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How Import Protection Affects the Philippines' Motor Vehicle Industry

Wendy E. Takacs

Heavy protection of motor vehicle imports in the Philippines imposes substantial costs on consumers and encourages the misallocation of resources to relatively high-cost activities.

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The motor vehicle industry in the Philippines is regulated and protected by the provisions of development programs for cars, commercial vehicles, and motorcycles. Each program virtually prohibits the import of completely built-up vehicles, specifies minimum local content requirements for vehicles assembled in the country from imported completedly knocked-down kits, and requires that firms assembling kits export to earn foreign exchange to cover the cost of the kits.

Similar protective regimes have existed in a number of countries, especially in Latin America.

Takacs develops a model to illustrate the economic impact and welfare cost of import prohibitions, local content requirements, and export requirements. She applies that model to Philippine data.

Her results indicate that the protective regime in the Philippines imposes substantial costs on consumers and encourages the allocation of resources to relatively high-cost activities. Eliminating all of the restrictions overnight may lead to adjustment problems, but gradual liberalization could limit these problems.

The proportion of domestic content required, the percentage of compensatory exports required for kits, and the tariff rates on kits could be lowered in stages, according to a preannounced schedule, to allow gradual adjustment. The prohibition on imports of assembled vehicles could be replaced by a tariff and phased out gradually. To avoid proportionately more protection of the assembly industry, the tariff on finished autos could be phased out more quickly than the other tariffs, to avoid sending false signals to the domestic industry about the direction of adjustment.

To avoid increasing the effective rate of protection on assembly operations during liberalization, elimination of the domestic content and compensatory export requirements should be accompanied by decreases in the tariff rates on assembled vehicles.

How Import Protection Affects the Philippines' Motor Vehicle Industry

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I. INTRODUCTION

The motor vehicle industry in the Philippines is regulated by and protected by the provisions of three development programs: The Car Development Program (CDP), which covers passenger vehicles; the Commercial Vehicle Development Program (CVDP), which covers trucks and busses; and the Motorcycle Development Program (MDP).

Although the details of the CDP, CVDP, and MDP differ, each program virtually prohibits the importation of completely built-up (CBU) vehicles, specifies minimum local content requirements for vehicles assembled within the Philippines from imported completely knocked-down kits (CKD), and also requires that firms assembling kits export to earn foreign exchange to cover the cost of the imported kits.

Similar protective regimes have been used in a number of countries, especially in Latin America.[1] The set of restrictions taken together affect both the sales price of the finished vehicles and the cost conditions of domestic assembly operations. The restriction on imports of assembled vehicles drives up the domestic prices of motor vehicles, encouraging domestic production, but the local content requirements and export requirements increase the cost of production for assembly operations. The protective regime and regulations impose costs upon consumers and misallocate resources, encouraging high-cost domestic production.

The purpose of this paper is to develop a model to illustrate the economic impact and welfare cost of the import prohibition, local content requirements, and export requirements, and apply that model to Philippine data to generate rough estimates of the cost to the country of maintaining this type of protective regime. The paper is organized as follows: section II explains the details of the three motor vehicle industry programs; section III develops a model to illustrate the impact of the protective regime; section IV uses that model to explain the transfers among groups, inefficiencies, and net

welfare costs arising from the protection; section V explains the calculation of these costs and transfers; and section VI applies the model to Philippine data. Section VII investigates the impact of the removal of just the domestic content and compensatory export requirements, leaving tariffs unchanged. Section VIII summarizes the paper and offers conclusions and policy recommendations.

II. THE MOTOR VEHICLE PROTECTIVE REGIME IN THE PHILIPPINES

The origins of the Philippine motor vehicle assembly industry can be traced back to 1949, when a shortage of foreign exchange led the Philippine government to impose foreign exchange controls. The foreign exchange controls denied foreign exchange to "nonessential" items, including passenger cars. By 1951, firms began assembling passenger cars in the Philippines from imported sets of components, or "kits". Another foreign exchange crisis in the early 1970s prompted the government to further regulate the industry via the Progressive Car Manufacturing Program (PCMP) and the Progressive Truck Manufacturing Program (PTMP), which became effective as of 1973. These programs prohibited importation of completely built-up vehicles (CBU), and imposed local content requirements. In 1984, the PCMP was revised to add export requirements that required firms assembling cars to earn foreign exchange by exporting automotive industry products to compensate for the foreign exchange used to import kits.

The new administration which took power in 1986 replaced the PCMP and PTMP with the Car Development Program (CDP) and the Commercial Vehicle Development Program (CVDP), as well as a similar Motorcycle Development Program (MDP). Patterned after the earlier protective regime, these programs continued the local content requirements, export requirements, and ban on imports of CBU vehicles that compete with domestic production. The local content requirements differed by type of vehicle and increased year-by year. The content requirements by type of vehicle can be found in Table 1. Firms assembling cars must earn 50% of the foreign exchange needed to import kits

and firms assembling commercial vehicles must earn 25% of the foreign exchange needed to import kits. At the beginning of the program in 1988, exports could be either automotive or non-automotive products, but exports of automotive products were encouraged. Credit for non-automotive exports is being gradually phased out, so that by 1993 only exports of automotive products will qualify for the compensatory export requirements. The schedule for phasing in the requirement for automotive industry exports can be found in Table 2.

III. A MODEL OF THE MOTOR VEHICLE PROTECTIVE REGIME

This section develops a model to assess the impact of the import prohibitions, domestic content and export requirements and the interactions among them. The model simplifies by ignoring differentiation among types of components, the trade-off between domestic content and compensatory exports allowed in the regime, regulations on minimum disassembly of components in kits, and prohibitions against importing certain components. The model also assumes a small importing country with competitive components and assembly industries[2], and assumes that the domestic content requirements and all export requirements are binding (that is, less domestic content would be used by assembly firms if there were no domestic content requirements, and exports of auto industry products would be less than the observed values in the absence of export requirements).

If the country imposing the domestic content and compensatory export requirements is small, the world price, or import price, of assembled autos (P_A*) and of auto components (P_C*) can be taken as given. Assume that there is only one type of finished or assembled automobile, made through a process of assembling a given number, "α", of components. For the moment, ignore differences among components.[3] A perfectly competitive domestic components industry manufactures components and a perfectly competitive domestic industry assembles vehicles by combining packages of imported components, called "kits" with domestically produced components. Assembly firms must earn a given percentage, x_K, of the foreign exchange necessary to import the kits by

exporting auto industry products. Equilibrium prices and quantities in the market for assembled autos and in the market for components will be determined jointly because they are tied together not only by the normal input-output relationships, but also by the domestic content and compensatory export requirements.

