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# 2 Voluntary Export Restraint in U.S. Autos, 1980–81: Quality, Employment, and Welfare Effects

Robert C. Feenstra

## 2.1 Introduction

On 1 May 1981 the Japanese agreed to limit their exports of automobiles to the U.S. market. Since the voluntary export restraint (VER) applies to the *number* of autos exported to the U.S. (and not their total value), we expect that Japanese auto producers will shift the composition of exports toward higher priced, higher quality cars (Gomez-Ibanez et al. 1983). In this way they are able to maintain the maximum profit per unit sold, while staying within the quantity restraint. Such a response to quota restrictions can be obtained from simple theoretical models (see section 2.4) and has been observed within the textile and shoe industries (Baldwin 1982).

This quality shift has important implications for the employment and welfare effects of the VER. It is reasonable to assume that consumers demand the *services* of automobiles, where services are measured by automobile size, horsepower, comfort, and so forth. For a single car, the services provided are a measure of quality. Then a change in the price of Japanese automobile services will lead to a welfare loss for consumers and a substitution toward American models. For example, if due to the VER the average price of Japanese auto imports rises by 10 percent, but in addition the average quality of imports improves by 7 percent, then we would conclude that the price of services obtained from these imports has increased by only $10 - 7 = 3$ percent. This 3 percent effective price rise would determine the consumer welfare loss and the extent of substitution

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away from Japanese models. Clearly, from this example, only looking at the change in purchase price, with no adjustment for quality, can be quite misleading in assessing the impact of the VER. A precise empirical measure of automobile quality is thus essential to our study.

After reviewing background data on the U.S. auto industry in section 2.2, a preliminary inspection of the VER is given in section 2.3. The number of imported Japanese autos met the restriction, and a substantial price increase—quite unprecedented by recent historical standards—occurred following the export restraint. In section 2.4 we review relevant theory concerning import restrictions and quality shifts. By focusing on the aggregate price of services obtained from Japanese imports, our analysis goes beyond the traditional framework which relates consumer welfare to the purchase price, unadjusted for quality. However, like the traditional framework, we relate consumer welfare to the *aggregate* import price. Thus, we do not attempt to measure the consumer loss or gain from a shifting composition of import models within an aggregate level of services. Such an exercise would be beyond the scope of the present study.

To measure the quality shift in imports, we have collected data on retail price and characteristics (e.g., length, horsepower, etc.) of twenty-two Japanese models for 1980, 1981, and 1982. The quality of automobiles is measured as the predicted price from hedonic regressions in which model prices are regressed on characteristics (see Griliches 1971). The quality-adjusted or service prices, which determine consumer demand and welfare, are measured by the residuals from the hedonic regressions. Using this method, in section 2.5 we identify three Japanese models which experienced substantial retail price, quantity, and quality increases following the VER with reductions in quality-adjusted price: Toyota Cressida, Toyota Celica Supra, and Datsun 810 Maxima.

In section 2.6 we apply hedonic regressions to eleven small and thirty-three large U.S. models for 1980 and 1981. Among the U.S. small cars, there is very little quality change and lower price rises than for other U.S. models. By comparing the results for Japanese imports and U.S. small cars, we conclude that about *two-thirds of the import price rise following the VER is due to quality improvement, with the remaining one-third a de facto price increase*. This is a major conclusion of our study.

In section 2.7 we apply the results of earlier sections to estimate the U.S employment and welfare effects of the VER. Since a major part of the import price rise is explained by quality improvement, the employment and welfare effects are both quite small. We estimate that between 1980 and 1981 the welfare loss was approximately 3 percent of revenue spent on Japanese imports. In the first year of the VER, unemployment in U.S. autos was reduced by 5 percent or less of existing layoffs, with the exact magnitude depending on the import elasticity of demand.

## 2.2 Recent Experience in U.S. Autos

On 1 May 1981 the Japanese government announced a three-year system of "voluntary export restraints" (VER) on the export of automobiles to the U.S. market. For the period from April 1981 to March 1982 these exports would not exceed 1.68 million units, while for the second year (April 1982 to March 1983) the export ceiling would be raised by 16.5 percent of the growth in the U.S. market. At the end of the second year, a decision about whether to extend the export restraint for a third year would be made. Later the Japanese government announced that the exports of certain "utility" vehicles (e.g., the Subaru Brat, Toyota Land Cruiser and Van) would be limited to 82,500 units over the initial year, and exports to Puerto Rico would not exceed 70,000. Thus, total Japanese exports for all these vehicles in the initial year would not exceed 1,832,500 units. On 29 March 1982 it was announced that the system of VER in place during the first year of the agreement would be extended without change to the second year (presumably because of the lack of growth in the U.S. market). The export limits are administered by the Japanese Ministry of International Trade and Industry (MITI), which allocates fixed proportions of the total export quantity to the Japanese producers; this method of restricting exports does not violate U.S. antitrust law.

These actions were made against a background of falling production and high unemployment in U.S. autos, along with several legislative attempts to curb imports. For example, on 5 February 1981 Senators Danforth and Bentsen introduced a bill (S.396) to impose quotas on the import of automobiles from Japan of 1.6 million units during 1981, 1982, and 1983. Indeed, this bill was scheduled for markup (line-by-line revision) in the Senate Finance Committee on May 12 and no doubt contributed to the specific action announced by the Japanese on May 1. Other outstanding bills include more stringent import quotas and domestic content requirements which specify the minimum content of American-made parts for autos sold in the United States.

An earlier legislative action was the petition for import relief made by the UAW in June 1980 to the U.S. International Trade Commission (ITC). In August 1980 the Commission received a petition for similar import relief from the Ford Motor Company. Under this legislation a recommendation for relief can be given only if the "increased imports of an article are a substantial cause of serious injury, or threat thereof, to the domestic industry." The statute defines the term "substantial cause" as "a cause which is important and not less than any other cause." The ITC determined that, while imports of autos into the United States had increased and the domestic industry was in fact injured, the recession in the United States was a greater cause of injury than the increased im-

ports. Accordingly, import relief was not given. The shift in consumer preferences toward small, fuel-efficient autos (due in part to rising gasoline prices) was also found to be an important cause of injury, but less important than the recessionary conditions.

Recent data on imports of passenger autos (including the "utility" vehicles referred to above) are reported in table 2.1. In the first row, first column it can be seen that actual Japanese imports for April 1981 to March 1982 essentially met the limit of 1,832,500 units. This represents a fall in quantity of 9 percent from the previous year and can be contrasted with an average annual rise of 14 percent in imports over 1978–80. Comparing the April 1981 to March 1982 imports with those of the previous year, and noting that imports had been rising, we certainly expect that the VER restricted imports by *at least* 180 thousand units. The actual extent of restrictions may be significantly higher and will be estimated in section 2.7.

Data on U.S. factory sales, consumption, and import market shares (ratios of imports to consumption) are also shown in table 2.1. Note that consumption fell continually over the years with a larger fall from 1979 to 1980, whereas import market shares show an abrupt rise in 1979–80 but only small changes in other periods. The rising import market share over 1979–80 is largely attributable to Japanese imports. Despite this larger share, the ITC found that the decline in U.S. consumption over the same period was a more important cause of injury to the domestic industry.[1] As factory sales have been reduced, employment has decreased at a slightly slower rate, resulting in a fall in the average product of labor shown in table 2.1 (eighth row). Along with the reduction in sales, of course, profits of the auto manufacturers have been cut dramatically.

## 2.3 Effect of the VER

To determine the employment effect of the VER during its first year of operation, an initial calculation could proceed as follows. Suppose that for each unit of import reduced by the VER, U.S. production rises by one unit. (We shall argue below that this assumption is false, however, due to imperfect substitution and quality change in imports.) Then if the VER reduced Japanese imports by at least 180 thousand units, as discussed above, this could lead to a rise in U.S. employment of at least 180/9.5 = 19 thousand workers, where we have used a middle value (9.5) of the average product of labor appearing in table 2.1. The increased employment of 19,000 can be compared with indefinite layoffs in the auto industry approaching 200,000 in late 1981 (see U.S. Department of Transportation 1982). Thus, the VER could affect at least one-tenth of the unemployment in autos during its first year. Of course, additional jobs would also be created in the rest of the economy.[2]

However, the employment impact of the VER may have been less than this estimate due to a shift of Japanese exports toward higher valued cars. Thus, at the bottom of table 2.1 we show the total value of Japanese imports and the average value (or price) obtained as the ratio of value to quantity. Over the period 1978–80 the average price of Japanese auto imports rose at an average rate of 6 percent, below the general rate of inflation. However, in the first year of the VER the price jumped by 17.4 percent as compared with the previous year. Annual inflation over the April 1980 to March 1982 period (as measured by the consumer price index) was 9.6 percent, which leaves a real increase of $17.4 - 9.6 = 7.8$ percent in import prices. Alternatively, we can compare the rise in prices from April 1980 to March 1982 with earlier years and obtain an unexpected increase of $17.4 - 6 = 11.4$ percent in import prices. In any case, it is clear from the data that the rise in average value during the initial year of the VER was quite unprecedented by recent historical standards and can be assumed to be a direct result of the export restraint. The average price of U.S. autos for some periods are shown for comparison; more recent figures will be computed in section 2.6.

