Preferential Trade Arrangements In Apparel Exports From The Caribbean To The U.S.: A Dynamic Investment Approach

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PREFERENTIAL TRADE ARRANGEMENTS IN APPAREL EXPORTS FROM THE CARIBBEAN TO THE U.S.: A DYNAMIC INVESTMENT APPROACH

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Abstract

A dynamic profit maximization model with adjustment costs of capital is implemented to study US outward processing trade in apparel and to examine the effects of preferential trade policies in the long and short runs. The model is used to determine the role of foreign investment and to simulate outcomes due to the introduction of the Trade and Development Act of 2000 and the elimination of Multi-Fiber Agreement quotas in selected Caribbean countries. The transitional dynamics as well as long-run costs and benefits of these trade policy changes are evaluated. While outward processing trade expands with preferences under the Caribbean Basin Initiative, policies typically require five years to be fully effective, and competition in freer markets could reverse the benefits realized under preferential trade.

Key words: outward processing, Caribbean, apparel, adjustment cost, investment, dynamic.

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Introduction

Preferential trading can be an important tool used by developed country apparel importers to expand trade with developing countries, to reduce the cost of apparel and textile production, to initiate industrial development in some third world countries, and in some cases to protect their own domestic industries by securing demand for domestic textiles as inputs. This has been done under outward processing programs which have become an important part of US (and EU) apparel trade during the last two decades. Outward processing is essentially a preferential trade arrangement that exempts the value of materials from a preference giving country used in foreign assembly from import duties. In some cases, the entire value of the outward processing output is exempt as long as the main condition for outward processing preferences - the usage of inputs from the preference giving country - is fulfilled.

The US established the Special Access Program (SAP) in 1986 that enabled outward processing trade in apparel and textiles with the countries of the Caribbean. CBERA's (Caribbean Basin Economic Recovery Act which is one of the trade components of the Caribbean Basin Initiative) apparel exports to the US grew rapidly (145%) between 1992-93 and 1998-99, from $3.4 billion to $8.4 billion (see figure 1). By 1999 outward processing apparel trade between the Caribbean countries and the US constituted 14% of US apparel imports, as compared to 9% in 1992. The beneficiary countries of SAP arrangements have used its provisions extensively. On average for all CBERA countries the share of US outward processing apparel in their total apparel trade with the US was 83% in 1992-93 and 85% in 1998-99 (based on data from USITC, 2000).

US outward processing firms enjoyed significant advantages from preferences in the Caribbean. The average preference margin (the difference between most favored nation (MFN)

duties and preferential duties) in 1992-93 was 11.7% and it was at 9.9% in 1998-99 in spite of MFN tariff reductions. Corresponding average preferential duties stood at 6.6% in 1992-93 and 5.8% in 1998-99 (USITC, 2000). As the result of these high preference margins, outward processing firms in the US earned higher profits, expanded their operations, and increased employment of Caribbean labor and the usage of US intermediates.

Preferential trading in apparel and textiles has two sides to it. The first is reduction of trade barriers while maintaining rules of origin to prevent transshipments. The second is facilitation of capital movements across countries in order to create supply capacity. Preferential trading initiatives can never be fully successful if trade barrier removals do not encourage investments in the countries who are the beneficiaries of trade preferences (Panagariya, 2000; McMillan *et al.*, 1999). Developing countries may have comparative advantage in terms of cheap and abundant labor, but they often lack adequate capital resources and modern technologies to benefit from their low labor cost.

In this article we hypothesize that foreign investment contributes significantly to overall capital stock for apparel production in the Caribbean and so determines US-Caribbean outward processing trade. Figure shows that US exports of apparel assembly machinery to the Caribbean followed an increasing trend along with apparel outward processing trade. This hypothesis has far-reaching implications for trade policy effects on outward processing trade in the short versus long runs. In particular, in the short-run when capital stock is fixed, policy changes do not affect trade if factor substitution is limited. In the long run when capital stock is allowed to adjust, the sluggish investment response to trade policy changes determines outward trade adjustments. If there are barriers to capital stock adjustment (capacity constraints and transactions costs), then the delays in capital adjustment are reflected

in the evolution of apparel outward processing trade flows, postponing the achievement of trade policy targets.

The US adopted the Trade and Development Act of 2000 (TDA2000) that improved preferential treatment of outward processing apparel from CBERA countries. The new preferences require the usage of US made materials as was implemented under SAP, but now completely eliminate tariffs (from an average of 5.8% in 1998-99 to zero).

The US apparel outward processing trade has experienced another indirect shock due to the introduction of the Agreement on Textiles and Clothing (ATC) by the WTO in 1995, which was to replace the Multi-Fiber Agreement (MFA) and to gradually eliminate apparel and textile quotas by 2005. The ATC should result in a significant liberalization of apparel and textile trade between WTO member countries, including China. That is likely to result in declining demand in the US (and the EU) for outward processing apparel from the Caribbean. Since the estimations of the International Textiles and Clothing Bureau are that 851 out of 932 US apparel and textile quotas will remain in place until 2005 (ITCB, 2002), the main impact of the removal of the MFA quotas on CBERA outward processing trade is yet to come.

Given these recent trade policy changes, the goal of this paper is to examine the effects of TDA2000 and ATC on US preferential outward processing trade in apparel and textiles from the Caribbean, emphasizing the role of foreign investment in the successful implementation of outward processing initiatives.

