Domestic Content and Compensatory Export Requirements: Protection of the Motor Vehicle Industry in the Philippines

Wendy E. Takacs

The motor vehicle industry in the Philippines is protected by a virtual embargo on the importation of new vehicles but operates under the burden of domestic content and compensatory export requirements that protect Philippine producers of automotive components. This article develops a model to assess the net impact of this complicated protective regime. Estimates indicate substantial benefits to the assembly and components industries and losses to vehicle purchasers. Reform of the system to eliminate the embargo as well as the domestic content and compensatory export restraints at current tariff rates would benefit vehicle purchasers but would increase the effective rate of protection to assembly operations by decreasing prices of components. Reform measures to eliminate the domestic content and compensatory export requirements should be accompanied by simultaneous reductions in tariffs on assembled vehicles.

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 as to the number of models produced and the amounts of imported, compared with domestic, components used. Also, firms assembling motor vehicles in the Philippines must export automobile industry products equal to given percentages of the value of imported kits.

Similar protective regimes have been used in several countries, especially in Latin America.\(^1\) The set of restrictions affects 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.


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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 on consumers and misallocate resources, encouraging high-cost domestic production.

This article develops a model to illustrate the economic impact and welfare cost of the import prohibition, local content requirements, and export requirements in the motor vehicle industry and then applies that model to Philippine data to generate rough estimates of the cost to the country of maintaining this type of protective regime. Section I outlines the protective regimes in the industry in the Philippines since 1949. Section II develops a model to illustrate the impact of the current protective regime. Section III uses that model to explain the transfers among groups, inefficiencies, and net welfare costs arising from the protection. Section IV applies the model to Philippine data. Section V investigates alternative liberalization scenarios. Section VI offers conclusions and policy recommendations.

I. THE PROTECTIVE REGIME FOR THE MOTOR VEHICLE INDUSTRY

The origins of the Philippine motor vehicle assembly industry can be traced back to 1949, when a shortage of foreign exchange led the government to impose foreign exchange controls. These 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 and a desire to promote the motor vehicle sector prompted the government to further regulate the industry in 1973 by continuing to prohibit the importation of completely built-up (CBU) vehicles and by imposing local content requirements. In 1984 the program was revised to add export requirements: firms assembling cars had to earn foreign exchange by exporting to partially compensate for the foreign exchange used to import kits.

Table 1. Local Content Requirements for Motor Vehicles Made in the Philippines, 1988–90

(percentage of total parts and components)

<table>
<thead>
<tr>
<th>Program and category</th>
<th>1988</th>
<th>1989</th>
<th>1990</th>
</tr>
</thead>
<tbody>
<tr>
<td>Car development program</td>
<td>32.26</td>
<td>36.58</td>
<td>40.00</td>
</tr>
<tr>
<td>Commercial vehicle development program (a)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Category I</td>
<td>43.1</td>
<td>51.2</td>
<td>54.8</td>
</tr>
<tr>
<td>Category II</td>
<td>35.6</td>
<td>41.6</td>
<td>44.4</td>
</tr>
<tr>
<td>Category III</td>
<td>16.8</td>
<td>20.3</td>
<td>21.9</td>
</tr>
<tr>
<td>Category IV</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>6,001–9,000 kilograms</td>
<td>16.5</td>
<td>19.9</td>
<td>21.4</td>
</tr>
<tr>
<td>9,001–12,000 kilograms</td>
<td>17.1</td>
<td>20.6</td>
<td>22.2</td>
</tr>
<tr>
<td>12,001–15,000 kilograms</td>
<td>10.7</td>
<td>12.6</td>
<td>13.5</td>
</tr>
<tr>
<td>15,001–18,000 kilograms</td>
<td>10.9</td>
<td>12.9</td>
<td>13.8</td>
</tr>
</tbody>
</table>

\(a\). Category I, all Asian utility vehicles up to 3,000 kilograms gross vehicle weight (GVW); category II, all light commercial vehicles up to 3,000 kilograms GVW; category III, all vehicles from 3,001 to 6,000 kilograms GVW; and category IV, all vehicles from 6,001 to 18,000 kilograms GVW.

Table 2. Compensatory Export Requirements of the Motor Vehicle Industry in the Philippines, 1988–93

<table>
<thead>
<tr>
<th>Year</th>
<th>Percentage of compensatory exports that must be automotive products</th>
<th>Implicit export requirements*</th>
<th>Commercial vehicles</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>Cars</td>
<td></td>
</tr>
<tr>
<td>1988</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>1989</td>
<td>20</td>
<td>10</td>
<td>5</td>
</tr>
<tr>
<td>1990</td>
<td>40</td>
<td>20</td>
<td>10</td>
</tr>
<tr>
<td>1991</td>
<td>60</td>
<td>30</td>
<td>15</td>
</tr>
<tr>
<td>1992</td>
<td>80</td>
<td>40</td>
<td>20</td>
</tr>
<tr>
<td>1993</td>
<td>100</td>
<td>50</td>
<td>25</td>
</tr>
</tbody>
</table>

*Note: The compensatory export requirement is the percentage of the value of imported kits that the firm is required to earn through exports. For the car development program, firms are required to earn foreign exchange from exports equal to 50 percent of the value of imported kits; for the commercial vehicle development program, the compensatory export requirement is 25 percent.

