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CAFTA-DR effects on FDI inflows, growth and distribution of the workforce in Costa Rica: A system dynamics approach

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ABSTRACT

As regional trading arrangements have spread, enlarged and deepened over the last decades, the study of the relation between trade agreements and foreign direct investment still presents difficulties due to the multi-dimensional character of such relationship. This paper attempts to shed new light on how some of the Central American Free Trade (CAFTA) policies will impact FDI inflows on the manufacturing and agricultural sectors in Costa Rica. Specifically we look at how the growth and distribution of the workforce is affected by the treaty. The results show that the agreement provisions will have a positive effect on foreign direct investment. From these results it is possible to estimate that in the long run, the implementation of CAFTA has a higher probability of generating the intended benefits. System dynamics modelling is used in this paper.

I. INTRODUCTION

The U.S.-Central America Free Trade Agreement (CAFTA) was initiated by the U.S. in January of 2002 in an effort to revitalize the faltering talks for a Free Trade Area of the Americas. Negotiations were completed in December 2003 between the United States, El Salvador, Guatemala, Nicaragua, and Honduras. Costa Rica joined the accord in January of 2004, and all six countries formally signed the agreement in May of 2004. In August of 2004,

the Dominican Republic was added to the core agreement, thereby creating the U.S.-Central America-Dominican Republic Free Trade Agreement (CAFTA-DR).

CAFTA-DR began to be implemented in El Salvador, Nicaragua, Honduras and Guatemala in 2006; and by the Dominican Republic in 2007. On October, 2007 the outcome of Costa Rica's first national referendum to be part of the agreement was a marginal yes with 51.6% in favor and 48.4% against. Implementation of the treaty began in January 2009. (USTR-CAFTA-DR, 2009)

The CAFTA-DR trade agreement includes a comprehensive legal framework of provisions to be implemented by the member countries. The aim of this paper is to study how CAFTA-DR will affect foreign direct investment in Costa Rica. More specifically we analyze the effects of two of the treaty provisions on the manufacturing and agricultural sectors in Costa Rica. The system dynamics approach provides an insight into the growth and distribution of the workforce in both sectors without the treaty and with the treaty implemented.

The CAFTA-DR policies considered in the model are the following:

1. Export tariffs implementation: Each member country will eliminate export subsidies on agricultural goods destined for another CAFTA-DR country.

2. Protections for U.S. Investors: The agreement establishes a secure, predictable legal framework for U.S. investors in Central America and the Dominican Republic, and contains a commitment to develop an appellate mechanism for investor-state disputes.

II. REGIONAL INTEGRATION AND FDI: LITERATURE REVIEW

As regional trading arrangements have proliferated over the last decades, they have posed challenges to economists on both intellectual and policy levels. Even though some integration agreements have been motivated by political considerations, more often the driving force for

such agreements is economics. In other words, countries enter into regional integration agreements because integration promises various economic benefits. In the short run, integration is expected to stimulate intra-regional trade and investment; in the longer run, it is hoped that the combination of larger markets, tougher competition, more efficient resource allocation, and various positive externalities will raise the growth rates of the participating economies. Far from taking place in a single global market, more than 80% of foreign direct investment and over half of the world trade take place in regional blocks. (Rugman, 2000)

The relation between trade agreements such as CAFTA-DR and foreign direct investment is multi-dimensional in nature thus posing difficulties for static studies. For example, regional integration will have different impacts on investors from the participating economies and outside investors. The impact may vary depending on the character of existing foreign direct investment: horizontal and vertical investment, or import-substituting and export-oriented investment. In addition, integration between developed countries differs from integration between developing countries depending on how competitive and complementary the economies are. (Blomström & Kokko, 2009).

FDI and Barriers to Trade

Even though reductions in tariff and non-tariff barriers are major features of all regional integration agreements, inward and outward investments are affected in different ways by regional integration. An important provision of CAFTA-DR is that each member country will eliminate export subsidies on agricultural goods destined for member countries which would increase trade. In addition, the investor protection provisions are expected to increase FDI in the region. This surge of inward FDI may not necessarily be evenly distributed, but rather concentrated to the geographical areas with the strongest locational advantages (Levy Yeyati et al., 2003). In the case of Costa Rica, due to the current economical and industrial development level, it is expected that FDI inflows resulting from the treaty will be primarily

directed towards the services and manufacturing sectors. (Trejos et al., 2007; Monge-Gonzalez et al., 2004)

Internalizing Firm-Specific Intangible Assets

One important theoretical development in the literature on multinational corporations and FDI is the recognition that the exploitation of intangible assets, such as marketing and technological expertise is often a major motive for foreign investment (Blomström & Kokko, 1997). As in the models where trade barriers motivate FDI, internalization theories imply that inflows of FDI from outsiders are likely to increase as a result of regional integration. (Buckley & Casson, 1976; Dunning, 1977). The CAFTA-DR provisions studied in this paper are expected to be good motives for increasing foreign investment in Costa Rica. (Levy Yeyati et al., 2003)

CAFTA-DR Framework

While implementation of CAFTA-DR has not been uniform, all signatory countries have made progress in implementing the agreement. However, the debate on the agreement's merit continues. Supporters of CAFTA envision its implementation as the next step after the establishment of the North American Free Trade Agreement (NAFTA) toward achieving a hemispheric free trade agreement. On the other hand, opponents are not persuaded the agreement will benefit all signatory countries and argue that it has not been established whether Central American signatories are economically and politically well suited for inclusion in this new free trade zone. Critics have questioned the advisability of adopting another free trade agreement in light of U.S. experiences under NAFTA. Concerns range from potential negative effects on the economic competitiveness of Central American farmers to threats of further job losses faced by American manufacturing workers. Given these publicly expressed concerns, there is no uniform support for CAFTA-DR's implementation.