The rise in average import prices may be achieved by (a) a simple rise in prices reflecting scarcity in the market; (b) a shift of Japanese exporters toward higher priced existing models which are larger, heavier, have greater horsepower, and so forth; (c) the introduction of new, or modified, models which are also larger, heavier, and the like. We shall refer to the specific features of a model such as weight and horsepower as "characteristics" and the bundle of characteristics embodied in a particular car as the "quality." With this terminology, the rise in average import price following the VER may be decomposed into a rise in quality (either within or across models) and a residual change in the price after adjusting for quality.

To evaluate the effect of the VER on consumer welfare, we shall have to measure the extent of quality change in Japanese imports. This shall be done in section 2.5 using hedonic regressions. In the following section we briefly review relevant theory concerning quality shifts in response to quota restrictions.

## 2.4 Theory of Import Restrictions and Quality Shifts

The theoretical impact of tariffs and quotas on import quality has been examined in Falvey (1979), Rodriguez (1979), and Santoni and Van Cott (1980). Falvey analyzes the case of fixed quality for each imported good but a shifting composition of imports. His analysis can be briefly summarized as follows.

Consider two import goods with unit costs $c_1$ and $c_2$, where $c_1 > c_2$ so that good 1 is the higher cost, higher quality item. In the absence of trade

**Table 2.1** **New Passenger Automobiles**

| | April 1981 to March 1982 | April 1980 to March 1981 | 1980 | 1979 | 1978 |
|---|---|---|---|---|---|
| | Quantity (thousands of units; thousands of employees) | | | | |
| Japanese imports | 1,833.3 | 2,012 | 1,992 | 1,617 | 1,563 |
| Total imports | 2,840 | 3,037 | 3,116 | 3,006 | 3,025 |
| U.S. factory sales | 5,602[a] | 6,220[b] | 6,400 | 8,419 | 9,165 |
| Apparent U.S. consumption | 7,962 | 8,684 | 8,904 | 10,643 | 11,505 |
| Ratio of Japanese imports to U.S. consump. (percent) | 23.0 | 23.2 | 22.4 | 15.2 | 13.6 |
| Ratio of total imports to U.S. consump. (percent) | 35.7 | 35.0 | 35.0 | 28.2 | 26.3 |
| Average employment[c] | 642 | 662 | 691 | 904 | 922 |
| Ratio of U.S. factory sales to employment | 8.7 | 9.4 | 9.3 | 9.3 | 9.9 |

| | Value (millions of dollars) and Average Price | | | | |
|---|---|---|---|---|---|
| Japanese imports | 9,421 | 8,804 | 8,229 | 6,471 | 5,771 |
| Ratio of Jap. import value to quantity | 5,139 | 4,376 | 4,131 | 4,002 | 3,692 |
| Ratio of U.S. production to quantity[d] | — | — | 6,097 | 6,014 | 5,829 |

SOURCES: Bureau of Labor Statistics, 1981, *Supplement to Employment and Earnings: Revised Establishment Data*, August and later issues; U.S. International Trade Commission, 1982, *The U.S. Automobile Industry: Monthly Report on Selected Economic Indicators*, Publication 1244, May, Washington, D.C., tables 1, 2, 4; U.S. International Trade Commission, 1981, *Automotive Trade Statistics, 1964–1980*, Publication 1203, December, Washington, D.C., tables 1, 2, 3; U.S. International Trade Commission, 1980, *Certain Motor Vehicles and Certain Chassis and Bodies Therefor*, Publication 1110, December, Washington, D.C., table 19.

[a]Domestic production, May 1981 to April 1982.

[b]Domestic production, May 1980 to April 1981.

[c]Employment in SIC 3711 (motor vehicles and car bodies) plus SIC 3714 (motor vehicle parts and accessories).

[d]Producer's shipments; 1980 figure is for January to June. Later data were not available.

restrictions and assuming competition (Falvey also considers the monopoly case), we have $p_1 = c_1 > p_2 = c_2$, where $p_i$ is the price of good $i$. In the presence of an ad valorem tariff of rate $t$, we could have $p_i' = (1 + t)c_i$, for $i = 1$ and 2, which implies $p_1'/p_2' = p_1/p_2$, so the relative price of the goods is unchanged. In this case we expect that the relative quantities imported are also unchanged. However, in the presence of a quota or VER on the *sum* of imports (over both goods), suppliers would ensure that the profits earned per unit imported are equalized in either good. That is, $p_1' - c_1 = p_2' - c_2$, where $p_i'$ are the postquota domestic prices. But an equal increase in the price of each good implies a lower *percentage* increase in the price of good 1, since $p_1 > p_2$ initially. In other words, $p_1'/p_2' < p_1/p_2$, so the relative price has *decreased* for the higher quality good. Correspondingly, we expect a larger relative quantity imported of this good.

Rodriguez, on the other hand, considers a single import good where competitive firms choose the optimal quality. He assumes that the import demand applies to the *services* the good provides, where services equal

$$S = xQ, \tag{1}$$

and $S$ = import demand for services; $Q$ = number of physical units imported; and $x$ = amount of services provided per physical unit, or the unit quality content.

Rodriguez demonstrates that an ad valorem tariff will not affect the quality level $x$ chosen by producers. However, in the presence of a binding quota or VER on imports, the quality content $x$ will be *increased*.

The welfare cost from the VER is shown in figure 2.1. $DD'$ is the import demand curve for services, $p$ denotes the price of services, and the free-trade equilibrium is at $E_0$. As demonstrated by Rodriguez, the export restraint will lead to a rise in the price of imported services, with a new equilibrium such as $E_1$. Since the *exporting* country receives the higher price and thus the quota rents, the loss to the importing country is given by the entire shaded region under the import demand curve. This loss is approximately measured by

$$L_S = (p_1 - p_0)S_1 + (1/2)(p_1 - p_0)(S_0 - S_1). \tag{2}$$

It is interesting to compare the appropriate measure of loss ($L_S$) with that obtained if the change in quality were not considered. That is, suppose we incorrectly measure the loss by the change in physical quantity imported and corresponding price. Since $x$ is the quality content of a physical unit, $px$ is the price per physical unit. Then the quantity measure of loss would be

$$\begin{aligned} L_Q = {} & (p_1x_1 - p_0x_0)Q_1 \\ & + 1/2(p_1x_1 - p_0x_0)(Q_0 - Q_1), \end{aligned} \tag{3}$$

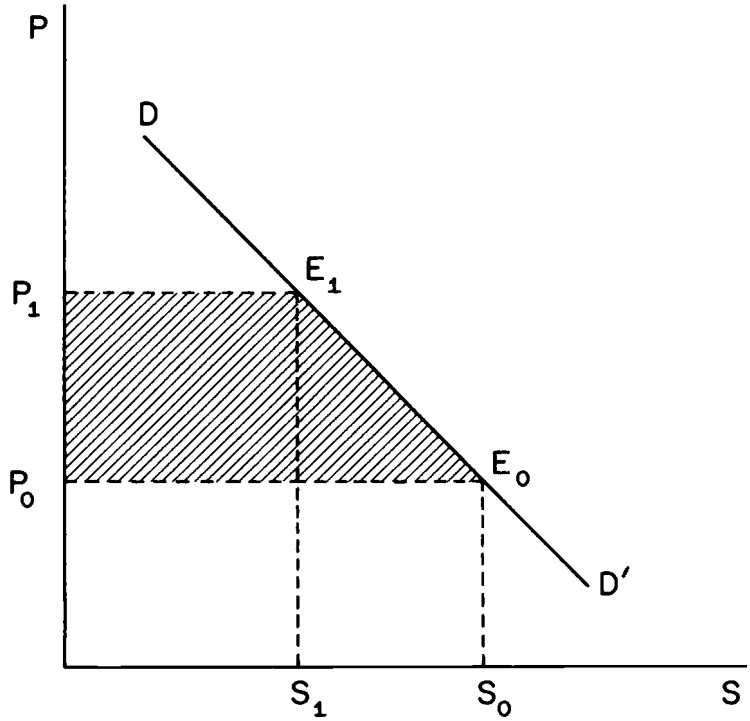


**Fig. 2.1** Effect of VER on services.

where the subscript 0 (or 1) refers to pre- (or post-) VER. It can be shown that

$$L_Q - L_S = (1/2)(x_1 - x_0)(p_0 Q_1 + p_1 Q_0). \tag{4}$$

With unit quality rising after the VER, $x_1 > x_0$, so the physical quantity measure of loss $L_Q$ *overstates* the actual loss $L_S$. Indeed, relative to the total income spent on importables, the extent of overstatement is approximately equal to the percentage increase in unit quality.

