

Graduate School of Economics, Hitotsubashi University  
Discussion Paper Series  
No. 2013-09

**An Analysis of Changes in Wealth Distribution upon the Entrance  
of Foreign Direct Investment Firms**

Tran Lam Anh Duong

September 2013

# An Analysis of Changes in Wealth Distribution upon the Entrance of Foreign Direct Investment Firms \*

Tran Lam Anh Duong †

Current version: September 2013

## Abstract

This paper investigates the role of foreign direct investment (FDI) firms with respect to various economic aspects in developing countries, such as the determination of wealth distribution and the entry and exit of entrepreneurs. The model used in this paper is based on the theoretical framework developed in Matsuyama (2011). Unlike the original model focusing on a closed economy, this paper will introduce the arrival of FDI firms as a new actual foreign factor. It is shown that the FDI firms can possibly have various negative effects. More specifically, the following somewhat interesting results are obtained.

First, the paper is the first to describe how the entrance of FDI firms can effect both wealth equality and inequality. This entrance can cause equality by acting as either a “big push” to push all the poorer members of society out of the poverty trap so that all domestic agents may become more equal with respect to wealth distribution and more free with respect to job selection. Conversely, it could lead to an “underdevelopment trap” whereby all domestic agents have no other choice than to work for FDI firms. On the other hand, the entrance of FDI firms may also cause inequality by widening the gap between rich and poor. The cost of starting a new business, the bequest motive and the world interest rate play critical roles in the determination of the effects of FDI-firm entry. Second, entry and exit of entrepreneurs is also analyzed under profitability and borrowing constraints and its relation to equality is also discussed.

*Keywords:* foreign direct investment, wealth distribution, entry and exit of entrepreneurs

*JEL classification codes:* D31, F21, O16

---

\*Work in progress. I am deeply grateful to Professor Etsuro Shioji, Professor Naohito Abe and Professor Taiji Furusawa, my academic Advisors, for their kindness and constant support at all phases of this work. Without their valuable advice and comments, the paper would have not been completed. My warm thanks go to members in Macroeconomics Workshop in Hitotsubashi University, members in Shioji seminar, Abe seminar and Ishikawa-Furusawa seminar for their helpful discussions. Remaining errors are my sole responsibility.

†Correspondence address: Tran Lam Anh Duong, Graduate School of Economics, Hitotsubashi University, 2-1 Naka, Kunitachi, Tokyo 186-8601, Japan. Email address: anhduongtl (at) gmail.com

# 1 Introduction

Over the last few decades, developing countries have witnessed a significant increase in foreign direct investment (FDI) inflows. From 1990 to 2007, FDI inflows into developing countries increased by 16.5 times, which is twice the world average.

Along with the increase in FDI inflows, there is a rising concern about the relationship between FDI and social wealth equality. Previous theoretical researches have mainly focused on the role of wealth distribution on foreign investment. For example, Amissah, Bougheas and Falvey (2011) and Gall, Schiffbauer and Kubny (2012) examine the impact of the distribution of wealth under credit market imperfections. However, there is a lack of research on the potential for adverse effects, such as with respect to the effects of foreign investment, especially FDI, on wealth distribution.

In contrast to theoretical researches, however there have been numerous empirical researches working on this matter. They have usually used income distribution as a proxy for wealth distribution. However, their conclusions with respect to the impact of FDI on income distribution are rather ambiguous. For example, Basu and Guariglia (2007) and Choi (2006) both use a panel data of more than one hundred developing countries and observe that FDI promotes income inequality. On the other hand, Lindert and Williamson (2001) and Milanovic (2002) do not find any significant relationship between FDI and income inequality.

The disagreement regarding the impact of FDI can be explained by a lack of researches that deal with theoretical models working on this matter. Therefore, the motivation of this paper is to develop a framework to examine the changes of an economy relevant to wealth distribution and the entry and exit of entrepreneurs upon the entrance of FDI firms.

The model used in this paper is based on the theoretical framework developed in Matsuyama (2011). Matsuyama (2011) provides a rich framework for highlighting some key results in the theoretical literature on credit market imperfections, household wealth distribution and development. He uses a series of illustrative models, which progressively build on one another to analyze the dynamics of inequality and development under credit market imperfections. Major research trends and perspectives are identified and the advantages of a hierarchically integrated approach are also discussed. More specifically, the framework revolves around the change in wealth distribution which is generated by the introduction of borrowing constraint. This constraint prevents agents from borrowing from credit market, building a wall between the rich and the poor. That each agent can pass through this wall or not will determine the distribution of wealth. This assumption of borrowing constraint is very natural, especially in the case of developing countries where the credit market is still immature. Furthermore, although being able to cover almost all properties of the relationship between imperfect credit markets and wealth distribution, the framework in Matsuyama (2011) is general and simple enough to allow for the extension of these properties for the purpose of introducing new factors such as the participation of FDI firms. Therefore, the particular significance of this paper is that it introduces the arrival of FDI firms as an actual foreign factor to the closed economy model in Matsuyama (2011) and analyzes how this factor affects the results of previous studies.

The FDI firm modeled in this paper has the following features. First, it has higher productivity than domestic firms. Second, the FDI firm is so credit worthy that it does not face any credit constraints which domestic firms do face. From the position of an economy, a representative FDI firm is from the “rest of the world”. The “rest of the world” is large enough to ensure that as long as the profit remains positive, there always exists an FDI firm that can afford the set-up costs to join the economy. This is the main difference of FDI firms compared to domestic firms in the credit market.

The paper yields some interesting results. First, the paper can describe how the entrance of FDI firms influence wealth distribution. This result provides a response to the disagreement in previous empirical researches, as it implies that FDI firms can cause both wealth equality and inequality. For example, the entrance can cause equality by acting as either a “big push” to push all the poorer members of society out of the poverty trap so that all domestic agents become more equal with respect to wealth distribution and more free with respect to job selection. Conversely, it could lead to an “underdevelopment trap” whereby all domestic agents have no other choice than to work for FDI firms. On the other hand, the entrance of FDI firms may also cause inequality by widening the gap between rich and poor. The cost of starting a new business, the bequest motive and the world interest rate play critical roles in the determination of the effects of FDI-firm entry. Specifically, the higher the cost of starting a new business, the more bequest is left to the next generation, or the higher the world interest rate, the more likely it is that the entrance of FDI firms may “push” the economy toward a high state where all domestic agents are indifferent with respect to wealth and job selection. Second, entry and exit of entrepreneurs is analyzed under profitability and borrowing constraints and the relation of this to equality is also discussed. Furthermore, a numerical simulation analysis using assumed parameter values also confirms the analytical findings.