The Domestic Market for Assembled Autos

Given the prohibition on imports of assembled vehicles, the price of vehicles will be determined by domestic demand and supply. Suppose that the quantity demanded (Q_A^D) is a decreasing function of the price of a vehicle (P_A):

$$Q_A^D = D\ (P_A) \qquad D' \text{ negative} \qquad (1)$$

On the supply side, suppose that there is an upward sloping supply function of value-added in domestic assembly operations, in which the quantity of vehicles firms are willing to assemble increases as the value-added per unit (V) increases[4], as in (2):

$$V = V\ (Q_A^S) \qquad V' \text{ positive} \qquad (2)$$

where Q_A is the quantity of finished autos produced. Suppose that the assembly technology requires a certain number of components, "α" per auto. Let "δ" be the proportion of total components that must be of domestic origin.[5] If 20 percent domestic content is required, then δ=0.2. Let x_K be the compensatory export requirement for <u>kits</u>, that is, the proportion of the value of the imported kit that must be compensated by exports. Then $\alpha(1-\delta)P_C^*$ is the value of a kit at world market prices. Given the compensatory export requirements, the value of compensatory exports required to import the kit would be $x_K\alpha(1-\delta)P_C^*=P_Cq_C$, where q_C is the quantity of compensatory exports required to import one kit. The tariff on kits would increase the cost of kits to the domestic assembly industry by the tariff revenue that would have to be paid per kit, or $\alpha(1-\delta)P_C^*t_K$. The cost of domestic components would

equal $\alpha\delta P_C$. The assumption of a perfectly competitive assembly industry implies that in the long-run unit cost equals price, so:

$$P_A = \alpha(1-\delta)P_C^*(1+t_K+x_K(P_C-P_C^*)/P_C) \quad \alpha\delta P_C + V(Q_A^S)$$

Let $\pi=(P_C-P_C^*)/P_C^*$ be the percentage by which domestic components prices exceed imported components prices. The above equation can then be written:

$$P_A = \alpha P_C^*(1-\delta)(1+t_K+x_K\pi) + \alpha P_C^*\delta(1+\pi) + V(Q_A^S) \qquad (3)$$

Equation (3) can be thought of as the long-run assembly industry inverse supply curve. Supply price is the (vertical) sum of the domestic value-added that would be required for firms to be willing to assemble various quantities of vehicles, the cost per vehicle of domestic components used as intermediate inputs ($\alpha P_C^*\delta(1+\pi)$) and the effective cost of the imported kit which would equal $\alpha P_C^*(1-\delta)(1+t_K+x_K\pi)$.

If importation of already assembled vehicles is prohibited, then the interaction of demand and the supply of vehicles from domestic assemblers will determine market price. The equilibrium in the domestic market would occur where the quantity demanded equals the quantity supplied:

$$Q_A^D = Q_A^S \qquad (4)$$

Equations (1)-(4) determine P_A, Q_A^D, Q_A^S and V, given P_C, P_C^*, t_K, x_A, x_K, α and δ.

The market for assembled autos is depicted graphically in the upper quadrant of Figure 1. The demand curve for assembled vehicles is shown by D_A. The supply curve of the domestic assembly operations is shown in Figure 1 by S_A. As explained in more detail in the section on the costs of protection below, S_A is the vertical sum of the supply curve under free trade (S_A^*), the increase in assembly industry costs per vehicle due to the tariff ($\alpha P_C^*(1-\delta)t_K$), and the increase in costs attributable to the domestic content and compensatory export requirements ($\alpha P_C^*(\delta\pi+(1-\delta)x_K\pi)$).

Given the domestic supply and demand conditions, the equilibrium price of autos in the domestic market would be determined where the quantity produced (Q_A) equals quantity demanded. The domestic price (P_A) is not

constrained by the price of a vehicle in the world market (P_A*) because imports are prohibited.

The various elements of the protective regime influence the market for assembled vehicles in potentially contradictory ways. The import prohibition increases the price of the finished vehicle to the consumer. Higher finished vehicle prices encourage greater output from domestic assembly operations, but or the other hand the domestic content and compensatory export requirements for kits and the tariff on kits discourage domestic assembly operations by increasing input costs. This shows up as an upward shift in the supply curve for vehicles assembled within the country.

The Domestic Market for Components

Assume that the perfectly competitive domestic components industry has a supply curve for components, given in inverse form by:

$$P_C = S(Q_C) \qquad S' \text{ positive} \qquad (5)$$

where Q_C is the quantity of components supplied by the domestic industry. The demand for domestic components includes the demand for components to be combined with imported kits for domestic assembly ($\alpha\delta Q_A$) and exports of components as compensatory exports for the importation of kits (X^K). Given the compensatory export requirements, $P_C X^K = x_K \alpha(1-\delta)P_C{*}Q_A$, so the demand for components to export to qualify to import kits will be $x_K\alpha(1-\delta)(P_C{*}/P_C)Q_A$, so the total demand for components can be expressed as:

$$Q_C = x_K\alpha(1-\delta)Q_A(P_C{*}/P_C) + \alpha\delta Q_A \qquad (6)$$

Equations (5) and (6) determine P_C and Q_C, given Q_A, P_C*, x_K, α, and δ.

The equilibrium in the market for components is depicted graphically in the lower quadrant of Figure 1. The supply curve of the domestic components industry is shown by S_C. The demand curve for components, D_C, is the horizontal sum of the demand for components by domestic assemblers ($\alpha\delta Q_A$), and the demand for components for export to satisfy compensatory export requirements for imported kits ($x_K\alpha(1-\delta)Q_A(P_C{*}/P_C)$). Equilibrium in the

components market would occur at the price/quantity combination P_C and Q_C.

Under free trade, domestic producers would be forced to match the world market price of components P_C*, at which price components production would be Q_C*. Both the domestic content and compensatory export requirements act to increase the demand for components produced within the country, driving up price and production.

Given the linkages between the markets for domestic components and assembled vehicles, equations (1)-(6) jointly determine the endogenous variables P_A, Q_A^D, Q_A^S, V, P_C, and Q_C given the world market components price P_C, the technical coefficient α and the policy parameters t_K, x_K, and δ. The equilibrium prices and quantities in both markets would be determined simultaneously.

IV. TRANSFERS AMONG GROUPS AND NET COST OF THE REGIME

If there were no protective regime, and abstracting from transportation costs, the world market prices of both assembled autos and components would prevail within the respective domestic markets. In the components market, a quantity Q_C* would be produced at the price P_C*. The domestic assembly operations would have access to components at this price, so their supply curve would be the vertical sum of the value-added per unit required for each output level and the cost of component inputs, αP_C*. This supply curve is shown by S_A* in the top quadrant of Figure 1. At the free-trade price P_A*, the domestic industry would assemble Q_A* units, consumers would purchase D_A* units, so (D_A*-Q_A*) assembled vehicles would be imported.

The costs of the entire protective regime can be assessed using the free-trade equilibrium as a benchmark for comparison. The tariff on kits, domestic content requirements and compensatory export requirements increase input costs to assemblers, and thus shift their supply curve upward from S_A* to S_A. This upward shift can be decomposed into the cost increase per unit assembled due to the tariff, $\alpha P_C^*(1-\delta)t_K$ (equal to the distance ef in Figure

1), and the upward shift due to the domestic content and compensatory export requirements $\alpha P_C^*(\delta\pi)+(1-\delta)x_K\pi$ (equal to the distance be in Figure 1). Let S_A' show the industry supply curve with the tariff, but without the domestic content and compensatory export requirements. Thus the shift from S_A^* to S_A' represents the impact of the tariff on kits, and the shift from S_A' to S_A represents the impact of the domestic content and compensatory export requirements.

The welfare costs can be measured as the effects of distortions in the markets for assembled vehicles and components. The cost to consumers of the restrictions is area abcd, the reduction in consumer surplus as compared to free trade. Of this, area bcg is the traditional deadweight loss in consumption due to higher assembled auto prices.