Preferences and Investment Modeling

Past literature on the topics of preferential trading, multinational enterprises, and investment dynamics is very useful for determining the right modeling approach to examine outward

processing trade in apparel and textiles. We draw from those three bodies of literature to develop the dynamic model used here to simulate TDA2000 and MFA quota removal impacts on firm behavior, including investment, production and so trade.

Preferential trading is not a new topic in the trade literature. For surveys see Panagariya (2000) and a book-length treatment by Bhagwati and Panagariya (1996). That literature as a whole mostly analyzes preferences from a pure trade theory viewpoint, typically addressing questions about welfare changes associated with changes in bilateral tariff levels, trade flows, and the terms of trade.

Developing countries receiving preferences are assumed to have sufficient resources, including capital, and an adequate level of technology to respond to preference incentives. Thus, countries are implicitly assumed to be able to move up a long run supply curve. This may not be the case and the preferential trade literature admits to the fact that foreign capital might play a significant role in the success of preferential incentives (Panagariya, 2000). However, that topic is still under early development, and literature is limited. Only a few studies addressed outward processing trade directly (e.g. McMillan *et al.* (1999) and Finger (1976)).

The literature on foreign direct investment studies the incentives to implement investments abroad and examines welfare changes resulting from operations of multinationals (e.g. Dunning (1981); Agarwal (1980); Helpman (1985); Ethier (1986); Markusen (1995); Brainard (1993)). The foreign direct investment literature can be used to explain foreign investment flows into apparel and textiles outward processing industries abroad in the presence of product differentiation, market power, and differences in country resource endowments. The literature is largely based on the ownership-location-internalization framework

developed by Hymer and Dunning. Outward processing operations fit this framework quite well. Location advantage is conferred by preferential tariffs and low foreign wages. Ownership advantages reveal themselves in the form of product differentiation and market power that imply better control over production and marketing. Internalization accounts for all other factors that make direct investment more attractive than, for example, licensing or sub-contracting. Costs that are associated with the implementation of foreign investment (adjustment costs) might also depend on location and the form of ownership.

An independent body of literature explicitly models dynamics of investment spending within a firm, although it does not specifically address foreign investments (for a recent survey see Chirinko (1993)). Investment spending models describe the dynamics of the investment process by explicitly incorporating adjustment costs of investment that allow gradual adjustment of capital stock over time to a steady state. The assumption of adjustment costs is natural, especially when operating in a developing country, and is reflected in the diversification of investment across CBERA countries as well as evidence of capacity constraints and sluggishness in investment. Without adjustment costs, the capital transition process is unclear since adjustment of the capital stock in theory (but not in practice) occurs instantaneously.

Following that literature, an adjustment cost investment model is adapted in this paper to describe the behavior of the apparel and textile outward processing firms operating abroad. The advantage of the adjustment cost approach is that transitional dynamics of capital investment, which in turn determine apparel outward processing trade, can be studied explicitly, and the role of investment in outward processing trade can be statistically tested.

Adjustment Cost Model of Caribbean Apparel Outward Processing Trade

A model that closely approximates the reality of preferential trading is necessary to provide theoretical grounds for estimation and hypothesis testing, and to forecast the effects of trade policy changes. The assumptions that we make are designed to give the model the closest resemblance possible to the real world, given mathematical tractability and data availability. We introduce the model as a dynamic profit maximization problem of an apparel outward processing firm operating in an imperfectly competitive environment. The model deals only with one industry, and therefore describes partial equilibrium.

In order to focus on the production side of the problem, we assume that all outward processing producers/firms in a single foreign country face identical constant elasticity demand functions ($p = aX^{\theta}$, where demand elasticity lies in the inelastic range $-1 < \theta < 0$), although their products are different, since firms are monopolists in their market for a differentiated apparel or textile product. Since the model is dynamic and covers a long period of time it is necessary to introduce a mechanism that allows a monopolist to exist and discourages entry into the same market by other competing firms. To achieve that, we assume that each firm has to make lump sum investments so that its long-run profits equals zero. Partially because we perform simulations for a limited number of outward processing countries, and also for the sake of simplicity and computational tractability, we ignore substitution effects between countries and simulate outcomes separately for each exporting country.

The production process has three inputs – capital (K), labor (L), and intermediates (textiles) (M), with their prices (p_I, w, and p_M respectively) taken as given. The production processes exhibit constant return to scale and is of a Leontieff type that mandates fixed input-output coefficients and no factor substitution ($Y = \min\{\alpha K; \beta L; \gamma M\}$). The Leontieff production function is an appropriate tool to model short-run rigidities in factor adjustment.

To justify the selection of Leontieff production function and the existence of capacity constraints in the short run, we tested it against CRTS Cobb-Douglas function that allowed factor substitution ($Y = K^{\alpha'} L^{\beta'} M^{1-\alpha'-\beta'}$), and found the Leontieff function to better fit observed behavior of Caribbean apparel assembly firms.