The rest of the paper is organized as follows. Section 2 presents the basic model used in this study. Section 3 provides the analytical computation. Section 4 concludes the paper.

## 2 The model

The basic framework is borrowed from Matsuyama (2011). The economic environment can be described as follows. In a country, there is an infinite number of generations. Each generation has a unit mass of identical agents who live for only one period. Thus, the population is assumed to be continuous and its size,  $N$ , is set to 1. There is a single numeraire good which may be allocated to consumption or investment.

And, the country in this paper is assumed to be a small economy where the interest rate,  $r$ , is determined exogenously depending on the current world rate.

### *Domestic agents*

At the beginning of period  $t$ , an  $Agent_t$  inherits  $w_t$  units of the numeraire good from his parent. Then, based on his own state of inheritance and ability, he decides to either run a business or work for another company. This job selection allows for endogenous entry and exit of entrepreneurs which is an important

channel of resource allocation. At the end of the period, the agent derives utility by consuming  $c_t$  and by leaving bequest  $w_{t+1}$  to the next generation. Thus, the utility function is:

$$u_t = c_t^{1-\beta} w_{t+1}^\beta \quad (1)$$

where  $\beta$ : bequest share.

In the case of being a worker,  $Agent_t$  can work in a domestic firm or an FDI firm and earn a wage  $v_t$ . At the beginning of period  $t$ , the agent also lends all of his unemployed inheritance  $w_t$  at interest rate  $r$  ( $r \geq 1$ ). Thus, at the end of period  $t$ , his wealth is  $v_t + rw_t$ .

In the case of being an entrepreneur,  $Agent_t$  establishes a firm. Each domestic firm is assumed to have an identical production function as follows:

$$Y_t = \phi(n_t) \quad (2)$$

where  $\phi' > 0, \phi'' < 0, \phi(0) = 0$  and  $n_t$  is the number of worker working in this domestic firm ( $n_t < 1$ ). Labor is the sole input into the production process. To start the firm, the entrepreneur has to pay a set-up cost  $F$  ( $F \geq 0$ ). At the beginning of period  $t$ , if he has more wealth than the set-up cost, he can lend the remainder at interest rate  $r$ . Thus, the income of the firm, or the wealth of the entrepreneur at the end of period  $t$ , can be derived as  $\phi(n_t) - v_t n_t + r(w_t - F)$ . Separate the part that varies with the number of worker,  $\phi(n_t) - v_t n_t$ , and denote it as  $\pi(n_t)$ , the wealth of the entrepreneur can be rewritten as  $\pi(n_t) + r(w_t - F)$ . In order to maximize the profit, the entrepreneur determines the optimal number of workers to recruit. His profit maximization condition takes the form of  $v_t = \phi'(n_t)$ . That is, the optimum number of workers is a decreasing function of equilibrium wage which is determined in the labor market,  $n_t = \phi'^{-1}(v_t), n'(v_t) < 0$ .

Every entrepreneur has to face two constraints: profitability constraint and borrowing constraint. First, in term of profitability constraint, an entrepreneur has no incentive to invest unless his income is larger than in the case of being a worker. Thus, his profitability constraint is

$$\pi(n(v_t)) + r(w_t - F) \geq v_t + rw_t \iff \pi(v_t) - v_t \geq rF$$

Solving the equation, we get

$$v_t \leq v^* \quad (3)$$

Second, in term of borrowing constraint, an entrepreneur can only run a business if he has enough set-up cost,  $F$ . By this assumption, the borrowing constraint can be written as follows:

$$w_t \geq F \quad (4)$$

### *FDI firms*

A new addition to the basic model in Matsuyama (2011) is the introduction of FDI firms. In contrast to domestic firms, the most important assumption relevant to FDI firms in this model is that the firms do not

face any borrowing constraints. FDI firms come from the “rest of the world”, and “the rest of the world” is large enough to ensure that as long as the profitability constraint is satisfied, there exist FDI firms that can afford to pay a set-up cost  $F$  to join this economy. FDI firms join the economy by hiring workers for production and at the end of the period they repatriate the income earned back to their host countries.

Furthermore, FDI firms are assumed to have a higher productivity than domestic firms. Theoretically, Helpman et al. (2004) predicts that the least productive firms serve only the domestic market and the most productive firms engage in FDI. Empirically, productivity differences between foreign-owned firms and domestically owned firms have been extensively investigated in other countries: Globerman et al. (1994) in Canada; Doms and Jensen (1998) in the United States; Girma et al. (2002) in the United Kingdom; Hallward-Driemeier et al. (2002) in Indonesia, Korea, Malaysia, the Philippines, and Thailand; Kimura and Kiyota (2006) in Japan. All of these studies, with the exception of Globerman et al. (1994), confirm that foreign-owned firms exhibit higher productivity than domestic firms.

Assume that each FDI firm has an identical production function which uses labor as its sole input:

$$\hat{Y}_t = \hat{\phi}(n_t) \quad (5)$$

where  $\hat{\phi}' > 0$ ,  $\hat{\phi}'' < 0$ ,  $\hat{\phi}(0) = 0$  and  $n_t$  is the number of workers in the FDI firm. Then, we assume

$$\hat{\phi}'(n_t) \geq \phi'(n_t), \forall n_t \quad (6)$$

Also, its profit maximization condition takes the form of  $v_t = \hat{\phi}'(n_t)$ . That is, the optimum number of workers is a decreasing function of equilibrium wage which is determined in the labor market,  $n_t = \hat{\phi}'^{-1}(v_t)$ ,  $n'(v_t) < 0$ .

