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System Dynamics Approach to the Analysis of Interaction of Foreign Direct Investment and Employment in Thailand

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Abstract

This research studies the effect of FDI policy on the wages and employment in Thailand. A system dynamics model that simulates the interaction between labor market and foreign direct investment in Thailand is used. The results show that having an FDI policy results in higher FDI in the short term but lower FDI in the long term. The effect of the policy on unemployment in the short term is not significant but the unemployment ratio is higher than it would be without such policy in the long term. Regarding the salary, having an FDI policy results in having higher average salary in both the short-term and the long-term.

INTRODUCTION

The effect of Foreign Direct Investment (FDI) on wages and employment has been studied extensively and shows that foreign firms offer higher salaries to the local workers (Bandick, 2004, Conyon, Girma, Thompson, & Wright, 2002, Görg, Strobl, & Walsh, 2007, Heyman, Sjöholm, & Tingvall, 2007, Lipsey & Sjöholm, 2004, Martins, 2004) and also create a spillover effect which results in a higher average salary and lower unemployment in other sectors of the economy (Fu & Balasubramanyam, 2005, Girma & Görg, 2007, McDonald, Tüselmann, & Heise, 2002, Williams, 1999). However, studies on the feedback effect of the increase in salary and lower unemployment on the level of FDI are very limited (for example see Cushman(1987)). Moreover, a study that incorporates both forward and backward linkages between FDI and salary and employment has not been done before.

Based on a basic mental model, higher FDI growth should provide higher employment and significantly push salaries up. However, the mental model tends to model the relation between each factor as an open loop with no feedback and such a model usually oversimplifies the complexity of the real situation (Sterman, 2000). In this study, system dynamics modeling is used to examine the dynamics of FDI, salary, and employment. A system dynamics model is appropriate for studying the dynamics of each factor with a feedback system between factors. System dynamics modeling is extensively applied to studies which observe the growth or change over time such as the growth of a city (Forrester, 1969) or the growth of biotechnology industries (Morecroft, Lane, & Viita, 1991). In addition, system dynamics is also applicable for policy analysis such as the implementation of a tax policy (Cavana & Clifford, 2006) and climate policy (Fiddaman, 2007).

The level of inflow FDI in Thailand had been growing continuously from the 1980s until 2008, except during the 1997 Asian financial crisis. Before the crisis, FDI in Thailand grew at about 30% every year. However, during the crisis, the level of FDI dropped by half. The Thai government had launched many FDI stimulus policies such as tax and import duty reduction (Thailand Board of Investment, 2009). These policies resulted in about 20% annual growth rate of FDI after the crisis.

In this study, we create a system dynamics model which includes the interaction between firms, workers, job vacancies, and salaries. We focus on the type of FDI that seeks low labor costs. The model is validated with empirical data from 2000 to 2008 and shows that the simulation result and the actual data have a significantly high correlation. We create two scenarios to see the effects of the implementation of an FDI stimulus policy that results in double and triple FDI growth rates. In the scenario, the policy is implemented in 2008 and it is effective for 10 years. The results from each policy scenarios will be compared to each other and also are compared to a scenario where no policy is in place. The results show that when comparing to the scenario without the FDI policy to the scenarios with an FDI policy, a strong FDI stimulus policy generates a higher FDI volume in the short term although in the long term the FDI volume is lower. The effect on the unemployment ratio is not significant in the short run but the unemployment ratio is larger in the case of higher FDI growth in the long run. The salary is also the highest in the case of high FDI growth.

This paper is structured as follows: The next two sections discuss previous literature that studies the effect of FDI on wages and employment as well as the use of system theory to model FDI. Then we present a brief history of FDI and the FDI regulations and policies in Thailand. After that, we explain the scope, assumptions and limitations of the proposed model as well as the details of the model. Finally, we present the model's validation and simulation results.