Investing in foreign countries is not a smooth process. There might be various costs pertinent to installing capital in a foreign country associated with the foreign country's economic and legal conditions (legal fees, cost of licenses, overtime labor costs, etc.). These costs can also occur due to the riskiness of outward processing operations. In this model we account for this possibility by introducing capital adjustment costs ($b\frac{I}{K}$, where $b > 0$, and I is investment), increasing with the share of investment in the firm's overall capital stock. This property of the model is essential to modeling sluggish response of capital stock to changes in preferential tariffs. We adapted this formulation of adjustment costs from Barro and Sala-i-Martin (1999).

Using the above functional form assumptions the profit maximization problem of an outward processing firm can be represented as follows:

$$\max_I \pi(t_0) = \int_{t_0}^{\infty} e^{-\bar{r}(t-t_0)} \left[(1-T)a(\alpha K)^{1+\theta} - \left(\frac{w}{\beta} + \frac{(1-T)p_M}{\gamma} \right) \alpha K - I\left(p_I + \frac{b}{2}\frac{I}{K} \right) \right] dt \tag{1}$$

subject to the dynamic investment equation $\dot{K} = I - \delta K$ and initial level of capital at t_0 where $K(t_0) = K_{t_0}$.

Since the production function uses inputs in fixed proportions, we can express labor, intermediates, and output using the capital variable, $Y = \alpha K$, $L = \frac{\alpha}{\beta} K$, and $M = \frac{\alpha}{\gamma} K$.

Therefore, the one state variable is capital K and the control variable is investment I. The nature of the given profit maximization problem is such that in the short run production and profits are determined by the level of accumulated capital stock.

Cost of production in each period varies due to the varying adjustment costs of capital. Apart from adjustment cost of capital, one period marginal costs are fixed at $(w/\beta + (1-T)p_M/\gamma)\,\alpha K$.

First order conditions for the Leontieff problem expressed in terms of capital stock (K) and the shadow price of capital (q) are:

$$\frac{\dot{K}}{K} = \left(\frac{q - p_I}{b} - \delta\right) \tag{2}$$

$$\dot{q} = q(\delta + r) - \frac{(q-p_I)^2}{2b} - \left((1-T)(1+\theta)a\alpha^{1+\theta}K^{\theta} - \alpha\left(\frac{w}{\beta} + \frac{(1-T)p_M}{\gamma}\right)\right) \tag{3}$$

$$\lim_{t\to\infty}\left(qKe^{-\bar{r}(t)t}\right) = 0 \tag{4}$$

The solution to the first order conditions is a maximum as long as demand is inelastic.

The first differential equation of the system tells us the relationship between the growth rate of capital and the shadow price of capital. The higher is the value of capital, the more investment a firm undertakes. The second differential equation states that under optimal behavior any change in the shadow price of capital equals the difference between opportunity cost of capital and returns to capital. If production/capital expansion results in high return to capital, reflecting profitability of operations, the value of additional capital would decline faster, resulting in more rapid changes in q and more investment. The final equation represents transversality condition that states that in the limit (as t goes to infinity) the present value of capital stock is zero.

The above system of differential equations (first order conditions) is essential to the analysis of effects of TDA2000 and ATC on Caribbean apparel outward processing trade. With its help we are able to solve numerically for the transitional dynamics of the model – paths of growth rates of capital, output, and inputs, and their response to changes in tariffs (TDA2000) and import demands (ATC). The intuition of the model is straightforward. Increased preference margins generate additional profits to apparel firms in the short run, but production and trade do not expand immediately due to capacity constraints (and very limited opportunities for factor substitution). Those profits are reflected in the shadow price of capital such that returns to apparel production exceed normal returns, and so encourage investment. But adjustment costs insure that investment only occurs gradually. The high initial profits permit paying greater adjustment costs and so result in more rapid investment. As steady state is approached, adjustment costs are lower due to lower investment rates, which just keep up with depreciation of the capital stock. When both preference margins improve and competition from elsewhere increases (due to eliminated MFA quotas) the incentives to invest are less, and can even turn negative and encourage disinvestment (or idle capacity), depending on the extent of the demand shock versus the profitability from the greater preference margin.

Data, Parameter Estimation, and Short-Run Capacity Constraint Testing

Data used to test for short-run capacity constraints on US outward processing trade and to estimate parameters for the simulation model was obtained from the USITC trade database for 7 countries - Guatemala, El Salvador, Dominican Republic, Costa Rica, Panama, Nicaragua, and Trinidad & Tobago. Data was collected on annual basis and ranged from 1992 through 1999. Accumulated capital stock was approximated by apparel and textile machinery ex-

ports from the US to the Caribbean countries using USITC data starting from 1989. We also used the Bureau of Labor Statistics estimate for apparel machinery depreciation ($\delta = 1/19$ years). Real interest rates came from World Development Indicators 2001 (World Bank). Wage data originated from the LABORSTA database maintained by International Labor Organization, with some data points interpolated where observations were missing.

All econometric estimations were performed on a data sample from 7 Caribbean countries. In general, econometric estimations supported the choice of a Leontieff production function, revealed short run-capacity constraints, and demonstrated the strong relationship between accumulated apparel machinery imports (capital stock) and trade flows (details are available from the authors). Simulations were limited to 4 major outward processing suppliers - Dominican Republic, El Salvador, Guatemala, and Costa Rica, who accounted for 65% of CBERA apparel trade with the US in 1998-99.