The administration that took power in 1986 adopted a new program the following year, patterned after the earlier protective regime. This program continued to ban imports of CBU vehicles competing with domestic production, increased the local content requirements year by year, and phased out the use of nonautomotive exports to meet export requirements. Table 1 lists the content requirements by type of vehicle under this new regime. Firms assembling cars are required to earn 50 percent of the foreign exchange needed to import kits, and firms assembling commercial vehicles must earn 25 percent of the foreign exchange needed to import kits. As shown in column 1 of table 2, credit for nonautomotive exports was gradually phased out, so that by 1993 only exports of automotive products qualified for the compensatory export requirements.

II. A MODEL OF THE PROTECTIVE REGIME IN THE MOTOR VEHICLE INDUSTRY

This section develops a model to assess the impact of the import prohibitions and domestic content and export requirements and the interactions among them. The model simplifies the situation by ignoring differentiation among types of components, the tradeoff 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 assumes that the domestic content requirements and all export requirements are binding (that is, more assembled vehicles would be imported if there were no embargo, less domestic content would be used by assembly firms if

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2. Increased use of local components over and above the prescribed percentages for local content is encouraged by an incentive scheme in which a firm receives additional foreign exchange credits equal to the foreign exchange equivalent of the value added of the local components.
there were no domestic content requirements, and exports of auto industry products would be less than the observed values without export requirements).  

The assumption of increasing costs and competitive markets in this model may appear unrealistic, given that the motor vehicle industry is frequently cited as an example of an industry with economies of scale and oligopolistic market structure. However, the automobile industries in developing countries are essentially assembly operations. The imported kits normally contain the components produced under economies of scale, such as stamped body parts and engines. Up-front design and engineering costs, which, spread over large volumes of output, contribute to economies of scale in production, are paid by the company abroad producing the kits. The assembly operations unpack the components from the kit and assemble them, incorporating local components produced using labor-intensive, low-technology processes in which economies of scale are less important. The domestic demand for replacement parts also helps component producers take advantage of the economies of scale that may exist. In addition, the assumption of competition in the motor vehicle assembly industry may be less unrealistic for the Philippines than for most developing countries. In the Philippines there are 8 car assembly firms and 26 commercial vehicle assemblers participating in the Motor Vehicle Development Program.  

If the country imposing the domestic content and compensatory export requirements is small, the world price, or import price, of assembled vehicles and of components can be taken as given. Assume there is only one type of finished or assembled vehicle, made by assembling a given number of components. Ignoring differences among components for the moment, 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 of the foreign exchange necessary to import the kits by exporting auto industry products. Equilibrium prices and

3. If no assembled vehicles would be imported even without the embargo, firms would use more domestic content than the minimum required if unconstrained, and profit-maximizing firms would export more automotive products than specified by the compensatory export requirements, then none of the constraints in the protective regime would be binding and the regime would have no effect.  

4. The relatively large number of official participants in the Motor Vehicle Development Program resulted from a liberalization of the program in 1990 to allow for the entry of new firms in the “people’s car” category. In 1990, the base year for the estimation, the new entrants had not yet begun to operate. The three assemblers of passenger cars had rapidly changing market shares: in 1989 the shares were 29, 33, and 38 percent; in 1991, they were 51, 24, and 24 percent (see Guy and Mayo 1991). Although the competitive model may be adequate for the Philippine market with the new entrants, work is now under way on the impact of domestic content and compensatory export requirements in a market with fewer firms and where economies of scale and strategic interactions among firms are important. This model will provide a richer analysis than, and interesting comparisons with, the results of the competitive model presented here.  

5. This approach is similar to the one used by Grossman (1981) in assuming that domestic and imported components are perfect substitutes. Mussa (1984) develops a model in which domestic and imported inputs are less than perfectly substitutable.
quantities in the market for assembled vehicles and in the market for components will be determined jointly because they are tied together not only by the normal input-output relations, but also by the domestic content and compulsory export requirements.

The Domestic Market for Assembled Vehicles

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

\[
Q_A^D = D(P_A), \quad D' \text{ negative.}
\]

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 that firms are willing to assemble increases as the value added per unit \( V \) increases, as in equation 2:

\[
V = V(Q_A), \quad V' \text{ positive}
\]

where \( Q_A \) is the quantity of finished vehicles produced.

Suppose that the assembly technology requires a certain number of components, \( \alpha \), per vehicle. Let \( \delta \) be the proportion of total components that must be of domestic origin. If 20 percent domestic content is required, then \( \delta = 0.2 \). Let \( x_K \) be the compensatory export requirement for kits, that is, the proportion of the value of the imported kit that must be compensated for by exports. Then \( \alpha(1 - \delta)P_c^e \), where \( P_c^e \) is the price of imported components, is the value of a kit at world market prices. Given the compensatory export requirements, the value of compensatory exports required to import each kit would be \( x_K \alpha(1 - \delta)P_c^e \). If components are bought (produced) at the domestic market price (cost) \( P_c \) but exported and sold at the world price \( P_c^e \), the cost to the firm of complying with the export requirements is \( (P_c - P_c^e)x_K \alpha(1 - \delta)Q_A \). The tariff on kits, \( t_K \), would increase the cost of kits to the domestic assembly industry by the tariff revenue that would have to be paid per kit, or \( \alpha(1 - \delta)P_c^e t_K \). The cost of domestic components would equal \( \alpha P_c \), where \( P_c \) is the domestic price of components. The assumption of a perfectly competitive assembly industry implies that in the long run unit cost equals price, so

6. This approach is similar to the one used by Corden (1971, chap. 3).

7. 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 free on board 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 price increases for domestic parts will not reduce the quantity of domestic parts required to fulfill the domestic content requirements.