FDI AND WAGES AND EMPLOYMENT

The effect of FDI on employment varies based on the mode of investment and the country of origin of the foreign firms. Williams (1999) presents the case of FDI in the UK. Williams (1999) observes that foreign firms from Asia Pacific and North America create more new jobs than European firms. In addition, they observed that Greenfield investment also provides more jobs than other entry modes, while 40% of samples using Mergers and Acquisitions did not change the number of employment. McDonald, Tüselmann et al. (2002) indicate that the FDI from Germany in North-West England mainly creates jobs for Germans while only a small number of new jobs are created for local people. For the macro level,

local jobs are reduced because local firms cannot compete with German firms and in turn close down. On the other hand, Fu and Balasubramanyam (2005) suggest that export-oriented FDI in China creates more jobs and encourages worker transfer from the agricultural sector to the non-agricultural sector. A study by Girma and Görg (2007), uses data from UK firms. They found that both skilled and unskilled workers have wage increases from US acquirers but not from EU acquirers.

The level of wages in the host country also affects the flow of FDI. From the FDI flow data of the US to and from the UK, France, Germany, Canada and Japan, rising wages and falling productivity stimulate FDI outflows and discourage FDI inflows (Cushman, 1987).

Therefore, based on the above mentioned studies, we can conclude that in general FDI encourages an increase in employment and provides higher salaries. However, a higher salary reduces the FDI attractiveness of the country.

SYSTEM MODELING OF FDI

The use of system modeling to analyze FDI has been explored in the international business arena for many years. The main purpose of such research is to find an optimum solution that provides the maximum benefits to firms.

Buckley and Casson (1996) created an economic model to justify the foreign market entry strategy i.e. licensing, international joint venture, and mergers and acquisition based on the market size, speed of technological change, interest rate, cultural distance, protection of independence, patent protection, economies of scope, and technological uncertainty. Buckley and Casson (1998) created another model based on Buckley and Casson (1996) to analyze the foreign market entry strategies between exporting, licensing, subcontracting, franchising, joint venture, acquisition, and Greenfield investments to find the lowest cost strategy based on location costs, internationalization factors, financial variables, cultural factors, market structure, adaptation costs, and cost of doing business abroad.

Later, Buckley and Hashai (2004) developed a model to justify which type of country the firm should invest in order to have the lowest cost by dividing the firm's operations into research and

development, production, and marketing. The location was categorized as a large developed country, a small developed country, and a developing country.

FDI IN THAILAND

From 1979 to 1998, the inflows of FDI in Thailand grew radically. According to the data from Thomson Datastream®, FDI in Thailand grew from 55 million US Dollars in 1979 to 7.3 billion US Dollars in 1998, which is a 30% growth on average per year. However, during the 1997 Asian financial crisis period, the FDI in Thailand dropped by half.

In order to promote FDI, the Thai government initiated an FDI stimulus policy. Examples of the implemented policies are the reduction of the joint venture restrictions, giving tax exemptions and tax reductions, exempting and reducing import duties, allowing foreign companies to own land and easing the regulations to obtain a working visa permit (Thailand Board of Investment, 2009). These policies resulted in around 20% FDI growth rate after the crisis.

SCOPE, ASSUMPTION, AND LIMITATION OF THE MODEL

The model incorporates the relationship among firms, workers, unemployment, salaries, and job vacancies. We categorize the firms into foreign firms, local FDI-related firms, and local firms in other industries. Workers are also categorized into workers in foreign firms, workers in local FDI-related firms, and workers in firms in other industries.

All working population, including workers in all firms and unemployed people, is homogeneous and able to work in any firm type. The movement of a worker between each type of firms is solely based on the salary gap between each type of firm without any additional training. We assume that foreign firms hire additional workers from local FDI-related firms and such local FDI-related firms fill their vacancies by hiring workers from firms in other industries. If any firm leaves the industry, workers in that firm become unemployed people. Salaries increase based on job vacancies. In other words, as there are more job vacancies, the salary increases are higher.

The inflow of FDI is represented by the number of foreign firms. We assume that foreign firms invest in Thailand mainly to access the low labor costs. Therefore, the amount of FDI inflow is based on the average salary of workers in foreign firms. The investment to access additional markets is not considered in the model.

