Main	LR_Direct	LR_Indirect	LR_Total
FDI	0.0083 *** (0.003)	0.0092 *** (0.003)	0.0101 ** (0.004)	0.0193 *** (0.007)
PGDP	-0.3442 * (0.181)	-0.3860 * (0.204)	-0.4308 (0.271)	-0.8168 * (0.463)
HC	-0.0186 * (0.010)	-0.0210 * (0.011)	-0.0231 (0.014)	-0.0442 * (0.025)
RSS	-1.6957 *** (0.362)	-1.9038 *** (0.381)	-2.0769 *** (0.587)	-3.9807 *** (0.859)
TC	0.0558 *** (0.019)	0.0629 *** (0.021)	0.0685 ** (0.027)	0.1315 *** (0.046)
TRADE	-0.0001 (0.000)	-0.0001 (0.000)	-0.0001 (0.000)	-0.0002 (0.000)
Spatial				
Rho	0.5666 *** (0.068)			
Lambda	-0.3568 *** (0.115)			
Variance				
sigma2_e	0.2337 *** (0.015)			
Observations	567	567	567	567
R-squared	0.156	0.155	0.154	0.154
Number of id	63	63	63	63

Standard errors in parentheses. \*\*\* $p < 0.01$ , \*\* $p < 0.05$ , \* $p < 0.1$ .

FDI on income inequality could be explained by knowledge spillover and high labor mobility between localities.

Secondly, the PGDP variable was significant at the 10% level and had a positive effect on reducing wage inequality. Thus, economic growth contributed to the reduction of wage inequality in Vietnam. This implied that Vietnam's economic development helped to reduce the wage gap between skilled and unskilled labor groups.

Thirdly, the HC variable was significant at the 10% level and had a positive effect on reducing wage inequality. This implied that when the proportion of trained laborers increased, which means an increase in the supply of skills, there would be a decrease in the wage gap between skilled and unskilled labor groups. This result was consistent with the theoretical analysis.

Fourthly, the RSS variable was calculated as the unemployment rate of skilled laborers against the unemployment rate of unskilled laborers, which was significant at the 1% level and had a negative coefficient. Thus, when this ratio increases, the unemployment rate of skilled laborers would also increase. This implied a decrease in the shortage of skills, which leads to a decrease in the wage inequality between skilled and unskilled laborers.

Finally, the TC variable was significant at the 1% level and had a positive impact on wage inequality. This meant that the higher the costs of training incurred by enterprises, the higher the wage inequality, implying that enterprises incurred training costs mainly on skilled laborers rather than on unskilled laborers. In the study conducted by Batra and Tan (1997) it was demonstrated that training had a positive effect on productivity growth, but this was only for skilled laborers. In general, skilled labor groups were often better learners because of their higher receptivity and were therefore more likely to benefit from this training. Therefore, the cost of training workers in Vietnamese enterprises is currently benefiting skilled laborers more than the unskilled laborers. The impact of the trade openness variable on wage inequality was not confirmed in this model.

The spatial econometric model allowed for the consideration of the complex structure of the dependent variables intertwined with the independent variables. LeSage and Pace (2009) showed that a direct effect exists in the spatial econometric regression model, and this was used to measure the fluctuating influence of the independent variables on the dependent variables at the provincial level. Meanwhile, indirect effects were regarded as cross-spatial effects and were used to measure how the changes in the independent variable in one province affected the dependent variable in the other provinces. The total marginal effect was the combination of the direct and indirect effects.

The remaining columns 2, 3 and 4 of Table 5 represent the results of estimating direct, indirect, and total marginal effects of FDI on wage inequality after taking into account the concepts put forward by LeSage and Pace (2009). The estimation results indicated that in all three cases, the coefficient values and the statistical significance of the variables were exactly as predicted by the original model. This implied that the variables selected in the model had direct, indirect, and total marginal effects when spatial factors were taken into account. As can be seen from Table 5, the direct effect and spatial spillover effect of FDI on wage inequality are 0.0092 and 0.0101, respectively, and the test of the significance level of 1% is passed. Specifically, the direct marginal effect (average of the diagonal component in the spatial matrix) indicated that FDI had a positive value; that is, FDI can increase wage inequality. Similarly, the indirect marginal effect (the row average of the components outside the main diagonal of the spatial matrix) also showed the same spatial effect; that is, FDI in one province increased wage inequality in other localities. Thus, the spatial econometric model revealed that FDI did not merely have a direct influence on wage inequality in a particular province but also had an indirect influence on wage inequality in other provinces.



