DOESFOREIGN DIRECT INVESTMENT AFFECT INCOME INEQUALITY? A THRESHOLD REGRESSION ANALYSIS IN VIETNAM

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Abstract

The benefits of FDI consist of being as an important source of capital, contributing to employment, transferring technology, increasing competition and generating spillover effects to domestic companies. However, the literature on equality argued that while FDI may bring many benefits to the host economy, it does not mean that everyone in the country could benefit in the same way. According to Figini & Gorg (2011); Herzer & Nunnenkamp (2011); Kyriacou & Roca-Sagales (2012), the growth of host economies and FDI inflows have been widening the income gap between rich and poor segments of population, between high and low skilled labours, which leads to the increase in income inequality. This paper aims to explore the relationship between FDI and income inequality in Vietnam using Panel Threshold Regression for a recent period (2006-2015), and examine the existence of FDI threshold(s) at which the impact of FDI on income inequality is minimal. By using a panel data of cities and provinces in Vietnam in the period of 2006 – 2015, this paper examines the relationship between regional income inequality and FDI growth using fixed effect threshold model developed by Hansen (1999). The findings indicate that FDI directly has a negative effect on income equality. Furthermore, the results show that FDI can influence on inequality indirectly through its impact on GDP. We found strong evidence that there are two threshold levels of FDI in the regression relationship. They are 4.38% and 11.96% of GDP with asymptotic 95% confidence interval. These thresholds divide the observations into three regimes, in which the relationship between GDP and inequality has an inverted U-shape. This finding is consistent with the previous studies on other countries such as Figini & Gorg (2011) and Kyriacou & Roca-Sagales (2012). It implies the tradeoffs of the country when trying to attract FDI. The fact in Vietnam shows that the competition among regional governments for the inward FDI generally deepens the gap between the rich and poor resource regions in the country. In the context that Vietnam has been putting so much efforts to attract FDI, this is a warning of an increase in region income inequality in the near future.

Keywords: Economic Growth, FDI, Income Inequality, Threshold Effect, Panel Threshold Regression (PTR), Vietnam.

1. Introduction

Foreign direct investment (FDI) is often found as an effective channel to boost economic growth in the host country. The benefits of FDI consist of being as an important source of capital, contributing to employment, transferring technology, increasing competition and generating spillover effects to domestic companies. However, the literature on equality argued that while FDI may bring many benefits to the host economy, it does not mean that everyone in the country could benefit in the same way. According to Figini & Gorg (2011); Herzer & Nunnenkamp (2011);Kyriacou & Roca-Sagales (2012), the growth of host economies and FDI

inflows have been widening the income gap between rich and poor segments of population, between high and low skilled labours, which leads to the increase in income inequality.

In Vietnam, FDI has been playing a crucial role in the country's development. Starting with no foreign investment in 1986, by the end of 2015, Vietnam has received US$281 billion of FDI for more than 20.000 projects. Over the past 10 years, the annual FDI growth rate of 27.31% has significantly contributed to the rapid economic growth of Vietnam (GSO, 2016).The income of local labors has been improved. According to World Bank (2014) the income inequality has increased modestly. In the period 1993 - 2012, the average income of the bottom 40 percent of population in Vietnam grew 9% per year which is "the very highest of growth in the world of the incomes of the bottom 40 percent" (World Bank, 2014). However, World Bank (2014) still raised the concerns about inequality in Vietnam that the income gap between the super-rich and most Vietnamese has been widening. In the Taking Stock Report July 2014 (World Bank, 2014), the comparison between 2003 and 2013 shows that number of super-rich in Vietnam was nearly triple after 10 years (110 super-rich in 2013 compared to only 34 super-rich in 2003).While Vietnam has more and more super-rich, number of the poor has been also increased dramatically. According to new standard of multidimensional poverty, the proportion of poor households in Vietnam in 2015 is around 14%, unchanged from 2010 (Vietnam Ministry of Labour – invalids and social affairs, 2016).

This paper aims to explore the relationship between FDI and income inequality in Vietnam using Panel Threshold Regression for a recent period (2006-2015), and examine the existence of FDI threshold(s) at which the impact of FDI on income inequality is minimal.

2. Theoretical Background and Related Empirical Literature

The literature underlying the relationship between FDI and income inequality are unsettled and can be classified into three camps. The first group of studies supports the hypothesis that FDI is associated with greater income inequality. The uneven distribution of FDI might results in the increasing regional inequality in a country (Wei et al, 2009). According to Taylor and Driffield (2005), the operations of multinational enterprises often require more skill intensive than the domestic firms. In addition, the finding of Te Velde (2001) showed that multinational activity was significantly correlated with skill upgrading. Therefore, FDI benefits skilled workers rather than unskilled workers in poorer host countries (Hanson, 2003; Goldin and Katz, 2008; Lipsey and Sjoholm, 2004).