Similar to domestic firms, FDI firms also face a profitability constraint. Unless the FDI firm's profit is less than what it gains from lending the set-up cost instead of investing it, the FDI firm will invest. Thus, its profitability constraint is

$$\hat{\pi}(v_t) \geq rF$$

where  $\hat{\pi}(v_t) = \hat{\phi}[n(v_t)] - n(v_t) \cdot v_t$ .

Solving the equation, we get

$$v_t \leq v^{**} \quad (7)$$

It is easy to find that if the profitability constraint of domestic firms is satisfied, that of FDI firms also holds,  $v^{**} \geq v^*$ .

#### *Labor market*

In this labor market, both domestic firms and FDI firms share a common wage:  $v_t = \phi'(n_t^{\text{DOS}}) = \hat{\phi}'(n_t^{\text{FDI}})$  where  $n^{\text{DOS}}(v_t)$ : optimum number of workers in domestic firms;  $n^{\text{FDI}}(v_t)$ : optimum number of workers in FDI firms. This wage is an equilibrium wage at period  $t$  as it is determined when the labor market is

clearing.

The labor supply, defined as participation in the labor force, is the number of people who cannot satisfy the borrowing constraint to run a firm. Therefore, labor supply takes the form:

$$N_t^S \equiv G_t(F)$$

Here,  $G_t(F)$  denotes the fraction of the households whose inheritance is less than  $F$ .<sup>1</sup>

On the other hand, labor demand is the number of workers that domestic firms and FDI firms need to maximize their profit. Labor demand is defined as follows.

$$N_t^D \equiv [1 - G_t(F)]n^{\text{DOS}}(v_t) + \theta n^{\text{FDI}}(v_t)$$

where  $\theta$ : ratio of number of FDI firms to domestic population. The first term on the right hand side of the equation above shows the number of workers in domestic firms, while the second term is that of FDI firms.

The market is clearing when labor demand equals labor supply  $N_t^S = N_t^D$ , then the equilibrium wage at every period,  $V_t$ , is solved.

#### *The bequest rule*

Based on the utility function in equation (1), it is found that to maximize his utility,  $Agent_t$  should leave a bequest that is equal to a fraction,  $\beta$ , of his wealth at the end of period  $t$ . Thus, the bequest rule is determined as follows

$$w_{t+1} = \begin{cases} \beta[V_t + rw_t] & w_t \leq F \\ \beta[\pi(V_t) + r(w_t - F)] & \text{otherwise} \end{cases} \quad (8)$$

### 3 The analytical computation

Analysis of entrance of FDI firms in an economy will be discussed in this section.

#### 3.1 Labor market

This section describes the labor market equilibrium and the wage movements upon the entrance of FDI firms.

**Proposition 1.** *The wage rate promptly after FDI firms' entry is higher than in the case with no FDI firms.*

*Proof.* • The case of no FDI firm:

1. Labor demand ( $N_t^D$ ):

$$N_t^D = \begin{cases} [1 - G_t(F)]n^{\text{DOS}}(v_t) & v_t \leq v^* \\ 0 & v_t > v^* \end{cases}$$

---

<sup>1</sup>Refer to borrowing constraint in equation (4)

2. Labor supply ( $N_t^S$ ):

$$N_t^S = \begin{cases} G_t(F) & v_t \leq v^* \\ 1 & v_t > v^* \end{cases}$$

where  $G_t(F)$  is the share of workers at period  $t$ .

Labor supply and demand curve described by the equations above are shown in Figure 1.1.<sup>2</sup> In this figure, the horizontal axis is the labor share and the vertical axis is the wage. As long as the profitability constraint holds, the equilibrium wage is determined at the intersection of labor supply and demand curve.

• The case of existing FDI firms:

1. Labor demand:

$$N_t^D = \begin{cases} [1 - G_t(F)]n^{\text{DOS}}(v_t) + n^{\text{FDI}}(v_t) & v_t \leq v^* \\ n^{\text{FDI}}(v_t) & v^* < v_t < v^{**} \\ 0 & v_t \geq v^{**} \end{cases}$$

2. Labor supply: The same as the case of no FDI firm.

On account of the entrance of highly productive FDI firms, the total demand for labor in this economy increases, thus the demand curve,  $N_t^{D'}$ , shifts upward. As long as the domestic profitability constraint holds ( $v \leq v^* (\leq v^{**})$ ), the new equilibrium wage is determined at the intersection of labor supply and new demand curve. Due to Figure 1.2, it is found that the equilibrium wage in the case of existing FDI firms is always higher than that in the case of no FDI firm,  $V_t' > V_t$ .  $\square$

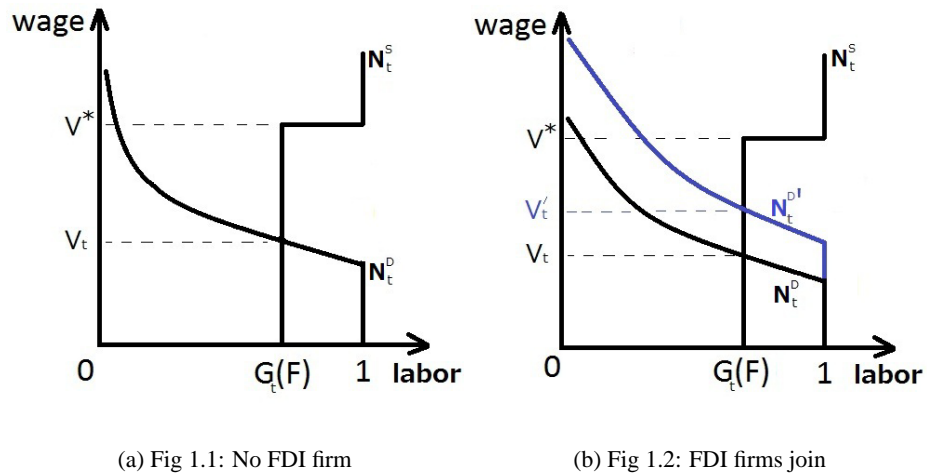


Figure 1

<sup>2</sup>In term of labor demand, if wage is too low, domestic firms need as much labor as possible, thus demand for labor is the whole population,  $N_t^D = 1$ . If wage increases to a certain level, labor demand curve is downward sloping.



The intuitive picture behind this proposition is quite basic, however it is necessary for the next analysis.

