The 1996 U.S.-Japan Bilateral Automotive Trade Deficit

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Executive Summary

Introduction. This report presents an analysis and discussion of recent developments in automotive trade between the United States and Japan, and provides a forecast of the bilateral automotive deficit for 1996. This analysis and forecast is the third such effort by the Office for the Study of Automotive Transportation. The first, performed in 1989, projected the automotive trade balance for 1993, while the second, performed in 1991, projected results for 1994. This analysis updates these earlier forecasts, reflecting developments in automotive competition and trade since publication of the earlier forecasts.

Trade Developments. In 1992, the bilateral automotive deficit stood at $31.5 billion, down nearly 6 percent from its high of $33.4 billion in 1989 and down about 1 percent from 1991. This 1992 deficit was over 37 percent of the total worldwide U.S. merchandise trade deficit, considerably below the nearly 49 percent of 1991, as the U.S. worldwide total grew by roughly 29 percent. It also represented more than 62 percent of the worldwide U.S. automotive deficit, down only slightly from 63 percent in 1991. Finally, it comprised 65 percent of the total U.S.-Japan bilateral deficit, receding from a high of 75 percent in 1990, inasmuch as the total bilateral deficit grew by nearly 18 percent over that period. The bilateral automotive deficit has been essentially stable for three years as the automotive market has declined almost 8 percent. Over this same period, the total U.S. worldwide deficit has fallen and then risen, the worldwide automotive deficit has fallen, and the total bilateral deficit has increased.

Two key components—vehicles and automotive parts—comprise the total automotive deficit. The vehicle deficit has risen as high as $25.9 billion (1986), but—at $20.6 billion in 1992—is now less than 5 percent above its 1985 level in current dollars. This reflects a sharp decline in the numbers of Japanese vehicle imports, largely offset by the increased value of the yen against the dollar and the enriched segmentation of imports. Trade in automotive parts has become more significant since 1985, increasing each year as a percent of the total bilateral automotive deficit, with the sole exception of from 1990 to 1991. In 1985, the parts category accounted for about 19 percent of the $24.3 billion deficit, while it accounted for nearly 35 percent of the $31.5 total in 1992. The vehicle deficit fell 5.5 percent from 1991 to 1992, but the parts deficit rose 9 percent to $10.9 billion, just under its 1989 record level of $11.0 billion.

Data and related issues. The analysis is based on three data sources. First, we relied on official U.S. government statistics for our review of past trade data. Second, we combined those data with industry performance data for our analysis of the factors that drive the deficit and the development of our model. Third, we interviewed representatives at each of the Big Three to inform our analysis and to develop the scenarios we explored for 1996. Unfortunately, we were unable to obtain similar interviews at the four Japanese manufacturers we contacted.

Analysts and companies report a variety of numbers that intuitively appear related to the bilateral automotive trade deficit. Thus a manufacturer may report the "U.S. content" of a particular vehicle, or report that it is a "domestic" vehicle under Corporate Average Fuel Economy (CAFE) standards. The manufacturers may also claim tariff-free crossing of the U.S.-Canadian border under the Free Trade Agreement, or report the total volume of "auto parts and materials" purchased for export to Japan. While all of these numbers do relate to the bilateral automotive trade deficit, they do so in different, and often complicated, ways.

For example, CAFE permits parts and components to count as 100 percent domestic even when they have large import content, because the rule applies to the final purchase by the manufacturer and does not trace the import content to the supplier level. In this instance, a vehicle may have significantly more import content in trade terms than in CAFE terms. A manufacturer may report large exports of automotive parts and components based on its use of those parts and materials in vehicle production, but not all of those parts and components are likely to be classified as "automotive" in official trade statistics. Thus the export of an aluminum ingot to Japan for use in automotive engine production will be counted in the calculation of the bilateral merchandise trade deficit, but probably not in the bilateral automotive trade deficit. In this instance, the exports claimed by a Japanese automotive company may be accurate, but still exceed the entire value of automotive exports, as the U.S. government defines them.