We have been implicitly assuming that the imported good is a perfect substitute for the domestic product. If instead they are *imperfect substitutes*, then the change in the imported services price from $p_0$ to $p_1$ will shift the entire domestic demand curve, and a new equilibrium domestic price would be obtained. Let us suppose that the import demand curve $DD'$ in figure 2.1 is drawn while *allowing* the domestic price to adjust to its new equilibrium levels. Then it can be argued (see Tarr 1980, pp. 11–15) that the shaded area in figure 2.1 is still an appropriate measure of welfare loss. This result is obtained essentially because the change in consumer

surplus in the domestic market is exactly offset by a change in producer surplus.

Finally, we should mention an important qualification to our measure of welfare loss ($L_S$). We shall estimate this welfare loss using the *aggregate* price of services from Japanese imports. By this method, we are ignoring any consumer gain or loss from a shifting composition of import models within the aggregate level of services. Measuring the welfare component would be beyond the scope of the present study but could be initiated using the recent theoretical models of monopolistic competition and trade (Helpman 1981, Krugman 1979, 1980, Lancaster 1980). Only recently, however, have these models been extended to incorporate import restrictions (Feenstra and Judd 1982, Lancaster 1982, Venables 1982). One result from these models is that only under very special assumptions will the market equilibrium lead to a socially optimal quantity and range of product varieties (see Feenstra and Judd 1982, sec. 1). It follows that the shift in the composition of import models induced by the VER, holding the aggregate level of services fixed, can raise or lower consumer welfare in general. Thus, by ignoring this welfare component we may be understating or overstating the actual welfare loss.

## 2.5 Model Data and Quality of Japanese Imports

To analyze more closely the impact of the VER, data on twenty-two Japanese models over the calendar years 1980, 1981, and 1982 were obtained fom the annual *Automotive News Market Data Book*. These data included quantity imported into the United States (except for 1982), suggested retail price in March or April for the base version (i.e., without options) of each model, and characteristics including length, weight, horsepower, miles per gallon, and others. The twenty-two imported models were comprehensive except that: (a) "utility" vehicles (e.g., the Subaru Brat), referred to in section 2.2, were omitted; (b) import quantities of individual models included both station wagon and nonwagon quantities (e.g., Toyota Corolla sedan plus wagon), whereas only the price and characteristics of nonwagon imports were obtained.[3]

Summary information for the Japanese imports is shown in table 2.2 (upper portion). The quantity imported fell by 57,000 units from calendar year 1980 to 1981. In addition, the average price (computed as a ratio of total value to quantity) shows a substantial increase of 19.8 percent over this period. Thus, while the calendar year periods do not correspond exactly to those of the VER (i.e., April 1981 to March 1982), the qualitative behavior of the aggregate data is similar to that in table 2.1. Accordingly, we feel that a careful study of the model data will be useful in assessing the impact of the VER.

**Table 2.2 Sample of Automobiles**

| | 1981 | 1980 | Percent Change from 1980 to 1981[a] |
|---|---|---|---|
| Japanese imports: | | | |
| Quantity (1,000) | 1,721 | 1,778 | −3.3 |
| Price ($)[b] | 5,950 | 4,881 | 19.8 |
| Quality ($)[c] | 5,250 | 4,943 | 6.0 |
| U.S. small car production: | | | |
| Quantity (1,000) | 1,321 | 1,449 | −9.3 |
| Price ($) | 5,673 | 5,064 | 11.4 |
| Quality ($) | 5,258 | 5,220 | 0.7 |
| U.S. large car production: | | | |
| Quantity (1,000) | 2,663 | 3,010 | −12.3 |
| Price ($) | 8,233 | 6,962 | 16.8 |
| Quality ($) | 7,420 | 7,078 | 4.7 |

[a]Difference in the natural logarithms.
[b]1982 average price computed using 1981 quantities is $6,306.
[c]1982 quality computed using 1981–82 regression and 1981 quantities is $5,236.

A scatter plot of the quantity change from 1980 to 1981 for individual models is shown in figure 2.2. The greatest percentage increase was obtained by the Toyota Cressida and Datsun 810 Maxima, the second and third most expensive models. (Note that the Toyota Starlet is an outlier, since this model was just introduced in 1980 leading to a high quantity increase in 1981.) The most expensive 1980 model was the Toyota Supra, a luxury sports version of the Celica. While this model experienced an import decline from 1980 to 1981, during the first seven months of 1982 Supra imports had substantially exceeded import sales during all of 1981.[4] Indeed, on an annual basis the import gain from 1981 to 1982 can be computed as 105 percent, placing the Supra up with the Cressida and Maxima as obtaining the largest import gains.

A glance at the other models in figure 2.2 certainly confirms our hypothesis that, due to the VER, the composition of imports shifts toward higher quality models. Next to the Cressida and Maxima, the next highest quantity gain is 30 percent (excluding the Starlet). The great majority of models are priced below $7,000, where there is no discernable trend in quantity changes. The model with the worst quantity decline—the Toyota Corona—will appear as an extreme point in following figures.

In figures 2.3 and 2.4 the price increases for 1980–81 and 1981–82 are shown. Most interestingly, the Cressida and Maxima (for 1980–81) and

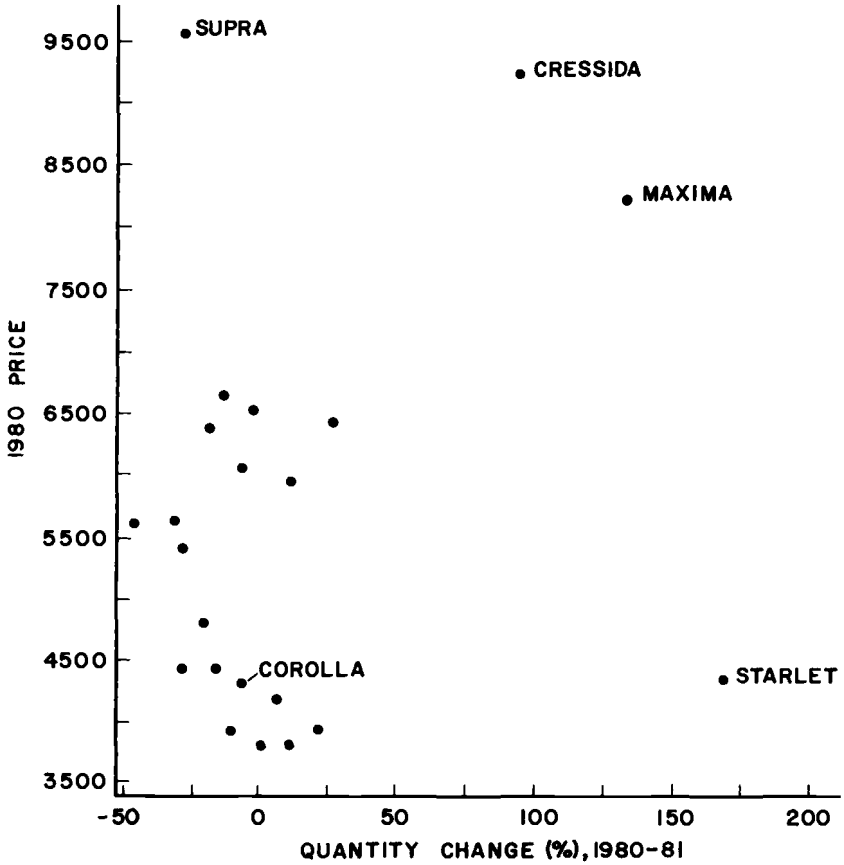


**Fig. 2.2** Quantity change in Japanese imports, from 1980 to 1981.

Supra (for 1981–82) record some of the largest price rises. The question then is how the import gains were accomplished in the face of higher prices. One possibility is that these three models experienced significant quality improvements, making them attractive to buyers despite the price increases. We shall examine this possibility now, using hedonic regressions. (The basic reference on this technique is Griliches 1971; see also Triplett 1975.)