On the other hand, the empirical evidences from Herzer & Nunnenkamp (2011); Chintrakarnet al. (2011) lead to the opposite conclusion that FDI may reduce inequality. Using the dataset of ten European countries from 1980 – 2000, Herzer & Nunnenkamp (2011) found that FDI only increased income inequality in short run, however, in long term an increase in FDI is suggested to reduce income inequality. In a similar vein, Chintrakarn et al. (2011) discovered the same results for the US states for the period 1977 - 2001.To explain this negative relationship, Feenstra and Hanson (1997)argued that the FDI flows from relatively rich source regions to the poorer regions are often accompanied by the skilled labors and technology; thereby it may increase the skill premium not only in the richer region, but also in the poorer ones.

The third group suggests that the effect of FDI on inequality is nonlinear. Aghion and Howitt (1998) pointed out that FDI may benefit local enterprises through spillover effects, then in its turn, these companies' absorptive capacity may results in greater inequality in short run and less inequality in the longer run. Sharing the same viewpoint, Figini and Gorg (1999) analyzed the case of Ireland and found that FDI first increased and then reduced inequality later. In another research, Figini and Gorg (2011) explore this complicated relationship using a panel of more than 100 developing and developed countries. The findings for developing countries suggested the existence of a nonlinear effect, however there is no evidence for developed countries.

The unsettled argument from different literatures on the relationship between income inequality and FDI can be explained by the differences in development strategy and the contemporary absorptive capacity level of the host country.

In the literature on equality of Vietnam, there are still few studies such as Fritzen (2002), Diep Phan & Ian Coxhead (2013), Molini & G. Wan (2008). However, most of them focus on the relationship between inequality and economic growth rather than FDI. In addition, to the best of our knowledge, none of them has examined the existence of a nonlinear relationship between inequality and FDI.

3. Methodology

Following Kyriacou & Roca-Sagales (2012), we use the population weighted coefficient of variation (PW-CV) to measure income inequality. This coefficient can be estimated by the following formula:

$$\text{PW-CV} = \frac{1}{y}\sqrt{\sum_{i=1}^{n} p_i(\bar{y} - y_i)^2} \qquad (1)$$

where $\bar{y}$ is the average country GDP per capita, y_i and p_i are the GDP per capital and population share of the region respectively, n is the number of regions. PW-CV basically presents the inequality among the regions of a country. The coefficient ranges from 0 (equality) to 1 (maximum inequality).

Inspired by Figini & Gorg (2011) and Kyriacou & Roca-Sagales (2012),we focus on examining the impact of FDI on income inequality and attempting to explore whether there is an existence of FDI threshold(s). Accordingly, by using a panel data of 50 cities and provinces of Vietnam for the period 2006 – 2015, we start with a basic panel regression:

$$PWCV_{it} = \beta_o + \beta_1 FDI_{it} + \beta_2 X + u_i + \varepsilon_{it} \qquad (2)$$

Where $PWCV_{it}$ is a measure of income inequality in city/province i at time t. FDI_{it} represent the scale of FDI inflows into city/province i, at time t; X is a vector of control variables assumed to be correlated with inequality (i.e. GDP per capita, expenditure share of regional governments in total public expenditure, region openness, and government quality); u_i represent region specific effects and assumed to be unchanged over the time (i.e. regional culture, geographic location); and the observation error ε_{it}.

However, the basic panel regression model could not show the nature of the relationship between FDI and income inequality changing when the level of FDI increases. So we adopt panel threshold model proposed by Hansen (1999), using Boostrap technique to test the existence of threshold effect which divided the equation into regimes. If there is an existence of at least one threshold value, it implies that the relationship between FDI and income inequality is non-linear. Following the works of Hansen (1999) and Wang (2015), the specification (2) can be rewritten as follows:

$$
\begin{aligned}
PWCV_{it} = \{ &\beta_{10} + \beta_{11} FDI_{it} + \beta_{12} X \} d[FDI_{it} \le \gamma_1] \\
+ \{ &\beta_{20} + \beta_{21} FDI_{it} + \beta_{22} X \} d[\gamma_1 < FDI_{it} \le \gamma_2] \\
+ \{ &\beta_{30} + \beta_{31} FDI_{it} + \beta_{32} X \} d[FDI_{it} > \gamma_2] + u_i + \varepsilon_{it} \qquad (3)
\end{aligned}
$$

where γ_1, γ_2 are the threshold parameters that split the sample into three sub-samples (assuming the model is double-threshold model); d(.) is the indicator function which is equal to 1 or 0, depending on the condition term; the regimes are distinguished by different regression slopes α.