Furthermore, there are equally significant concerns about CAFTA-DR's nature and structure regarding its legal effects. (Byrnes, 2009)

The CAFTA-DR agreement extended immediate duty free access to more than half of all U.S. agricultural exports. Average tariffs applied by the member countries to imports of agricultural products from the United States exceed 11% and on certain import sensitive products, can be more than 150%. Tariffs on the most sensitive agricultural products will be phased out over periods ranging from five to 20 years. Liberalization will be undertaken using tariff-rate quotas. (Clark, 2009)

Some of the concerns about the negative impacts of the agreement are summarized in the following table:

Table 1. Potential Negative Impacts of CAFTA-DR

CAFTA Impacts in U.S.	CAFTA Impacts in Central America
Trade deficits rise and shifts in production overseas accelerate	Imports of staple crops and falling prices displace subsistence farmers
More U.S. jobs lost, particularly in manufacturing	New opportunities in export-oriented industries insufficient to absorb farmers and other workers displaced by imports
Downward pressure on wages intensifies and income inequality rises	Weakened rules on workers' rights prevent workers from organizing and pull down wages even in export sectors
Employers use threats to violate workers' right to organize unions, further eroding wages and working conditions	Deteriorating labor conditions force the region to compete with China on wages, not high standards and quality

The Economic Commission for Latin America and the Caribbean as well as other institutions such as the Institute of Social Studies have published a several studies and reports on the impact of CAFTA on several member countries as well as the impact on different

industrial sectors (Sanchez Cantillo & Vos, 2005; Paunovic & Martinez, 2003; Jansen et al., 2008; Monge-Gonzalez et al., 2004). The analysis tool used in these reports is the general equilibrium computational modeling (GCM). Generally, the results of these reports are mixed and do not present polarizing statements.

Suwen Pan et. al (2008) conclude that CAFTA-DR increases the national economic welfare of both the United States and the Central American, member countries. (Pan et al., 2008). D.P. Clark (2009) determines potential factor adjustment problems based on trends in intra-industry specialization over the 1992--2006 period and concludes that all seven CAFTA-DR members should use either much shorter phase-out periods or liberalized all trade immediately. (Clark, 2009)

III. DYNAMICS MODEL OF CAFTA-DR: THE CASE OF COSTA RICA

System Dynamics (SD) is a research tool provides two very important analytical possibilities. First, it allows us to model dynamic changes that occur on the economies of the CAFTA member countries, particularly Costa Rica in the present study. Second, it allows us to analyze the interaction of several variables in the economy as opposed to the unidirectional impact of exogenous variables on a dependent variable. Finally, system dynamics models have been previously used in policy studies as they can illustrate the effect of the policy in both short-run and long-run (Fiddaman; 2007; Thompson & Tebbens, 2008).

Costa Rica has a long experience in open trade practices and in the establishment of free trade agreements. In Costa Rica, the CAFTA-DR negotiations were accompanied by intense public debate which had an impact on the presidential elections. Despite the ongoing debate, implementation of the treaty began in January, 2009.

Model Scope, Assumptions and Limitations

In general the CAFTA-DR's provisions are expected to increase the overall FDI inflows. Particularly in Costa Rica, according to Trejos et al. (2007), it is expected that the manufacturing sector will benefit the most from the additional FDI expected as a result of implementing the treaty due to the economical level of development the country. On the other hand, it is also expected that the agricultural sector will not exhibit a sustained growth because of the inability to compete with other member countries which in turn will increase the unemployment rate in this sector. (Trejos et al., 2007).

The basic interaction of the System Dynamics model of CAFTA-DR is the cause and effect of an increase of FDI on the manufacturing and agricultural sectors and on their respective workforce. For modeling purposes, we assume that the number of manufacturing firms will increase as a result of the additional FDI inflows and the number of agricultural firms will decrease due to external competitiveness and other factor. We also assume that unemployed workers from the agricultural sector are eventually employed in the manufacturing sector. The assumption is consistent with the observation that industrialization leads to labor migration from the agricultural sectors to the manufacturing sectors. (Monge-Gonzalez et al., 2004; Pan et al., 2008)

Finally, we assume factor mobility so that workers are able to move between each type of firm freely without any additional training, in order to reduce the transition time in the model. The model does not consider the limitation of resources; the only constraint for the model is the number of workers. Even though inflation percentages and other macroeconomic indicators are used for calculation purposes, the model does not take into account the overall macroeconomic situation of the country.

Causal Loop Diagram of CAFTA-DR

The causal loop diagram presented in Figure 1, illustrates in more detail the relationships between the number of agricultural and manufacturing firms as well as the workforce in Costa Rica used in the model. The causal loop consists of several balancing loops, where the feedback reduces the impact of a change. Such causal loops are usually represented by the letter "B" or a negative sign that indicates self-corrections over a period of time. Assuming that the agricultural product demand is constant, the balancing loop B1 indicates that when the number of agricultural firms increases, the tendency is to create an agricultural overproduction problem. The overproduction problem in turn discourages the growth of agricultural firms. Balancing loop B2 indicates that an increase in the number of agricultural firms generates a higher demand for agricultural workers. Assuming that the number of agricultural workers does not change, then an agricultural worker shortage occurs which reduces the agricultural firms' growth. Balancing loops B3 and B4 follow the same reasoning as the balancing loops B1 and B2 applied to manufacturing industry. Balancing loops B5 and B6 present an increase in wages in both the agricultural and manufacturing sectors which have an impact on the job vacancies in each sector. The wage difference between the agricultural and manufacturing sectors signifies the number of workers who prefer to move from the agricultural sector to the manufacturing sector.