It is important that readers recognize these definitional distinctions. Our analysis is based on trade data collected by the United States, and those data often do not have any direct or even necessary relationship to other data that bear on other meanings of "domestic," "import," or "export." Thus, reported changes in CAFE content levels over a particular period may have little if any relationship to changes in automotive sourcing in trade terms.

The trade data we use for our analyses, and upon which we base our projections, are provided by the U.S. International Trade Commission. These data permit finer analysis than similar, although not identical, data available from the U.S. Department of Commerce, because they are available as a monthly series rather than just annually. These two automotive series differ in the definitions, categorization, and methods of calculating the deficit—although their results are quite close on an annual basis.

Past Forecasts. Automotive trade forecasts for a specific year reflect assumptions about macroeconomic developments, market size, and industry competitiveness. While we have not yet reached the target years for either of our past forecasts, they have been labeled as "wrong" by a number of critics. One can certainly ask whether these forecasts look reasonable in light of ensuing developments and in view of the 1992 trade results. However, that requires making some simple adjustments. If we adjust our 1989 forecast to the smaller actual 1992 market, our more accurate alternative economic scenario "best case" expects a 1993 bilateral automotive trade deficit some 12 percent below the 1992 actual, while our "most likely case" anticipates a 1993 value some 17 percent above 1992's. Similar adjustments to our 1994 forecasts reveal a "best case" 1994 that is 11 percent below, and a "most likely" 1994 that is 16 percent above, 1992 actual. Thus, these earlier forecasts appear to be robust and place a reasonable band around the actual outcomes. If our "best case" forecasts were somewhat optimistic, our "most likely" were perhaps a bit pessimistic—if one defines deficit reduction as a desirable event.

Automotive Developments. Three major automotive developments are likely to influence the bilateral automotive deficit by 1996. The first is centered on the changing competitive balance between the traditional Big Three automotive manufacturers and their Japanese rivals. The competitive gap is closing as the Big Three continue to improve product quality, design, and process efficiencies. At the same time, the Japanese industry has found itself facing increased costs, as its capital advantage has withered, enhanced product mix has increased production costs, and the strengthened yen has driven up the dollar price of Japanese automotive products. On balance, this suggests that the Japanese vehicle and parts share may well fall between now and 1996.

The second development reflects the changing pattern of vehicle sourcing by the Japanese manufacturers, as their U.S. facilities' share of total U.S. sales grows, driven in part by favorable production economics and perhaps in part by political considerations.

Moreover, the increased quality and clear cost advantage of U.S. parts suppliers should increase the U.S. content of these New Entrant vehicles. In an automotive market where Japanese vehicles face stable or declining shares, this should lower the volume of Japanese imports. However, continued strengthening of the yen will prevent dollar values from falling to the same degree.

Third, the internationalization of the automotive industry continues. The Japanese automotive industry has established significant offshore production capability in Europe and Southeast Asia as well as in both the United States and Canada, and the anticipated signing of the North American Free Trade Agreement expands the production options of the traditional Big Three. That means that the bilateral focus of the current analysis and projection may become less relevant in the future, as manufacturers and suppliers in both nations increase their sourcing options. We would expect the bilateral deficit to decrease as a proportion of the worldwide automotive deficit, as both national industries pursue these alternatives.

Scenarios. Our 1996 scenarios reflect both fixed and varying assumptions. First, all the scenarios reflect the assumption that light truck (pick-ups, vans, and sports utility vehicles) share of the market increases slightly, from 1992's 36 percent to 37 percent. This is consistent with our own expectations and those expressed by our Big Three respondents, and reflects the continuing share growth of that type of vehicle. Second, we assume that sales of Japanese-produced passenger cars and light trucks will be sourced 55 percent in the United States and 45 percent in Japan. This reflects our own and the Big Three respondents' belief that the economics of production and the preferences of the major Japanese manufacturers will result in the cross-over to preponderant sourcing from North American facilities.