In hedonic regressions we attempt to explain the variation in automobile prices using information on model characteristics. Specifically we shall regress the natural logarithms of Japanese model prices on their length, weight, horsepower, gas mileage, and dummy variables for five-speed transmission, air-conditioning, and year. The results of these re-

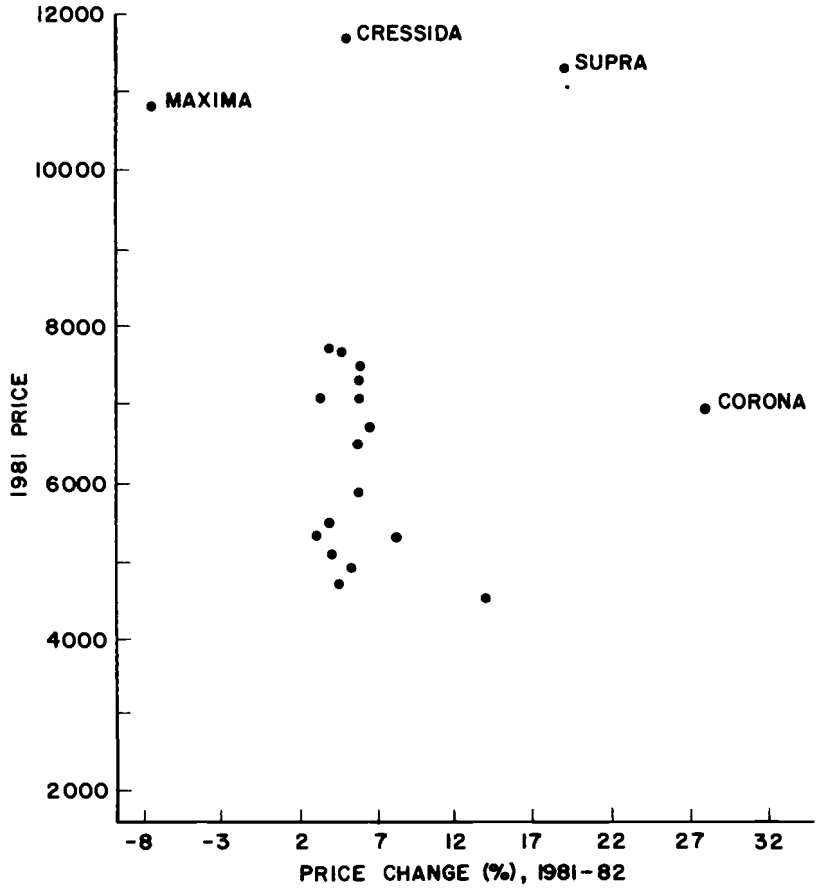


**Fig. 2.3** Price change in Japanese imports, from 1980 to 1981.

gressions for 1980–81 and 1981–82 are shown in the first two columns of table 2.3.

Since the dependent price variable is measured as a natural log, the coefficients in the regressions can be interpreted as the proportionate change in price from a unit change in the independent variable. For example, in the 1980–81 regression for Japanese imports, an increase in length of one foot reduces the model price by an estimated 16 percent. Similarly, an increase in weight of one ton increases the model price by 77 percent. It can be seen that the presence of a five-speed transmission or air-conditioning as standard features are positively related to price, whereas gas mileage is negatively related. The standard errors of the estimates are shown in parentheses, and the gas mileage coefficient is

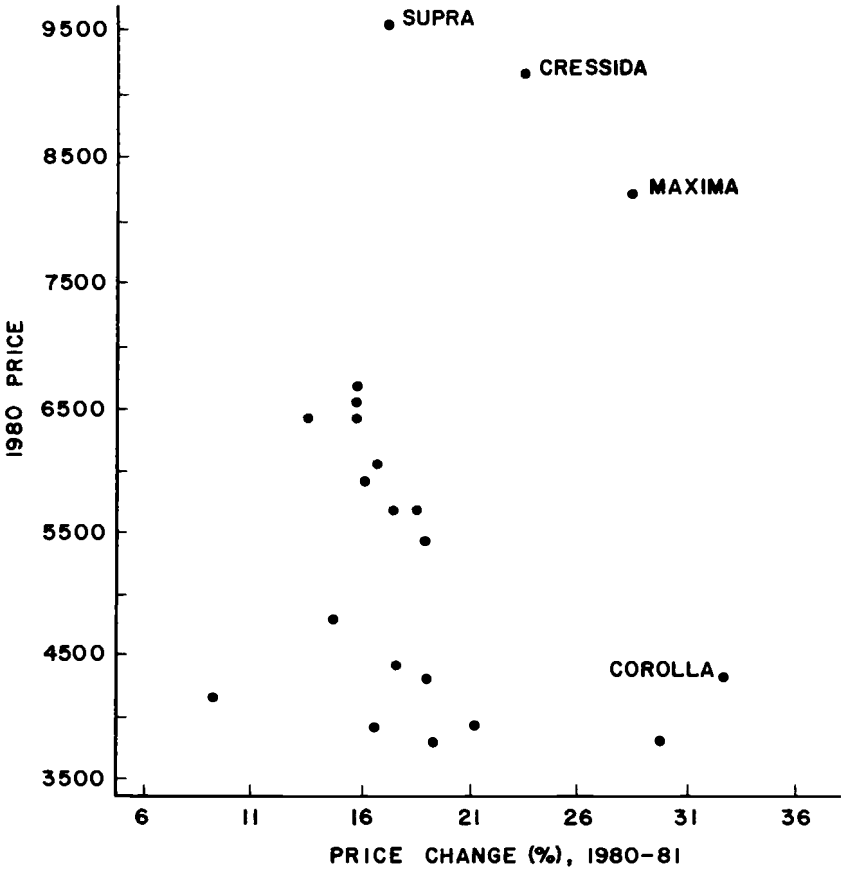


**Fig. 2.4** Price change in Japanese imports, from 1981 to 1982.

insignificantly different from zero. Overall, the regression is able to explain 90 percent of the variation in model prices with a total of forty-four observations over the two years.

The regression for Japanese imports in 1981–82 is similar to that of 1980–81. In either case, additional explanatory variables were considered, including interior room area, turning circle, number of doors, hatchback, and others.[5] However, these variables were generally insignificant and of the "wrong" sign. One useful explanatory variable that was not available is dealer discounts, which were used extensively in 1981 (see U.S. Department of Transportation 1982).

The last variable in each regression is a dummy for the next year. The coefficient of this variable can be interpreted as the average rise in model prices *not* explained by the improvement in characteristics. Thus, for

**Table 2.3** **Hedonic Regressions (dependent variable: natural logarithm of model price)**

| | Japanese 1980–81 | Japanese 1981–82 | U.S. Small 1980–81 | U.S. Large 1980–81 |
|---|---|---|---|---|
| | Obs. = 44<br>$R^2$ = 0.90 | Obs. = 44<br>$R^2$ = 0.93 | Obs. = 22<br>$R^2$ = 0.80 | Obs. = 66<br>$R^2$ = 0.95 |
| Intercept | 9.56*<br>(0.82) | 9.28*<br>(0.69) | 7.96*<br>(0.55) | 8.99*<br>(0.44) |
| Length (feet) | −0.16*<br>(0.069) | −0.10<br>(0.054) | 0.14*<br>(0.040) | −0.16*<br>(0.023) |
| Weight (tons) | 0.77<br>(0.41) | 0.47<br>(0.30) | −0.48<br>(0.26) | 1.48*<br>(0.16) |
| Horsepower (100 HP) | 0.74*<br>(0.23) | 0.54*<br>(0.17) | −0.20<br>(0.30) | −0.27<br>(0.093) |
| Gas mileage (100 MPG) | −0.78<br>(0.76) | −0.57<br>(0.64) | −2.29*<br>(1.08) | 1.84*<br>(0.80) |
| Dummy variables: | | | | |
| Five-speed | 0.080<br>(0.041) | 0.15*<br>(0.038) | — | — |
| Automatic | — | — | — | 0.090*<br>(0.040) |
| Power brakes | — | — | 0.12*<br>(0.042) | — |
| Air-conditioning[a] | 0.21*<br>(0.066) | 0.26*<br>(0.054) | — | 0.43*<br>(0.050) |
| Year 1981 | 0.13*<br>(0.034) | — | 0.089*<br>(0.035) | 0.11*<br>(0.024) |
| Year 1982 | — | 0.057*<br>(0.025) | — | — |

*Significant at 5 percent level. Standard errors are in parentheses.

[a]For Japanese models this variable indicates air-conditioning and automatic transmission, which were nearly perfectly correlated.

1980–81 the suggested retail price rose by 19.8 percent, but after adjusting for quality improvements, such as greater horsepower, air-conditioning, and the rest, the residual price rose by only 13 percent. The difference between these two figures is the rise in quality content. More precisely, the total import of Japanese automobile *services* can be measured as the predicted price from the hedonic regression times the quantity, summed over all models.[6] The *quality* of imports is then obtained as the total services divided by total quantity. As shown in table 2.2, we measure the quality content of imports as $4,943 and $5,250 in 1980 and

1981, respectively, obtained using the 1980–81 regression. The difference between these figures gives a 6 percent rise in quality.