The compensatory export requirements for kits and the domestic content requirements shift up the assembly industry supply curve from $S_A'$to S_A (=be), so, at the resulting domestic level of assembly operations Q_A, area abeh represents the extra cost of components to assemblers because of the existence of these restrictions. The increased cost to domestic assemblers of area abeh is in part a transfer to domestic manufacturers of components and in part a deadweight efficiency loss. To see how the area is divided, note that area abeh in the upper quadrant of Figure 1 equals area ijkl in the lower quadrant of the same diagram.[6] Area ijml represents a transfer to the domestic components manufacturers in the form of higher profits, and area jkm represents a deadweight loss due to the excess of production costs domestically over the price at which the components could have been purchased in the world market, for the extra output mk produced because of the domestic content requirements and the compensatory export requirements for kits.[7]

Area nfqd represents an increase in profits to domestic assembly operations due to the net effect of the entire protective regime. Area fgq represents a production deadweight loss, the extra cost of assembling $Q_A-Q_A^*$

vehicles within the country rather than buying them in the world market at P_A*.

To summarize the net welfare effect of all of the restrictive measures taken together, the regime imposes losses on consumers equal to area abcd. This loss can be subdivided into transfers to the government, the assembly industry, the components manufacturers, and deadweight losses due to inefficient production in the assembly and components industries. Area nfqd represents a transfer to domestic assemblers of autos and fgq represents a deadweight loss due to inefficient assembly operations. Area hefn is a transfer to the government in the form of tariff revenue on kits. Area abeh (equal to area ijkl) represents a transfer from consumers to domestic components manufacturers, which in turn can be divided into increases in producer surplus or short-run profits of ijml plus deadweight production loss of area jkm. Area bcg is the deadweight loss due to the consumption distortion in the market for assembled autos. The net effect, ignoring transfers, is a consumption loss of bcg, and production deadweight losses of fgq and jkm in the assembly and components industries, respectively.

The transfers from consumers to both the domestic assembly and the domestic components industry show that both assemblers and manufacturers of components can gain from the protective regime, but in some respects their interests are contradictory. From the point of view of the manufacturers of domestic components, the more restrictive the domestic content and compensatory export requirements, the greater their gains. From the point of view of the domestic assembly industry, the more restrictive the regime on imported assembled vehicles the greater their gains. However, the more restrictive the domestic content requirement (the higher δ) and the more severe the compensatory export requirements for kits (the higher x_K), the smaller will be the gains to domestic assembly operations. Note that the assemblers need not necessarily gain on balance from the regime. Sufficiently high δ, t_K, and x_K, relative to the import restriction on assembled vehicles,

could leave the domestic assemblers with a net loss and, on balance, discourage rather than encourage domestic assembly of automobiles.[8]

V. APPLICATION TO THE PHILIPPINES

The magnitude of the areas in Figure 1 identified above as net welfare losses and transfers from the entire protective regime can be calculated for the Philippines based on the actual values of the policy parameters t_K, x_K and δ, and observed values of other variables for the motor vehicle industry. The method used for quantifying the magnitude of the losses and transfers is explained in Appendix A. Separate calculations were made for the Car Development Plan (CDP) and the Commercial Vehicle Development Plan (CVDP). The values of the variables and parameters used in the calculations are shown in Table 3. A detailed explanation of the sources of the data used can be found in the Data Appendix.

Table 4 presents the estimates of the magnitude of the loss to buyers of vehicles, the transfers to the domestic assembly and components industries, and the efficiency losses, or net costs, of the protective regime. These estimates should be thought of as rough approximations of the potential magnitudes of the costs, not as exact estimates. They are based on assumed values for elasticities of demand and supply, not values estimated from Philippine data, and, as explained in the data appendix, the values of some parameters for cars had to be borrowed from the values for commercial vehicles for lack of data.

The results indicate that the cost of the protective regime to purchasers of motor vehicles in 1990 was about 5.2 billion pesos (US$215 million) per year. This was roughly equivalent to almost US$4000 per vehicle assembled domestically. The assembly industry and the components industry benefitted from the protective regime, gaining 1.8 billion pesos (US$ 73 million) and 1.2 billion pesos (US$ 50 million), respectively. The deadweight efficiency losses exceeded 1.2 billion pesos (US$50 million), or about 22,000 pesos (US$905) per vehicle.

VI. LIBERALIZATION AT CURRENT TARIFF RATES

The calculations in the previous section estimate the cost of the entire protective regime, including tariffs, domestic content requirements, and compensatory export requirements. These costs are the gains that could be achieved by moving to completely free trade. This scenario is, however, unlikely, as tariffs are likely to remain after other forms of protection are eliminated. A relevant question is: what would be the impact of eliminating the domestic content and compensatory export requirements at current tariff rates for assembled vehicles and kits? The welfare impact of eliminating the domestic content and compensatory export restrictions can be assessed by calculating the size of the transfers and net costs under the tariff regime and comparing the result with those calculated in the previous section for the entire protective regime.

Eliminating the embargo on imports of assembled vehicles would allow unlimited imports of vehicles at the present tariff rate. The price of vehicles to consumers would fall to the import price plus tariff paid, or $P_A*(1+t_A)$, where t_A is the ad valorem tariff on assembled vehicles. The markets for assembled vehicles and for components under the tariffs-only regime are illustrated in Figure 2. At the tariff rate t_A, the domestic vehicle price would be $P_A*(1+t_A)$. D_A^T vehicles would be sold, of which Q_A^T would be assembled within the country and $(D_A^T-Q_A^T)$ would be imported. The consumer surplus loss attributable to the tariff on assembled vehicles would be area rscd, of which scg would be a deadweight consumption loss.

On the production side, if the domestic content and compensatory export requirements were abolished, assembly firms would be free to import components at the world price, so the price of components would fall to $P_C*(1+t_K)$. Production of components would fall to Q_C^T. The lower components cost would reduce assembly industry costs and shift their supply curve down to S_A^T. S_A^T lies above S_A* by the extra cost of components per vehicle due to the tariff, αP_C*t_K. At the prevailing price for assembled vehicles under the tariff structure, $P_A*(1+t_A)$, the domestic industry would assemble Q_A^T vehicles.

In the assembly industry, the deadweight loss from domestic production at costs above the world market price under the tariff regime would be area uvq. Area wuqd represents extra profits of the assembly industry above those it would earn under free trade. This represents a transfer from consumers to assembly firms. In the components industry, the deadweight loss under the tariffs-only regime would be yzm, while the transfer to components manufacturers would be xyml.

The transfers and costs of protection resulting from the hypothetical tariffs-only regime appear in Table 5. The method of calculating these figures is also explained in Appendix A. Eliminating the domestic content and compensatory export requirements but maintaining current tariff rates would benefit purchasers of vehicles. The consumer loss would drop from 5.2 to 4.8 billion pesos. The decrease is not very dramatic because the tariff rate is fairly high (50% on cars and an average 46% on commercial vehicles). The estimates indicate that the switch to a tariffs-only regime would greatly benefit the assembly industry. The cost of components would drop significantly, increasing the effective rate of protection to assembly operations, increasing the transfers to the assembly firms, and increasing the efficiency losses from the assembly operations. In contrast, the transfers to the components industry would be almost halved, and the efficiency losses from domestic components production cut by approximately 60%. This result implies that an elimination of the domestic content and compensatory export requirements should be accompanied by a tariff cut on assembled vehicles to increase the gains to purchasers of vehicles and prevent an increase to the effective rate of protection to assembly operations.