Least squares are suggested to determine the thresholds, which are the values that minimize the residual sum of squared:

$$\hat{\gamma} = arg \min_{\gamma \in (\underline{\gamma}, \bar{\gamma})} S_1(\gamma) \qquad (9)$$

The "no-reject region" method with a likelihood ratio (LR) statistic is used to construct the confidence interval because of the nuisance parameter problem (Hansen, 1999). To examine the existence of a threshold effect, the F statistic in the likelihood ratio test under H_o of no threshold effect ($\beta_1 = \beta_2$) is constructed as follows:

$$F_1 = \frac{S_0 - S_1}{\hat{\sigma}^2} \qquad (11)$$

Furthermore, to examine the significance of threshold effect in the model with the given thresholds, LR statistics and bootstrap approach are applied.

4. Results and Discussions

4.1. Data and Variables

It would be ideal for data analysis to employ the full data set of 63 cities and provinces in Vietnam, however, due to data gaps, data of only 50 cities and provinces are available. Therefore, the paper uses the panel data of 50 cities and provinces in Vietnam from 2006to 2015 to analyze the relationship between FDI and inequality.

We first control GDP per capital since it naturally influences on the increase of income inequality (Kyriacou& Roca-Sagales, 2012). However, several empirical evidences showed that inequality may increase at low level of income, but then reduced at higher income (Williamson, 1965; Lessmann, 2009). Our second control variable is fiscal decentralization, measured as expenditure share of regional governments as a percentage of GDP. Empirical studies showed ambiguous findings that fiscal decentralization may either widen the income gap (Prud'homme, 1995; Oates, 1999),or narrow it (McKinnon, 1997; Qian and Weingast, 1997). Region openness is another control variable, measured by the sum of exports and imports as a share of regional GDP. Giannetti (2002) and Petrakos et al (2005) show that openness is associated with the increase in regional inequality. Also, we control for government quality which refers to the level of regional governance. For our purposes here, the ideal proxy for government quality is the average of six governance indicators from World Governance Indicator (Kaufmann et al, 2010). However, in the absence of such measure, we use Provincial Competitiveness Index (PCI) instead. PCI index is constructed by Vietnam Chamber of Commerce and Industry to assess the economic governance quality of provincial authorities. [1]

Table 1: Variables and sources

Variable	Definition	Source
PWCV	Income inequality measured by the population weighted standard deviation of regional GDP per capita within a country divided by the country's GDP per capita	GSO (2016)
fdi	The net FDI inflow into a region as a share of GDP (%)	GSO (2016)
gdp	Regional GDP per capita	GSO (2016)
gov_exp	Total expenditure of regional government as a share of GDP (%)	GSO (2016)
open	Sum of exports and imports as share of regional GDP (%)	GSO (2016)
pci	Provincial Competitiveness Index	VCCI (2016)

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[1]The test for variance inflation factor (VIF) showed no multicollinearity problem with the data set.

4.2. Empirical Result

We first test for the existence of threshold in the model. To do so, we fit the single-threshold model, with the null hypothesis of no threshold effect (H_0: $\beta_{11} = \beta_{21} = \beta_{31}$), and the alternative H_1: $\beta_{11} \neq \beta_{21} \neq \beta_{31}$ (threshold effect does exist). Using 300 bootstrap replications to test for a single threshold effect, the existence of threshold is highly significant with a bootstrap p-value of 0.0167. This implies the relationship between income inequality (PWCV) and FDI is non-linear, and there is an existence of at least one threshold.

Table 2: Single threshold model

```
Threshold estimator (level = 95):
```

model	Threshold	Lower	Upper
Th-1	0.1196	0.1140	0.1221

```
Threshold effect test (bootstrap = 300):
```

Threshold	RSS	MSE	Fstat	Prob	Crit10	Crit5	Crit1
Single	0.1192	0.0002	36.66	0.0167	18.1435	21.5135	41.5911

Source: Author's computation in STATA 14

Furthermore, we determine the number of thresholds by sequentially fitting the model with one, two, and three thresholds. The same bootstrap number is used for each of the three bootstrap tests. F_1 and F_2 statistics in the test for a single and double threshold are highly significant with a bootstrap p-value of 0.0067 and 0.0733 respectively, while the bootstrap p-value of F_3 statistic in the test for a triple threshold is not significant (0.62). These imply the existence of two thresholds in the model.

Table 3: Results of threshold effects in different threshold models

```
Threshold estimator (level = 95):
```

model	Threshold	Lower	Upper
Th-1	0.1196	0.1140	0.1221
Th-21	0.1196	0.1170	0.1221
Th-22	0.0438	0.0375	0.0438
Th-3	0.0881	0.0764	0.0882

```
Threshold effect test (bootstrap = 300 300 300):
```

Threshold	RSS	MSE	Fstat	Prob	Crit10	Crit5	Crit1
Single	0.1192	0.0002	36.66	0.0067	20.5682	24.2803	32.6876
Double	0.1139	0.0002	22.97	0.0733	18.0301	27.8822	38.9638
Triple	0.1121	0.0002	7.66	0.6200	18.9920	23.6019	42.0062

Source: Author's computation in STATA 14

In order to determine the value of thresholds, we re-estimated the double-threshold model, and found the two thresholds of 11.96% and 4.38% respectively.