The sensitivity of this quality measurement to specification of the hedonic regression can be checked by examining the "year 1981" coefficient. For various additional explanatory variables considered, the 1981 dummy coefficient was between 0.126 and 0.136, indicating an average rise in model prices not explained by quality improvement of approximately 13 percent, as found in table 2.3. For example, when variables for roominess, maneuverability, and axle ratio (a measure of durability) are added to the Japanese regression in table 2.3, the year 1981 coefficient is 0.132 for 1980–81. This compares with an estimate of 0.126 for 1980–81 when these three additional variables are excluded. If engine displacement and horsepower/weight are used in place of horsepower and weight, while retaining room, maneuverability, and axle ratio, then the 1981 dummy coefficient is 0.136 for 1980–81. Other combinations and additional explanatory variables result in a coefficient between these bounds. The measure of quality improvement can be approximately obtained as the difference between the retail price increase (19.8 percent) and the year 1981 coefficient (13 percent). Since the latter is not very sensitive to the regression specification, our measure of quality improvement appears to be quite robust.

The scatter plots of the residual, or quality-adjusted, price changes for 1980–81 and 1981–82 are shown in figures 2.5 and 2.6. Comparing figures 2.3 and 2.5 we can see substantial difference in the price changes for the Supra, Cressida, and Maxima, relative to the other models. Thus, while the retail price increases for these models over 1980–81 were well above average, the quality-adjusted price increases were well below average. From the raw data the quality improvement of the Supra can be identified as an increase in horsepower and the introduction of a five-speed transmission; the Cressida became heavier with greater horsepower; and the Maxima increased in weight with air-conditioning and automatic transmission added as standard equipment.

A similar pattern of high retail price increase with much smaller quality-adjusted price change can be seen for the Supra over 1981–82 in figures 2.4 and 2.6. These overall results neatly confirm the hypothesis that the quantity gain in the highest priced Japanese imports was brought about by a significant improvement in the quality content, as expected from the theory. Aside from the Cressida, Maxima, and Supra models, no general pattern of price or quality change is identified.

## 2.6 Model Data and Quality of U.S. Production

In addition to the data on Japanese imports, data on prices and characteristics of forty-four U.S. models were also obtained from the same

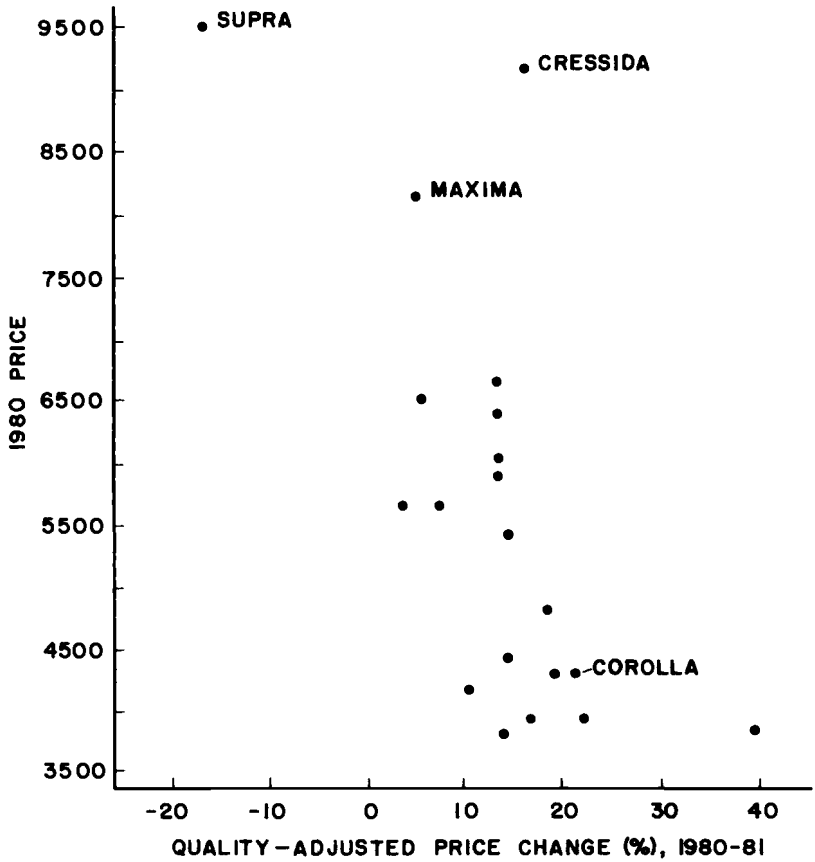


**Fig. 2.5** Quality-adjusted price change in Japanese imports, from 1980 to 1981.

source for the calendar years 1980 and 1981. Station wagons and several other models were omitted from the sample because of lack of information. The sample will be used to make comparisons with the Japanese imports and to establish general conclusions in section 2.7.

The data for U.S. small cars and large cars are summarized in table 2.2. (Note that the large car category includes both intermediate and large models.) The small cars experienced a lower price rise than large cars. This difference is explained in part by a changing composition *within* the large car category. In particular, the price of intermediate-sized cars (below $8,000 in price) rose substantially more in percentage terms than the price of very large cars (above $8,000 in price). The general price rise, then, partially reflects a quantity shift toward more expensive models within the large car category. Overall, U.S. large cars experienced a

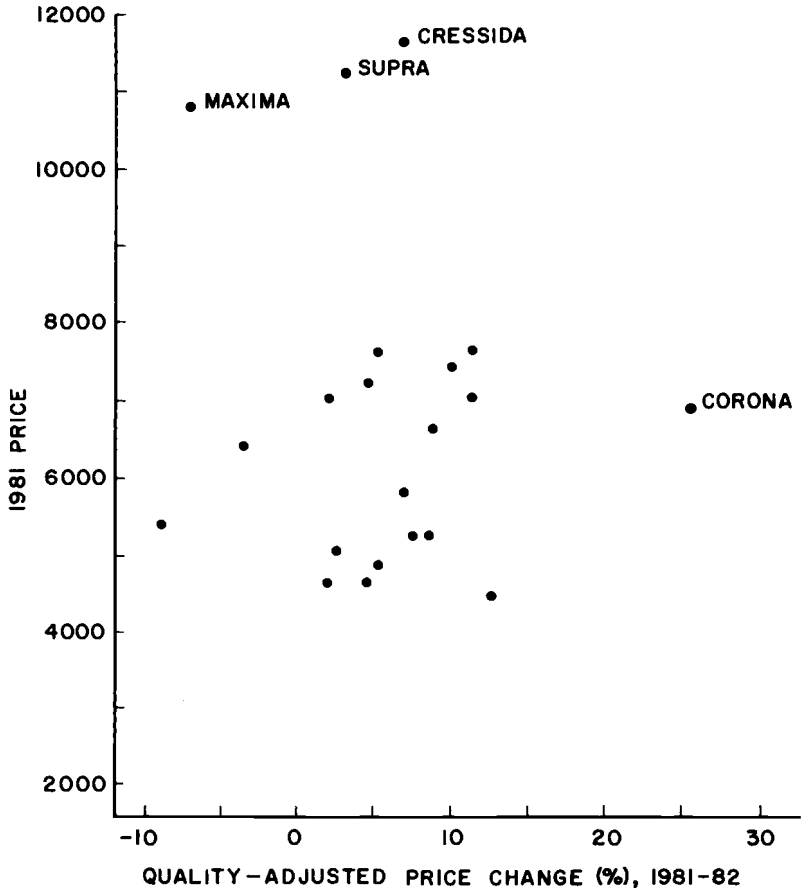


**Fig. 2.6** Quality-adjusted price change in Japanese imports, from 1981 to 1982.

greater percentage quantity decline than small cars, as reported in table 2.2.

One conclusion to be drawn from the summary information is that U.S. small car prices do not appear to include a significant monopolistic increase over the 1980–81 period, in contrast to the prediction of traditional theory (see, e.g., Lindert and Kindleberger 1982, appendix E). That is, despite the export restriction, those models which compete most directly with Japanese imports—U.S. small cars—experienced lower price increases than intermediate and large cars. One possible explanation for this result is that, faced with limited availability of lower priced, lower quality Japanese imports, U.S. consumers did not substitute toward small U.S. models. Instead they could have substituted toward

intermediate U.S. models, used cars, or they could have decided to defer their purchases.[7] To the extent that substitution did *not* take place toward U.S. cars, the employment impact of the VER is reduced.

Hedonic regressions were also run for U.S. small and large cars, using similar explanatory variables as in the analysis of Japanese imports described in section 2.5. The results are shown in table 2.3. The U.S. small car regression contains several unusual signs, with less explanatory power than for U.S. large cars.[8] In the latter case, all estimated coefficients are significant at the 5 percent level, with length having a negative and gas mileage a positive relation to price.

As with the Japanese imports, the predicted prices from the hedonic regressions can be used to construct an estimate of total *services* produced (predicted price times quantity, summed over all models). When divided by the quantity of small or large cars, we then obtain a measure of *quality*, as shown in table 2.2. The quality content of U.S. small cars increased only slightly from 1980 to 1981, in contrast to the substantial quality change of Japanese imports. For U.S. large cars, quality increased by 4.7 percent. This is partially explained by the quantity shift from intermediate to very large cars as discussed above.