The working population is the only resource constraint in the model. The firms are assumed to be able to have access to capital at no cost. Therefore, investment capital is not a constraint. Exchange rate risk, political risk, and operational risk are not in the scope of the model. The spillover effect from multinational firms to local firms is neglected. The macroeconomic situation is not considered in the study either.

FDI AND EMPLOYMENT MODEL

The number of firms in each category can increase and decrease over time. This is represented by the firm entry and exit shown with thick arrows in Figure 1. The light arrows represent the relationship between two variables. The foreign firm entry and exit rates are based on the domestic-to-global salary ratio, which is the ratio between the salary of workers in a foreign firm and the average global salary. High domestic-to-global salary ratio will reduce the number of new foreign firm entry and increase the rate of foreign firms leaving the country. For local FDI-related firms, the entry rate is positively affected by the growth rate of foreign firm. The higher the foreign firm growth rate, the more new local FDI-related companies.

--- Figure 1 goes about here ---

Figure 2 shows the movement of workers between unemployment, firms in other industries, local FDI-related firms, and foreign firms. The thick arrow shows the direction of the flow that firms in other industries have when hiring unemployed people, how local FDI-related firms hire workers in firms in other industries, and how foreign firms hire workers from local FDI-related firms. The arrows from

workers in foreign firms, workers in local FDI-related firms, and workers in other industries to unemployed people represent the workers who become unemployment when the firms close down.

The dismissal rate, which is workers who become unemployed, is affected by the firm's exit rate. The unemployment hiring rate is controlled by the number of vacancies in other industries and the number of unemployed people. The worker movement rate from firms in other industries to local FDI-related firm and from local FDI-related firm to foreign firms depends on the vacancies in the target firms, the number of workers in the source firms, and the difference in salary between two types of firm.

--- Figure 2 goes about here ---

The Firm module and Worker module are connected through the job vacancies and the average salary, as shown in Figure 3. The number of firms determines the number of jobs. The difference between the number of workers and the number of jobs is the job vacancy. An increase in job vacancy will increase the average salary in order to attract more workers to fill the positions. Then, the difference in salary between each type of firm will increase the number of workers who move to the target firm type. The domestic-to-global salary ratio, as shown in Figure 1, is calculated from the average salary of workers in foreign firms and the average global salary.

--- Figure 3 goes about here ---

MODEL VALIDATION

The model is validated with the data for inward FDI, number of companies, employment, working population, and average salary of Thailand from 2000 to 2008. The figures of employment, working population, average salary, and inward foreign direct investment are collected from Thomson Datastream®. The number of firms is acquired from the Department of Business Development of the Thai

Ministry of Commerce. The comparison between the empirical data and the model simulation is presented in Table 1.

--- Table 1 goes about here ---

SIMULATION RESULTS

The model is simulated based on the scenario that the government launches a new FDI stimulus policy in 2008 and the policy is in effect for 10 years. Two scenarios are studied which are the “Medium growth” scenario in which the policy makes the FDI entry rate increase by two times and the “High growth” scenario in which the policy makes the FDI entry rate increase by three times. These two scenarios are compared with the “Base” case in which there is no change in the FDI stimulus policy. The simulation is conducted until 2030 to study both short-term effects and long-term effects of the policy.

Figure 4 shows the inflow FDI in each scenario. Line number 1, 2, and 3 represent the base case, “Medium Growth”, and “High growth” respectively. The simulation shows a significant increase in the inflow FDI volume during an early period and then how it drops later. However, comparing between each scenario, the “High growth” scenario provides benefits over the base case during the short-term period which is shown by higher inflow FDI volume from 2008 to around 2018. After that, the inflow FDI volume of “High growth” scenario drops below the volume of the base case in the long run.

--- Figure 4 goes about here ---

When considering the effect of a FDI stimulus policy on unemployment, the unemployment ratio does not differ significantly during the period that the policy is in effect as shown in Figure 5. However, after the policy period, the unemployment ratio of “High growth” scenario increases to a significantly higher level than the base case.