To implement simulations of the outcomes of TDA2000 and ATC on Caribbean outward processing trade, we needed to have the estimates of demand parameters (a and θ), the adjustment cost parameter (b), and Leontieff production coefficients (α, β, and γ). Their estimates are presented in table 1 along with other parameters and starting variable values used in simulations. We obtained demand parameters from a fixed-effect regression of a constant elasticity demand function (as was specified in the model). The elasticity of demand (θ) was assumed to be the same across Caribbean countries and demand shifters (a) were assumed to vary across countries. The estimate of adjustment cost coefficient (b) was obtained from estimations of a discrete version of the Euler equation derived from the first order conditions (equation 2 and 3) under rational expectation assumptions. The estimation method was GMM. The adjustment costs proved to be an important part of capital costs

and accounted for 8.2% to 17.1% of total investment expenditures in 1999. Finally, we used the GTAP 1997 database and USITC trade data to benchmark input-output production coefficients for apparel and textile industries in the Caribbean Basin.

Simulations of Trade Policy Changes in Caribbean Outward Processing Trade

Simulations consisted of four scenarios for each country that featured various trade policy alternatives. In the first scenario (P_0) no policy change was implemented. The outcomes of that scenario served as benchmarks for comparison. In the second scenario (P_T), we decreased outward processing tariffs to zero, simulating the impact of the TDA2000. The last two scenarios (P_{T10} and P_{T30}) modeled the effects of simultaneous implementation of TDA2000 and MFA quota elimination.

MFA quota removal has a significant potential to adversely influence US outward processing trade with the Caribbean region. Apparel and textile imports from Asia, when no longer restricted by quotas, may put significant pressure on US demand for outward processing imports from the Caribbean region because US consumers would partially substitute Asian apparel and textile products for Caribbean goods. Several studies have addressed the issue of MFA quota removal in the past. For example, Trela and Whalley (1990) provided general equilibrium estimates of the effects of MFA quota removal on trade flows for three Caribbean countries. According to their estimates, the changes in the value of imports of apparel and textiles from those countries as the result of MFA quota elimination were -14% for Costa Rica, -21% for Dominican Republic, and 7% for Guatemala. Yang *et al.* (1997) used a computable general equilibrium model based on the GTAP database to simulate the outcomes of the abolishment of MFA quotas. According to their results, Latin American countries would decrease exports of clothing by 23%. Admitting to the fact that supply

effects are likely to be present in general equilibrium estimates, we decided to use 10% and 30% for negative shocks in US demand for outward processing apparel from the Caribbean in order to obtain reasonable demand decreases, and at the same time see how sensitive the simulation results are to the different magnitudes of demand responses to MFA quota removal. To implement the demand shock we decreased the demand equation constant (a) by 10% for all countries under P_{T10} and by 30% under P_{T30}.

Simulations that represented solutions for the system of differential equation (equations 2, 3, and 4) were run for each country separately and the results are summarized in table 2 and figure . We used MATLAB 6.1 to conduct the simulations.

Figure presents transitional dynamics for capital accumulation/apparel outward processing trade from the Dominican Republic to the US. Behavior depicted there is typical of results found for the four Caribbean exporters simulated in this paper. In 1999, capacity constraints are binding, the shadow price of capital exceeds its equilibrium value, and so capital stock and investment are not yet at steady state levels. Transition to steady state capital stock (and so trade) as represented by curve P_0 takes about 5 years, asymptotically approaching long run base scenario capital by 2003. When tariffs are removed, capital accumulates more quickly and higher trade flows are realized, according to curve P_T. In this case both demand shocks (P_{T10} and P_{T30}) overwhelm the effects of increased profit incentives, so corresponding curves show disinvestment and a lower long run capital stock, with the 30% shock bringing very significant declines in capital and so production and trade. The larger shocks require a bit longer to converge to steady state, but near convergence within five years is typical.

Simulation of Effects of Trade and Development Act of 2000

Simulation of the impact of TDA2000 introduces significant changes to model predictions (see P_T in table 2). Elimination of tariffs on outward processing apparel imports from the Caribbean region increased the returns to capital, resulting in higher shadow prices of capital. In 2000, the shadow price of capital for Dominican Republic increases 7% to \$1,629 from benchmark policy's \$1,523 when tariffs are set to zero. (Results for the Dominican republic will be used to illustrate the consequences of trade policy changes, with simulation results for all four countries included in tables 2, 3 and 4.)

Tariff reductions revitalize outward processing trade. Even though its effects would not show immediately, outward processing expansion would be clearly seen within several years. It takes on average 5 years to get close the long run equilibrium. In the first year of the forecast (2000) outward processing trade would go up as compared to the benchmark forecast by 10% in Dominican Republic. In 2006, the difference would be 15% (see table 3).

Tariff removal affects outward processing firms' profitability and production cost, which in turn influences investment and outward processing trade patterns. This scenario is bound to increase the total cost of apparel outward processing since the simulations showed that overall outward processing trade levels were to increase. Cost decomposition under different scenarios for each country is shown in table 2. Intermediates constituted the largest part of expenditures. For example, in 2000, expenditures on intermediates in the Dominican Republic increased from benchmark \$893 million to \$986 million in P_T. In 2006 corresponding expenditures would be \$916 million versus \$1056 million. Labor costs increased as well in 2000 from benchmark \$269 to \$297 million. In 2006 the difference would be even larger – \$276 million versus \$318 million.