Table 4:Double threshold model estimation

```
Threshold estimator (level = 95):
```

model	Threshold	Lower	Upper
Th-1	0.1196	0.1140	0.1221
Th-21	0.1196	0.1170	0.1221
Th-22	0.0438	0.0375	0.0438

```
Threshold effect test (bootstrap = 300 300):
```

Threshold	RSS	MSE	Fstat	Prob	Crit10	Crit5	Crit1
Single	0.1192	0.0002	36.66	0.0100	18.2367	22.8128	30.7137
Double	0.1139	0.0002	22.97	0.0633	19.5430	25.1476	37.9155

Source: Author's computation in STATA 14

Table 5: Regression Estimates: Double Threshold Model

```
Fixed-effects (within) regression        Number of obs      =        500
Group variable: id                       Number of groups   =         50

R-sq:  within  = 0.2287                   Obs per group: min =         10
       between = 0.0330                                  avg =       10.0
       overall = 0.0460                                  max =         10

                                          F(7,443)           =      18.77
corr(u_i, Xb)  = 0.0434                   Prob > F           =     0.0000
```

PWCV	Coef.	Std. Err.	t	P>|t|	[95% Conf. Interval]	
open	-.0006208	.0011104	-0.56	0.576	-.0028031	.0015615
fdi	-.188252	.0251421	-7.49	0.000	-.2376646	-.1388395
gov_exp	-.0669556	.0323254	-2.07	0.039	-.1304859	-.0034254
pci	-.0692807	.0196016	-3.53	0.000	-.1078044	-.0307569
_cat#c.lgdp						
0	-.0000812	.0015394	-0.05	0.958	-.0031067	.0029442
1	.0040445	.0014839	2.73	0.007	.0011281	.0069609
2	.0115363	.0017165	6.72	0.000	.0081628	.0149098
_cons	.1013249	.0107118	9.46	0.000	.0802727	.1223771
sigma_u	.05849902					
sigma_e	.0160742					
rho	.92979791	(fraction of variance due to u_i)				

```
F test that all u_i=0: F(49, 443) = 105.77              Prob > F = 0.0000
```

Source: Author's computation in STATA 14

The F statistic of 105.77 at the 1% level of significance with the null hypothesis of all $u_i=0$ confirms that the fixed effect model is appropriate. The bootstrap p-values of thresholds support the existence of threshold effect at the 10% level.

The result shows that the increase of FDI flows into Vietnam widens the regional inequality in the country in terms of income. Furthermore, the threshold effect of FDI on income inequality is found. However, this effect is indirect through the influence of FDI on GDP. In particular, the regression slope estimates in Panel Threshold Regression model indicate the threshold effect of FDI in the three regimes:

- When FDI ≤ 4.38%, the negative coefficient implies that each 1% increase in GDP may reduce regional inequality by 0.0000812%. However, this impact is statistically insignificant with the high p-value of 0.958.
- When 4.38% < FDI ≤ 11.96%, we found strong evidence that GDP widens the regional income gap in Vietnam with a p-value of 0.007. In specific, each 1% increase in GDP may increase regional inequality by 0.004%.
- When the country continues to attract FDI more than 11.96% GDP, the indirect impact of FDI via GDP will be even stronger. Each 1% increase in GDP would increase inequality by 0.011%.

Conclusion

Using a panel data of cities and provinces in Vietnam in the period of 2006 – 2015, this paper examines the relationship between regional income inequality and FDI growth using fixed effect threshold model developed by Hansen (1999). The findings indicate that FDI directly have a negative effect on income equality. Furthermore, the results show that FDI can influence on inequality indirectly through its impact on GDP. We find strong evidence that there are two threshold levels of FDI in the regression relationship. They are 4.38% and 11.96% of GDP with asymptotic 95% confidence interval. These thresholds divide the observations into three regimes, in which the relationship between GDP and inequality has an inverted U shape. This finding is consistent with the previous studies on other countries such as Figini & Gorg (2011) and Kyriacou& Roca-Sagales (2012). It implies the tradeoffs of the country when trying to attract FDI. The fact in Vietnam shows that the competition among regional governments for the inward FDI generally deepens the gap between the rich and poor resource regions in the country. In the context that Vietnam has been putting so much efforts to attract FDI, this is a warning of an increase in region income inequality in the near future.

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