### 3.2 Wealth dynamics

The bequest rule is derived in equation (8):

$$w_{t+1} = \begin{cases} \beta[V_t + rw_t] & w_t \leq F \\ \beta[\pi(V_t) + r(w_t - F)] & \text{otherwise} \end{cases}$$

This transition of wealth will take the shape shown in Figure 2. The horizontal axis corresponds to

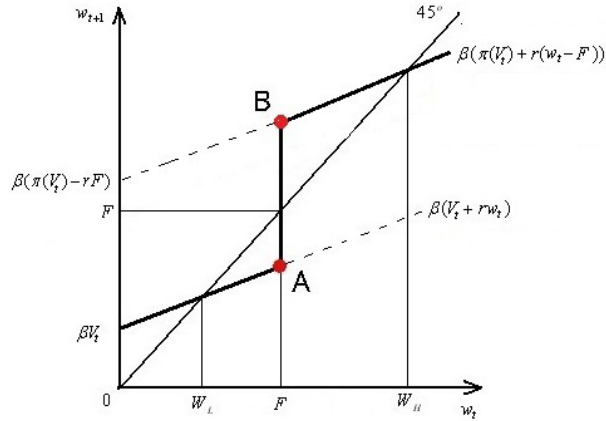


Figure 2

inheritance that  $Agent_t$  receives from his parent  $w_t$ , and the vertical axis to bequest he leaves to his child  $w_{t+1}$ . To the left of  $F$  on the horizontal axis lies the line  $\beta(V_t + rw_t)$ , called “lower line”, showing the transition of a worker’s wealth. The line  $\beta(\pi(V_t) + r(w_t - F))$  to the right of  $F$ , called “upper line”, indicates the transition of an entrepreneur’s wealth. The equilibrium wage obtained in labor market will determine the position of these two lines in each period. However, due to the profitability constraint of domestic firms, the “upper line” is always vertically higher than the “lower line”.

At the steady state, size of the bequest from an agent to his child is exactly equal to the inheritance he receives from his parent,  $w_t = w_{t+1}$ . Under the assumption of  $\beta r < 1$ , the steady state can be solved. Wealth of workers at the steady state is obtained at the intersect between “lower line” and 45-degree line, while that of entrepreneurs locates at the intersect between “upper line” and 45-degree line.

It is important to note that under the assumption that every agent in the economy is homogeneous in ability, the graph of wealth transition can be applied to the whole economy. Therefore, the steady-state wealth of each agent is also the wealth per capital at the steady state of this economy.

When FDI firms join the economy, an increase in equilibrium wage causes a shift in the transition path of wealth for all agents. The increase in equilibrium wage will increase the income, thus increase

the bequest toward the next generation of the worker. On the other hand, the increase in equilibrium wage will decrease the profit of the entrepreneur, thus decrease the income and subsequently decrease the bequest left to his child. Therefore, the transition path of a worker's wealth shows a shift-up and vice versa for the wealth transition path of an entrepreneur. The shift is shown in Figure 3.

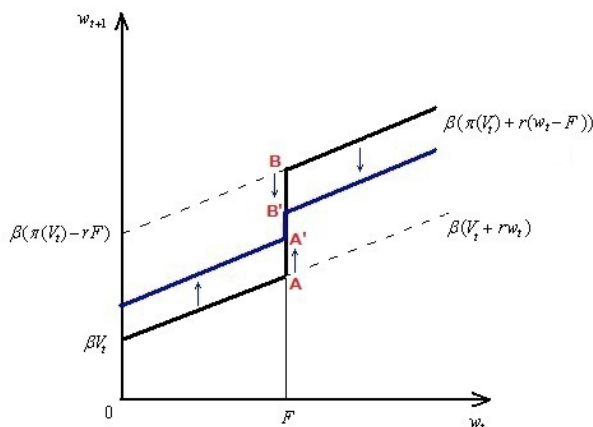


Figure 3

With such shifts, the comparative position of point A and point B changes, and this definitely alters the steady-state wealth of all the agents. For example, upon the shift-up of “lower line”, point A moves vertically upward. If it moves to above the 45-degree line, the intersect between this line and “lower line” will disappear. The same situation happens to the intersection between 45-degree line and “upper line” when point B moves to below the 45-degree line upon the shift-down of the “upper line”. Therefore, the participation of FDI firms may cause three scenarios for the economy: ① Poverty trap, ② High state and ③ Low state.

### 3.3 The equilibria

#### Case 1: Poverty trap

Figure 4 indicates this case. Graphically, it is found that when point A and point B simultaneously lie below and above the 45-degree line, respectively, there exists a steady state that contains both the existence of entrepreneurs and workers. At the new steady state, the job share does not change. Agents whose initial wealth is smaller than set-up cost  $F$  can never become an entrepreneur, hence this steady state is called the “poverty trap”. However, because of the increase in wages, the steady-state wealth of workers increases ( $W_L \uparrow$ ) while that of entrepreneurs falls ( $W_H \downarrow$ ). Workers become better off and entrepreneurs become worse off, thus the entrance of FDI firms makes this economy more equal.

#### Case 2: High state

Figure 5 illustrates this case. The case happens when both point A and point B lie above the 45-degree