Tariff reductions made investment expenditure in Dominican Republic double in 2000.

The new investment level stood at $46 million, versus $22 million. Such a large investment expansion resulted in a significant increase in adjustment costs. The benchmark adjustment cost in 2000 in Dominican Republic was $1.6 million, as compared to $7.4 million if the tariff reduction were implemented. By 2006 investment and adjustment costs would be much smaller because the model would be close to its steady state equilibrium. Production costs of outward processing firms in El Salvador, Costa Rica, and Guatemala responded to a tariff shock in a similar way.

When tariffs on outward processing were eliminated, the simulation showed that outward processing firms significantly increased their profits (returns to capital). In 2000 profit margins of outward processing firms in Dominican Republic increased from 33.3% in the no-shock benchmark to 40.4%. Over time the P_T scenario resulted in increasing profits. However, the profit margins in percentage terms were stable, not changing very much. In 2000 tariff removal increased profits of outward processing firms in Dominican Republic from benchmark $703 million to $906 million. As the model converged to a new equilibrium with zero tariffs, accumulating capital, profits gradually approached their new, higher values. Simulations showed that in 2006 aggregate profit of outward processing firms in Dominican Republic became $949 million.

Long-run expansion of outward processing trade in the Caribbean region as a result of tariff removal led to lower prices of imported apparel. In 2000 prices of outward processing apparel from Dominican Republic dropped from $70.9 to $68.2.

The US government is estimated to lose $223 million in 2000 in net tariff revenue on outward processing apparel imports from Dominican Republic. In the situation where production capacities are close to steady state (in 2006), tariff revenue loss would be $225

million.

Simulation of ATC Effects

In this section we assess the impacts of MFA quota removal on apparel and textile outward processing trade from the Caribbean region (see table 2). Differences between the effects of policies P_{T10} and P_{T30} on capital and trade growth rate were significant. A 10% shock shifted growth rates down, leaving them positive in El Salvador and Guatemala, and pushing capital growth rates in Dominican Republic and Costa Rica negative. In 2000 P_{T10} growth rates were -0.6% in Costa Rica as compared to benchmark level of 4.7%, 1.2% in Guatemala as compared to 3%, -2% in Dominican Republic as compared to 2.5%, and 2.2% in El Salvador as compared to 4.5%. The P_{T10} scenario resulted in positive capital accumulation in El Salvador and Guatemala and negative capital accumulation in Dominican Republic and Costa Rica.

Policy scenario P_{T30} completely reversed the dynamics of the model, due to disinvestment. Under scenario P_{T30} growth dropped initially (year 2000) to -26.6% in Dominican Republic P_{T30} capital accumulation paths were all below benchmark policy paths (P_0), indicating disinvestment (most of the adjustment occurred within 5 years). Thus, according to the results of simulations, adverse demand shocks that are likely to occur have more influence on investment and outward processing trade than changes in tariff policy as implemented in TDA2000, taking into consideration that demand shocks were implemented simultaneously with the tariff decrease.

Long-run apparel outward processing trade decreased significantly as the results of MFA quota removal (see table 3). P_{T10} scenario reduced the trade by 5% to 14% depending on the country. A negative 30% demand shock cut it approximately in half.

Over time under both scenarios, investment, whether positive or negative, converged to the equilibrium level of capital depreciation as capital stocks were reaching their new steady states. Initial introduction of policy P_{T10} pushed down investment in 2000 to \$4.8 million in Guatemala, \$2.8 million in Costa Rica, \$3.7 million in Dominican Republic, and \$6.5 million in El Salvador. Policy P_{T30} resulted in disinvestment and in 2000 outward processing firms in Guatemala disinvested \$15 million, in Costa Rica - \$17 million, in Dominican Republic - \$67 million, and in El Salvador - \$18 million.

Adjustment costs under a 10% demand shock scenario in El Salvador and Guatemala behaved in the same way as in the previous cases. They decreased as the amount of new investment decreased. However, under a 30% demand shock scenario adjustment costs were high and decreasing in the beginning when firms were actively disinvesting, getting close to zero around 2002 when investments were close to zero, and then started to increase again when capital disaccumulation slowed down and investment became positive to counter capital depreciation. Under scenario P_{T10} adjustment costs in 2000 decreased to \$0.4 million in Guatemala, \$0.16 million in Costa Rica, \$0.047 million in Dominican Republic, and \$0.61 million in El Salvador. Under P_{T30} scenario in 2000 the adjustment costs were estimated to be respectively \$4 million, \$6 million, \$15.6 million, and \$4.6 million.

As the result of demand shocks profitability of outward processing operations declined as compared to no-tariff scenario P_T . Under scenario P_{T10} in 2000 outward processing profits in Dominican Republic dropped to \$734 million, which was still larger than the benchmark profit of \$703 million. When a 30% demand shock was introduced, the decrease in profit was significant for outward processing firms in all countries. In 2000 in Dominican Republic profits fell to \$438 million. The P_{T30} profits remained much lower than the benchmark profits

in the next periods. Such significant decreases in profits completely eliminated profit gains that resulted from tariff removal.