## 2.7 Effects of the VER within the Sample

We shall now derive general conclusions about the effect of the VER within our sample of Japanese imports and U.S. production. In particular, we shall investigate the U.S. employment and welfare impact. Recalling that our sample covers the calendar years 1980 and 1981, whereas the initial year of the VER was April 1981 to March 1982, our quantitative results do not directly measure the effect of the VER in its first year. But we certainly expect that our general conclusions will carry over to other, similar time periods.

Returning to table 2.2, we must first decide what portion of the 19.8 percent rise in retail import prices is a general inflationary effect across producers from cost increases and simple price leadership but not related to the VER. We noted above that the U.S. small car prices do not appear to include a significant monopolistic increase in 1981, rising by less than intermediate and large car prices, so it seems reasonable to regard the 11.4 percent increase in small car prices as the general inflationary effect. It follows that the difference between the retail price increases of Japanese imports and U.S. small cars, or *19.8 − 11.4 = 8.4 percent, is the increase in import prices directly caused by the VER*, after correcting for the inflationary effect across producers. The next question is what portion of this price increase is directly the result of quality improvement. From table 2.2, we see that the quality improvement of the Japanese imports exceeded that of U.S. small cars by 6.0 − 0.7 = 5.3 percent. That is,

5.3/8.4 or about *two-thirds of the rise in import prices can be attributed to quality improvement.* The remaining 8.4 − 5.3 = 3.1 percent, or one-third of the total, is a de facto price increase for which the consumer is not compensated by a change in quality.

To obtain further conclusions, we must begin to introduce some assumptions and parameters. In table 2.4 we give alternative values of the elasticity of U.S. demand for Japanese automobile services, ranging from 2 to 5. Using these elasticities and the 3.1 percent residual price increase obtained above, we can readily compute the value of imported services restricted by the VER. In the absence of this restraint we would have expected the 1981 Japanese quality to be approximately the same as in 1980. Accordingly, we can compute the extent to which the VER restricted auto imports in the second row of table 2.4. For demand elasticities of 2 and 3, the extent of import restrictions is measured as 220,000 and 277,000 units, respectively.

From the estimates reported in Toder (1978, chap. 3), a value of 1 to 2 for the short-run elasticity of demand for imported autos is expected, while the value of 3 is somewhat high. In assessing the employment impact of the VER during its first year, we shall thus focus on the first two columns of table 2.4. The last column, with an elasticity of 5, would be relevant for periods exceeding one year when consumers show greater adjustment to a price increase.

Let us make the strong assumption that the *overall* U.S. demand elasticity for domestic and Japanese autos is unity. That is, a fixed proportion of total income is spent on these autos, and a reduction of $1 million spent on Japanese imports because of a price change will imply exactly $1 million extra spent on U.S. models. This assumption is supported by the empirical evidence (see Toder 1978, p. 44 and the references cited there) that the price elasticity for *all* cars purchased in the United States is approximately one. By excluding European imports, we may be overstating the income which consumers continue to spend on Japanese and American models after a price rise. The assumption of an overall demand elasticity of unity, combined with specific import elasticities, permits us to model the degree of substitution between Japanese and U.S. models, as follows.

For the various import elasticities in table 2.4 we can readily compute the additional income spent on U.S. autos because of the VER as being equal to the reduced income spent on Japanese imports. Dividing this revenue by an average 1981 price of $6,000 for cars which substitute quite closely with Japanese imports, we obtain the additional U.S. production (fourth row). These production gains can be contrasted to the number of auto imports restricted, with the differences due to imperfect substitution. Further dividing the production gain by the average product of labor, we obtain the additional U.S. employment (fifth row). With im-

port elasticities of 2 and 3, the employment gains are 5,600 and 11,100 workers, respectively. These figures can be compared with indefinite layoffs in the auto industry exceeding 200,000 in early 1982.

Thus, the employment impact of the VER during its first year was 5 percent or less of existing layoffs. Further evidence would be required to assess the employment impact over later years, though the last column of table 2.4 suggests that the reduction in unemployment would be larger.

In the last row of table 2.4 we give the correct welfare loss $L_S$ derived in section 2.4 and the incorrect loss $L_Q$ which ignores the quality change in imports. These magnitudes can be compared with 1981 expenditures on Japanese imports of $10,240,000. Thus, the correct welfare loss is approximately 3.1 percent of 1981 expenditures, while the incorrect welfare loss is approximately 8.4 percent. These amounts are just the quality-adjusted and unadjusted rise in import prices, respectively, since the welfare loss from the VER is the entire reduction in consumer surplus (see figure 2.1)

**Table 2.4 Effects of the VER from 1980 to 1981**

| | Elasticity of Demand for Japanese Automobile Services | | |
|---|---|---|---|
| | 2 | 3 | 5 |
| Japanese services restricted[a] ($ mill) | 560 | 840 | 1400 |
| Japanese autos restricted[b] (1,000) | 220 | 277 | 390 |
| Additional U.S. revenue[c] ($ mill) | 317 | 635 | 1270 |
| Additional U.S. production[d] (1,000) | 53 | 106 | 212 |
| Additional U.S. employment[e] (1,000) | 5.6 | 11.1 | 22.3 |
| Welfare loss: | | | |
| $L_S$ ($ mill)[f] | 327 | 332 | 342 |
| $L_Q$ ($ mill)[g] | 915 | 929 | 958 |

[a]0.031 × elasticity × 1981 Japanese services. Services = quality × quantity.

[b](1981 Japanese services + services restricted)/1980 Japanese quality − 1981 Japanese auto imports.

[c]0.031 × (elasticity − 1) × 1981 Japanese import value.

[d]Additional U.S. revenue/$6,000.

[e]Additional U.S. production/9.5.

[f](0.031 × 1981 Japanese services) + 1/2 × (0.031 × 1981 Japanese service price × Japanese services restricted). Service price = nominal price/quality.

[g](0.084 × 1981 Japanese import value) + 1/2 × (0.084 × 1981 Japanese price × Japanese autos restricted).

with quota rents accruing to Japanese producers. The specification of the import elasticity only modestly affects the loss. The correct measure of welfare loss is about one-third of the incorrect measure.

## 2.8 Conclusions

Our major conclusion is that two-thirds of the increase in Japanese import prices following the VER was due to quality improvement, with the remaining one-third a de facto price rise for which the consumer is not compensated by a change in quality. This result was found to be quite insensitive to the specification of the hedonic regressions used to measure quality (section 2.5). It also depends on the general inflationary price increase across producers, not related to the VER. Since U.S. small car prices rose by less than the intermediate or large car prices (section 2.6), we chose the former as a measure of the general inflationary increase. We then took the *difference* between the Japanese import and U.S. small car price rise and regarded this amount as the increase in import prices directly caused by the VER. Two-thirds of this price increase could be explained by quality improvement in Japanese imports.

The residual import price rise not accounted for by quality change was measured as 3.1 percent. It followed that the loss to American consumers in 1981 from the VER was approximately 3.1 percent of expenditure on Japanese imports. The exact welfare loss depends only slightly on the import demand elasticity, since most of the loss comes from the quota rents obtained by Japanese producers. It is also observed that three Japanese models experienced substantial retail price, quantity, and quality increases following the VER, with reductions in their quality-adjusted prices: the Toyota Cressida, Toyota Celica Supra, and Datsun 810 Maxima. The increased imports of these luxury models neatly confirm the theoretical predictions.

Our conclusions about the effect of the VER on employment in U.S. autos are subject to greater qualification. Clearly, we have not considered the general equilibrium response of wages to unemployment in one industry, or the extent to which decreased U.S. imports would result in lower demand for U.S. exports. More specifically, we have not been able to consider imports from countries other than Japan or the introduction of new U.S. models following the VER. Including European imports into our analysis could decrease the employment impact of the VER because of substitution by U.S. consumers toward these models. On the other hand, introduction of new U.S. models, such as the General Motors J-car (and earlier the Chrysler K-car), could present desirable alternatives for limited Japanese imports. While a consideration of these factors would be useful, our general conclusion that the employment impact of the VER

was small during the first year due to quality improvement and imperfect substitution between Japanese and U.S. autos does not seem to be overstated.

# Notes

1. Thus, suppose the import market share were held *constant* at its 1979 value. Then 1980 factory sales could be estimated as 6,400 + 3,116 − (8,904 × 0.282) = 7,005, where the first figure is actual 1980 sales and the next figures are actual and estimated 1980 imports. Factory sales in 1979 were 8,419, so the extent of decline due to falling consumption (i.e., recessionary conditions) is (8,419 − 7,005)/(8,419 − 6,400) = 70 percent. The remaining 30 percent of falling sales can be attributed to import competition. Precisely this type of simple calculation was instrumental in leading to the ITC decision.