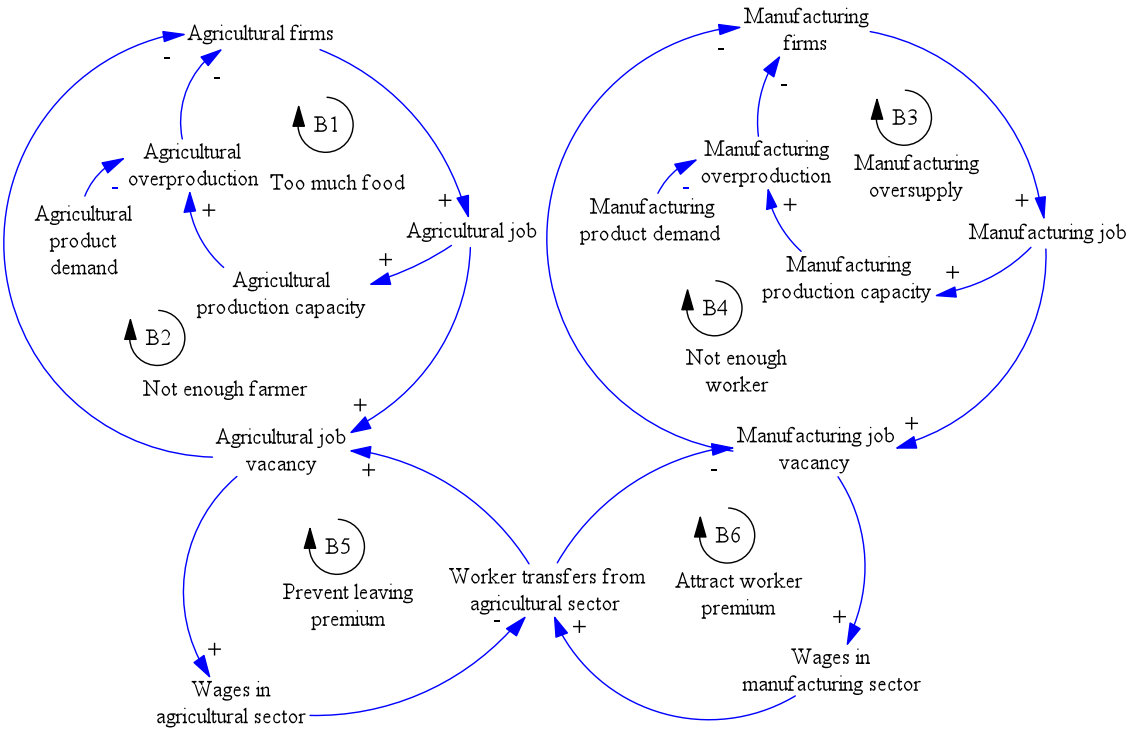

Figure 1: Causal loop diagram for the effect of CAFTA on distribution of workforce

Mathematical Equations of the CAFTA-DR Model

The mathematical equations and assumptions that describe the proposed CAFTA-DR model of are presented below. We use $X_{i,j}$ to represent a firm type i at time t. In this particular case the agricultural and the manufacturing sectors are represented by $i = 1$ and 2 respectively. The unemployed workers are represented when $i = 0$. The term $X_{i,j}$ represents the flow of variable X from sector i to sector j. The time t is not included in the equations where it is assumed to be constant over the simulation period.

The model starts off by calculating the number of agricultural and manufacturing firms. The number of firms in the next period $N_{i,t+1}$ is calculated by adding the number of firms in the current period $N_{i,t}$ to the number of new firms established $i_{i,t}$ minus the number of firms closed $o_{i,t}$.

$$N_{i,t+1} = N_{i,t} + i_{i,t} - o_{i,t}$$

The new firm establishment and closure rate is affected by the demand-supply ratio. If the demand exceeds the production capacity, new firms will be established to capitalize on the market opportunity. On the other hand, firms will close-down if the production capacity is beyond the demand due to the lack of market. The firm establishment rate is also affected by the number of workers available for hiring. If the number of available workers is limited, firms are reluctant to expand or establish new subsidiaries. The demand-supply ratio is calculated from the difference between the production capacity P and the demand D as a ratio of the capacity. The vacancy ratio which is calculated by dividing the difference between the number of jobs J and the number of worker W over the number of jobs J represents the worker's availability. The firm's establishment and closure rate is also affected by other factors which are not included in the model. We assume the normal firm establishment ratio Ω and normal firm closure ratio Ψ to capture the effect of other variables.

$$i_{i,t} = N_{i,t} \cdot f\left(\frac{P_{i,t} - D_{i,t}}{P_{i,t}}\right) \cdot f\left(\frac{J_{i,t} - W_{i,t}}{J_{i,t}}\right) \cdot \Omega_i$$

$$o_{i,t} = N_{i,t} \cdot f\left(\frac{P_{i,t} - D_{i,t}}{P_{i,t}}\right) \cdot \Psi_i$$

The production capacity P is calculated from the number of jobs provided by each firm. We assume that the average number of jobs each firm offers Φ is constant over the simulation duration. The productivity rate Λ is the product quantity each worker can produce, and is also constant.