--- Figure 5 goes about here ---

The effect of FDI stimulus policy on the average salary, which is represented by the salary in other industries, is significant. As shown in Figure 6, the salary in the “High growth” scenario is significantly diverse from the base case from the early period right after the policy is in place.

---Figure 6 goes about here ---

CONCLUSION AND POLICY IMPLICATION

This paper studies the effect of a FDI stimulus policy on the employment and average salaries in Thailand in the short and long terms. We create a model which incorporates the relationship between firms, workers, job vacancy, and salary as a way to study the effect of such policy. The model is validated with the empirical data of inflow FDI, number of companies, employment, working population, and average salary during 2000 and 2008 and the results show a significant high correlation between the empirical data and the simulation result.

The policy is studied through two scenarios in which the government enacts the FDI stimulus policy in 2008 and the policy is in place until 2018. The two scenarios are that the policy can double and triple the inflow FDI rate. The results suggest that high growth FDI is benefited by having a higher FDI volume in the short run. However, the inflow FDI volume in the high growth case drops below the growth observed in the scenario without the policy. Therefore, the FDI stimulus policy provides a benefit on higher FDI volume in the short term at the expense of a lower FDI volume in the long term.

Regarding the effect of the policy on employment and salaries, the difference in the unemployment ratio between each scenario is not significant in the short run. However, when the policy is removed, the unemployment ratio of the high FDI growth case is significantly higher than the unemployment ratio of the case scenario without the policy. The salary of the scenario with strong FDI stimulus policy is significantly higher than the one without the policy.

Based on the simulation results, the FDI stimulus policy provides benefits to the host country only in the short-term period at the cost of lower the FDI volume and higher unemployment in the long run. Therefore, a FDI stimulus policy should be used only to stimulate FDI in the short term. Other policies should also be implemented to prevent the drawback of a FDI stimulus policy in the long run. Which policy should be implemented along with the FDI stimulus policy is not clearly identified and needs further examination. Moreover, the risks that involve in FDI investment decision such as political risk and exchange rate risk are excluded in this model and need further study.

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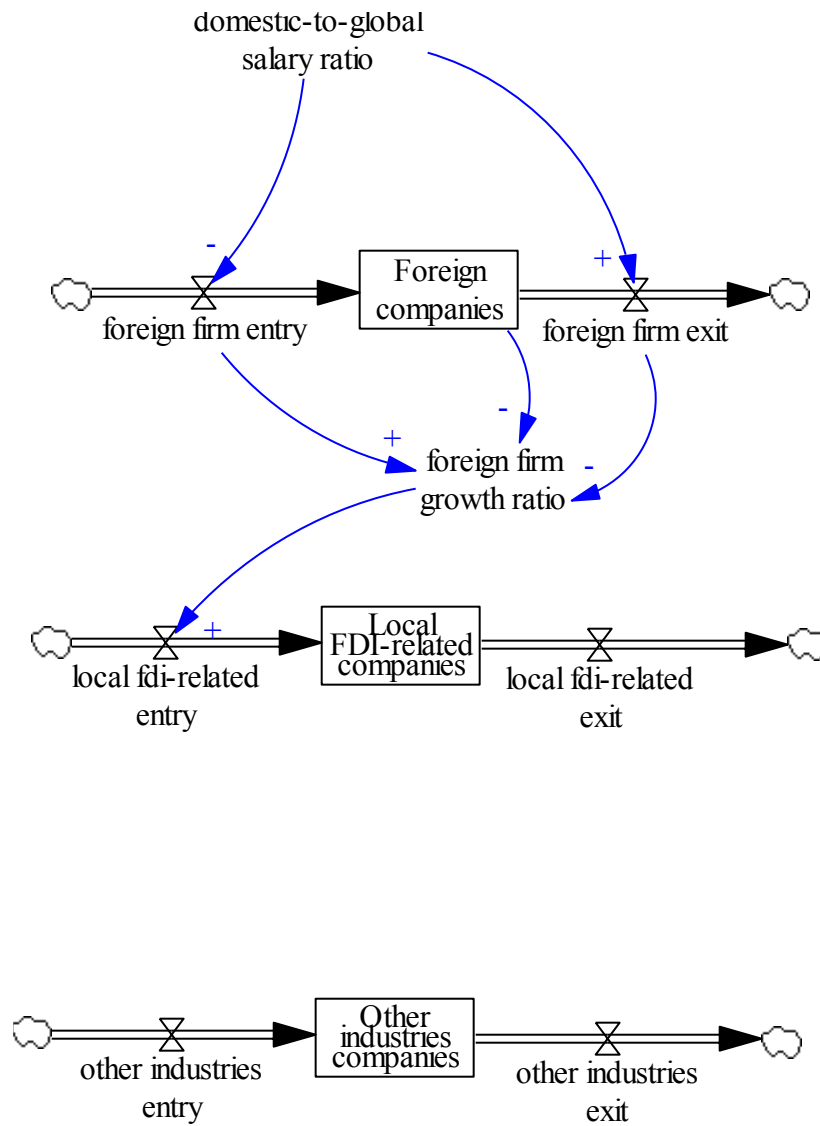