Our past trade projections each included a fixed assumption about the size of the U.S. automotive market in the forecast year, reflecting macroeconomic assumptions about the state of the economy and a consensus of industry experts. We assumed a market of 16 million light vehicles for each of our prior forecasts. However, the lateness and length of the recent recession, combined with a weak recovery to date make it unlikely that we will reach that large a market in either 1993 or 1994. Consequently, for the current forecast, we elected to develop two scenarios of market size. The first, based upon our interviews with the Big Three, is again a strong 16 million, reflecting a belief that the economy will strengthen and that at least some of the low sales of recent years will result in pent-up

demand, yielding a strong sales year by 1996. The second scenario calls for 15 million total sales, or an average market. This scenario is consistent with an earlier economic recovery, and a strong market earlier than 1996, or with a continuing weaker market, reflecting concerns for demographic shifts and persistent weakness in personal income levels.

We think that a strong market will somewhat alter the segmentation of passenger vehicles sold, such that about 1 percent of sales will move upward from entry-level small cars to intermediates, and about 1 percent of intermediate sales will move upscale to large/luxury cars. In the average market, segmentation is 33 percent, 45 percent, and 22 percent, the same as in 1992. The relatively stable segmentation of passenger vehicles reflects the assumption that CAFE standards will not rise excessively by 1996, and that there will not be sharp increases in the price of fuel.

We also developed scenarios that reflect different assumptions about Japanese-produced vehicles' market share. The first calls for the Japanese-produced share to remain stable, at its 1992 level of 28 percent of the total vehicle market. This scenario is consistent with the expectation that Japanese-produced share loss thus far in 1993 is simply a temporary reversal, and that the Japanese manufacturers will emerge from their current adversity stronger and more competitive, retaking by 1996 any share losses they might suffer in the interim. Some of our Big Three respondents subscribe to this stable scenario.

The second scenario calls for Japanese-produced share to decline 3.4 points, largely driven by the strengthening of the yen and the enhanced competitiveness of the Big Three. This declining share scenario reflects our own estimates of the likely size of the loss; some of the Big Three respondents expected somewhat smaller losses.

Japanese-produced share of light trucks actually increases slightly in the stable share scenario, moving from 1992's 14.7 percent to 16 percent. This reflects the larger share of light trucks in the overall market, stable Japanese car share, and our belief that Japanese manufacturers will compete more aggressively in this growing market. Similarly, Japanese light truck share falls 1.2 points in the declining share scenario, somewhat less than the overall 3.4 points. However, Japanese share of sport utility and vans increases in both scenarios—just over 3 points in the stable share scenarios, and about 1.25 points in the declining share scenarios.

Parts model. Our analysis of monthly parts data from 1985 through 1992 again emphasizes the importance of New Entrant or transplant production as a source of demand for imported Japanese automotive parts, although it incorporates other variables. This forecast model reflect the analyses performed for two other models as well: an explanatory model and a dynamic adjustment model. Big Three production is negatively, but not significantly, related to Japanese parts imports in the United States.

Results. While we generated four scenarios for our forecast, and report them in constant 1992 and current 1996 dollars, this summary reports only two constant dollar estimates. These are the strong market, stable Japanese share scenario (yielding the largest deficit projection) and the average market, declining Japanese share (yielding the smallest deficit projection.) The bilateral automotive deficit is made up of imports minus exports, for both parts and vehicle trade flows.

Parts imports from Japan are forecast to increase over the next few years, but then turn down by 1996. In our strong, stable scenario, parts imports for 1996 will reach $12 billion 1992 dollars. This is up 1 percent from 1992 levels, although the market and total Japanese sales in the United States are each 24 percent larger. In our average, shrinking scenario, parts imports in 1996 will reach just over $11 billion 1992 dollars, down 6.5 percent from 1992, although the market is 16 percent larger, and Japanese sales rise 1 percent.

Our scenarios differ in their assumptions about the level of parts exports from the United States to Japan. For our stable share scenarios, we assume the trend line value for 1996—about $1.39 billion 1992 dollars, up 50 percent from 1992. For the declining share scenario, we assume that parts exports will increase some 150 percent by 1996, reaching $2.31 billion. This assumption captures the rate of potential improvement possible over four years. First, in early 1992, the Japanese industry pledged efforts to double U.S. exports to Japan by 1994 from their 1990 levels. Second, we believe once the process has begun, there will be accelerated improvement. Third, the yen has strengthened, and we anticipate increased New Entrant production.