8. The extra cost of complying with the export requirements was at times explicitly recognized by multinational firms. Bennet and Sharpe (1985: 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.
\[ P_A = \alpha(1 - \delta)P^*_C[1 + t_K + x_K(P_C - P^*_C)/P^*_C] + \alpha\delta P_C + V(Q^*_A). \]

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

\[ (3) \quad P_A = \alpha P_C(1 - \delta)(1 + t_K + x_K \pi) + \alpha P_C \delta (1 + \pi) + V(Q^*_A). \]

Equation 3 can be thought of as the long-run inverse supply curve for the assembly industry. 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 \( \alpha P_C^*(1 + \pi) \), 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 assembled vehicles is prohibited, then the interaction of the demand for, and 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:

\[ (4) \quad Q^*_D = Q^*_A. \]

Equations 1 to 4 determine \( P_A, Q^*_D, Q^*_A, \) and \( V \), given \( P_C, t_K, x_K, \alpha, \) and \( \delta \), and holding \( P_C \) constant.

The market for assembled autos is shown in figure 1. The demand curve for assembled vehicles is shown by \( D_A \). The supply curve of the domestic assembly

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**Figure 1. The Market for Assembled Vehicles under the Current Protective Regime**
operations is shown by $S_A$. As explained in more detail in section III, $S_A$ is the vertical sum of the supply curve under free trade, $S_A^*$, the increase in assembly industry costs per vehicle caused by 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)\pi K]\).

Given the domestic supply and demand conditions, the equilibrium price of vehicles 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 Domestic Market for Components***

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

$$P_C = S(Q_C), \quad S' \text{ positive}$$

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 ($\alpha Q_A$) and exports of components as compensatory exports for importing kits, $x_K \alpha (1 - \delta) (P_C^*/P_C) Q_A$. Thus the total demand for components can be expressed as

$$Q_C = x_K \alpha (1 - \delta) Q_A(P_C^*/P_C) + \alpha Q_A.$$

Equations 5 and 6 determine $P_C$ and $Q_C$, given $P_C^*$, $x_K$, $\alpha$, and $\delta$, and holding $Q_A$ constant.

The equilibrium in the market for components is shown in figure 2. The supply curve of the domestic components industry is shown by $S_C$ and the demand curve for components by $D_C$. 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 the domestic production of components would be $Q_C^*$. Both the domestic content and compensatory export requirements increase the demand for components produced within the country, driving up price and production.

Given the links between the markets for domestic components and assembled vehicles, equations 1 to 6 jointly determine the endogenous variables $P_A$, $Q_A^*$, $Q_A^*$, $V$, $P_C$, and $Q_C$, given the world market price of components $P_C^*$, the technical coefficient $\alpha$, and the policy parameters $t_K$, $x_K$, and $\delta$. The equilibrium prices and quantities in both markets would be determined simultaneously.

***III. Transfers among Groups and the Net Cost of the Protective 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, $\alpha P^*_C$. This supply curve is shown by $S^*_A$ in figure 1. At the free-trade price, $P^*_A$, the domestic industry would assemble $Q^*_A$ units, and consumers would purchase $D^*_A$ units; $D^*_A - Q^*_A$ 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, the domestic content requirements, and the 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 as a result of the tariff, $\alpha P^*_C(1 - \delta)x_k$ [ef in figure 1], and the upward shift caused by the domestic content and compensatory export requirements, $\alpha P^*_C(\delta \pi) + (1 - \delta)x_k \pi$ [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 restric-
tions is area abcd, the reduction in consumer surplus compared with what it would be under free trade. Of this, area bcg is the traditional deadweight loss in consumption from higher assembled auto prices.

The consumer loss abcd can be subdivided into transfers to the government, the assembly industry, and the components manufacturers and deadweight losses from inefficient production in the assembly and components industries. Area nfqd represents an increase in profits to domestic assembly operations from 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 $P_A^*$. Area hefn is a transfer to the government from tariff revenues on kits.

The compensatory export requirements for kits and the domestic content requirements shift up the assembly industry supply curve from $S_A$ to $S_A'$. At the resulting domestic level of assembly operations, $Q_A$, area abeh represents the extra cost of components to assemblers because 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. Area abeh in figure 1 equals area ijkl in figure 2. Area ijml represents a transfer to the domestic components manufacturers in the form of higher profits. Area jkm represents a deadweight loss—from the excess of domestic production costs 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. The net effect, ignoring transfers, is a consumption loss of bcg (in figure 1) and production deadweight losses of fgq (in figure 1) and jkm (in figure 2) in the assembly and components industries, respectively.