$$P_{i,t} = N_{i,t} \cdot F_i \cdot L_i$$

$$J_{i,t} = N_{i,t} \cdot \Phi_i$$

L is the product demand acquired from the local demand plus the export volume minus the import volume. The local demand is assumed to be constant. Export and imports are determined by the manufacturing volumes, thus an increase in manufacturing is determined solely by the profit margin of exporting from the US to Costa Rica. *M* is the import margin and *X* is the export margin that comes from exporting from Costa Rica to the US which is affected by taxes and tariffs.

$$D_{i,t} = L_{i,t} + f\left(M_{i,t}\right) + f\left(X_{i,t}\right)$$

The number of workers *W* is determined adding the number of workers in the previous year and the new hired workers *w* minus the workers that leave to other sectors. We assume that workers are move freely between sectors and that the movement is due solely to the wage premium *S*. The amount of workers being hired in each period is limited by the number of vacant position at the target sector and the number of workers from the source sector that are willing to move based on the salary. Unemployed workers are assumed to be seeking for and willing to get any vacant position. We also assume that manufacturing positions have higher priority as compared to positions in the agricultural sector.

$$W_{i,t+1} = W_{i,t} + \sum\nolimits_{i \neq j} w_{ji,t} - \sum\nolimits_{i \neq k} w_{ik,t}$$

$$w_{12,t} = \min\left[J_{2,t} - W_{2,t}, W_{1,t} \cdot f\left(\frac{S_{2,t} - S_{1,t}}{S_{1,t}}\right)\right]$$

$$w_{02,t} = \min\left(W_{0,t}, J_{2,t} - W_{2,t} - w_{12,t}\right)$$

$$w_{01,t} = \min\left(J_{1,t} - W_{1,t}, W_{0,t} - w_{02,t}\right)$$

The number of unemployed people can increase from the workers being laid off from the firm closure. The number of workers being laid off is calculated from the number of closure firms, the average jobs per firm, and the vacancy ratio.

$$w_{i0,t} = o_{i,t} \cdot \Phi_i \cdot \left(\frac{w_{i,t}}{J_{i,t}} \right)$$

Finally, the worker's wages are represented by *S*. The wages are assumed to change based on the vacancy ratio. If the number of vacant positions is higher, firms will increase the salary to attract more potential workers.

$$S_{i,t+1} = S_{i,t} + f\left(\frac{J_{i,t} - W_{i,t}}{J_{i,t}} \right)$$

IV. MODEL VALIDATION

In order to validate the model we used real data for total export by sector, total import by sector, GDP per capita, population growth, unemployment percentage, inflation percentage, real wages, etc. were collected from Thomson Datastream® from 1995 to 2008. This data range is sufficient for validation purposes.

Figure 2 illustrates how the actual data for the unemployment from 1995 to 2008 compare to the model simulation. The validation simulation results indicate that the model closely traces the actual situation in Costa Rica for that particular period, and therefore, we believe that we can use the model to observe how changes in policy would affect our variables.

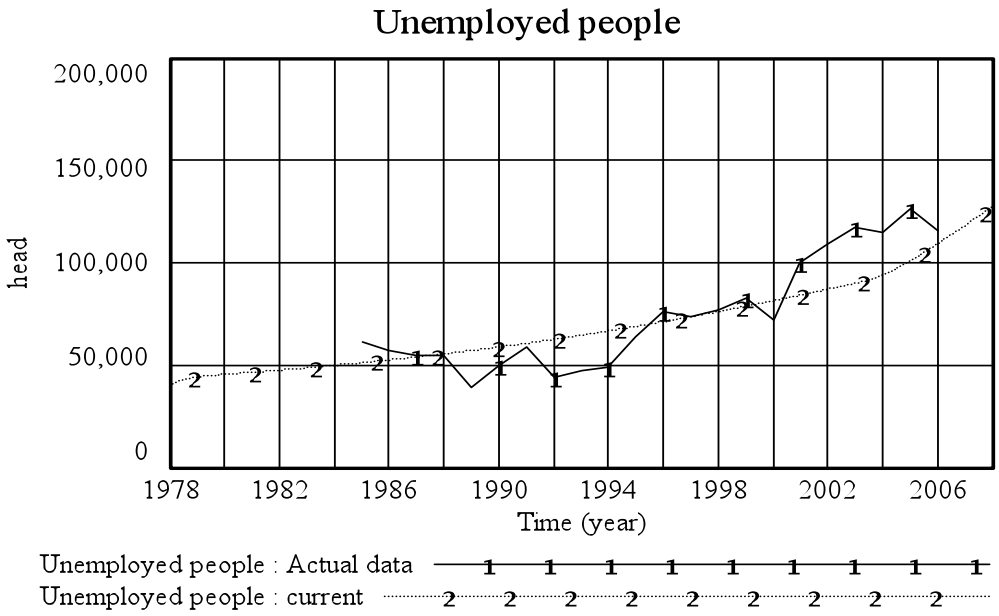

Figure 2: Comparison between the simulation and the actual data for an unemployment in Costa Rica

V. RESULTS

In order to see the effects of the changes of some the variables described above the model was simulated. The effects of the variable changes can be observed in the graphs as "if-then" type scenarios. Figure 3 shows a line called "cafta" in which the variables are set as if CAFTA-DR has been implemented (line markers labeled with number 2). The "no cafta" line (line markers labeled with number 1) illustrates the effect if we consider that the treaty is not implemented. Specifically Figure 3 indicates that if the treaty is implemented then the workforce in the manufacturing sector would increase at a faster rate than if the treaty is not implemented. Therefore, according to this result, the general expectation of CAFTA-DR benefiting the manufacturing sectors would indeed seem to be the case.