## 5. Conclusions and implications

The main purpose of this study was to analyze the impact of FDI on wage inequality in Vietnam. Based on the review of theoretical and empirical evidence for the relationship between FDI and wage inequality, the study utilized a spatial econometric model with panel data from 63 provinces in Vietnam over the period 2010–2018 to answer the following questions: (1) How FDI would affect wage inequality in Vietnam; (2) whether there was a spatial effect of FDI on wage inequality in localities.

The findings from the spatial econometric model yielded the following results: Firstly, the study showed that FDI had an impact on increasing wage inequality in the provinces of Vietnam, including direct and spatial effects. This stemmed from the fact that FDI enterprises often placed higher requirements on the skills and discipline of laborers. The spatial effect of FDI on wage inequality could be explained by the high labor mobility between localities. Secondly, the economic growth in Vietnam has led to a reduction in the wage inequality between skilled and unskilled labor groups, as all workers benefited from it. Thirdly, localities with high human capital, developed education systems, and an increased proportion of skilled labor force helped to reduce wage inequality. Fourthly, when the unemployment rate of skilled laborers relative to unskilled ones decreased, wage inequality improved. Lastly, the higher the cost of training, the higher the wage inequality, which implied that enterprises were currently training mainly for the skilled labor groups instead of focusing on the unskilled laborers.

Based on the above research results, this article suggests some policy implementation to reduce the negative impact of FDI on wage inequality in Vietnam. FDI, combined with the strategy of improving the quality of human resources, would contribute to reducing wage inequality in Vietnam. From a theoretical perspective, FDI enterprises are also often capital-intensive and require higher skills than local enterprises. As a result, FDI growth leads to an increasing demand for skilled labor in the host countries. The negative impact of FDI on wage inequality can only be reduced when the local education system provides more skilled laborers for FDI enterprises and enables them to obtain higher salaries. However, the qualifications and skills of Vietnamese laborers were of low quality initially and have not significantly improved even with FDI inflows in recent years. Therefore, labor market development plays an important role in reducing the negative influence of FDI on wage inequality. There are four main measures to attract FDI combined with improving domestic human resources. Firstly, the professional and technical qualifications of employees can be improved by allocating the state budget to prioritized education projects and promoting socialization to attract non-government capital funding for education and training. Policies should focus on increasing investment in public education and improving human capital, for instance, supplying a good educational basis (at least secondary education) and an appropriate technical education, which not only can reduce income inequality but also can attract more FDI inflows. Besides, the government can encourage training in MNEs and other firms. When firms pay for training, the employees do not capture all the benefits from training; in reality, firms capture some by raising productivity more than wages. Secondly, it is necessary to strengthen the professional training, skills, discipline, and labor culture of the workforce; in line with international standards. In addition, the requirements for attracting FDI should be channeled towards prioritized industries. Thirdly, human resources must be developed to support industries and focus on promoting and training skilled laborers. Lastly, the vocational education and training system must be improved: the professional secondary schools can be expanded to train middle-level managers, technicians, and skilled laborers, so as to increase the proportion of skilled labor groups in the economy. Vietnam has not been successful in providing good quality and appropriate education and training. Aiming for good quality human resource development at the lower end of the labor market would also have a positive impact on the way in which FDI affects inequality. Therefore, Vietnam's policies to attract and utilize FDI should be aligned with training and human capital development. In order to reimagine the interactions between the economy, nature, and environment and move toward more sustainable development, it is essential to modify investment flows, social and economic equity, economic structure, and patterns of energy resources (Khan et al., 2022).

Nevertheless, there are some limitations to this study that should not be overlooked. Firstly, generalizing the findings to other settings must be undertaken with the utmost caution because the study focuses solely on Vietnam. Replication and extension to other transitional economies is a direction for future research. Secondly, FDI and wage inequality are complex phenomena, and this study only examines part of their relationship. FDI in different sectors can have different effects on wage inequality. However, due to the limitation of FDI data disaggregated by sector for the 63 provinces in Vietnam, the study only uses the data of total realized FDI inflow as a proxy variable. Therefore, the use of FDI data by sector will be the direction of future research. Last but not least, the interconnectedness of the challenges of poverty, inequality, energy transition, and climate change mitigation is widely accepted. In the coming decades, these challenges will affect global stability. Thus, it would motivate future research to tackle the crucial relationship between FDI, inequality, and energy consumption (Khan et al., 2022)