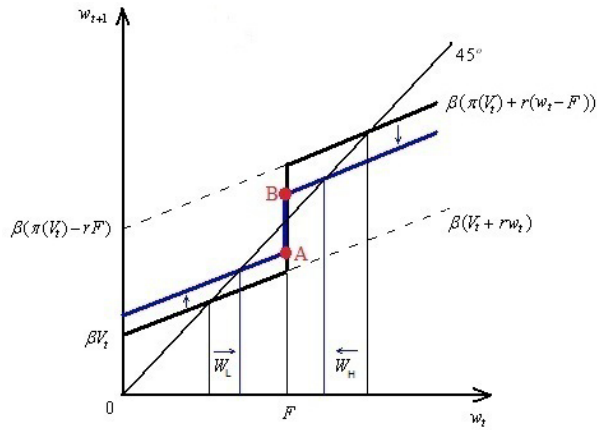
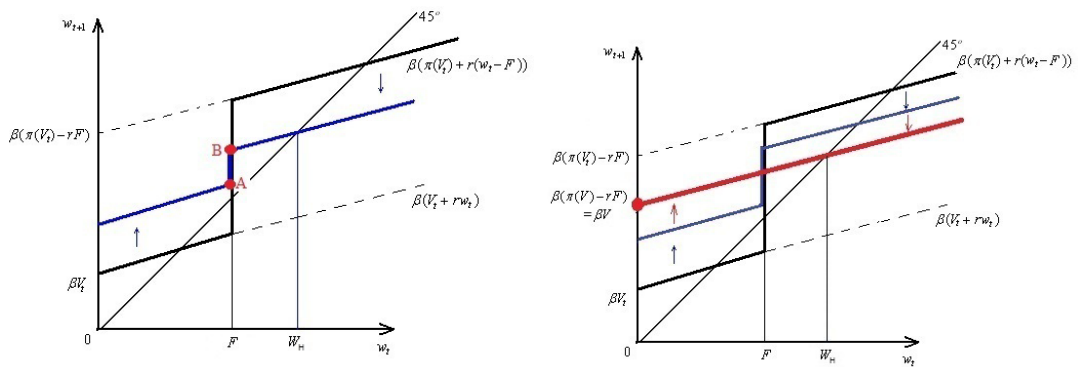


Figure 4



(a) Fig 5.1

(b) Fig 5.2

Figure 5

line. In this case, workers can escape from the poverty trap and become entrepreneurs. The FDI firms in this case act as a “big push”. The process of this equilibrium is as follows. First, the increase in wages upon the entrance of FDI firms can cause all workers to become better off, with some of them becoming wealthy enough to run their own businesses. That is, they become entrepreneurs. This leads to a shrinking of the labor force and an increase in the labor demand. As a result, wages increase continuously, and thus more worker can become entrepreneurs. This process repeats itself again and again until the wealth levels of workers and entrepreneurs are even. The “lower line” and “higher line” now merge into just one line somewhere in the middle. This steady state is shown in Figure 5.2. Here, every agent has the same level of wealth and it is higher than set-up cost  $F$ . Therefore, this steady state is also called “high state”, and here the economy becomes completely equal. However, there is an indistinctness in wealth between workers

and entrepreneurs; the job share is undetermined.

### Case 3: Low state

This case is shown in Figure 6. This case happens when both point A and point B lie below the 45-degree line. The process of this equilibrium is described as follows. First, the increase in wages upon the

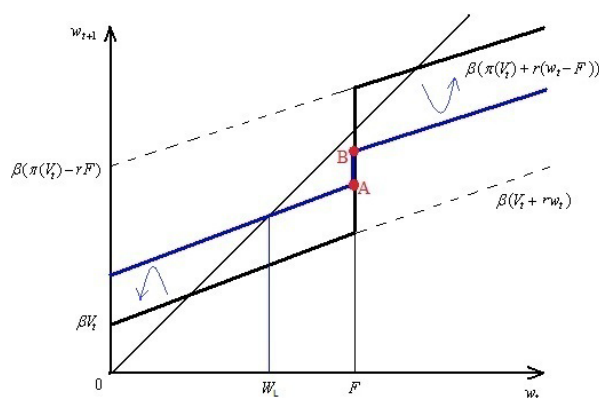


Figure 6

entrance of FDI firms causes all entrepreneurs to become poorer. Some entrepreneurs can not maintain their own businesses and become workers, leading to a shrinking of the labor demand and an increase in the labor force. This leads adversely to a decrease in wages. Graphically, the “lower line” and “higher line” initially move toward each other upon the wage-increasing effect of the entrance of FDI firms. Soon afterwards, they move outward. That the transition paths of workers’ and entrepreneurs’ wealth moves backwards makes this case more complicated than the other two. How far the two lines move outward will determine the properties of the new steady state. This depends mainly on the wealth distribution of this economy before FDI firms join, which is discussed as follows:

1. In the case whereby all entrepreneurs in the economy are not rich enough to avoid significant loss of profit following the wage increase effected by the entry of FDI firms, they will be incapable of leaving a large bequest. The next generation will come to be unable to continuously run the businesses, and will become workers. As a result, the labor force will come to include the whole population, and labor demand will now be the purview of FDI firms only. Intuitively, the large increase in labor supply, together with the decrease in labor demand, will lead to a decrease in wages. No domestic agent is able to become an entrepreneur; all of the population works for FDI firms. The wage at the steady state in this case is lower than the set-up cost  $F$ , thus this is called an “underdevelopment trap”. The economy is completely equal and the labor share is 1. Figure 7.1 shows this case. Every agent in this economy now shares the same steady-state wealth at  $W_L$ .

There is a good and simple example of this case. That is before FDI firms join, this economy was

already at a steady state where the wealth of all the entrepreneurs equals  $W_H$ .<sup>3</sup> In this case, if the increase in wages upon the entrance of FDI firms makes an entrepreneur become a worker, other entrepreneurs will become workers also, because they are all identical. This case clearly leads to the “underdevelopment trap” steady state.

2. Regarding the case whereby, although some poor entrepreneurs cannot continue running their own business upon the increase in wages, others are rich enough so that the loss in profit does not prevent them from continuously leaving the next generation an amount of bequest larger than set-up cost  $F$ , the domestic businesses can be maintained. The economy will equilibrate at the “poverty trap”, as in case 1. As mentioned in the process of “low state”, the market exit of poor entrepreneurs leads to an increase in labor supply and decrease in labor demand, resulting in a wage decrease. However, the decrease in wages reduces the loss in profits of the remaining entrepreneurs. If these relatively rich entrepreneurs can wait until this loss becomes zero, they can continuously maintain their businesses. At the steady state, the number of workers has increased while the number of entrepreneurs has decreased. This case can explain the increased inequality which may occur by the entrance of FDI firms. Figure 7.2 shows such an example.

In figure 7.2, the “lower line” and “higher line” move to a position below and above their respective lines at the old steady state prior to the entry of FDI firms. In this case, the wealth of workers decreases while that of entrepreneurs increases. The gap between the wealth of workers and entrepreneurs widens, thus inequality occurs. This case will be simulated with assumed parameter values in Appendix A.