The various elements of the protective regime affect domestic assembly operations in different, and potentially contradictory, ways. Higher prices for finished vehicles encourage greater output from domestic assembly operations, whereas the domestic content and compensatory export requirements and the tariff on kits increase input costs and discourage domestic assembly activity. On balance, the effective rate of protection provided to domestic assembly operations could be either positive or negative, depending on the net impact of all the regulations.

9. Area abeh = $\alpha P_A^e [\pi \delta + (1 - \delta)\pi x_k] Q_A$
   = $\alpha P_A^e [\delta (P_C - P_E^k)/P_E^k] + (1 - \delta)\pi x_k (P_C - P_E^k)/P_E^k] Q_A$
   = $\alpha Q_A [\delta + (1 - \delta)\pi x_k] (P_C - P_E^k)$
   = ijkl.

10. The prohibition of imports provides a greater protective effect the greater the domestic demand for vehicles. During the Philippine economic downturn in the early 1980s (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.
### Table 3. Losses and Transfers Caused by the Protective Regime in the Motor Vehicle Industry in the Philippines, 1990

<table>
<thead>
<tr>
<th>Loss or transfer and area in figures</th>
<th>Cars</th>
<th></th>
<th>Commercial vehicles</th>
<th></th>
<th>Total</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Millions of pesos</td>
<td>Percentage of sales</td>
<td>Millions of pesos</td>
<td>Percentage of sales</td>
<td>Millions of pesos</td>
<td>Percentage of sales</td>
</tr>
<tr>
<td>Consumer loss, abcd</td>
<td>3,231</td>
<td>40</td>
<td>1,997</td>
<td>40</td>
<td>5,228</td>
<td>40</td>
</tr>
<tr>
<td>Efficiency loss (consumption), bcd</td>
<td>476</td>
<td>6</td>
<td>294</td>
<td>6</td>
<td>770</td>
<td>6</td>
</tr>
<tr>
<td>Transfer to assembly industry, nfq</td>
<td>955</td>
<td>12</td>
<td>831</td>
<td>17</td>
<td>1,786</td>
<td>14</td>
</tr>
<tr>
<td>Efficiency loss (assembled autos), fgq</td>
<td>108</td>
<td>1</td>
<td>148</td>
<td>3</td>
<td>256</td>
<td>2</td>
</tr>
<tr>
<td>Transfer to components industry, ijml</td>
<td>831</td>
<td>10</td>
<td>376</td>
<td>8</td>
<td>1,207</td>
<td>16</td>
</tr>
<tr>
<td>Efficiency loss (components), jkm</td>
<td>165</td>
<td>2</td>
<td>60</td>
<td>1</td>
<td>225</td>
<td>2</td>
</tr>
<tr>
<td>Total transfer to producers, nfq + ijml</td>
<td>1,786</td>
<td>22</td>
<td>1,207</td>
<td>24</td>
<td>2,993</td>
<td>23</td>
</tr>
<tr>
<td>Total efficiency loss, bcd + fgq + jkm</td>
<td>749</td>
<td>9</td>
<td>502</td>
<td>10</td>
<td>1,251</td>
<td>10</td>
</tr>
</tbody>
</table>

**Source:** Author's calculations.
Table 4. **Consumer and Efficiency Losses per Unit Assembled Caused by the Protective Regime, 1990**

<table>
<thead>
<tr>
<th>Loss</th>
<th>Cars</th>
<th>Commercial vehicles</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Pesos</td>
<td>Dollars</td>
</tr>
<tr>
<td>Consumer loss per unit assembled</td>
<td>93,840</td>
<td>3,860</td>
</tr>
<tr>
<td>Efficiency loss per unit assembled</td>
<td>21,754</td>
<td>895</td>
</tr>
</tbody>
</table>

*Source: Author's calculations.*

**IV. Application of the Model to the Philippines**

The magnitude of the areas in figures 1 and 2 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—the tariff on kits, the compensatory export requirement on kits, and the percentage of components that must be sourced locally—and observed or assumed values of other variables and parameters for the motor vehicle industry. The method used to quantify the magnitude of the losses and transfers is explained in appendix A. Separate calculations were made for the Car Development Program (CDP) and the Commercial Vehicle Development Program (CVDP). Appendix B explains the sources of the data and the values of the variables and parameters used in the calculations.

Tables 3 and 4 present the results of applying the model to the Philippine data. These estimates are rough approximations of the potential magnitudes of the costs, not exact estimates. To my knowledge, no estimate of the elasticity of demand for, or supply of, motor vehicles in the Philippines is available. A value of 1.0 was used for the elasticity of demand, consistent with estimates of the demand elasticity in the United States. The value of 1.0 for the elasticity of supply was used as a benchmark. Also, as explained in appendix B, the values of some parameters for cars had to be borrowed from the values for commercial vehicles for lack of data.

The estimated cost of the protective regime to purchasers of motor vehicles in 1990 was about 5.2 billion pesos ($215 million) a year. This loss amounts to approximately 40 percent of the value of vehicle sales in the Philippines and is roughly equivalent to $3,800 per vehicle assembled domestically. The assembly industry and the components industry benefited from the protective regime, gaining 1.8 billion pesos ($73 million) and 1.2 billion pesos ($50 million), respectively. The transfer to producers amounted to about 22 percent of sales.