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#### References

- Aghion, P., Ljungqvist, L., Howitt, P., Howitt, P. W., Brant-Collett, M., & García-Peñalosa, C. (1998). *Endogenous growth theory*. MIT press.
- Aitken, B. J., & Harrison, A. E. (1999). Do domestic firms benefit from direct foreign investment? Evidence from Venezuela. *American Economic Review*, 89(3), 605–618. <https://doi.org/10.1257/aer.89.3.605>
- Aitken, B., Harrison, A., & Lipsey, R. E. (1996). Wages and foreign ownership a comparative study of Mexico, Venezuela, and the United States. *Journal of International Economics*, 40(3–4), 345–371. [https://doi.org/10.1016/0022-1996\(95\)01410-1](https://doi.org/10.1016/0022-1996(95)01410-1)
- Anderson, J. E., & Van Wincoop, E. (2003). Gravity with gravitas: A solution to the border puzzle. *American Economic Review*, 93(1), 170–192. <https://doi.org/10.1257/000282803321455214>
- Anselin, L., Florax, R. J., & Rey, S. J. (2004). Econometrics for spatial models: Recent Advances. In *Advances in spatial econometrics* (pp. 1–5). Springer. [https://doi.org/10.1007/978-3-662-05617-2\\_1](https://doi.org/10.1007/978-3-662-05617-2_1)
- Batra, G., & Tan, G. (1997). *Malaysia: Enterprise training, technology and productivity*. World Bank.
- Baumont, C., Ertur, C., & Le Gallo, J. (2003). Spatial convergence clubs and the European regional growth process, 1980–1995. In B. Fingleton (Ed.), *European regional Growth. Advances in spatial science*. Springer. [https://doi.org/10.1007/978-3-662-07136-6\\_5](https://doi.org/10.1007/978-3-662-07136-6_5)
- Belotti, F., Hughes, G., & Mortari, A. P. (2017). Spatial panel-data models using Stata. *The Stata Journal*, 17(1), 139–180. <https://doi.org/10.1177/1536867X1701700109>
- Bernard, A. B., & Jensen, J. B. (1997). Exporters, skill upgrading, and the wage gap. *Journal of International Economics*, 42(1–2), 3–31. [https://doi.org/10.1016/S0022-1996\(96\)01431-6](https://doi.org/10.1016/S0022-1996(96)01431-6)
- Bhandari, B. (2006). *Essays on Foreign direct investment and income inequality, and cross-price effects in the United States trade balance*. University of Oregon.
- Bhandari, B. (2007). Effect of inward foreign direct investment on income inequality in transition countries. *Journal of Economic Integration*, 22(4), 888–928. <https://doi.org/10.11130/jei.2007.22.4.888>
- Blonigen, B. A., & Slaughter, M. J. (2001). Foreign-affiliate activity and US skill upgrading. *Review of Economics and Statistics*, 83(2), 362–376. <https://doi.org/10.1162/00346530151143888>
- Bogliaccini, J. A., & Egan, P. J. (2017). Foreign direct investment and inequality in developing countries: Does sector matter? *Economics and Politics*, 29(3), 209–236. <https://doi.org/10.1111/ecpo.12098>
- Bronzini, R., & Piselli, P. (2009). Determinants of long-run regional productivity with geographical spillovers: The role of R&D, human capital and public infrastructure. *Regional Science and Urban Economics*, 39(2), 187–199. <https://doi.org/10.1016/j.regsciurbeco.2008.07.002>
- Brun, J. F., Combes, J. L., & Renard, M. F. (2002). Are there spillover effects between coastal and noncoastal regions in China? *China Economic Review*, 13(2–3), 161–169. [https://doi.org/10.1016/S1043-951X\(02\)00070-6](https://doi.org/10.1016/S1043-951X(02)00070-6)
- Chen, C., Sheng, Y., & Findlay, C. (2013). Export spillovers of FDI on China's domestic firms. *Review of International Economics*, 21, 841–856. <https://doi.org/10.1111/roie.12074>
- Chintrakarn, P., Herzer, D., & Nunnenkamp, P. (2012). FDI and income inequality: Evidence from a panel of US states. *Economic Inquiry*, 50(3), 788–801. <https://doi.org/10.1111/j.1465-7295.2011.00384.x>
- Choi, C. (2006). Does foreign direct investment affect domestic income inequality? *Applied Economics Letters*, 13(12), 811–814. <https://doi.org/10.1080/13504850500400637>
- Chu, H., & Le, H. (2016). Impact of financial development on income inequality in Vietnam. *Journal of Economics and Development*, 23(2), 22–37. <https://doi.org/10.24311/jed/2016.23.2.02>