The 1996 parts deficit, then, will fall somewhere in the range of $8.8 billion and $10.6 billion 1992 dollars, depending on the size of the market and competitive dynamics. These represent declines of 20 percent and 3 percent from 1992, but declines in either case.

Our strong, stable vehicle forecast calls for imports of $26.04 billion in Japanese vehicles, based on 2.02 million unit imports. Our average, declining share scenario results in $21.25 billion dollars in Japanese imports, based on 1.66 million units.

We again distinguish the export levels of our stable and shrinking scenarios, reasoning that exports should be higher under the monetary and competitiveness assumptions of our declining share scenario. The stable scenario calls for exports of 100,000 vehicles, valued at $1.71 billion 1992 dollars, while the declining share scenario forecasts 120,000 unit exports at $2.05 billion 1992 dollars. The vehicle deficit, then, reaches $24.34 billion 1992 dollars in the strong, stable scenario—up 19 percent—but falls 6 percent, to $19.20 billion in the average market, declining Japanese share scenario.

The total bilateral automotive deficit then, ranges from $34.95 to $27.97 billion 1992 dollars. Thus we expect an increase of over 11 percent in the total deficit for the strong, stable scenario, as sales of Japanese-produced vehicles increase 24 percent. We anticipate that it will fall almost 11 percent in the average, declining scenario, as Japanese vehicle sales rise 1 percent.

I. Introduction

The United States finds itself, in mid-1993, still facing a number of serious economic challenges. Among the most serious and consistent of these problem areas are the "twin deficits," the federal budget deficit and the balance of trade deficit. This report focuses on a conceptually narrow component of the U.S. trade deficit: the U.S. deficit in one product area with one country. Although conceptually limited, the bilateral automotive trade deficit with Japan accounts for a larger share of the overall U.S. trade deficit than any other bilateral, product-specific category of trade. An understanding of the development of this specific trade deficit remains critical to the formation of policies meant to improve overall U.S. trade performance.0

This report updates and extends our 1989 and 1991 forecasts of the 1993 and 1994 U.S.-Japan automotive trade deficits.[1] We think this update is necessary for three primary reasons. First, since 1991, the Japanese manufacturers have announced substantial efforts to increase sourcing of U.S. automotive goods, and preliminary reports suggest some movement in that direction. A critical issue for the bilateral automotive deficit is the effect of the Japanese commitment to $19 billion in U.S. purchases on our original forecast, especially since much of that commitment has been tied to increased U.S. production.

Second, our most recent forecast year was 1994, and the effect of industry decisions on that year are already virtually fixed, given normal industry lead times. The Japanese have announced a more restrictive Voluntary Export Restraint Program (VER) and the past 18 months have shown some Japanese vehicle share loss in the United States. These developments might portend shifts from the near-term expectations of our last analysis.

Finally, as is always the case, our studies can be improved. It seems clear now that our forecast for the total size of the U.S. market, and the high level of Japanese-affiliated vehicle build in the United States was too high. We also had some concerns about the rather limited number of data points. Our 1991 study, Trade II, relied on 69 months of data, and 96 months of data are now available. This expanded data set

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[1] Michael S. Flynn, Sean P. McAlinden, and David J. Andrea, *The U.S.-Japan Bilateral 1993 Automotive Trade Deficit*, UMTRI Report 89-18, Office for the Study of Automotive Transportation, Transportation Research Institute, The University of Michigan, Ann Arbor, 1989; and Sean P. McAlinden, David J. Andrea, Michael S. Flynn, and Brett C. Smith, *The U.S.-Japan Automotive Bilateral 1994 Trade Deficit*, UMTRI Report 91-20, Office for the Study of Automotive Transportation, Transportation Research Institute, The University of Michigan, Ann Arbor, 1991.

supports more thorough analysis of the underlying trends and patterns, and provides the opportunity to examine whether there have been any substantial shifts in these patterns over the last two years. We also improve our analysis of the automotive trade imbalance through the use of more advanced analytic and modeling methods.