VII. CONCLUSIONS

The motor vehicle protective regime in the Philippines is made up of a complicated set of regulations. Imports of assembled vehicles are prohibited, with certain exceptions. Imports of sets of components (kits) to be assembled within the country are subject to tariffs. Firms are constrained with respect

to the number of models produced and the amounts of imported versus domestic components used. Assembly firms that want to import kits must export automobile industry products equal to given percentages of the value of kits.

The model developed to analyze the impact of the protective regime indicates that the tariff on kits, the domestic content requirements, compensatory export requirements, and the prohibition on imports of finished vehicles keep vehicle prices high, maintain high-cost domestic production of both vehicles and components, and transfer large sums to special interest groups.

The protective regime drives up the price of finished vehicles to consumers. The consumer loss is in part a transfer to the domestic producers in both the assembly and components industries in the form of higher profits, and in part efficiency losses, or net losses, due to the distortion of consumer decisions and production levels.

The various elements of the protective regime affect domestic assembly operations in different, and potentially contradictory, ways. Higher finished vehicle prices encourage greater output from domestic assembly operations, but on the other hand the domestic content and compensatory export requirements for kits and the tariff on kits discourage domestic assembly activity by increasing input costs. On balance the net effect could either discourage or encourage domestic assembly operations, depending upon the net impact of the regulations. In the case of the Philippines, the protective regime appears to encourage domestic assembly, so part of the consumer loss from higher prices represents a transfer to the assembly industry, and part represents an efficiency loss due to increased domestic assembly of vehicles at a higher cost than the price of assembled vehicles in the world market.

The domestic components producers are unambiguously helped by all of the elements of the protective regime. The tariff on kits provides them with protection from imported components, the import restriction on assembled vehicles helps maintain domestic assembly operations and the domestic demand for components, the domestic content requirements force domestic assembly

operations to use domestically produced components, and the compensatory export requirements for the importation of kits increases the demand for domestically produced components for export. The compensatory export requirements in fact act like an export subsidy to the components industry. All the elements of the protective regime act to increase the demand for components produced within the country and drive up both price and output in the market for domestic components. Part of the consumer loss from higher finished vehicle prices thus takes the form of a transfer to domestic components manufacturers, and part represents an efficiency loss corresponding to the extra cost of producing components within the country that could be obtained at lower cost in the world market.

Preliminary estimates of the magnitude of these effects indicate that the protective regime imposes a loss on Philippine purchasers of vehicles of about 5.2 billion pesos per year (US$215 million), while transferring roughly 3.0 billion pesos (US$123 million) to domestic assembly operations and components manufacturers. The estimated net loss to the country is approximately 1.2 billion pesos (US$51 million) per year. These estimates must be considered tentative because the model assumes a competitive industry, does not include some aspects of the protective regime, does not consider the differentiated nature of both autos and components, and suffers from lack of complete data.

Despite these caveats, the results indicate that the protective regime imposes substantial costs on consumers and encourages the allocation of resources in activities that are relatively high-cost. Eliminating all of the restrictions overnight may lead to adjustment problems, but these can be limited by gradual liberalization. The major parameters of the system, specifically the percentage of domestic content required, the percentage of compensatory exports required for kits, and the tariff rates on kits could be lowered in stages according to a preannounced schedule to allow gradual adjustment. The prohibition on imports of assembled vehicles could be replaced by a tariff, and phased out gradually. During the process of

liberalization care should be taken not to inadvertently increase the degree of effective protection to the assembly industry by, for example, phasing out tariffs and domestic content and compensatory export requirements on kits faster than the tariff on finished autos. Doing so could temporarily increase the costs of protection and provide false signals to domestic industry concerning the direction of adjustment by temporarily further encouraging domestic assembly operations.

The results of calculations of the impact of eliminating the domestic content and compensatory export requirements at 1991 tariff rates indicate that the change would have benefitted consumers, but would have increased the effective rate of protection to assembly operations because of the substantial decrease in components costs. To avoid increasing the effective rate of protection to assembly operations during the liberalization, elimination of the domestic content and compensatory export requirements should be accompanied by decreases in the tariff rates on assembled vehicles.

ENDNOTES

1. See Lloyd (1973) for a description of the Australian system. Munk (1969) provides a survey of Latin American cases. For descriptions of the Brazilian, Argentinean, and Mexican protective regimes for automobiles, see Mericle (1984, pp. 29-32), Jenkins (1985, pp 59-61), and Bennett and Sharpe (1985), respectively. For Uruguay, see Takacs (1991).

2. The assumption of competition in the automobile industry may be less unrealistic for the Philippines than for most developing countries. In the Philippines there are 10 car assembly firms and 26 commercial vehicle assemblers. The model in this paper is intended to clarify the protective effects of and interactions between the domestic content and compensatory export requirements and provide rough estimates of the order of magnitude of the potential costs of the protective regime. Future work to take into account strategic interactions among firms could provide a richer analysis and possibly more accurate estimates of the true costs.

3. This approach is similar to Grossman (1981) in that it assumes that domestic and imported components are perfect substitutes. Mussa (1984) develops a model in which domestic and imported input are less than perfectly substitutable.

4. This approach is similar to that used by Corden (1971), Chapter 3.

5. Grossman (1981) shows that the domestic content requirements will have different effects if defined in terms of physical quantities or value-added. The Philippine local content requirements can be treated as similar to a restriction in quantity terms. The contribution for each part is based on "points", equal to the ratio of the FOB CKD price of the part to the CKD full pack price of the vehicle model. The valuations are based on world prices, not domestic prices, so increases in domestic parts prices will not reduce the quantity of domestic parts required to fulfill the domestic content requirements.

6. $$\begin{aligned} abeh &= \alpha P_C^* \ (\pi\delta + (1-\delta)x_K\pi) \ Q_A \\ &= \alpha P_C^* \ \{\delta((P_C-P_C^*)/P_C^*) + (1-\delta)x_K(P_C-P_C^*)/P_C^*) \ Q_A \\ &= \alpha \ Q_A \ (\delta + (1-\delta)x_K) \ (P_C-P_C^*) \\ &= ijkl \end{aligned}$$

7. It is interesting to note that the portion of the demand for components that arises because of the compensatory export requirements acts like an export subsidy. This subsidy element to components exports was at times explicitly recognized by multinational firms. Bennett and Sharpe (1985, p. 186) report that Chrysler arranged for its Mexican assembly operations to transfer funds to its U.S. assembly operation to cover the extra cost of Mexican parts.

8. In this light it is interesting to note that the prohibition of imports gives a higher protective effect the greater is domestic demand for vehicles. During the economic downturn in the early 1980s in the Philippines (which would have decreased domestic demand and decreased the ad valorem equivalent protection to the assembly industry) affiliates of Ford, Isuzu, and Toyota all shut down operations and pulled out of the Philippines.