- Du, Y., Park, A., & Wang, S. (2005). Migration and rural poverty in China. *Journal of Comparative Economics*, 33(4), 688–709. <https://doi.org/10.1016/j.jce.2005.09.001>
- Elhorst, J. P. (2010). Applied spatial econometrics: Raising the bar. *Spatial Economic Analysis*, 5(1), 9–28. <https://doi.org/10.1080/17421770903541772>
- Elhorst, J. P. (2017). Spatial Panel Data Analysis. *Encyclopedia of GIS*, 2, 2050–2058. [https://doi.org/10.1007/978-3-319-17885-1\\_1641](https://doi.org/10.1007/978-3-319-17885-1_1641)
- Feenstra, R. C., & Hanson, G. H. 1996. Globalization, outsourcing, and wage inequality.
- Feenstra, R. C., & Hanson, G. H. (1997). Foreign direct investment and relative wages: Evidence from Mexico's maquiladoras. *Journal of International Economics*, 42(3–4), 371–393. [https://doi.org/10.1016/S0022-1996\(96\)01475-4](https://doi.org/10.1016/S0022-1996(96)01475-4)
- Figini, P., & Görg, H. (1999). Multinational companies and wage inequality in the host country: The case of Ireland. *Weltwirtschaftliches Archiv*, 135(4), 594–612. <https://doi.org/10.1007/BF02707386>
- Figini, P., & Görg, H. (2011). Does foreign direct investment affect wage inequality? An empirical investigation. *The World Economy*, 34(9), 1455–1475. <https://doi.org/10.1111/j.1467-9701.2011.01397.x>
- Fosfuri, A., Motta, M., & Rønde, T. (2001). Foreign direct investment and spillovers through workers' mobility. *Journal of International Economics*, 53(1), 205–222. [https://doi.org/10.1016/S0022-1996\(00\)00069-6](https://doi.org/10.1016/S0022-1996(00)00069-6)
- Fu, X. (2011). Processing trade, FDI and the exports of indigenous firms: Firm-level evidence from technology-intensive industries in China. *Oxford Bulletin of Economics and Statistics*, 73(6), 792–817. <https://doi.org/10.1111/j.1468-0084.2011.00673.x>
- Gopinath, M., & Chen, W. (2003). Foreign direct investment and wages: A cross-country analysis. *Journal of International Trade and Economic Development*, 12(3), 285–309. <https://doi.org/10.1080/0963819032000132067>
- Ho, D. B., Le, T. H., & Le, Q. H. (2020). Impacts of foreign direct investment on economic growth in Vietnam. *Journal of Economics and Development*, 279, 2–11. <https://ktpt.neu.edu.vn/tap-chi/so-279/muc-luc-340/vai-tro-cua-dau-tu-truc-tiep-nuoc-ngoi-doi-voi-tang-truong-kinh-te-cua-viet-nam.379355.aspx>
- Jaumotte, F., Lall, S., & Papageorgiou, C. (2013). Rising income inequality: Technology, or trade and financial globalization? *IMF Economic Review*, 61(2), 271–309. <https://doi.org/10.1057/imfer.2013.7>
- Jensen, N. M., & Rosas, G. (2007). Foreign direct investment and income inequality in Mexico, 1990–2000. *International Organization*, 61(3), 467–487. <https://doi.org/10.1017/S0020818307070178>
- Johansson, A. C., & Liu, D. (2020). Foreign direct investment and inequality: Evidence from China's policy change. *The World Economy*, 43, 1647–1664. <https://doi.org/10.1111/twec.12901>
- Khan, I., Zakari, A., Dagar, V., & Singh, S. (2022). World energy trilemma and transformative energy developments as determinants of economic growth amid environmental sustainability. *Energy Economics*, 108, 105884. <https://doi.org/10.1016/j.eneco.2022.105884>
- Kugler, M. (2006). Spillovers from foreign direct investment: Within or between industries? *Journal of Development Economics*, 80(2), 444–477. <https://doi.org/10.1016/j.jdeveco.2005.03.002>
- Le, Q. H. (2020). The role of policy credit in income inequality reduction in Vietnam. *Journal of Economics and Development*, 274, 75–82. <http://ktpt.neu.edu.vn/Uploads/Bai%20bao/2020/So%20274/379217.pdf>
- LeSage, J., & Pace, R. K. (2009). *Introduction to spatial econometrics*. Chapman and Hall/CRC. <https://doi.org/10.1201/9781420064254>
- Lipsey, R. E., & Sjöholm, F. (2004). Foreign direct investment, education and wages in Indonesian manufacturing. *Journal of Development Economics*, 73(1), 415–422. <https://doi.org/10.1016/j.jdeveco.2002.12.004>