Long-Run Cost Benefit Analysis

Long-run costs and benefits of the effects of trade policies/scenarios related to outward processing were calculated as discounted streams of payments to the agents participating in Caribbean outward processing - firms' profits, payments to Caribbean labor, payments to US producers of intermediate textiles, and US government's net tariff revenue. Discounted streams were annualized in order to show costs and benefits in per-period terms. Annualized terms represent uniform one-period gains/losses which, if summed and discounted over an infinite period of time, would equal long-run discounted gains/losses. The main results of the cost-benefit analysis for the Caribbean outward processing countries are presented in table 4, and discussion again focuses on results from that table for the Dominican Republic. The values in the tables represent differences between the outcomes of scenarios in which tariff and demand shocks were implemented and the outcomes of the benchmark scenarios.

The scenario simulating the outcomes of TDA2000 showed that the zero tariff policy benefited all agents except for the US government. According to P_T long-run compensation of labor increased by $37 million in Dominican Republic. Because of its higher value share, intermediates gained more than labor. The increase in purchases of intermediates by outward processing firms from Dominican Republic exceeded $122 million. The loss in net US government tariff revenue was significant. Due to tariff removal the model estimated that the present value of long-run revenue loss from the Dominican Republic would be $373 million.

Lost US government tariff revenues partially contributed to firms' profit gains (capital return gains). In particular, outward processing firms in Dominican Republic are expected

to gain $219 million in long-run profits. The rest of lost US tariff revenues went to US consumers, since tariff removal decreased prices of outward processing imports. (Consumer welfare calculation is complicated by the gains due to lower Asian (substitute) apparel prices, and so is not implemented.)

The scenario that decreased demand for Caribbean outward processing imports by 10% decreased the benefits going to the factors of production. However, long-run profits/returns to capital still were above the benchmark levels (except for Costa Rica) mainly because no tariffs were imposed in that simulation.

After a negative 10% shock to outward processing import demand for apparel, foreign apparel and textile workers would lose in the long-run $28 million in Dominican Republic as a result of a 10% decrease in outward processing import demand. The losses of US intermediate textile producers who supply outward processing firms were higher. Long-run purchases of intermediate textiles would go down by $94 million in the Dominican Republic.

Firms' long-run profits would still be higher in most cases than what they would earn if there were not a tariff and demand shock, except for Costa Rica. Long-run profits of firms from Dominican Republic would increase by $13 million. Firms in Costa Rica would experience a long-run profit loss of $7 million. In the Costa Rican apparel outward processing industry elimination of tariffs would not provide enough leverage to increase profits in the event of a 10% decrease in demand.

The last scenario that featured a 30% import demand decrease reversed the benefits for all the agents (in the Caribbean and the US), including outward processing firms' long-run profits, and diverted the long-run outward processing trade. Long-run compensation of apparel workers in the Caribbean region dropped significantly. In Dominican Republic

long-run wage expenses decreased by $130 million. The benefits to US intermediate textile producers went down significantly, as well. The largest loss would be in intermediate textile sales to the outward processing industry in Dominican Republic, constituting $431 million.

Long-run profits decreased significantly from their benchmark level. Loss in long-run profits as a result of a 30% demand shock was $311 million for outward processing operations in Dominican Republic.

Conclusions

Overall, the approach taken here to study apparel outward processing trade in the Caribbean is quite restrictive since simplifying assumptions about demand, adjustment cost structure, and the production process were necessary in order to make the model solvable. Data used in this study also was subject to weaknesses. However, the study still provides important insights on the phenomenon of apparel outward processing trade in the Caribbean and helps understand its dynamics despite modeling limitations.

The study shows the importance of capital accumulation by way of foreign investment, and adjustment costs of capital in apparel outward processing trade in the Caribbean region. It also highlights capacity constraints and rigidities in factor allocation as determinants of trade flow adjustments.

Simulations of the effects of the Trade and Development Act showed that outward processing firms, assembling apparel in the Caribbean region, respond to tariff elimination by speeding up their investment, expanding trade, and lowering import prices. Adjustment to the tariff change would take time instead of occurring instantaneously. In the first year of policy implementation trade would change somewhat as compared to the no-shock scenario. However, most of the adjustment of capital and trade would occur over 5 years, ultimately

increasing trade by 13% to 24% in volume depending on country.

The simulations of MFA quota influence on the Caribbean outward processing apparel trade showed that even if elimination of MFA quotas results in relatively little substitution away from the Caribbean apparel toward Asian apparel, the positive effects of complete tariff elimination on apparel trade and investment in the Caribbean could be compromised, and investment and trade would slow down. In cases when MFA substitution affects import demands significantly, trade and investment expansion can be reversed, resulting in shrinking outward processing trade and disinvestment or idle capacity along with falling profitability and depressed import prices.

The results of the long-run cost-benefit analysis show that within a dynamic partial equilibrium setting even small demand shocks as a result of MFA removal can significantly harm US production factor suppliers in the outward processing business in the Caribbean region. Negative demand shocks of a higher magnitude (30% in our case) can result in considerable long-run trade diversion in the Caribbean region. If the magnitude of the demand shock increases, the long-run profitability (returns to capital) of outward processing firms would be compromised, as well, despite the fact that the former does not have to pay tariffs any longer and output prices decrease. Among suppliers of factors of production, US producers of intermediates and then foreign (Caribbean) outward processing workers would lose noticeably in terms of long-run revenues. US government loses automatically, since according to TDA2000, tariff revenues are no longer collected on outward processing apparel and textile imports. The US government loss is, however, mostly a transfer of benefits because lost tariff revenues would be re-distributed between outward processing firms and US consumers.