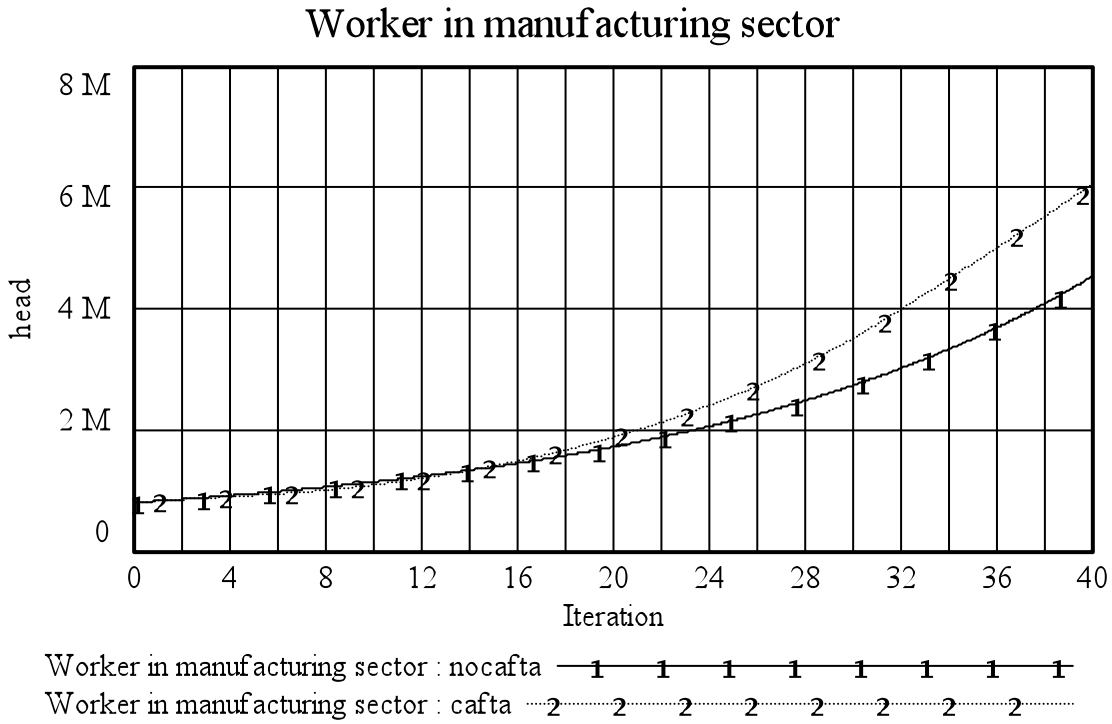

Figure 3: Workforce trend in the manufacturing sector with and without CAFTA-DR

On the other hand, as shown in Figure 4, the model indicates that the workforce in the agricultural sector would decrease if the treaty is implemented, whereas if the treaty is not implemented the agricultural workforce would continue to increase steadily although eventually it would level off. In the model the agricultural workforce decreases mainly because the number of agricultural firms decreases. This means that after the implementation of the treaty, unemployment in the agricultural sector would increase.

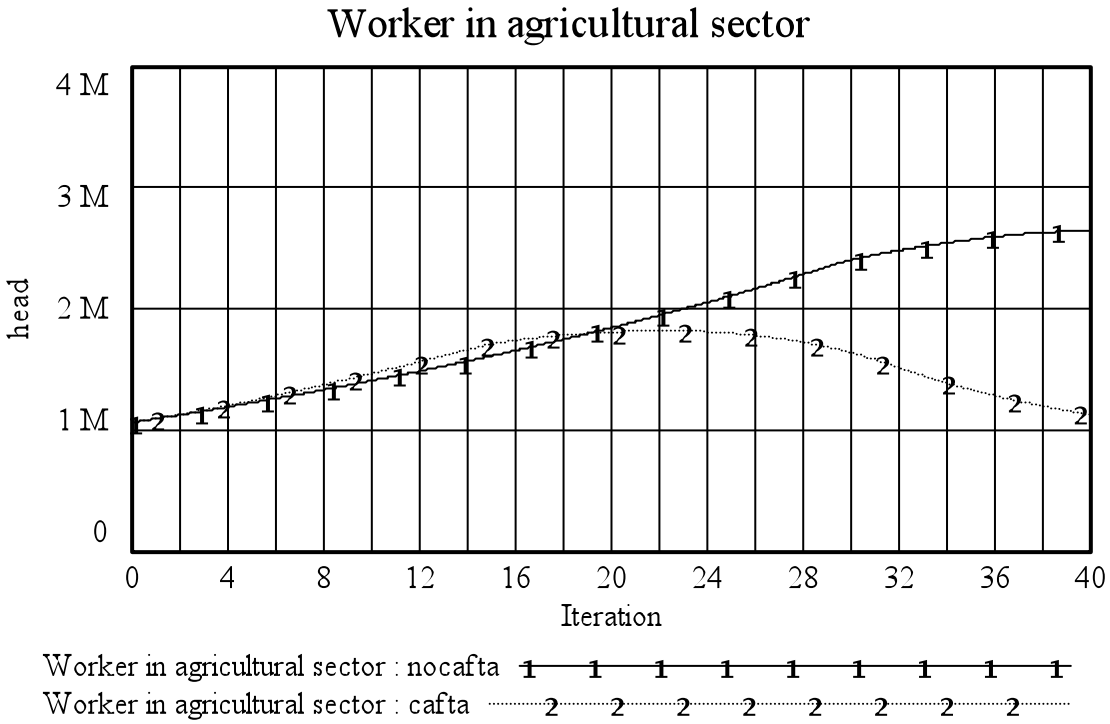

Figure 4: Workforce trend in the agricultural sector with and without CAFTA-DR

However, according to the model, it can be observed that eventually the unemployment in the agricultural sector would curb down if the treaty is in place, otherwise unemployment in this sector would continue to increase and perhaps curb down at much later point in time. In Figure 4, most likely the pattern displayed by the curve labeled with 2 is due to an improved ability of the manufacturing sector of absorbing the agricultural workforce at a faster rate if the treaty is implemented.