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APPENDIX A

The magnitude of the areas in Figure 1 that represent the transfers and losses due to the protective regime can be estimated for the Philippines based on the actual values of the policy parameters t_K, x_K and δ, and observed values of other variables for the motor vehicle industry.

The consumer loss was identified as area abcd in Figure 1. Let $\phi = (P_A - P_A^*)/P_A^*$ be the percentage by which the price of domestically assembled vehicles exceeds the price of equivalent foreign vehicles, and η_{DA} be the elasticity of demand for assembled vehicles. Then, given that

$$\begin{aligned}
\text{Area abcd} &= (P_A - P_A^*)Q_A + 1/2\ (P_A - P_A^*)(D_A^* - Q_A) \\
&= \phi P_A^* Q_A + 1/2\ \phi\ P_A^*\ (dQ_A/dP_A\ P_A/Q_A)\ Q_A/P_A\ P_A^* \phi \\
&= (\phi/(1+\phi))\ P_A Q_A + 1/2\ (\phi/(1+\phi)) P_A Q_A \eta_{DA} (\phi/(1+\phi)) \\
&= (\phi/(1+\phi))\ V_A\ (1 + 1/2\ \eta_{DA}(\phi/(1+\phi)) \qquad (7)
\end{aligned}$$

where V_A if the value of domestic motor vehicle output.

The deadweight loss in consumption, area bcg, would be:

$$\begin{aligned}
\text{Area bcg} &= 1/2\ (P_A - P_A^*)(D_A^* - Q_A) \\
&= 1/2\ \phi P_A (1/(1+\phi) Q_A \eta_{DA} (\phi/(1+\phi)) \\
&= 1/2\ (\phi/(1+\phi))^2\ V_A \eta_{DA} \phi
\end{aligned}$$

The gain to the assembly industry (area nfqd) and the deadweight loss to the economy from excess assembly operations (area fgq) can be calculated by first noting that the height of each of these areas equals the net impact of the restrictive regime, that is, the amount, net of cost increases, by which revenue per vehicle assembled exceeds free-trade revenue per unit. Let this distance (fg) be designated N:

$$N = (P_A - P_A^*) - \alpha P_C^*(1-\delta)t_K - \alpha P_C^*[\delta\pi + (1-\delta)x_K\pi]$$

Let $\sigma = \alpha P_C^*/P_A^*$ be the share of components production in the final cost of a finished vehicle. Then:

$$N = P_A\ (1/(1+\phi))\ [\phi - \sigma\{(1-\delta)tK + (1-\delta)x_K\pi + \delta\pi\}].$$

Let V^* $(=(1-\sigma)\ P_A^*)$ be value-added per unit under free trade, ϵ_{SA} be the elasticity of the supply of vehicle assembly with respect to value added, and note that $(Q_A-Q_A^*) = \epsilon_{SA}(Q_A/V)N$. Then,

$$\text{Area fgq} = 1/2\ N(Q_A-Q_A^*) = 1/2\ N^2\ \epsilon_{SA}\ (Q_A/P_A^*)$$

$$= 1/2\ N^2 \epsilon_{SA}\ Q_A\ (1+\phi)/P_A \qquad (8)$$

The gain to the assembly industry, area nfqd, can be calculated as area nfgd less area fgq, or:

$$\text{Area nfqd} = Q_A\ N - 1/2\ N^2\ \epsilon_{SA}\ Q_A(1+\phi)/P_A \qquad (9)$$

Let ϵ_{SC} be the elasticity of supply of components, and V_C be the value of domestic components production. The deadweight loss from excess production in the components industry is shown in Figure 1 as area jkm.

$$\text{Area jkm} = 1/2(P_C-P_C^*)(Q_C-Q_C^*)$$

$$= 1/2\pi P_C^*\epsilon_{SC}(Q_C/P_C)P_C\ \pi/(1+\pi)$$

$$= 1/2\ V_C\ \epsilon_{SC}\ (\pi/(1+\pi))^2 \qquad (10)$$

The transfer to the domestic components industry as a result of the protective regime is area ijml, which equals area ijkl less the deadweight loss:

$$\text{Area ijml} = (P_C-P_C^*)Q_C - 1/2\ V_C\ \epsilon_{SC}\ (\pi/(1+\pi))^2$$

$$= (\pi/(1+\pi))V_C - 1/2\ V_C\ \epsilon_{SC}(\pi/(1+\pi))^2 \qquad (11)$$

Equations 7 through 12 were used to calculate the estimated costs and transfers associated with the Philippines motor vehicle protective regime. Separate calculations were made for the Car Development Plan (CDP) and the Commercial Vehicle Development Plan (CVDP). The values of the variables and parameters used in the calculations are shown in Table 3. A detailed explanation of the sources of the data used can be found in Appendix B.

The impact of eliminating the domestic content and compensatory export requirements at current tariff rates can be assessed by calculating the transfers and costs that would result from a tariffs-only regime at current tariff levels, and comparing these with the transfers and costs of the current protective regime. The transfers and losses from the tariff, identified in

the text, can be quantified using procedures similar to those above for the current protective regime.

The consumer loss can be calculated as:

$$\text{area rscd} = P_A{*}t_A D_A^T + 1/2\ P_A{*}t_A(D_A{*}-D_A^T)$$

$$= P_A{*}t_A\ [Q_A+\eta_{DA}Q_A((\phi-t_A)/(1+\phi))]+1/2\ P_A{*}t_A\eta_{DA}Q_A t_A(1/(1+\phi))$$

$$= V_A(t_A/(1+\phi))\ [1+\eta_{DA}(\phi-t_A)/(1+\phi)] + 1/2\ V_A\ \eta_{DA}(t_A/(1+\phi))^2 \qquad (12)$$

Of this, the deadweight loss in consumption would be:

$$\text{area scg} = 1/2\ V_A\ \eta_{DA}(t_A/(1+\phi))^2 \qquad (13)$$

To calculate the transfers and costs associated with assembly operations under the tariff regime, denote distance uv as M, where

$$M = P_A{*}t_A-\alpha P_C{*}t_K = (P_A/(1+\phi))\ (t_A-\sigma t_K)$$

then area uvq $= 1/2\ M\ [Q_A^T-Q_A{*}]$

$$= 1/2\ P_A/(1+\phi)[t_A-\sigma t_K]\ \epsilon_{SA}\ Q_A\ (t_A-\sigma t_K)$$

$$= 1/2\ \epsilon_{SA}\ V_A\ [1/(1+\phi)](t_A-\sigma t_K)^2 \qquad (14)$$

The transfer to the assembly industry under the tariff-only regime would be area wuqd:

$$\text{area wuqd} = M\ Q_A^T - \text{area uvq}$$

$$= M\ [Q_A - \epsilon_{SA}\ Q_A/P_A{*}\ (N-M)] - \text{area uvq}$$

Given that $(N-M) = P_A(1/(1+\phi))(t_A-\sigma t_K)[\phi-\sigma(\pi\delta+(1-\delta)x_K\pi-\delta t_K)-t_A]$,

$$\text{area wuqd} = V_A(1/(1+\phi))(t_A-\sigma t_K)[1-\epsilon_{SA}\{\phi-\sigma(\pi\delta+(1-\delta)x_K\pi-\delta t_K)-t_A\}]$$

$$- 1/2\ \epsilon_{SA}\ V_A\ [1/(1+\phi)](t_A-\sigma t_K)^2 \qquad (15)$$

The transfer to the components producers, area xyml, and the deadweight efficiency loss from extra components production, yzm, can be calculated as:

$$\text{area yzm} = 1/2\ P_C{*}t_K[Q_C^T-Q_C{*}]$$

$$= 1/2\ \epsilon_{SC}\ V_C\ (t_K/(1+\pi))^2 \qquad (16)$$

and area xyml = area xyzl - area yzm

$$= P_C{*}t_K Q_C^T - 1/2\ \epsilon_{SC}\ V_C\ (t_K/(1+\pi))^2$$

$$= V_C(t_K/(1+\pi))(1+\epsilon_{SC}(t_K-\pi)/(1+\pi)) - 1/2\ \epsilon_{SC}\ V_C\ (t_K/(1+\pi))^2 \qquad (17)$$