- Machin, S., & Van Reenen, J. (1998). Technology and changes in skill structure: Evidence from seven OECD countries. *The Quarterly Journal of Economics*, 113(4), 1215–1244. <https://doi.org/10.1162/003355398555883>
- Mah, J. S. (2002). The impact of globalization on income distribution: The Korean experience. *Applied Economics Letters*, 9(15), 1007–1009. <https://doi.org/10.1080/13504850210149124>
- Markusen, J. R., & Venables, A. J. (1999). Foreign direct investment as a catalyst for industrial development. *European Economic Review*, 43(2), 335–356. [https://doi.org/10.1016/S0014-2921\(98\)00048-8](https://doi.org/10.1016/S0014-2921(98)00048-8)
- McLaren, J. (2000). “Globalization” and vertical structure. *American Economic Review*, 90(5), 1239–1254. <https://doi.org/10.1257/aer.90.5.1239>
- Mugeni, S. 2015. *Foreign investment, democracy and income inequality: Empirical evidence* [Master's thesis]. Department of Economics, University of Ottawa.
- Mundell, R. A. (1957). International trade and factor mobility. *The American Economic Review*, 47(3), 321–335. <http://www.jstor.org/stable/1811242>
- Nguyen, T. H. 2016. *A study on the factors affecting the wealth gap in Vietnam*. [Ph.D thesis]. National Economics University.
- Nguyen, V. T., Le, V. D., & Phi, M. H. (2019). Impact of foreign direct investment to labor productivity in Vietnam in 2011–15 period. *Journal of Economics and Development*, 264, 23–33. <https://ktpt.neu.edu.vn/tap-chi/so-264/muc-luc-56/tac-dong-cua-dau-tu-truc-tiep-nuoc-ngoi-den-nang-suat-lao-dong-tai-viet-nam-giai-doan-2011-2015.379111.aspx>
- Pan-Long, T. (1995). Foreign direct investment and income inequality: Further evidence. *World Development*, 23(3), 469–483. [https://doi.org/10.1016/0305-750X\(95\)00136-Z](https://doi.org/10.1016/0305-750X(95)00136-Z)
- Pham, H. C., & Ho, D. B. (2021). Differences in impacts of foreign direct investment on productivity of Vietnamese firms. *Journal of Economics and Development*, 287, 2–12. <https://ktpt.neu.edu.vn/tap-chi/so-287/muc-luc-172/nhung-khac-biet-trong-tac-dong-cua-dau-tu-truc-tiep-nuoc-ngoi-den-nang-suat-cua-cac-khu-vuc-doanh-nghiep-viet-nam.380476.aspx>
- Reuveny, R., & Li, Q. (2003). Economic openness, democracy, and income inequality: An empirical analysis. *Comparative Political Studies*, 36(5), 575–601. <https://doi.org/10.1177/0010414003036005004>
- Taylor, K., & Driffield, N. (2005). Wage inequality and the role of multinationals: Evidence from UK panel data. *Labour Economics*, 12(2), 223–249. <https://doi.org/10.1016/j.labeco.2003.11.003>
- Te Velde, D. W. (2003). *Foreign direct investment and income inequality in Latin America: Experiences and policy implications* (no. 04/03). Documento de Trabajo.
- Te Velde, D., & Morrissey, O. 2001. *Foreign ownership and wages: Evidence from five African countries* (no. 01/19). CREDIT Research Paper.

- Te Velde, D., & Morrissey, O. (2004). Foreign direct investment, skills and wage inequality in East Asia. *Journal of the Asia Pacific Economy*, 9(3), 348–369. <https://doi.org/10.1080/1354786042000272991>
- Tobler, W. R. (1970). A computer movie simulating urban growth in the Detroit region. *Economic Geography*, 46, 234–240. <https://doi.org/10.2307/143141>
- 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>
- Wood, A. (1995). How trade hurt unskilled workers. *Journal of Economic Perspectives*, 9(3), 57–80. <https://doi.org/10.1257/jep.9.3.57>
- Yu, J., de Jong, R., & Lee, L.-F. (2008). Quasi-maximum likelihood estimators for spatial dynamic panel data with fixed effects when both n and t are large. *Journal of Econometrics*, 146(1), 118–134. <https://doi.org/10.1016/j.jeconom.2008.08.002>
- Zhang, Q., & Felmingham, B. (2002). The role of FDI, exports and spillover effects in the regional development of China. *Journal of Development Studies*, 38(4), 157–178. <https://doi.org/10.1080/00220380412331322451>