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11. Estimates of the elasticity of demand for automobiles in the United States are available from a number of sources. Hess (1977) reports previously estimated demand elasticities by Chow (1960) of 0.6 and 1.0 and by Juster and Wachtel (1972) of 0.9 and 1.1. Hess's model yields a somewhat larger elasticity estimate of 1.63. Suits (1958) reported previous estimates by Roos and von Szepesi (1939) of 1.5 and by Atkinson (1950) of 1.3. Suits's own model yielded estimates of 0.59 and 0.55. Given this range of results, the value of 1.0 appeared a reasonable value for the elasticity of demand for motor vehicles in this study.

12. All dollar amounts are in current U.S. dollars. A billion is 1,000 million.
revenue, with somewhat larger gains for the assemblers than for manufacturers of components. The deadweight efficiency losses exceeded 1.2 billion pesos ($50 million), or about 22,000 pesos ($895) per vehicle. The total efficiency losses corresponded to about 10 percent of the value of sales.

V. ALTERNATIVE LIBERALIZATION SCENARIOS

The calculations in section IV 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. Eliminating all of the restrictions overnight might lead to adjustment problems, but these could 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. Care would need to be taken during the process of liberalization to avoid inadvertently increasing the degree of effective protection to the assembly industry by, for example, phasing out tariffs on kits, domestic content requirements, and compensatory export requirements faster than the tariff on finished vehicles. Doing so would temporarily increase the costs of protection and provide false signals to the domestic industry by temporarily further encouraging domestic assembly operations.
An alternative liberalization scenario would be to eliminate the quantitative restrictions in the current regime (the prohibition on imports of new assembled vehicles, and the domestic content and compensatory export requirements) but to maintain the existing tariff rates for assembled vehicles and kits.\textsuperscript{13} 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 a tariffs-only regime and comparing the results with those calculated in section IV for the entire existing protective regime.

Eliminating the embargo on imports of assembled vehicles would allow unlimited importation of vehicles at the current tariff rate. The price of vehicles to consumers would fall to the import price plus the tariff paid, or $P_A(1 + t_A)$, where $t_A$ is the ad valorem tariff on assembled vehicles. The market for assembled vehicles under the tariffs-only regime is illustrated in figure 3. At the tariff rate $t_A$, the domestic vehicle price would be $P_A(1 + t_A)$. $D$ vehicles would be sold, of which $Q_A^D$ would be assembled within the country and $(Q_A^D - Q_A^I)$ 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 $P_C(1 + t_K)$ (figure 4). Production of components would fall to $Q_C^T$. The lower components cost would reduce assembly industry costs and shift the supply curve down (from the equivalent of $S_A$ in figure 1) to $S_A^T$ (figure 3). $S_A^T$ lies above $S_A^*$ by the

\textsuperscript{13} Although it may seem odd to have a tariff on imports when imports are prohibited, there are some exceptions to the prohibition (such as imports by diplomats and occasional special exemptions for buses).
Table 5. Impact of Removing Domestic Content and Export Requirements at Prevailing Tariff Rates in the Motor Vehicle Industry in the Philippines, 1990

<table>
<thead>
<tr>
<th>Loss or transfer and area in figures</th>
<th>Cars</th>
<th></th>
<th>Commercial vehicles</th>
<th></th>
<th>Total</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Millions of pesos</td>
<td>Percentage change</td>
<td>Millions of pesos</td>
<td>Percentage change</td>
<td>Millions of pesos</td>
<td>Percentage change</td>
</tr>
<tr>
<td>Consumer loss, rscd</td>
<td>-142</td>
<td>-4</td>
<td>-221</td>
<td>-11</td>
<td>-363</td>
<td>-7</td>
</tr>
<tr>
<td>Efficiency loss (consumption), scg</td>
<td>-48</td>
<td>-10</td>
<td>-70</td>
<td>-23</td>
<td>-118</td>
<td>-15</td>
</tr>
<tr>
<td>Transfer to assembly industry, wuqd</td>
<td>+367</td>
<td>+38</td>
<td>-16</td>
<td>-2</td>
<td>+118</td>
<td>+21</td>
</tr>
<tr>
<td>Efficiency loss (assembly), uvq</td>
<td>+94</td>
<td>+87</td>
<td>+6</td>
<td>+4</td>
<td>+100</td>
<td>+39</td>
</tr>
<tr>
<td>Transfer to components industry, xyml</td>
<td>-367</td>
<td>-44</td>
<td>-191</td>
<td>-51</td>
<td>-578</td>
<td>-48</td>
</tr>
<tr>
<td>Efficiency loss (components), yzm</td>
<td>-104</td>
<td>-63</td>
<td>-43</td>
<td>-71</td>
<td>-147</td>
<td>-65</td>
</tr>
<tr>
<td>Total transfer to producers, wuqd + xyml</td>
<td>+1</td>
<td>0</td>
<td>-175</td>
<td>-14</td>
<td>-174</td>
<td>-6</td>
</tr>
<tr>
<td>Total efficiency loss, scg + uvq + yzm</td>
<td>-58</td>
<td>-8</td>
<td>-107</td>
<td>-21</td>
<td>-165</td>
<td>-13</td>
</tr>
<tr>
<td>Tariff revenue gain</td>
<td>1,136</td>
<td>n.a.</td>
<td>552</td>
<td>n.a.</td>
<td>1,688</td>
<td>n.a.</td>
</tr>
</tbody>
</table>

n.a. Not applicable.