The tariff revenue collected under the current protective regime, T_0 (from kit imports only), and under the tariff regime, T_1 (from imports of both kits and assembled vehicles), can also be estimated:

$$T_0 = \alpha P_C^*(1-\delta)t_K = \sigma(1-\delta)t_K\ P_A/(1+\phi)$$

$$T_1 = \text{area rscd} - \text{area scg} - \text{area uvq} - \text{area wuqd} - \alpha P_C^* t_k \tag{18}$$

$$= \text{area rscd} - \text{area scg} - \text{area uvq} - \text{area wuqd} - \sigma t_K P_A/(1+\phi) \tag{19}$$

APPENDIX B

Calculation of costs and transfers due to the motor vehicle protective regime in the Philippines requires information on prices, production, price differentials between domestic and world prices, tariff rates, and some information on costs. Not all of this information is readily available. This appendix explains the sources used, rationale for the specific values used when alternative estimates were available, and assumptions used when it was necessary to assume values for particular parameters. The year 1990 is chosen as the base year of comparison.

VARIABLE	EXPLANATION AND SOURCES USED
ϕ	Percentage by which domestic vehicle prices exceed world market prices for equivalent models. Sources: CVDP: The nominal rate of protection associated with QRs on trucks and buses is calculated at 52.7% in CRC, 1991, Table A (p. 139) In the absence of specific equivalent information for passenger vehicles, the same value was used for passenger vehicles.
π	Percentage by which domestic components prices exceed world market components prices under the protective regime. There is no data currently available on this measure. The regulations specify that domestic components will not exceed the landed cost of imported components by more than 15%. Presuming that the landed cost includes import duties paid, and given the tariff rates for passenger vehicle and commercial vehicle kits, this regulation would imply that domestic components cannot exceed imported components cost by more than 38.6 per cent for commercial vehicles or 49.5 per cent for passenger vehicles. For the purposes of the estimates in this paper, pending more accurate estimates π is set equal to these numbers.
t_A	Tariff on assembled vehicles. As of 1991, the tariff rates on assembled vehicles were: Passenger Cars 50 Jeeps 50 Trucks 30 Buses 20 Source: World Bank For commerical vehicles the figure used was 46, the weighted average across jeeps, trucks and buses, using 1990 sales (CRC, 1991, Table 3.6) as weights.
t_K	Tariff on kits. In 1990, the tariff rates on kit imports for motor vehicle assembly were: Passenger cars 30 (1991) Asian Utility Vehicles 20 Trucks 20 Buses 30

Sources: AUV, trucks, and buses: CRC, 1991, Table 4.10.
Passenger cars: World Bank
To aggregate to estimate average tariff on commercial vehicles, the weighted average tariff using 1990 production (CRC, 1991, Table 3.6) as weights. The resulting average tariff for commercial vehicles was 20.54.

δ Percentage of components that must be sourced locally.
CDP: In 1990 the Car Development Program required local content of 40%.
CVDP: The local content requirements for commercial vehicles varied by category as shown in Table 1. A weighted average of the local content requirements by category, weighted by 1990 production by category, was calculated using data on output by type of vehicle (CRC, 1991, Table 3.6). The resulting average δ was 41.5%.

x_K Compensatory export requirement for kits.
CDP: The compensatory export requirement for imports of kits to assemble passenger vehicles is 50%. The requirement that exports be automotive products is being phased in. In 1990, 40% of the compensatory exports had to be auto industry products. Thus the effective requirement for exports of auto industry products was 20%.
CVDP: The compensatory export requirement for imports of kits to assemble commercial vehicles is 25%. The phase-in of the requirement that exports be auto industry products reached 40% in 1990, which implies an effective compensatory export requirement of auto industry parts of 10%.

σ Ratio of components cost to final cost of vehicle.
For commercial vehicles,the value was set at 0.74, calculated as a weighted average (weighted by production) of the ratio for trucks (.743) and buses(.690). In the absence of specific information for passenger vehicles, the same value was used.
Sources:The figures for trucks and buses were calculated from data on CKD kits and local components as a percentage of ex-factory prices from CRC, 1991, p. 10.

V_A Value of Vehicle production.
Source: Board of Investments (1991) Annex B. Prices are unit values calculated from the value and quantity data.

Q_A Quantity of vehicles assembled.
Source: Board of Investments (1991) Annex B.

P_A Price of assembled vehicle.
Source: Average price of a vehicle as calculated from value and quantity data in Board of Investments (1991) Annex B.

V_C Value of components production.
2,452 million pesos under CDP and 1,047 million pesos under CVDP for 1990.
Estimated as the sum of purchases of local parts and components by assembly firms (1,596 million pesos under CDP and 697 million pesos under CVDP in 1990) (BOI, Annex B, Table 10) and portion of estimated compensatory exports (88 million dollars under CDP and 36 million dollars under CVDP in 1990 (BOI, Annex B, Table 6) made up of auto industry products (40% for both CDP and CVDP), converted at 1990 average exchange rate of 24.311 pesos/US$ (IMF,

International Financial Statistics) Does not include manufacture of replacement parts.

η_{DA} Elasticity of demand for assembled motor vehicles
Assumed equal to 1 for preliminary calculations

ϵ_{SA} Elasticity of supply of value-added in motor vehicle assembly
Assumed equal to 1 for preliminary calculations

ϵ_{SC} Elasticity of supply of components industry
Assumed equal to 1 for preliminary calculations

TABLE 1

LOCAL CONTENT REQUIREMENTS
(PERCENTAGE)

CAR DEVELOPMENT PROGRAM

1988	1989	1990
32.26	36.58	40.00

COMMERCIAL VEHICLE DEVELOPMENT PROGRAM

	1988	1989	1990
Category I	43.1	51.2	54.8
Category II	35.6	41.6	44.4
Category III	16.8	20.3	21.9
Category IV			
6001-9000 kgs	16.5	19.9	21.4
9001-12000 kgs	17.1	20.6	22.2
12001-15000 kgs	10.7	12.6	13.5
15001-18000 kgs	10.9	12.9	13.8

TABLE 2

COMPENSATORY EXPORT REQUIREMENTS

CAR DEVELOPMENT PROGRAM (CDP)	50%
COMMERCIAL VEHICLE DEVELOPMENT PROGRAM (CVDP)	25%

	Percentage Automotive Required	Implicit Requirement CDP	Implicit Requirement CVDP
1988	0	0	0
1989	20	10	5
1990	40	20	10
1991	60	30	15
1992	80	40	20
1993	100	50	25