In looking at the unemployment in both sectors in Figure 5 shows that in both cases ("cafta", "no cafta") there is an initial increase of the unemployment ratio. However, in the case of CAFTA, the unemployment ratio has a steeper increase but it also drops faster than without CAFTA. In other words the country would not necessarily be able to measure or witness the benefits in the very short run, but it certainly seems that in the long run the treaty would be beneficial.

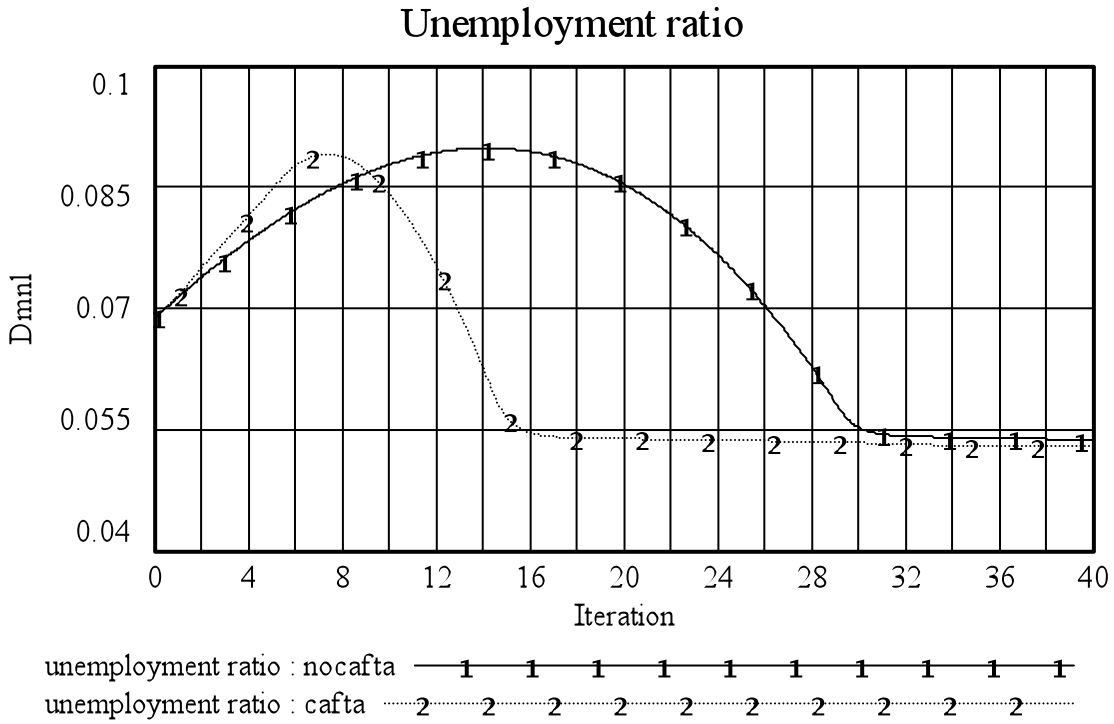

Figure 5: Unemployment ratio trend with and without CAFTA-DR

VI. CONCLUSIONS

The debate and close vote on CAFTA-DR in Costa Rica reflected the strong opposition to the treaty of many NGOs and labor and civil society organizations, largely amid fears that it would negatively affect Costa Rican agricultural and industrial sectors. Much of the fear has, so far, been unfounded and Costa Rican agricultural imports and exports have continued to increase since CAFTA-DR. Overall, Costa Rica remains relatively unaffected, but gains under free trade agreements in general favor large-scale agri-businesses, not farmers (Trejos, et al. 2007).

The implementation of new policies and laws has effects on the general development of a country's economy. Sometimes the effects are unsatisfactory, other times are successful, and often it is not well known its direct or indirect effects on the economy. On balance, based on this paper's model it can be concluded that CAFTA-DR policies of modifying export tariffs

and providing investor protections policies are going to positively affect in the long run FDI inflows in the form of an increase of manufacturing firms. As a consequence of the positive FDI inflows, the manufacturing sector would develop further but the agricultural sector will not directly benefit from the FDI inflows. However, according to the model simulation results, the scenario in which the treaty is implemented shows that there would be a decrease in the agricultural workforce, but the chances that this workforce is absorbed into the manufacturing sector is higher if the treaty is implemented than if it is not.

There are several possible extensions to the model, which are worth mentioning. First, unintended effects such as growing inequality and ongoing poverty are not predictable using the current model. The model can be refined in order to discern those unintended policy effects. Finally, it is possible that in the short term, the negative effects mentioned on Table 1 will be observable, however, as previously mentioned, in the long-term the intended benefits have a higher probability of occurring.