The properties of three equilibria above are summarized in the following table:

Table 1

		<b>Equality</b>	<b>Worker share</b>	<b>Equilibrium wage</b>
Poverty trap		Equal	Unchanged	Increase
High state		Completely equal	Undetermined	Increase
Low state	Underdevelopment	Completely equal	1	Increase
	Poverty trap	Equal or unequal	Increase	Increase or decrease

With these cases, the role of the entrance of FDI firms on wealth equality is clarified. In sum, this entrance can create both equality and inequality as empirical researches indicate. Now, the conditions under which the three equilibria above may occur should be discussed.

### 3.4 Conditions of the equilibria

First, discuss the condition under which workers and entrepreneurs exist. The condition for the existence of worker or entrepreneur or both depends on the comparative position of the 45-degree line on the plane

<sup>3</sup>See figure 2

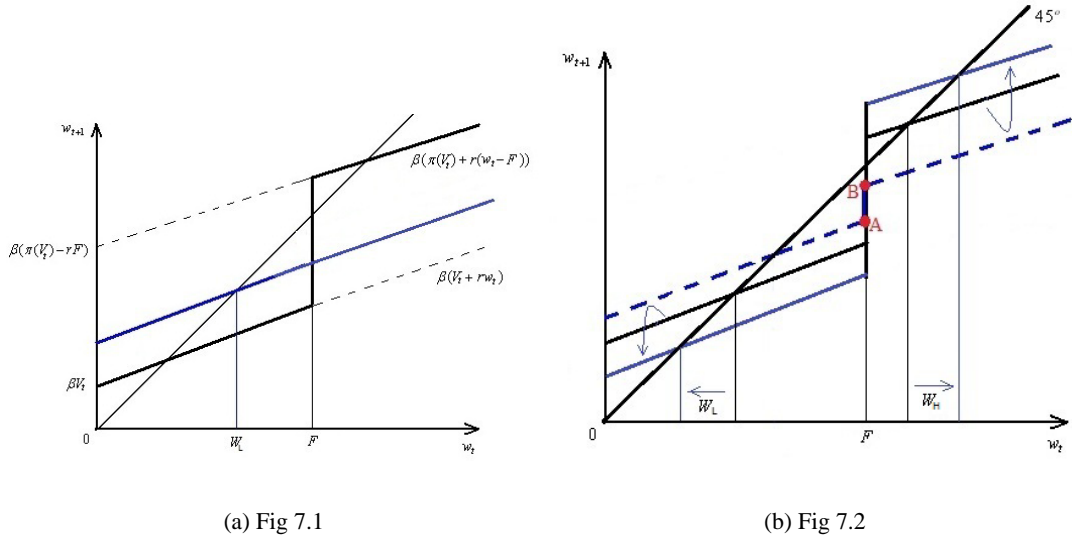


Figure 7

of the wealth transition path.

If the “lower line” and 45-degree line intersect, there exist workers and the intersection will determine their equilibrium wealth. This happens if and only if point A lies under the 45-degree line, or

$$\beta(V_t + rF) \leq F \iff V_t \leq V_1$$

where  $V_1 \equiv \frac{F}{\beta}(1 - \beta r)$ . Thus,  $V_1$  is the minimum wage that ensures the existence of the worker.

On the other hand, the “higher line” and 45-degree line intersect, there exist entrepreneurs and the intersection will determine their equilibrium wealth. And this happens if and only if point B lies above the 45-degree line, or

$$\beta[\pi(V_t) + r(F - F)] \leq F \iff \pi(V_t) \leq \frac{F}{\beta} \iff V_t \leq V_2$$

where  $V_2$  is the solution of equation  $\pi(V_t) = \frac{F}{\beta}$ . Thus,  $V_2$  is the minimum wage that ensures the existence of the entrepreneur.

Then, discuss the condition under which the three cases of equilibrium above may occur.

1. Poverty trap: The condition for this case is that:

$$V_t \leq \min(V_1, V_2)$$

Intuitively, when equilibrium wage is low, workers are so poor that they can never run a firm, while entrepreneurs get such a high profit that they can keep running their business. Therefore, the

economy will contain both workers and entrepreneurs.

2. High state: The case happens when both point A and point B lie above the 45-degree line. In this case, workers can escape from the poverty trap to reach the high state under the following condition:

$$V_1 < V_t < V_2$$

3. Low state: In this case, every agent becomes a worker, working in the FDI firms. The condition of the equilibrium wage for this case is:

$$V_2 < V_t < V_1$$

In both the case of high and low state, the condition of equilibrium wage is higher than the case of two equilibria. However, the specific conditions of the economy when converging to high state or to low state need to be clarified.

The main difference between these two cases is the scale of  $V_1$  in comparison with that of  $V_2$ . In the case of low state,  $V_2 < V_1$  and in the case of high state, the reverse is true. Figure 8 shows the comparative position of  $V_1$  and  $V_2$ . On the horizontal axis is shown the equilibrium wage, and the profit

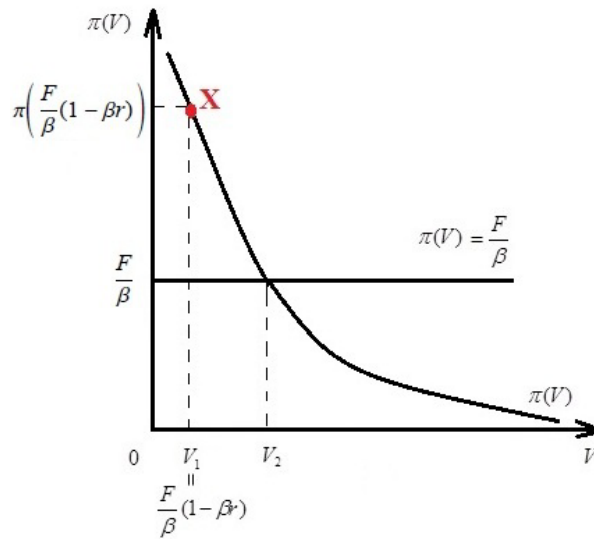


Figure 8

is on the vertical axis. Profit is the decreasing function of wage,<sup>4</sup> thus the profit function is presented by a downward-sloping curve.  $V_1$  is chosen at the value of  $\frac{F}{\beta}(1-\beta r)$ , and  $V_2$  is determined at the intersection point between profit function curve and the horizontal line  $\frac{F}{\beta}$ . In Figure 8, there is also an appearance of a point X. The ordinate of this point is calculated as the function  $\pi(\cdot)$  at  $V_1 = \frac{F}{\beta}(1-\beta r)$ . According