TABLE 3

DATA USED IN CALCULATIONS OF IMPACT OF MOTOR VEHICLE PROTECTIVE REGIME

Variable	Units	AUTOMOBILES	COMMERCIAL VEHICLES
ϕ		0.527	0.527
π		0.495	0.386
t_A		0.50	0.46
t_K		0.30	0.205
x_K		0.20	0.10
δ		0.40	0.415
P_A	pesos	231,913	223,636
Q_A	units	34,431	22,076
V_A	millions of pesos	7,985	4,937
σ		0.740	0.740
V_C	millions of pesos	3,008	1,570

TABLE 4

MOTOR VEHICLE INDUSTRY PROTECTION IN THE PHILIPPINES

Gains and Losses from Protective Regime (1990)

(Millions of Pesos)

	AUTOMOBILES	COMMERCIAL VEHICLES	TOTAL
Consumer Loss (abcd)	3,231	1,997	5,228
Efficiency Loss (Consumption) (bcg)	476	294	770
Transfer to Assembly Industry (nfqd)	955	831	1,786
Efficiency Loss (Assembled Autos) (fgq)	108	148	256
Transfer to Components Industry (ijml)	831	376	1,207
Efficiency Loss (Components) (jkm)	165	60	225
Total Transfer to Producers (nfqd+ijml)	1,786	1,207	2,993
Total Efficiency Loss (bcg+fgq+jkm)	749	502	1,251
Tariff Revenue	0.020	0.013	
Consumer Cost per Unit Assembled (pesos)	93,840	90,506	
Efficiency Loss per Unit Assembled (pesos)	21,754	22,740	

TABLE 5

IMPACT OF PROTECTION AT PREVAILING TARIFF RATES ONLY (1990)

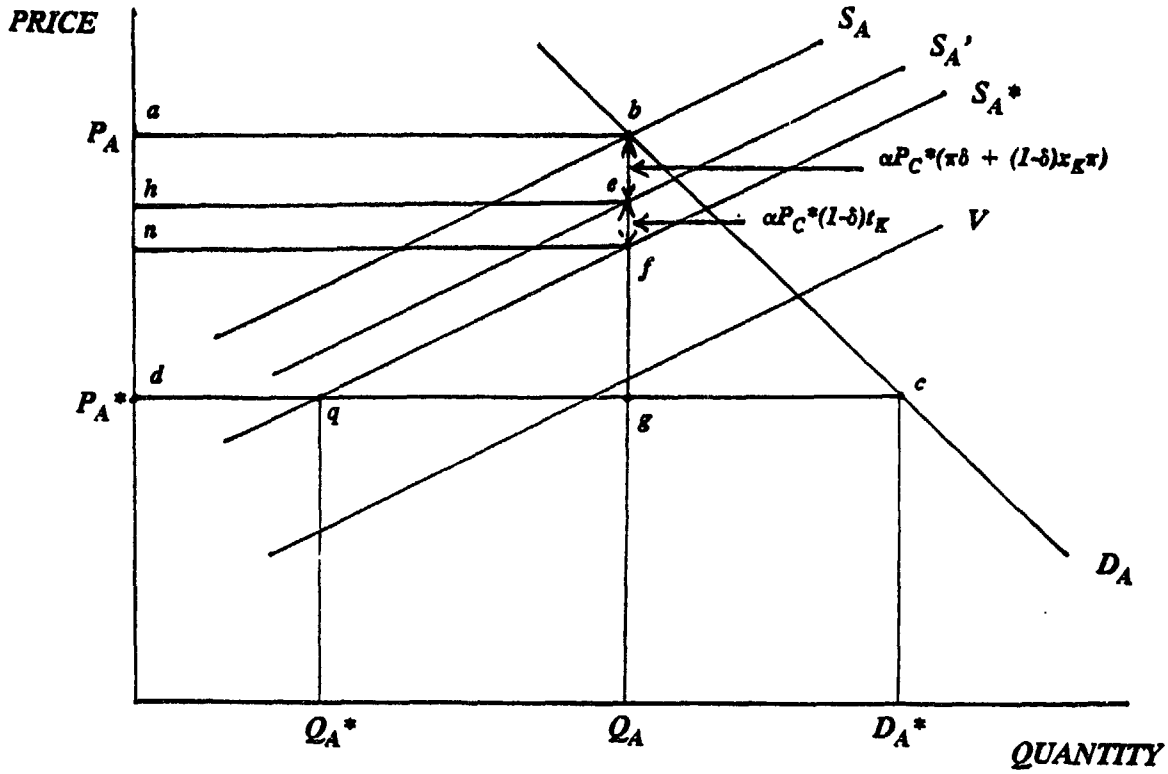
(Millions of Pesos)

	AUTOMOBILES	COMMERCIAL VEHICLES	TOTAL
Consumer Loss (rscd)	3,089	1,776	4,865
Efficiency Loss (Consumption) (scg)	428	224	652
Transfer to Assembly Industry (wuqd)	1,322	847	2,169
Efficiency Loss (Assembly) (uvq)	202	154	356
Transfer to Components Industry (xyml)	464	185	629
Efficiency Loss (Components) (yzm)	61	17	78
Total Transfer to Producers (wuqd+xyml)	1,787	1,032	2,819
Total Efficiency Loss (scg+uvq+yzm)	691	395	1,086
Tariff Revenue	1,136	552	1,688
Consumer Loss per Vehicle Assembled	87,027	74,560	
Efficiency Loss per Vehicle Assembled	20,069	10,147	