Figure 1: The firm module of FDI and employment in Thailand model

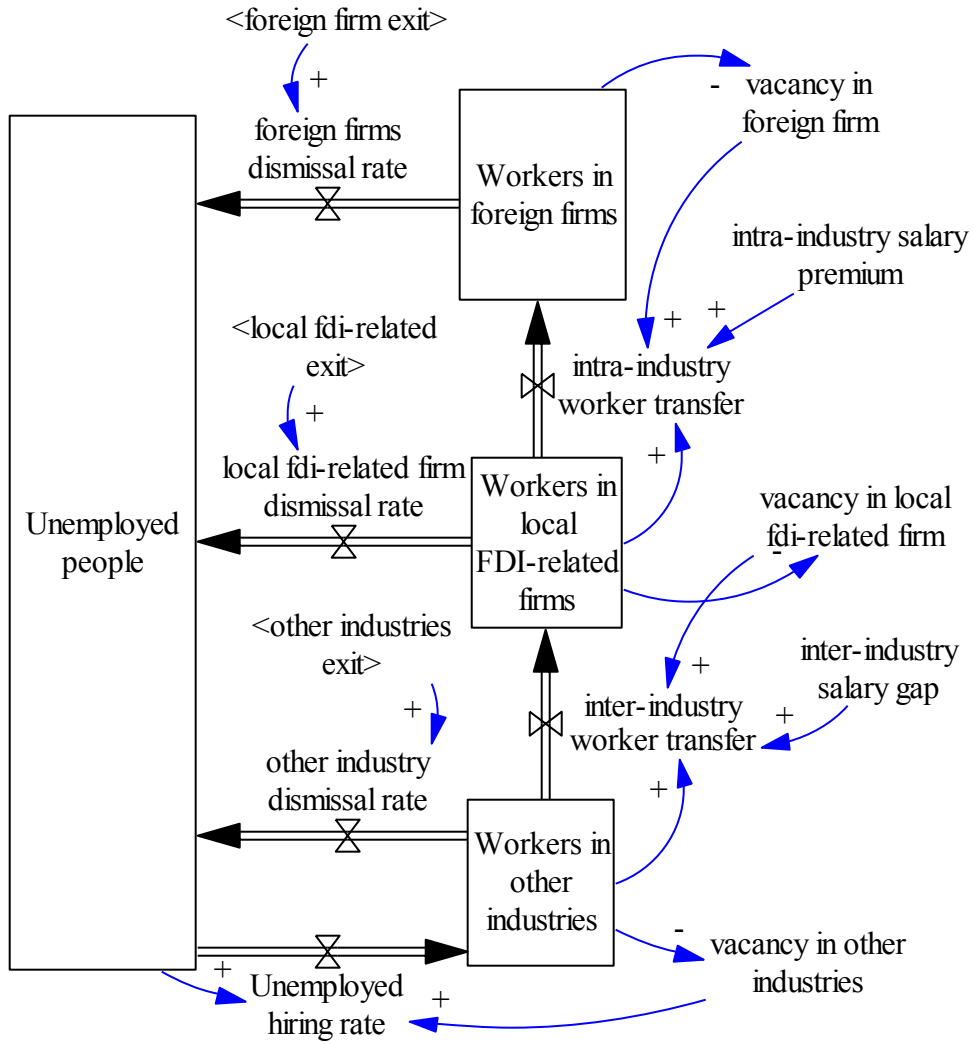


Figure 2: Worker module of FDI and employment in Thailand model

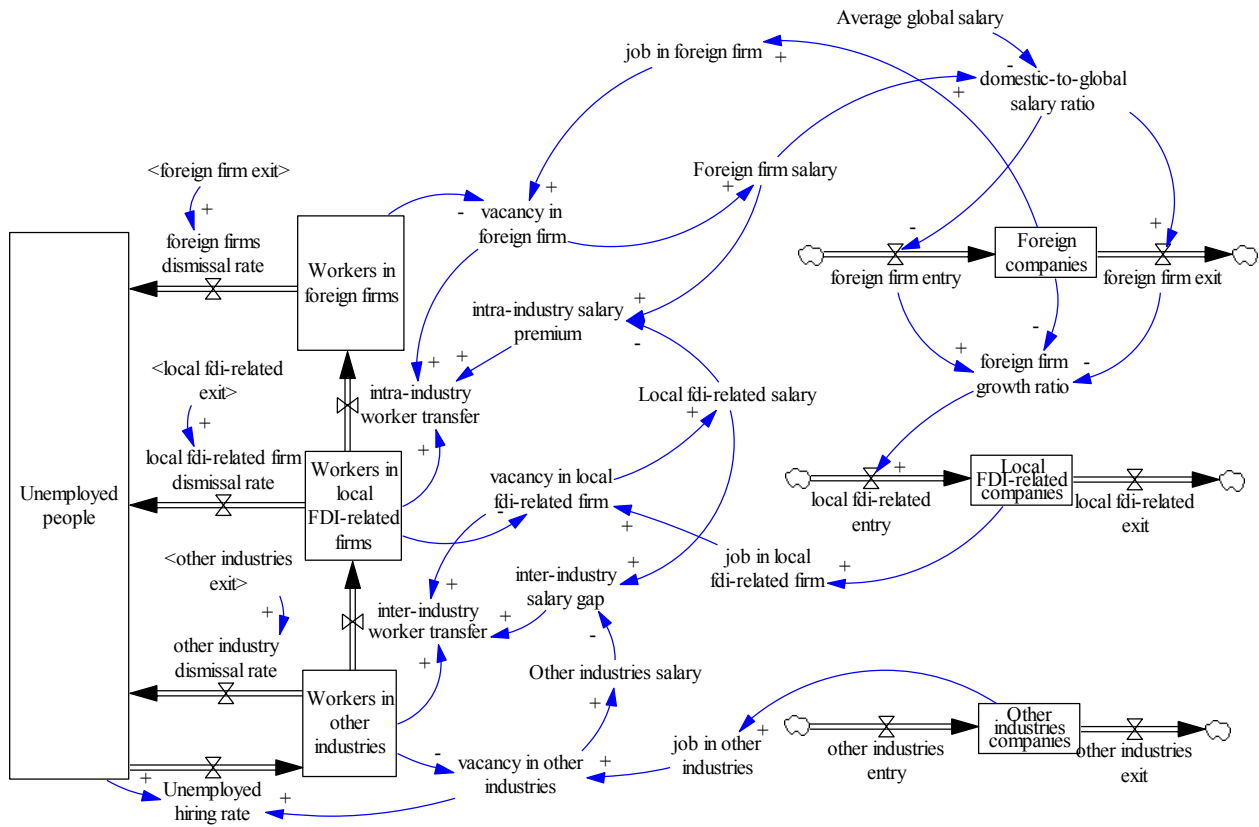