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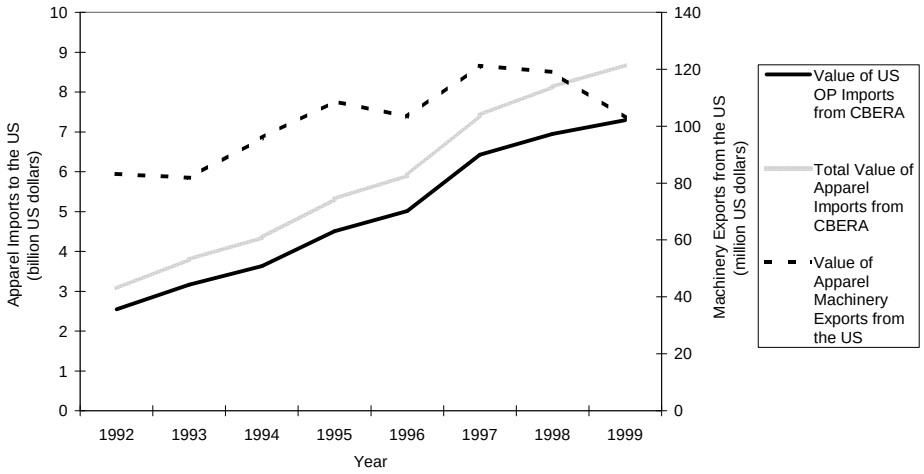

Figure 1: CBERA apparel exports to the US and US apparel machinery imports

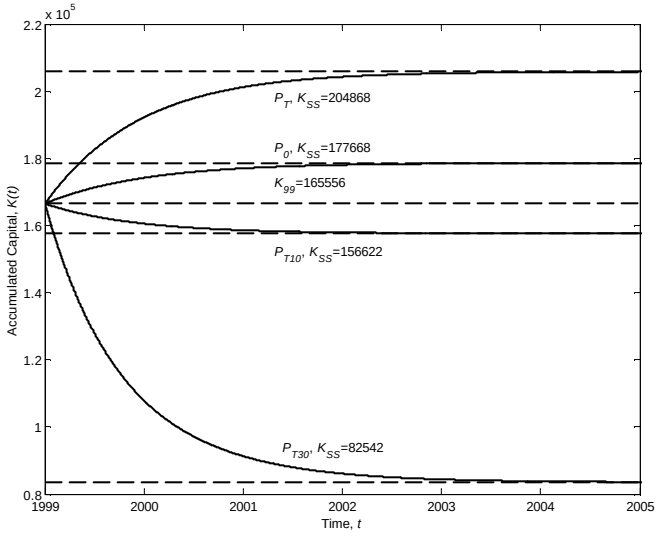

Figure 2: Capital accumulation under alternative scenarios in Dominican Republic

Table 1: Data from 1999 Used in Simulations of US Outward Processing Trade in Apparel

		Guatemala	El Salvador	Costa Rica	Dominican Republic
Initial Capital Stock (units of aggregated capital)	K_{99}	77,567	59,545	89,797	165,556
Price of Capital	p_I	\$879.84	\$1,114.39	\$751.01	\$1,359.58
Wage, hourly	w	\$1.24	\$1.31	\$1.62	\$1.72
Price of Intermediates	p_M	\$27.00	\$18.38	\$14.60	\$15.73
MFN Tariff	T	19.1%	17.8%	15.6%	18.3%
Demand Multiplier	a	40646	29329	37123	60690
Capital Production Coefficient	α	94.30	479.56	145.56	172.22
Labor Production Coefficient	β	0.08	0.19	0.21	0.19
Intermediates Production Coefficient	γ	0.97	1.62	0.6	0.53
Adjustment Cost Coefficient	b	\$2,079.18	\$2,079.18	\$2,079.18	\$2,079.18
Elasticity of Demand	θ	-0.39	-0.39	-0.39	-0.39
Initial Capital Growth Rate	γ_{99}	6.76%	15.18%	11.38%	7.24%
Depreciation Rate	δ	5%	5%	5%	5%
Discount Factor	$\bar{r}$	10%	10%	10%	10%