FIGURE 1

CURRENT PROTECTIVE REGIME

MARKET FOR ASSEMBLED VEHICLES



MARKET FOR COMPONENTS

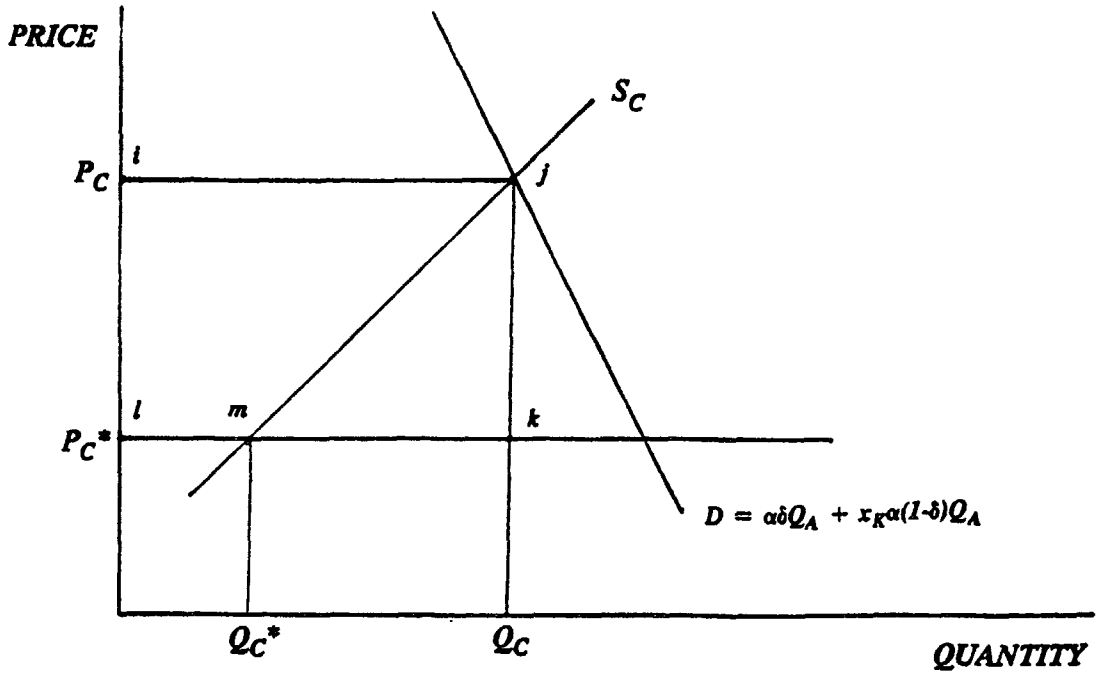
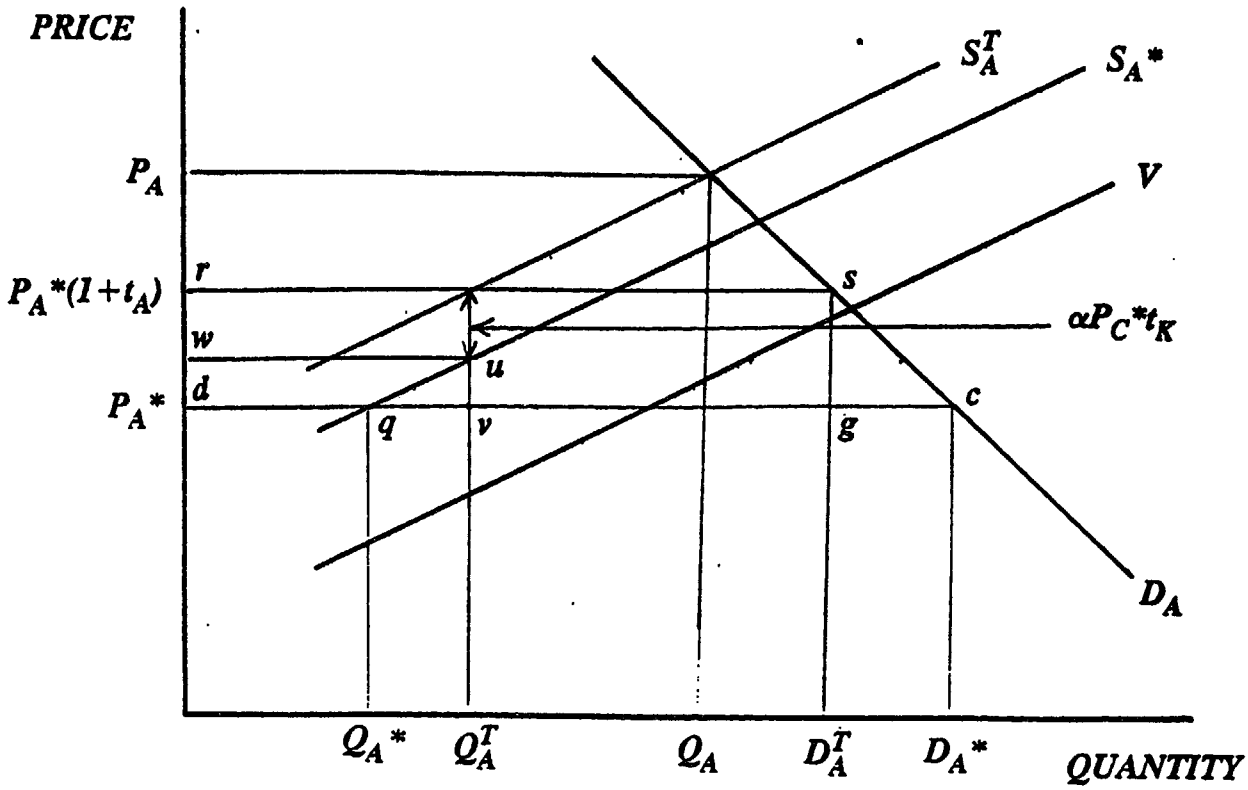


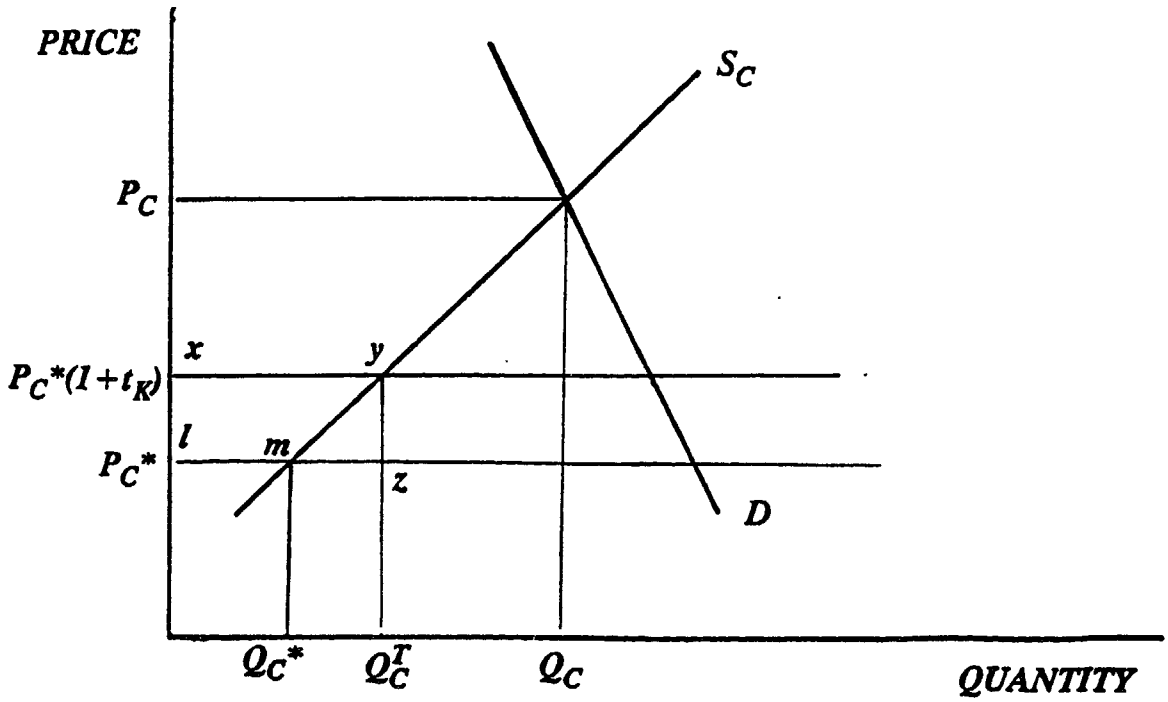
FIGURE 2

TARIFFS-ONLY PROTECTIVE REGIME

MARKET FOR ASSEMBLED VEHICLES



MARKET FOR COMPONENTS



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