Source: Author's calculations.
extra cost of components per vehicle caused by the tariff, $\alpha P_C^e t_K$. 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 $uvq$ (in figure 3). Area $wuqd$ represents extra profits in 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 $yzm$ (in figure 4), and the transfer to components manufacturers would be $xym$.

The changes in the transfers and costs of protection that would result from switching to a tariffs-only regime appear in tables 5 and 6. The method of calculating these figures is also explained in appendix A. Eliminating the domestic content and compensatory export requirements while maintaining current tariff rates would benefit purchasers of vehicles. The consumer loss would drop by 4 percent for cars and 11 percent for commercial vehicles. The decrease is not very dramatic, because the existing tariff rate is fairly high (50 percent on cars and an average 46 percent on commercial vehicles).

The switch to a tariffs-only regime at current rates would greatly benefit the assembly industry. The significant drop in the cost of components would increase the effective rate of protection to assembly operations, boost the transfers to the assembly firms by about 21 percent, and increase the efficiency losses from assembly operations by about 39 percent. In contrast, the transfers to the components industry would be cut almost in half, and the efficiency losses from domestic production of components would fall by 65 percent. 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 in the effective rate of protection to assembly operations.

VI. CONCLUSIONS AND POLICY RECOMMENDATIONS

The motor vehicle industry in the Philippines is protected by a complicated set of regulations consisting of a virtual prohibition on imports of assembled vehi-

<table>
<thead>
<tr>
<th>Loss</th>
<th>Percentage change from protective regime</th>
<th>Cars</th>
<th>Pesos</th>
<th>Percentage change from protective regime</th>
<th>Commercial vehicles</th>
<th>Pesos</th>
</tr>
</thead>
<tbody>
<tr>
<td>Consumer loss per unit assembled</td>
<td>-4,124</td>
<td>-4</td>
<td>-10,057</td>
<td>-11</td>
<td>-1,685</td>
<td>-8</td>
</tr>
<tr>
<td>Efficiency loss per unit assembled</td>
<td>-1,685</td>
<td>-8</td>
<td>-4,847</td>
<td>-21</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Source: Author’s calculations.
cles, tariffs on imported components and assembled vehicles, domestic content requirements, and compensatory export requirements. This protective regime keeps vehicle prices high, maintains high-cost domestic production of both vehicles and components, and transfers large sums to special interest groups.

Purchasers of motor vehicles are hurt by the high vehicle prices. Assembly operations are encouraged by these high prices but discouraged by higher input costs resulting from the tariff on imported components and from the domestic content and compensatory export requirements. On balance, the entire protective regime could result in either a positive or negative effective rate of protection to vehicle assemblers. Evidence indicates that the 1990 Philippine protective regime provided a positive effective rate of protection.

Domestic producers of components are unambiguously helped by all of the elements of the protective regime. The tariff on kits protects them 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 importing kits increase 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 increase the demand for components produced within the country and drive up both price and output in the market for domestic components.

Estimates indicate that the protective regime imposes substantial costs on consumers and encourages the allocation of resources to relatively high-cost activities. Eliminating the domestic content and compensatory export requirements at 1991 tariff rates would benefit consumers but would boost the effective rate of protection to assembly operations because of the substantial decrease in the cost of components. To avoid increasing the effective rate of protection to assembly operations during the liberalization, elimination of the domestic content and compensatory export requirements would need to be accompanied by decreases in the tariff rates on assembled vehicles.

**Appendix A. Quantifying the Welfare Losses and Transfers under the Protective Regime**

The magnitude of the areas in figures 1 and 2 that represent the transfers and losses resulting from the protective regime can be estimated for the Philippines based on the actual values of the policy parameters—the tariff on kits, the compensatory export requirement on kits, and the percentage of components that must be sourced locally—and observed values of other variables for the motor vehicle industry. The calculations of welfare losses and transfers are based on a model (as illustrated in figures 1 and 2) with linear demand and supply curves, with the assumed elasticities at the initial protected equilibrium.

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

$$\text{Area abcd} = (P_A - P_A^a)Q_A + \frac{1}{2} (P_A - P_A^a)(D_A^a - Q_A)$$

$$= \phi P_A Q_A + \frac{1}{2} \phi P_A (dQ_A/dP_A)(P_A/Q_A)(Q_A/P_A) P_A^a \phi$$

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

$$= [\phi/(1 + \phi)] V_A [1 + \frac{1}{2} \eta_{DA}[\phi/(1 + \phi)]]$$

(A-1)

where $V_A$ is the value of domestic output of motor vehicles. The deadweight loss in consumption, area bcg, would be

$$\text{Area bcg} = \frac{1}{2} (P_A - P_A^a)(D_A^a - Q_A)$$

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

$$= \frac{1}{2} [\phi/(1 + \phi)]^2 V_A \eta_{DA} \phi.$$

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 $N$:

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

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

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

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

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

(A-2)

$$= \frac{1}{2} N^2 \epsilon_{SA} Q_A(1 + \phi)/P_A.$$
The gain to the assembly industry, area nfqd, can be calculated as area nfqd less area fgq, or

\[(A-3)\] Area nfqd = \(Q_A N - \frac{1}{2} N^2 \epsilon_{SA} Q_A (1 + \phi)/P_A\).