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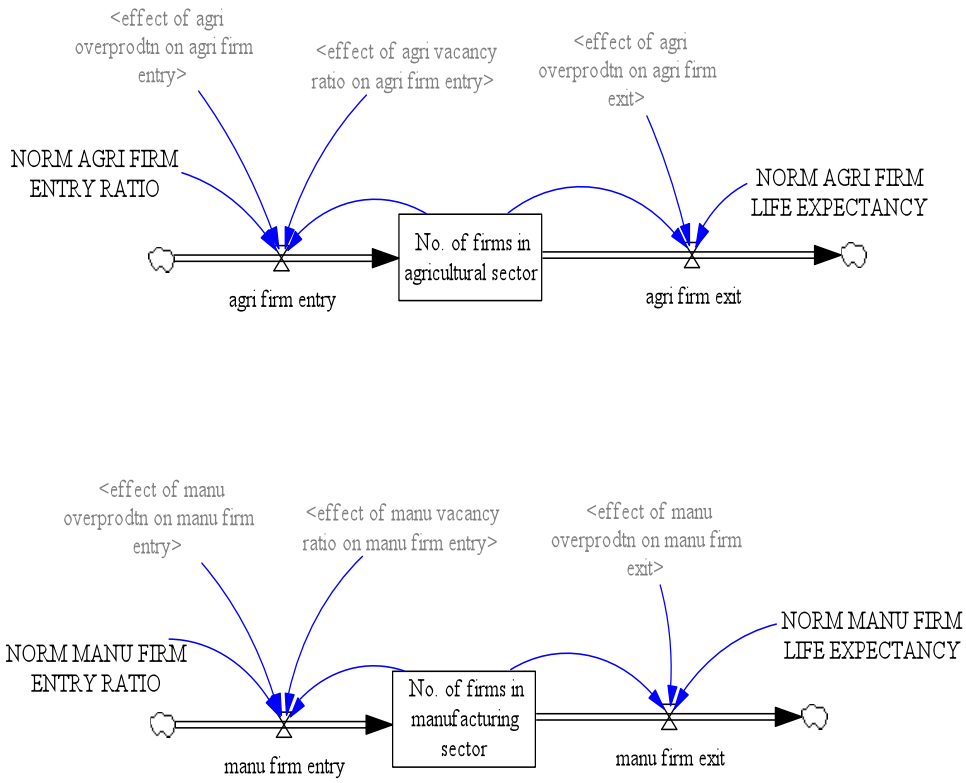
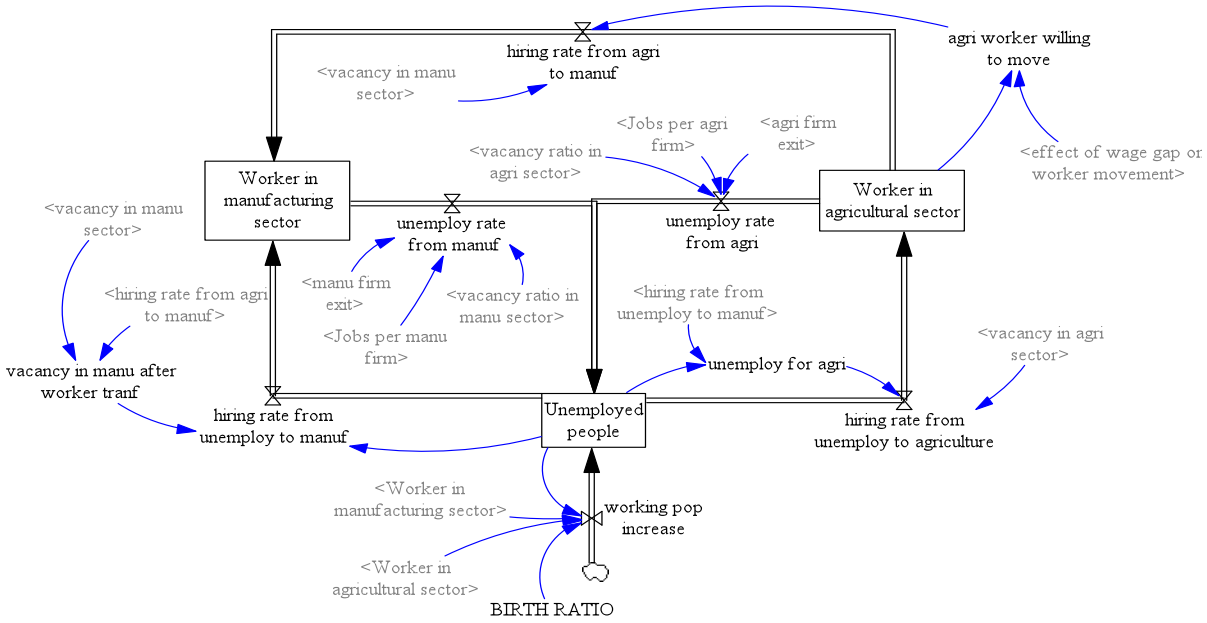
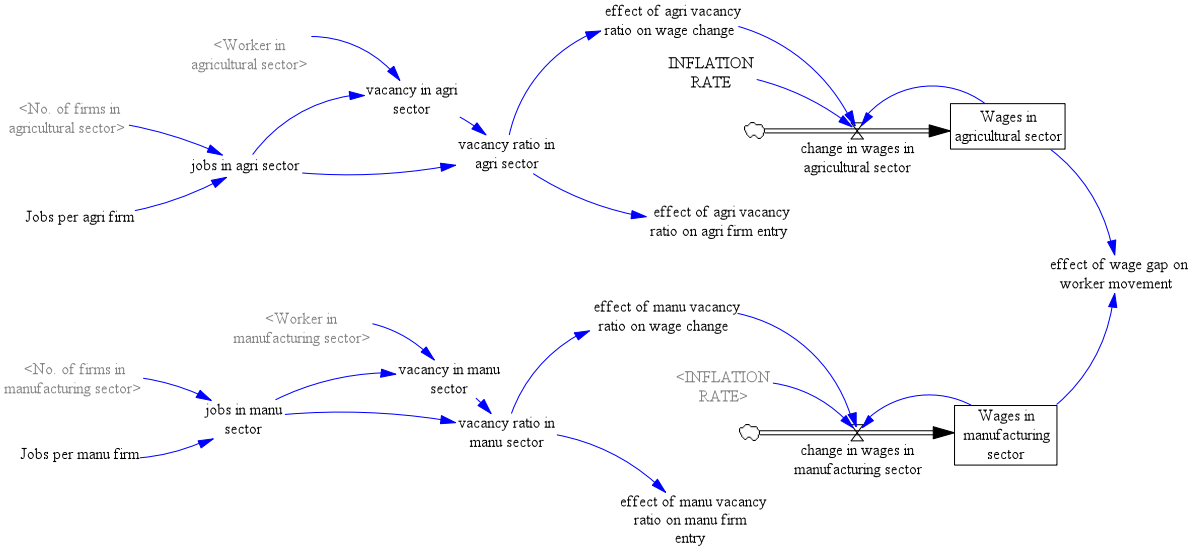
VIII. APPENDIX