<sup>4</sup> $\pi(n_t) = \phi(n_t) - v_t n_t = \phi(n_t) - \phi'(n_t) \cdot n_t \Rightarrow \pi'(n_t) = -\underbrace{\phi''(n_t)}_{<0} \cdot n_t \geq 0 \Rightarrow \pi'(v_t) \leq 0$

to Figure 8, it is found that  $V_1 < V_2$  only when point X lies higher than line  $\frac{F}{\beta}$ . Then the condition for  $V_1 < V_2$  is as follows:

$$\pi \underbrace{\left( \frac{F}{\beta} (1 - \beta r) \right)}_{V_1} > \frac{F}{\beta} \quad (9)$$

This equation is applied to derive the following proposition:

**Proposition 2.** *The high (low) state exists if at least one of the conditions below holds:*

1. *The set-up cost is sufficiently low (high).*
2. *The bequest share is sufficiently high (low).*
3. *The interest rate is sufficiently high (low).*

Mathematically, when  $F$  is low, or  $\beta$  and  $r$  are high,  $V_1$  is more likely smaller than  $V_2$ . Thus high state may take place. Intuitively, first, if the cost required for starting a firm is low, the earning at the end of the period is high. Therefore, the bequest that an agent leaves to his child may become larger than that he received from his parent. Then, his child may get enough set-up cost to start a business,  $\beta\pi(V_t) > F$ . Here, the increase in the bequest results in the social prosperity as well as the high state of the economy. This role of the set-up cost towards the economic growth leads to a policy implication. The set-up cost used in this paper is the expense associated with entire process of establishing a new firm. It is obvious that a part of this cost is related to the government policies, both tangible (i.e. legal and professional fees, license, etc.) and intangible (i.e. registration time, administrative, corruption etc.). Therefore, if the government runs policies that ease the environment for firm establishment, the economy can reach the high state. Second, if the bequest share of the agent is high or he is altruistic, the bequest increases. Last, when the interest rate is high, although none of the agents can borrow, returns to lenders increase because of high capital gains. Wealth of workers increases, thus the bequest increases as well. Therefore, the economy may converge to the high state.

## 4 Conclusion

The purpose of this paper has been to examine the changes of an economy relevant to wealth distribution and the entry and exit of entrepreneurs upon the entrance of FDI firms. The paper introduces a model on wealth distribution in the presence of imperfect capital market, and analyzes the impact of FDI firms' participation. There are two main assumptions for these FDI firms. First, they have higher productivity compared to domestic firms. Second, FDI firms are so credit worthy that they do not have to face any borrowing constraints, as domestic firms do.

Against this background, the model developed here was used to derive the transition of wealth and labor corresponding to the entry of FDI firms. Through the analytical computation, the paper is the first to describe how the entry of FDI firms can cause both wealth equality and inequality. The entry may



cause equality by acting as either a “big push” to pull workers away from a “poverty trap” so that all domestic agents become even with respect to wealth and job selection, or cause the economy to drop into an “underdevelopment trap” whereby all domestic agents have no choice other than working for FDI firms. Further, the entrance of FDI firms can also cause inequality by widening the gap between rich and poor. There are three factors that affect the impact of FDI firms on the economy. They are set-up cost, the bequest motive and the world interest rate. More specifically, the smaller the challenge in starting a new business, the more altruistic the current generation is toward the next one, or the higher the world interest rate, the more readily can social wealth equality originate. Second, entry and exit of entrepreneurs is also analyzed under profitability and borrowing constraints and its relation to equality is also discussed.

## References

- [1] Amissah, E., S. Bougheas and R. Falvey (2011) “Financial Constraints, the Distribution of Wealth and International Trade”, *The World Economy*, Wiley Blackwell, 34, pp 707-724, 05.
- [2] Basu, P. and A. Guariglia (2007) “Foreign Direct Investment, inequality, and growth”, *Journal of Macroeconomics*, Elsevier, 29(4), pp. 824-839, December.
- [3] Choi, C. (2006) “Does Foreign Direct Investment Affect Domestic Income Inequality?”, *Applied Economics Letters*, 13, pp. 811-814
- [4] Doms, M.E. and J.B. Jensen (1998) “Comparing wages, skills, and productivity between domestically and foreign-owned manufacturing establishments in the United States”, in: R. Baldwin, R. Lipsey and J.D. Richardson, eds., *Geography and Ownership as Bases for Economic Accounting* (Chicago: Chicago University Press), pp. 235-255
- [5] Gall, T., M. Schiffbauer and J. Kubny (2009) “Dynamic Effects of Foreign Direct Investment When Credit Markets are Imperfect”, Boston University - Department of Economics - The Institute for Economic Development Working Papers Series dp-188, Boston University - Department of Economics.
- [6] Girma, S., D. Greenaway and R. Kneller (2004) “Does exporting lead to better performance? A microeconomic analysis of matched firms”, *Review of International Economics*, 12(5), pp. 855-866
- [7] Globerman St., J.C. Ries and I. Vertinsky (1994) “The Economic Performance of Foreign Affiliates in Canada”, *Canadian Journal of Economics*, 27, pp.143
- [8] Hallward-Driemeier, M., G. Iarossi and K. Sokoloff (2002) “Exports and Manufacturing Productivity in East Asia: A Comparative Analysis with Firm-level Data”, NBER Working Paper No. 8894.
- [9] Helpman, E., M. J. Melitz and S. R. Yeaple (2004) “Export versus FDI with heterogeneous firms”, *The American Economic Review*, 94, pp. 300-16

- [10] Kiyota, K. (2006) “Reconsidering the Effects of Intranational and International R&D Spillovers on Productivity Growth: Firm-level Evidence from Japan”, Discussion papers 06001, Research Institute of Economy, Trade and Industry (RIETI)
- [11] Lindert, P.H. and J.G. Williamson (2001) “Does Globalization Make the World More Unequal?”, NBER Working Papers 8228, National Bureau of Economic Research, Inc.
- [12] Matsuyama, K. (2011) “Imperfect Credit Markets, Household Wealth Distribution, and Development”, *Annual Review of Economics*, 3, pp. 339-362
- [13] Milanovic, B. (2003) “Can we discern the effect of globalization on income distribution? Evidence from household budget surveys”, *International Trade* 0303004, EconWPA.