Let \(\epsilon_{SC}\) be the elasticity of supply of components and \(V_C\) be the value of domestic production of components. The deadweight loss from excess production in the components industry is shown in figure 2 as area jkm:

\[(A-4)\] Area jkm = \(\frac{1}{2} (P_C - P_C^e)(Q_C - Q_C^e)\)  
\[= \frac{1}{2} \pi P_C \epsilon_{SC} (Q_C/P_C) P_C \pi/(1 + \pi)\)  
\[= \frac{1}{2} V_C \epsilon_{SC} [\pi/(1 + \pi)]^2.\)

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:

\[(A-5)\] Area ijml = \((P_C - P_C^e)Q_C - \frac{1}{2} V_C \epsilon_{SC} [\pi/(1 + \pi)]^2\)  
\[= [\pi/(1 + \pi)] V_C - \frac{1}{2} V_C \epsilon_{SC} [\pi/(1 + \pi)]^2.\)

Equations A-1 through A-5 were used to calculate the estimated costs and transfers associated with the protective regime for motor vehicles in the Philippines. Separate calculations were made for the CDP and the CVDP. The values of the variables and parameters used in the calculations are shown in table A-1. 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 can be quantified using procedures similar to those above for the current protective regime.

Referring to figure 3, the consumer loss can be calculated as

\[(A-6)\] Area rscd = \(P_C t_A D_A^e + \frac{1}{2} P_C t_A (D_A^e - D_A^*)\)  
\[= P_C t_A [Q_A + \eta_{DA} Q_A ([\phi - t_A]/(1 + \phi)) + \frac{1}{2} P_C 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)] + \frac{1}{2} V_A \eta_{DA} [t_A/(1 + \phi)]^2.\)

Of this, the deadweight loss in consumption would be
Table A-1. Values of Variables Used to Calculate the Impact of the Protective Regime for Motor Vehicles in the Philippines

<table>
<thead>
<tr>
<th>Variable</th>
<th>Cars</th>
<th>Commercial vehicles</th>
</tr>
</thead>
<tbody>
<tr>
<td>Percentage by which domestic vehicle prices exceed world market prices, $\phi$</td>
<td>0.527</td>
<td>0.527</td>
</tr>
<tr>
<td>Percentage by which domestic components prices exceed world market prices, $\pi$</td>
<td>0.495</td>
<td>0.386</td>
</tr>
<tr>
<td>Tariff on assembled vehicles, $t_A$</td>
<td>0.50</td>
<td>0.46</td>
</tr>
<tr>
<td>Tariff on kits, $t_K$</td>
<td>0.30</td>
<td>0.205</td>
</tr>
<tr>
<td>Percentage of components that must be sourced locally, $\delta$</td>
<td>0.40</td>
<td>0.415</td>
</tr>
<tr>
<td>Compensatory export requirement for kits, $x_K$</td>
<td>0.20</td>
<td>0.10</td>
</tr>
<tr>
<td>Ratio of components cost to final cost of vehicle, $\sigma$</td>
<td>0.740</td>
<td>0.740</td>
</tr>
<tr>
<td>Value of vehicle production (millions of pesos), $V_A$</td>
<td>7,985</td>
<td>4,937</td>
</tr>
<tr>
<td>Quantity of vehicles assembled (units), $Q_A$</td>
<td>34,431</td>
<td>22,076</td>
</tr>
<tr>
<td>Price of assembled vehicle (pesos), $P_A$</td>
<td>231,913</td>
<td>223,636</td>
</tr>
<tr>
<td>Value of components production (millions of pesos), $V_C$</td>
<td>3,008</td>
<td>1,570</td>
</tr>
</tbody>
</table>

\[(A-7)\]

\[
\text{Area scg} = \frac{1}{2} V_A \eta_{SA} [t_A/(1 + \phi)]^2.
\]

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

\[
M = P_A t_A - \alpha P_A t_K = [P_A/(1 + \phi)](t_A - \sigma t_K).
\]

Then area $uvq = \frac{1}{2} M (Q_A - Q_K)$

\[
= \frac{1}{2} [P_A/(1 + \phi)](t_A - \sigma t_K) \epsilon_A Q_A (t_A - \sigma t_K)
\]

\[(A-8)\]

\[
= \frac{1}{2} \epsilon_A V_A [1/(1 + \phi)](t_A - \sigma t_K)^2.
\]

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

\[
\text{Area wuqd} = M Q_K^A - \text{Area uvq}
= M [Q_A - \alpha Q_A/P_A (N - M)] - \text{Area uvq}.
\]

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

\[(A-9)\]

\[
\text{Area wuqd} = V_A [1/(1 + \phi)](t_A - \sigma t_K)
(1 - \epsilon_A \phi - \sigma [\pi \delta + (1 - \delta)x_K \pi - \delta t_K] - t_A)]
= \frac{1}{2} \epsilon_A V_A [1/(1 + \phi)](t_A - \sigma t_K)^2.
\]