Table 2: Summary of Simulation Results

	Scenario	Dominican Republic		El Salvador		Guatemala		Costa Rica	
		2000	2006	2000	2006	2000	2006	2000	2006
Trade/Turnover	P_0	2,113.7	2,146.5	1,049.1	1,073.7	619.9	634.4	819.9	847.7
(millions of	P_T	2,244.5	2,340.5	1,152.1	1,217.2	670.8	723.5	859.2	911.9
US$)	P_{T10}	1,809.9	1,789.5	920.4	930.6	548.6	553.4	700.4	697.4
	P_{T30}	1,103.7	943.3	547.9	490.5	346.5	292.0	438.8	367.8
Profit	P_0	703.6	715.5	347.6	355.0	206.0	210.1	282.9	290.0
(millions of	P_T	906.6	949.8	462.6	488.2	275.2	294.8	351.7	368.2
1999 US$)	P_{T10}	734.7	726.2	369.7	373.3	223.9	225.4	282.4	281.6
	P_{T30}	438.0	382.8	211.4	196.7	131.0	118.9	159.2	148.5
Labor	P_0	269.3	276.2	213.4	221.7	115.5	120.0	108.9	115.0
Costs	P_T	297.3	318.5	249.0	272.6	131.5	149.0	117.6	129.7
(millions of	P_{T10}	248.1	243.5	204.7	208.4	112.4	114.0	99.9	99.2
1999 US$)	P_{T30}	166.2	128.4	131.8	109.8	79.8	60.2	70.0	52.3
Intermediate	P_0	893.7	916.6	353.4	367.1	212.9	221.1	343.4	362.7
Costs	P_T	986.5	1,056.9	412.3	451.3	242.4	274.5	370.9	409.1
(millions of	P_{T10}	823.4	808.1	338.8	345.0	207.0	210.0	315.1	312.9
1999 US$)	P_{T30}	551.7	426.0	218.2	181.9	147.0	110.9	220.7	165.1
Investment	P_0	22.26	12.74	9.57	3.97	6.85	3.94	8.84	4.08
Costs	P_T	46.70	14.71	21.64	4.88	16.77	4.94	14.67	4.61
(millions of	P_{T10}	3.73	11.20	6.59	3.72	4.90	3.72	2.86	3.49
1999 US$)	P_{T30}	-67.86	5.83	-18.14	1.95	-15.28	1.87	-17.14	1.77
Adjustment	P_0	1.68	0.51	1.29	0.19	0.81	0.25	1.60	0.30
Costs	P_T	7.41	0.59	6.58	0.24	4.87	0.31	4.42	0.34
(millions of	P_{T10}	0.05	0.45	0.61	0.18	0.42	0.23	0.17	0.25
1999 US$)	P_{T30}	15.65	0.23	4.63	0.10	4.04	0.11	6.03	0.12
Tariff Revenue[a]	All	223.1	224.9	123.8	125.7	77.8	79.0	74.3	75.6

continued on next page

Table 2: continued

	Scenario	Dominican Republic		El Salvador		Guatemala		Costa Rica	
		2000	2006	2000	2006	2000	2006	2000	2006
Price of Apparel Output, (US$)	P_0	70.9	70.2	33.7	33.2	80.9	79.7	58.2	56.9
	P_T	68.2	66.3	31.7	30.6	76.9	73.2	56.4	54.3
	P_{T10}	65.9	66.3	30.8	30.6	73.6	73.2	54.1	54.3
	P_{T30}	59.9	66.3	28.5	30.6	65.5	73.1	48.4	54.3
Physical Capital, $K(t)$ (thousand units)	P_0	173	178	65	68	81	84	97	102
	P_T	191	205	76	83	93	105	105	115
	P_{T10}	160	157	62	63	79	80	89	88
	P_{T30}	107	83	40	33	56	42	62	47
Capital Growth Rate, $\gamma_{K(t)}$	P_0	2.59%	0.01%	4.52%	0.00%	3.04%	0.03%	4.72%	0.03%
	P_T	7.67%	0.01%	11.51%	0.01%	10.82%	0.07%	9.08%	0.04%
	P_{T10}	-2.04%	0.00%	2.27%	0.00%	1.21%	0.01%	-0.64%	0.00%
	P_{T30}	-26.68%	-0.04%	-21.77%	-0.01%	-22.29%	-0.17%	-24.59%	-0.13%
Shadow Price of Capital, $q(t)$ (US$)	P_0	1,523	1,469	1,318	1,224	1,053	990	959	861
	P_T	1,629	1,469	1,463	1,224	1,214	991	1,049	861
	P_{T10}	1,427	1,469	1,271	1,224	1,014	989	847	860
	P_{T30}	914	1,468	771	1,224	526	986	349	858

[a]Millions of 1999 US$

Table 3: Long-Run Changes in US Apparel Outward Processing Trade as Compared to the Base Scenario P_0*

Country	Scenario		
	P_T	P_{T10}	P_{T30}
Dominican Republic	15%	-12%	-54%
El Salvador	23%	-6%	-50%
Guatemala	24%	-5%	-50%
Costa Rica	13%	-14%	-54%

*Outward processing apparel trade flows in 2006 under trade policies P_T, P_{T10}, and P_{T30} are compared to 2006 P_0 benchmark outward processing apparel trade flows.

Table 4: Annualized Discounted Gains and Losses under Different Policy Scenarios with Outward Processing*

Agent	Policy	Guatemala	El Salvador	Costa Rica	Dominican Republic
CBI Labor	P_T	24.6	44.7	12.6	36.9
	P_{T10}	-5.1	-11.6	-13.5	-28.4
	P_{T30}	-51.3	-99	-54	-129.8
US Intermediate Textiles	P_T	45.3	74.1	39.8	122.4
	P_{T10}	-9.4	-19.3	-42.5	-94.3
	P_{T30}	-94.5	-163.9	-170.4	-430.8
Firms' Profit	P_T	78.3	124.6	73.2	219.1
	P_{T10}	15.1	18.1	-6.7	13.3
	P_{T30}	-84.9	-148.9	-133.1	-310.5
US Government	All	-114.8	-181.3	-124.9	-372.8

*Millions of 1999 US$