## Appendix A: The simulation

The most interesting result in the analytical computation is the case of wealth inequality caused by the entrance of FDI firms. The motivation of this section is to replicate this result by introducing a numerical simulation analysis using assumed parameter values .

### Some settings

First, the model is approximated by a discrete number of domestic agents in order to be suitable for the simulation.

Second, all functions used in the model need to be explicitly specified. The production functions of domestic firms and the FDI firm are assumed to have the following shapes:

$$Y_t = \phi(n_t) = A \cdot n_t^\alpha$$

and

$$\hat{Y}_t = \hat{\phi}(n_t) = \hat{A} \cdot n_t^\alpha$$

respectively.

Third, inheritance is different across each agent. The initial wealth distribution is assumed to take the Pareto distribution form as follows:

$$w_i^0 = (w_{max}^0 - w_{min}^0) \left( \frac{i}{N} \right)^k, i = 1 \dots N \quad (10)$$

where  $N$  is the population.

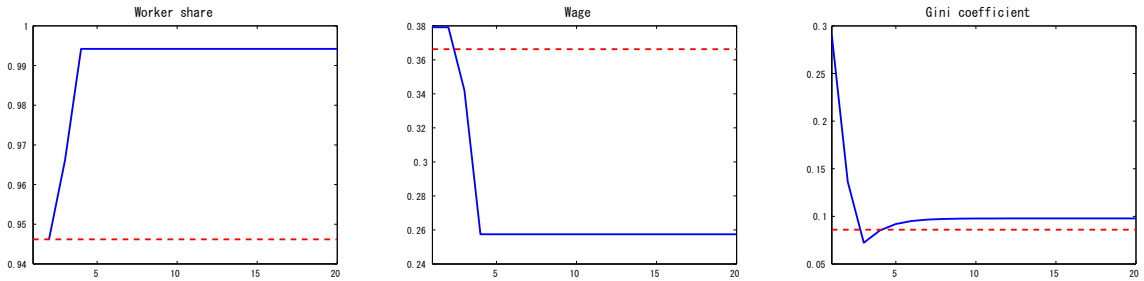
Last, all the parameters in the model are set as in Table A.1.

Table A.1

Parameter	Value	Note
$\alpha$	0.75	Labor share in production function of domestic firm
$\gamma$	0.75	Labor share in production function of FDI firm
$\beta$	0.4	Bequest share
$r$	1.1	World interest rate
$F$	1	Initial set-up cost
$A$	1	Productivity of domestic firms
$\hat{A}$	2	Productivity of FDI firms
$w_{max}$	$3 \cdot F$	Wealth of the richest agent
$w_{min}$	$0.01 \cdot F$	Wealth of the poorest agent
$\phi$	0.005	Share of FDI firms over population
$k$	20	Parameter of Pareto distribution
$N$	5000	Population

## Simulation results

The simulation results are described in Figure A.1. In Figure A.1, solid lines show the case of the entry of FDI firms, while dotted lines illustrate the case of a completely closed economy or the case of no FDI firm. The horizontal axis in each of the three figures indicates time. FDI firms enter this economy at time zero.



(a) Fig A.1.1

(b) Fig A.1.2

(c) Fig A.1.3

Figure A.1

Figure A.1.1 shows the worker share schedule. The worker share increases because of the decrease in the number of entrepreneurs whose profits are distorted by the entrance of FDI firms. The worker share adjusts to a level higher compared to the case of no FDI firm.

Figure A.1.2 shows the wage schedule. Wages increase as soon as FDI firms enter, but then decrease. The wage at the steady state is shown to be lower than in the case of no FDI firms. This occurs because of the increase in labor supply due to the conversion of entrepreneurs to workers.

Figure A.1.3 shows the Gini coefficients. This represents equality in this economy. First, the economy

becomes more equal due to the increase in the wealth of workers and the decrease in that of entrepreneurs. However, as the wage rate declines sharply to even lower than before FDI firms join, the gap between workers and rich entrepreneurs who are wealthy enough to remain in the market widens. The level of the Gini coefficient at the new steady state is higher than that at the state preceding the entrance of FDI firms. That is, this economy becomes more unequal.

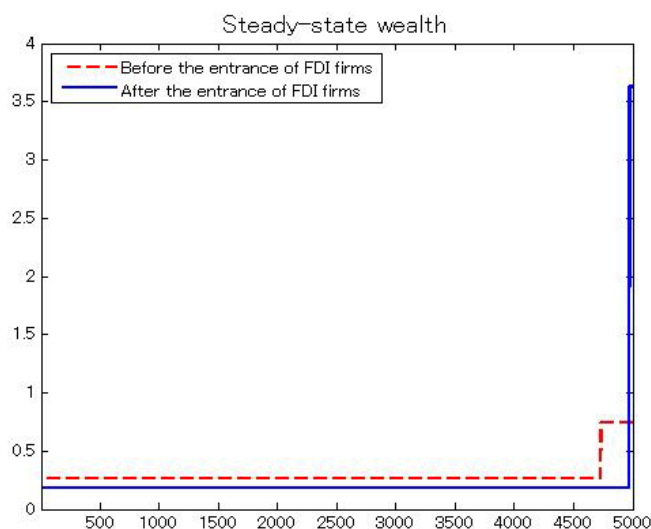


Figure A.2

Last, Figure A.2 shows steady-state wealth. The horizontal axis represents domestic agents arranged in order from poor to rich. As in Figure A.1, the solid line shows the case which includes the entry of FDI firms, while the dotted line illustrates the case of a completely closed economy. It is found that there is a small number of entrepreneurs who hold a large amount of wealth and a large number of workers who hold just a small amount of wealth. By comparison to the case with no FDI firms, it is clear that this economy has become more unequal.