Figure 3: Full FDI and employment in Thailand model

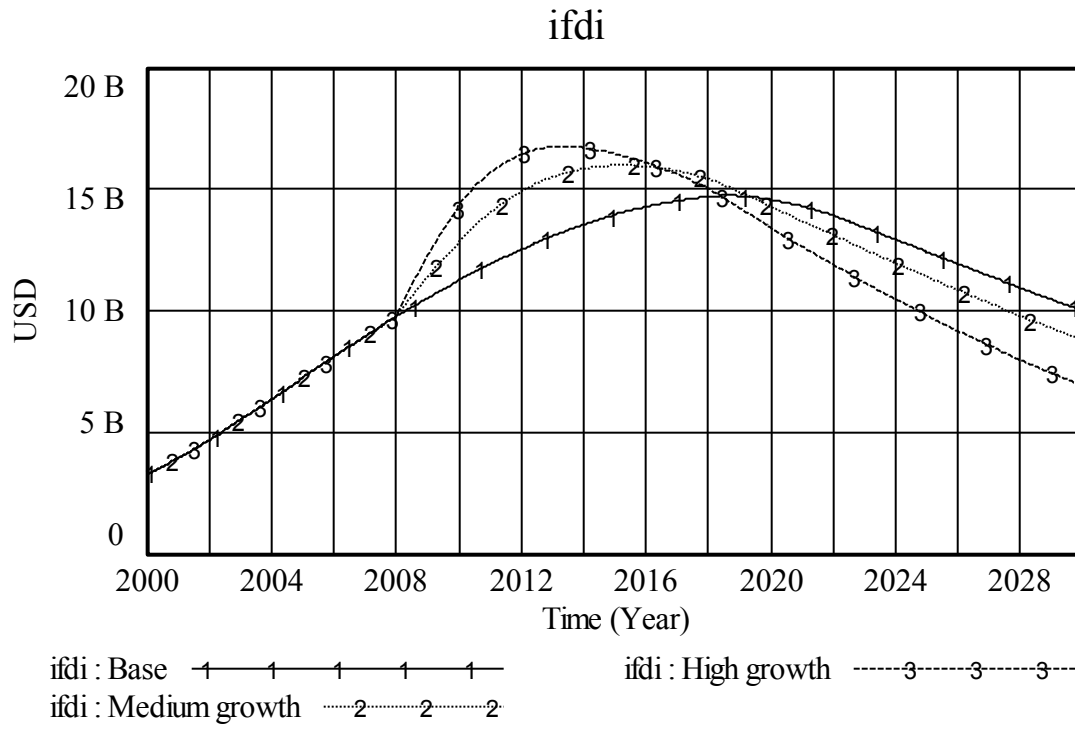


Figure 4: Volume of inflow FDI for each scenario

unemployment ratio

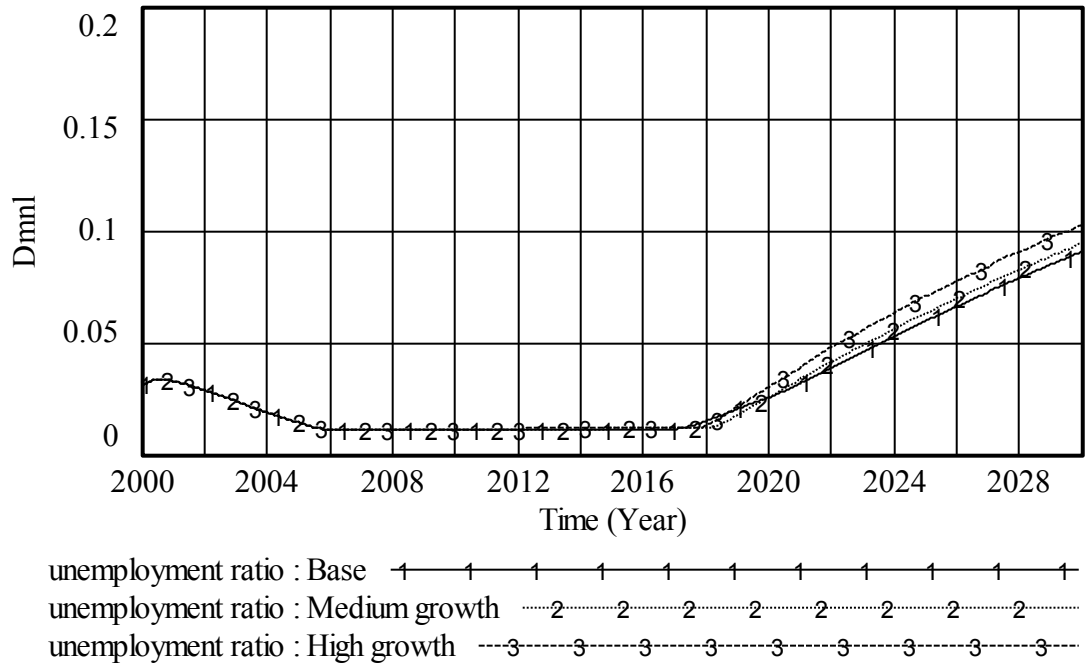