2. For example, the Council of Economic Advisors (submission to Senate, 3 April 1980) reports that the production of 50 autos creates 10 jobs in the economy, with 2.3 workers employed directly in autos and 7.7 employed elsewhere. These data are from the Department of Labor (apparently based on a study referenced in submission to the House of Representatives, 7, 18 March 1980). However, the average product of labor in autos implicit in these figures is extremely high (50/2.3 = 22). I have been unable to account for the difference between this estimate and those reported in table 2.1.

3. Dealers were contacted to try and separate the station wagon and nonwagon import quantities, but this proved unsuccessful. In addition, note that the imported models include those built for U.S. firms, such as the Chrysler-Mitsubishi Challenger, Champ, and Colt. Imports into Puerto Rico are not included.

4. Imports of the Toyota Celica Supra during 1980, 1981, and the first seven months of 1982 were 21,542 units, 16,146 units, and 19,266 units, respectively. Ward's Communications, Inc., kindly supplied this information. Due to its overall performance, the Supra was chosen as *Motor Trend* magazine's 1982 Import Car of the Year.

5. The occurrence of air-conditioning was very highly correlated with the occurrence of automatic transmissions in the Japanese imports, so these were combined into one dummy variable. Also, the prices were adjusted so that all models excluded a radio.

6. The predicted price used in this calculation does not include that portion of the model price explained by the year dummy in the regression, since the year dummy captures that portion of the price *not* related to the physical characteristics (i.e., services) of the model.

7. Since the 1981 U.S. small and large car prices were collected on April 10, it is of course possible that the small car prices had not responded to the VER simply because it was not announced until May 1. On the other hand, the evidence is quite strong that at least the Japanese had anticipated the VER in setting their prices as of 6 April 1981, which are used in our sample. But whether the VER was anticipated by U.S. producers or not, we still obtain the result that the U.S. small car price rise over 1980–81 does not appear to include a monopolistic increase, and this result will be used in section 2.7.

8. At a later stage of our research we also pooled the Japanese import and American small car models to test for equality of the regression coefficients. By the usual $F$-test, the test statistic for the null hypothesis that the regression coefficients were equal, was computed as 1.55. The 95 percent significance point of the $F$-distribution with degrees of freedom (5, 60) is 2.37, so we cannot reject the null hypothesis. In future research it would be useful to pool these data.

# References

*Automotive news market data book*. 1980, 1981, 1982. Detroit: Automotive News.

Baldwin, Robert E. 1982. The efficacy (or inefficacy) of trade policy. Frank Graham Memorial Lecture, Princeton University.

Falvey, Rodney E. 1979. The composition of trade within import-restricted product categories. *Journal of Political Economy* 87, no. 5 (October):1105–14.

Feenstra, Robert C., and Kenneth L. Judd. 1982. Tariffs, technology transfer, and welfare. *Journal of Political Economy* 90, no. 6 (December):1142–65.

Gomez-Ibanez, Jose A., Robert A. Leone, and Stephen A. O'Connell. 1983. Restraining auto imports: Does anyone win? *Journal of Policy Analysis and Management* 2:196–219.

Griliches, Zvi. 1971. Hedonic price indexes for automobiles: An econometric analysis of quality change. In *Price indexes and quality change*, ed. Zvi Griliches. Cambridge: Harvard University Press.

Helpman, Elhanan. 1981. International trade in the presence of product differentiation, economies of scale and monopolistic competition: A Chamberlin-Heckscher-Ohlin approach. *Journal of International Economics* 11 (August):305–40.

Krugman, Paul R. 1979. Increasing returns, monopolistic competition, and international trade. *Journal of International Economics* 9 (November):469–79.

———. 1980. Scale economies, product differentiation, and the pattern of trade. *American Economic Review* 70 (December):950–59.

Lancaster, Kelvin J. 1980. Intra-industry trade under perfect monopolistic competition. *Journal of International Economics* 10 (May):151–75.

———. 1982. Protection and product differentiation. Columbia University. Mimeo.

Lindert, Peter H., and Charles P. Kindleberger. 1982. *International economics*. Homewood, Ill.: Richard D. Irwin.

Rodriguez, Carlos Alfredo. 1979. The quality of imports and the differential welfare effects of tariffs, quotas, and quality controls as protective devices. *Canadian Journal of Economics* 12, no. 3:439–49.

Santoni, Gary J., and T. Norman Van Cott. 1980. Import quotas: The quality adjustment problem. *Southern Economic Journal* 46, no. 4 (April):1206–11.

Tarr, David. Federal Trade Commission 1980. *Effects of restrictions on United States imports: Five case studies and theory*. Washington, D.C.: GPO.

Toder, Eric J., with Nicholas Scott Cardell, and Ellen Burton. 1978.

*Trade policy and the U.S. automobile industry*. Charles River Associates Research Report. New York: Praeger Publishers.

Triplett, Jack E. 1975. Consumer demand and characteristics of consumption goods. In *Household production and consumption*, ed. Nestor E. Terlecky. Conference on Research in Income and Wealth: Studies in Income and Wealth, vol. 40. New York: Columbia University Press for the National Bureau of Economic Research.

U.S. Congress. Senate. Committee on Banking, Housing, and Urban Affairs. Subcommittee on Economic Stabilization. 1980. *The effects of expanding automobile imports on the domestic economy*. 96th Cong., 2d sess., 3 April.

U.S. Congress. House. Committee on Ways and Means. Subcommittee on Trade. 1980. *World auto trade: Current trends and structural problems*. 96th Cong., 2d sess., 7, 18 March. Serial 96-78.

U.S. Department of Transportation. 1982. *The U.S. automobile industry, 1981*. May. Washington, D.C.: GPO.

Venables, Anthony J. 1982. Optimal tariffs for trade in monopolistically competitive commodities. *Journal of International Economics* 12 (May):225–42.

## Comment Ronald W. Jones

Voluntary export restraints have recently attained prominence in the portfolio of techniques used in exercising U.S. commercial policy, and this stimulating paper by Feenstra analyzes the possible effects of such a program on welfare and employment in the currently depressed U.S. automobile industry. Believing as I do in the advantages of division of labor and in the doctrine of comparative advantage, I leave to my codiscussant from the state of Michigan remarks as to the nuances of the automobile industry and concentrate, instead, on some points of more theoretical interest suggested by the paper.

The application of VER instead of, say, a U.S. tariff or quota has the obvious welfare disadvantage that foreigners are invited to capture the rents created by the restraint. As Feenstra carefully points out, however, if the composition of the limited imports is altered in favor of higher quality products, the welfare loss would be incorrectly expressed in the price rise. Indeed, economic theory associated with the work of Alchian and Allen (1972) suggests that it is in the producers' best interest to adjust the product mix in favor of higher quality. (In their classic example,

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transport costs are shown to lower the *relative* price of the higher quality apples in distant markets, thus explaining, for Western apple growers, why the "good apples move East"). Recently Falvey (1979) has harnessed this logic to the case of quantity restrictions to argue that, unlike the case of ad valorem tariffs, the price rise associated with quotas will be relatively less for higher quality products. Feenstra estimates that a full two-thirds of the price rise on imported Japanese automobiles was due to an improvement in quality and should thus not be counted as a welfare loss.

This argument about quality changes does alter the traditional measure of welfare loss, but what can be said about employment? To the extent that a restriction on imports of Japanese automobiles shifts demand toward home-produced autos, local employment can be expected to rise. However, Feenstra emphasizes that much depends on the elasticity of demand. Suppose demand for Japanese cars is inelastic, although, say, demand in the aggregate for all cars is unit elastic. Then the VER could cause a reduction in the value of demand for American-made autos (neglecting the effect on European imports), which, assuming no price fall in this area, translates into a loss of output and jobs. Thus, argues Feenstra, it is not clear that the VER will raise employment of U.S. autoworkers.

I concur with this result and merely add two observations. First, the argument concerning employment need not rest on changes in quality, as does the argument concerning welfare. What is required is inelastic demand for auto imports, and this can be expressed either in quality or quantity units. Thus Feenstra used the Rodriguez (1979) concept of import demand related to the *services* of a good, so that

$$S = xQ,$$

where $Q$ measures the quantity of auto imports, $x$ is a measure of services provided per physical unit, and $S$ is the demand for services (from imports). If $p_Q$ represents the price of autos and $p_S$ the price of services, and if demand for autos is inelastic so that a rise in $p_Q$ results in:

$$-\hat{Q} < \hat{p}_Q,$$

it must be the case that

$$-\hat{S} < (\hat{p}_Q - \hat{x}).$$

Since $p_s$ equals $p_Q/x$, demand for services would also be inelastic. Expressed either way, the VER could lower employment.