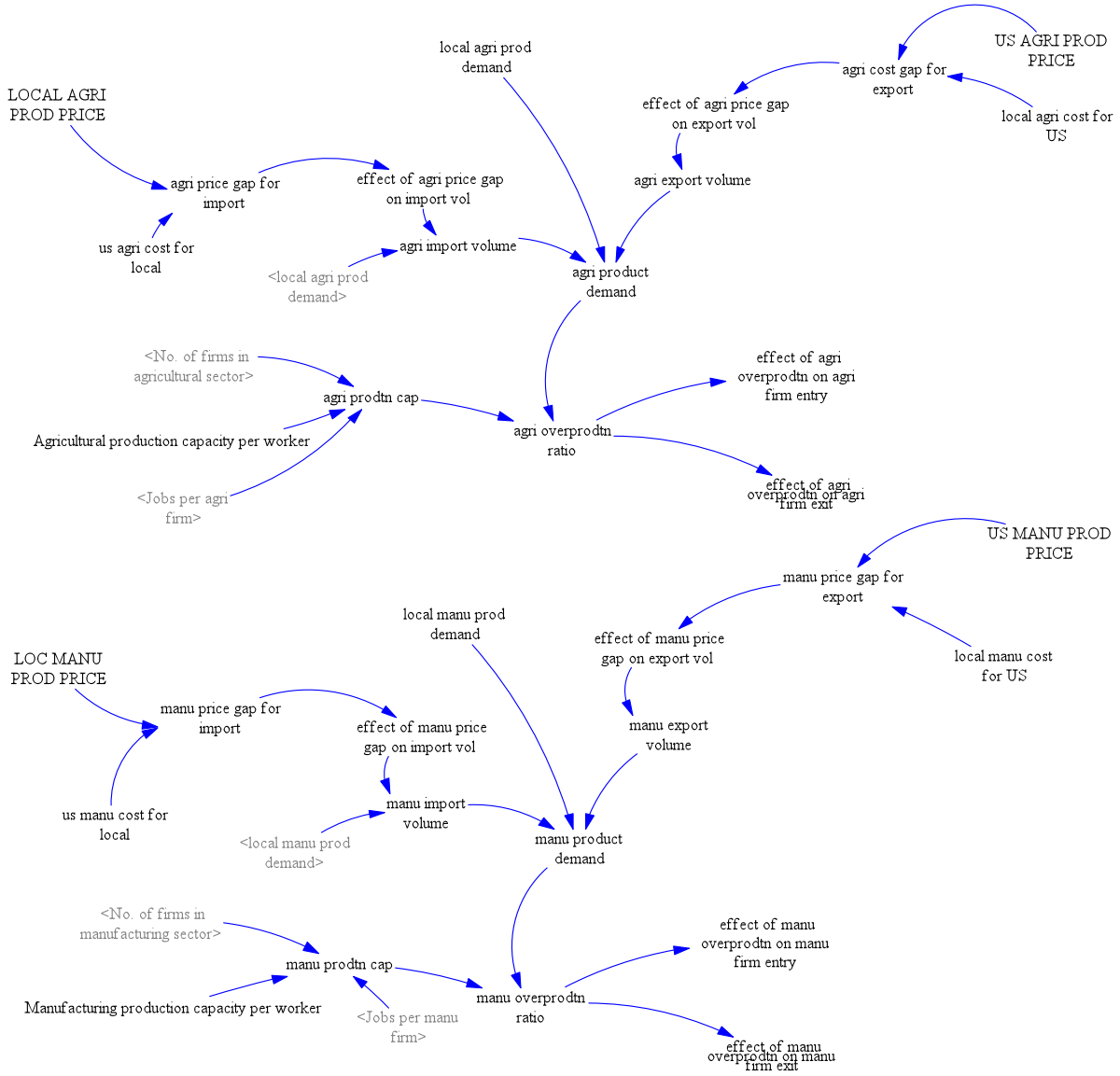
System dynamics model of CAFTA-DR effects on Firms



System dynamics model of Workforce



System dynamics model of Wages & Vacancy



System dynamic model of Demand & Production