Figure 5: Unemployment ratio for each scenario

Other industries salary

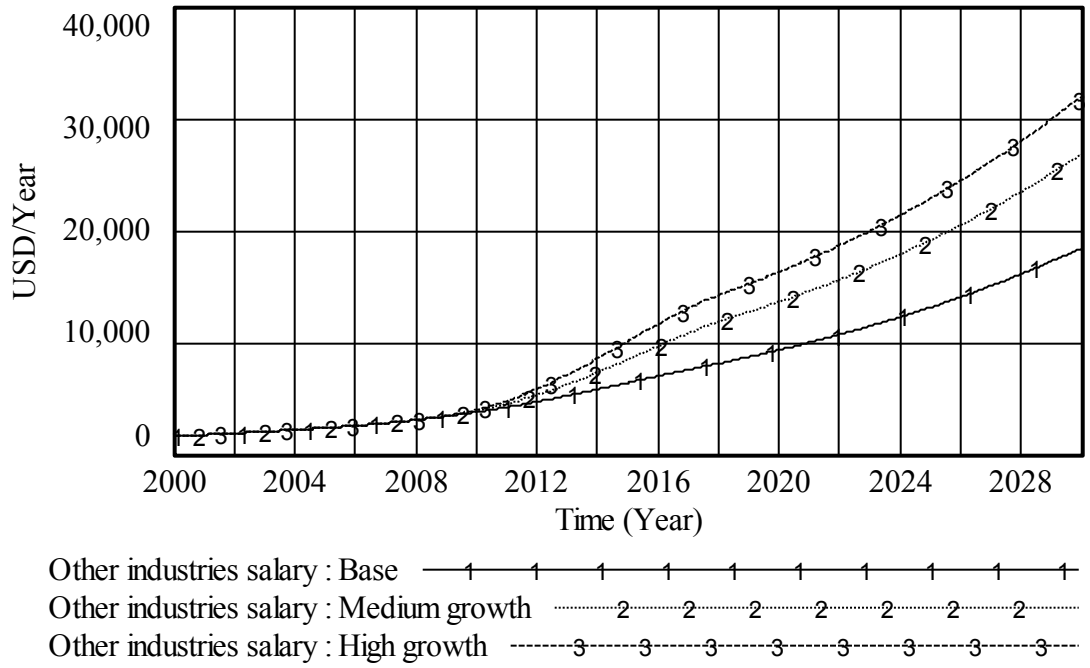


Figure 6: Average salary in other industries represents the average salary in Thailand for each scenario

Table 1: Correlation between simulation results and actual data

Variable	Correlation between the simulation and empirical data (R^2)
Inflow FDI	0.84
Number of companies	0.98
Employment	0.98
Working population	0.98
Average salary	0.84