A general equilibrium approach, however, shifts the focus of the argument. If trade stays roughly balanced, a rise in the value of imports may reduce employment in import-competing sectors, but it would be matched by a rise in the value of exports (and employment in exporting

sectors). Similarly, if a VER cuts back on import spending, there are negative employment effects in exportables to be considered in conjunction with any employment gains in the protected sectors. Net employment effects depend both on a comparison of labor intensities in various sectors of the economy as well as on the issue raised by Feenstra as to the expansionary or contractionary effect in the import-competing sector. In any case Feenstra's conclusion that the employment effects of the VER are less obvious than the welfare effects seem supported at the economy-wide level as well as in the U.S. auto industry.

**References**

Alchian, A., and W. Allen. 1972. *University economics*, 3d ed. Belmont, Calif.: Wadsworth.

Falvey, R. 1979. The composition of trade within import-restricted product categories. *Journal of Political Economy* 87:1105–14.

Rodriguez, C. 1979. The quality of imports and the differential welfare effects of tariffs, quotas, and quality controls as protective devices. *Canadian Journal of Economics* 12:439–49.

# Comment

Mordechai E. Kreinin

This is an excellent paper, employing an imaginative approach to an important problem. At issue is the effect of the Japanese Voluntary Export Restraint in autos on U.S. welfare and employment.

Product upgrading is a well-known outcome of any quantitative import restriction (import quotas, VERs) limiting the importation of a product to a specified number of units without distinction between brands, grades, or other product attributes. Because such quantitative limitations are equivalent to a specific tariff, they raise the price of cheap brands proportionately more than the price of expensive brands. This constitutes an incentive on the part of buyers and of exporters to upgrade the product. Upgrading occurs in all cases where product differentiation exists.

Using hedonic regressions, Professor Feenstra estimates the degree of product upgrading that occurred in Japanese cars exported to the United States as a result of the VER. Because of the many features of product differentiation that exist in autos, I suspect that somewhat less than the entire degree of upgrading could have been so captured; but the author competently demonstrates that the "leftover" bias could not have been large. The author's estimated U.S. welfare loss due to the VER, after

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taking into account the product upgrading, is only one-third of the estimated loss when the quality upgrading is ignored. He then proceeds to estimate the rise in U.S. auto output and the additional U.S. employment attributable to the VER under alternative elasticity assumptions. Both effects are very small under the assumptions of import-demand elasticities of 2, 3, or 5.

Having revealed my general admiration for the paper, I shall proceed with specific criticisms. They were made orally on an earlier draft, but the author merely recognizes them without adjusting his calculations. Some of the following points have offsetting effects on the results, but the extent of the net bias cannot be determined without further calculations. Table C2.1 is computed from the author's table 2.1 and will be useful in highlighting some of the criticisms.

*1. How effective was the VER?* The first VER year spanned the months from April 1981 to March 1982, and it is the only period for which data were available at the time of the author's calculations. Under the VER agreement, total Japanese exports were not to exceed 1,832,500 units. And indeed the last column (first row) in table C2.1 shows that their exports were held to that number. By subtracting that figure from 2,012,000—Japanese exports to the United States in the previous year—

**Table C2.1** **New Passenger Cars (thousands of units)**

| | 1980 | | April 1980 to March 1981 | | April 1981 to March 1982 (VER period) |
|---|---|---|---|---|---|
| Japanese imports | 1,992 | | 2,012 | | 1,833 |
| Percentage change | | 1.0 | | −9.8 | |
| Total imports | 3,116 | | 3,037 | | 2,840 |
| Percentage change | | −2.6 | | −6.9 | |
| Non-Japanese imports[a] | 1,124 | | 1,025 | | 1,007 |
| Percentage change | | −9.7 | | −1.8 | |
| U.S. factory sales | 6,400 | | 6,220 | | 5,602 |
| Percentage change | | −2.9 | | −11.0 | |
| Apparent U.S. consumption | 8,904 | | 8,684 | | 7,962 |
| Percentage change | | −2.5 | | −9.1 | |
| Ratio of Japanese import to U.S. consumption | 22.4% | | 23.2% | | 23.0% |
| Ratio of total import to U.S. consumption | 35.0% | | 35.0% | | 35.7% |
| Ratio of non-Japanese imp. to U.S. consumption | 12.6% | | 11.8% | | 12.7% |

[a]Obtained by subtraction of row 1 from row 2 in the author's table 2.1.

the author suggests that the VER restricted imports by at least 180,000 units. But total U.S. car output and consumption also declined by 9 and 11 percent, respectively, over the same period. Indeed the ratio of Japanese imports to U.S. consumption was reasonably stable, at 23 percent, over the two years. Can one attribute the entire 9.8 percent drop in Japanese imports to the VER? It is probably an overestimate, which is then reflected in the final results.

2. *The role of European imports.* Following comments on the original version of the paper, the author now recognizes the existence of European imports but does not incorporate them in his calculations. By subtracting row 1 from row 2 in the author's table 2.1, row 3 in table C2.1 shows that non-Japanese imports account for about one-third of total imports. Although the author does not explicitly say so, I am assuming that (following convention) Canadian imports (governed by the U.S.-Canada auto treaty) are excluded. Thus non-Japanese imports are essentially European models.

Imported European cars cover the entire range of quality and price. And the product upgrading by the Japanese means that they compete with the Europeans in the U.S. market in the entire product range, certainly at both ends of the price spectrum. Because the VER was limited to Japan, one might expect some substitution of European (rather than American) models for the excluded Japanese cars. That such substitution may have been important is clear from table C2.1. European imports declined by only 1.8 percent from 1981 to 1982, while Japanese imports declined by 9.8 percent, and U.S. auto consumption by 9.1 percent. By making some simple assumptions about market shares (as the author does in other cases, such as in section 2.2), one may tentatively infer that over one-third of the "slack" created by the VER was picked up by European rather than American-built cars.

The exclusion of European cars from his calculations may have a profound effect on the results, especially on the estimated welfare and employment effects of the VER. Substitution from European models is likely to have scaled down the effect of the VER on U.S. employment. In fact, such possible substitution must be incorporated into the author's own calculations because his accompanying assumption of a fixed proportion of consumer income spent on cars applies to *all* cars, including European ones.

In sum, the assumption of U.S.-Japanese substitution, ignoring European imports, affects results throughout the paper. It is possible to indicate the direction of the bias so created. For example, the rise in U.S. employment due to the VER is overestimated. Furthermore, by making certain credible assumptions, the estimates themselves could have been revised to more realistic levels.

3. *Is a constant share of income spent on automobiles?* That assumption crops up in various places. As stated above, at best it should be applied to all cars, including European.

How realistic is that assumption? Although there are not a priori grounds for making it, the assumption is supported by data not cited by the author.[1] But that evidence relates only to the 1960s and 1970s. In view of the profound changes that have taken place in the industry over the past three years, the assumption cannot be accepted on its face value for 1980–82, the main period under study. The author needs to check explicitly the validity of the assumption (critical to parts of his discussion) for the 1980s. The possibility must be recognized that if consumers spend more (less) on cars they have less (more) money to spend elsewhere.

4. *To what extent was the rise in U.S. auto prices triggered by (resulted from) an increase in Japanese prices?* There is evidence of such pricing behavior by U.S. automakers from episodes of devaluations or depreciations of the dollar. This may partly account for the rise in the price of intermediate-sized cars. The failure of small car prices to rise may have been due to depressed market conditions and to European competition rather than to market structure.

5. *Effect of exchange rate changes*. The sharp 1982 appreciation of the dollar could have depressed the dollar price of Japanese models, so the price rise embodied in the calculations (attributed to the VER) may be biased.

6. *The hedonic regressions*. Although the results appear robust, the regressions may not have captured all quality characteristics (e.g., improved carpeting or seat covers) and need to be regarded as a lower bound.

A few words beyond the scope of this well-crafted paper are in order. What is the cause of the decline in the competitive position of the U.S. auto industry that triggered demands for VERs and domestic content legislation?

Wrong management decisions in the 1970s, especially concerning the product mix and perhaps the introduction of new technology, are well-known. But a recent study[2] shows that during the 1970s there had been a distinct increase in unit labor costs in the auto industry *relative to that in U.S. manufacturing in general*: Labor compensation in autos rose at a faster rate than its counterparts in all manufacturing, while output per worker rose in tandem with all manufacturing. No such change occurred in Japan, where both compensation and productivity in autos rose at a faster rate than in all Japanese manufacturing, so that unit labor costs

rose in tandem. Indeed, in 1980 labor compensation in the U.S. auto industry was 60 percent above that of the U.S. manufacturing average. In Japan and Germany that excess is only 25 percent, while in other European countries it is even lower than that. Apparently the U.S. comparative advantage in autos has eroded.

## Notes

1. U.S. Department of Transportation, *The U.S. Automobile Industry, 1980*, Washington, D.C., January 1981, fig. 2-1.

2. Mordechai E. Kreinin, "United States Comparative Advantage in Motor Vehicles and Steel," in *Michigan Fiscal and Economic Structure*, ed. H. E. Brazer and D. S. Laren. (Ann Arbor: University of Michigan Press, 1982), chap. 6.

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