The transfer to the components producers, area $xyml$ in figure 4, and the deadweight efficiency loss from extra components production, $yzm$, can be calculated as
Area \( yzm = \frac{1}{2} P_c^* t_K (Q^C - Q^E) \)
\[ (A-10) \]
\[ = \frac{1}{2} \epsilon_{SC} V_C [t_K/(1 + \pi)]^2. \]

And Area \( xyml = Area \ xyzl - Area \ yzm \)
\[ = P_c^* t_K Q^C - \frac{1}{2} \epsilon_{SC} V_C [t_K/(1 + \pi)]^2 \]
\[ (A-11) \]
\[ = V_C [t_K/(1 + \pi)][1 + \epsilon_{SC}(t_K - \pi)/(1 + \pi)] \]
\[ - \frac{1}{2} \epsilon_{SC} V_C (t_K/(1 + \pi))^2. \]

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 (referring to areas in figure 3):
\[ T_0 = \alpha P_c^* (1 - \delta) t_K = \sigma (1 - \delta) t_K P_A /(1 + \phi) \]
\[ (A-12) \]
\[ T_1 = Area \ rscd - Area \ scg - Area \ uvq - Area \ wuqd - \alpha P_c^* t_K \]
\[ (A-13) \]
\[ = Area \ rscd - Area \ scg - Area \ uvq - Area \ wuqd - \sigma_{sc} t_K P_A /(1 + \phi). \]

**Appendix B. Values of the Variables and Parameters and Data Sources**

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

Table A-1 lists the values of variables used to calculate the impact of the protective regime for motor vehicles. The rest of the appendix explains each variable and provides information on the sources for the data.

- \( \phi \): The percentage by which domestic vehicle prices exceed world market prices for equivalent models. The nominal rate of protection associated with quota restrictions on trucks and buses is calculated at 52.7 percent by the Center for Research and Communication (1991: 139, tab. A). Without specific equivalent information for passenger vehicles, the same value was used for passenger vehicles.

- \( \pi \): The percentage by which domestic components prices exceed world market components prices under the protective regime. There are 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 percent. Presuming that the landed cost includes import duties paid and given the tariff rates for kits for passenger vehicles and commercial vehicles, this regulation would imply that the cost of domestic components cannot exceed the cost of imported components by more than 38.6 percent for commercial vehicles or 49.5 percent for passenger vehicles. For the purposes of the estimates in this article, pending more accurate estimates, \( \pi \) 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; and buses, 20 (World Bank data). For commercial vehicles the figure used was 46, the weighted average across jeeps, trucks, and buses, using 1990 sales (Center for Research and Communication 1991, tab. 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; and buses, 30 (for trucks, buses, and Asian utility vehicles, Center for Research and Communication 1991, tab. 4.10; for passenger cars, World Bank data). Production values from 1990 (Center for Research and Communication 1991, tab. 3.6) were used as weights in the aggregation to estimate the weighted average tariff on commercial vehicles. The resulting average tariff for commercial vehicles was 20.54.

\( \delta \) The percentage of components that must be sourced locally. In 1990 the CDP required local content of 40 percent. 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 (Center for Research and Communication 1991, tab. 3.6). The resulting average \( \delta \) was 41.5 percent.

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

\( \sigma \) Ratio of the cost of components to the final cost of a vehicle. For commercial vehicles, the value was set at 0.74, calculated as a weighted average (weighted by production) of the ratio for trucks (0.743) and buses (0.690). In the absence of specific information for passenger vehicles, the same value was used. The figures for trucks and buses...
were calculated from data on CKD kits and local components as a percentage of ex-factory prices from the Center for Research and Communication (1991: 10).

\( V_A \) Value of the production of vehicles. From the Board of Investments (1991, ann. B), prices are unit values calculated from the value and quantity data.

\( Q_A \) Quantity of vehicles assembled. Data are from the Board of Investments (1991, ann. B).

\( P_A \) Price of an assembled vehicle. Data are the for the average price of a vehicle as calculated from value and quantity data in Board of Investments (1991, ann. B).

\( V_C \) Value of the production of components. The value of the production of components is 2,452 million pesos under the CDP and 1,047 million pesos under the CVDP for 1990. These values were estimated as the sum of the purchases of local parts and components by assembly firms—1,596 million pesos under the CDP and 697 million pesos under the CVDP in 1990 (Board of Investments 1991, ann. B, table 10)—and the portion of estimated compensatory exports—88 million dollars under the CDP and 36 million dollars under the CVDP in 1990 (Board of Investments 1991, ann. B, table 6)—made up of auto industry products (40 percent for both the CDP and the CVDP), converted at the 1990 average exchange rate of 24.311 pesos to one U.S. dollar (International Monetary Fund 1993). The value of components production does not include the manufacture of replacement parts.

\( \eta_{DA} \) Elasticity of demand for assembled motor vehicles. The elasticity is assumed to be equal to 1.

\( \epsilon_{SA} \) Elasticity of supply of value added in motor vehicle assembly. The elasticity is assumed to be equal to 1.

\( \epsilon_{SC} \) Elasticity of supply of components industry. The elasticity is assumed to be equal to 1.

References

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