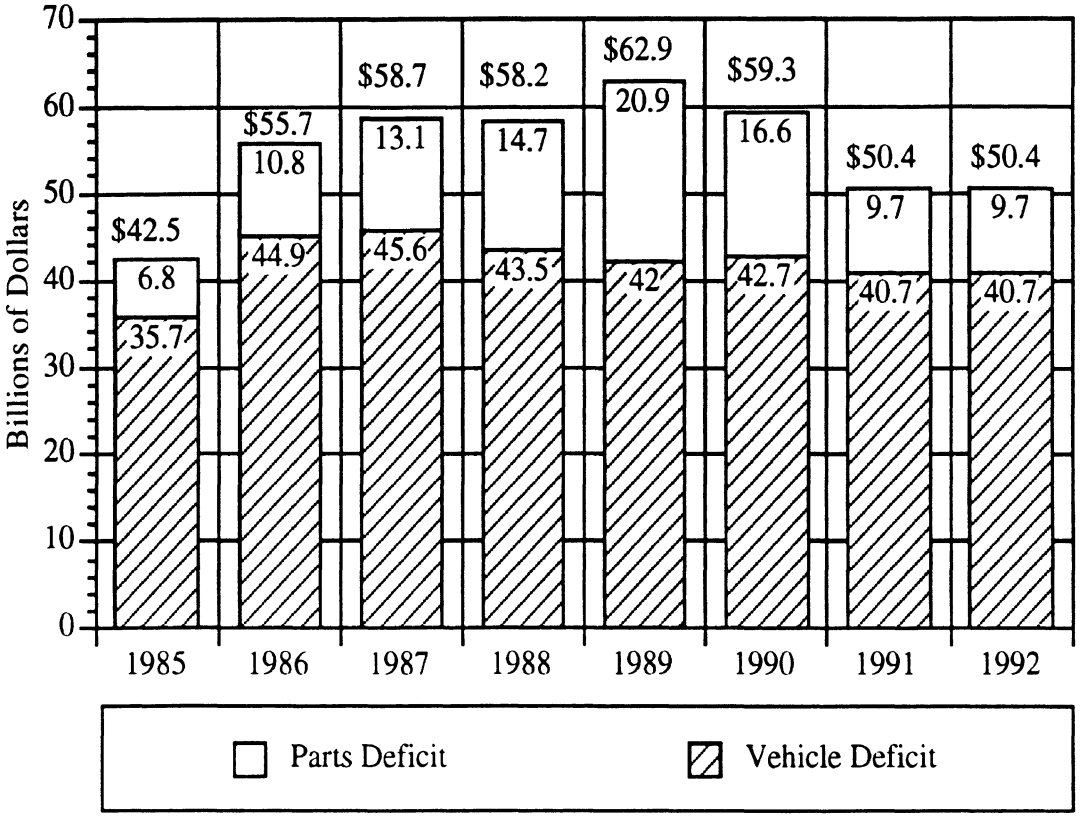
Once again, the ultimate focus of our analysis is to project the likely bilateral automotive balance with Japan for a specific forecast year: 1996. We, again, stress that much of the analysis is based on factors, developments, and events that are important in automotive competition, but may be less important in other trade areas.

The U.S. Automotive Trade Balance

Figure 1 displays the U.S. automotive trade deficit from 1985 through preliminary estimates for 1992.[2] Automotive products generated a current-dollar deficit of $50 billion in 1992, up from about $42 billion in 1985, but down from about $63 billion in 1989. Complete vehicles accounted for a deficit of about $41 billion, reflecting vehicle imports of some $54 billion and exports of nearly $14 billion. The 1992 vehicle deficit is almost 11 percent below its high of $46 billion in 1987, and virtually identical to 1991. In contrast, automotive parts generated a deficit of almost $10 billion in 1992, about the same level as 1991, but some 54 percent below the 1989 record.

[2] All automotive trade figures, unless otherwise noted, were supplied directly by the U.S. International Trade Commission, Washington D.C. Please see Appendix I for historical, trade-related data tables.

Figure 1
Total U.S. Automotive Deficit
1985-1992

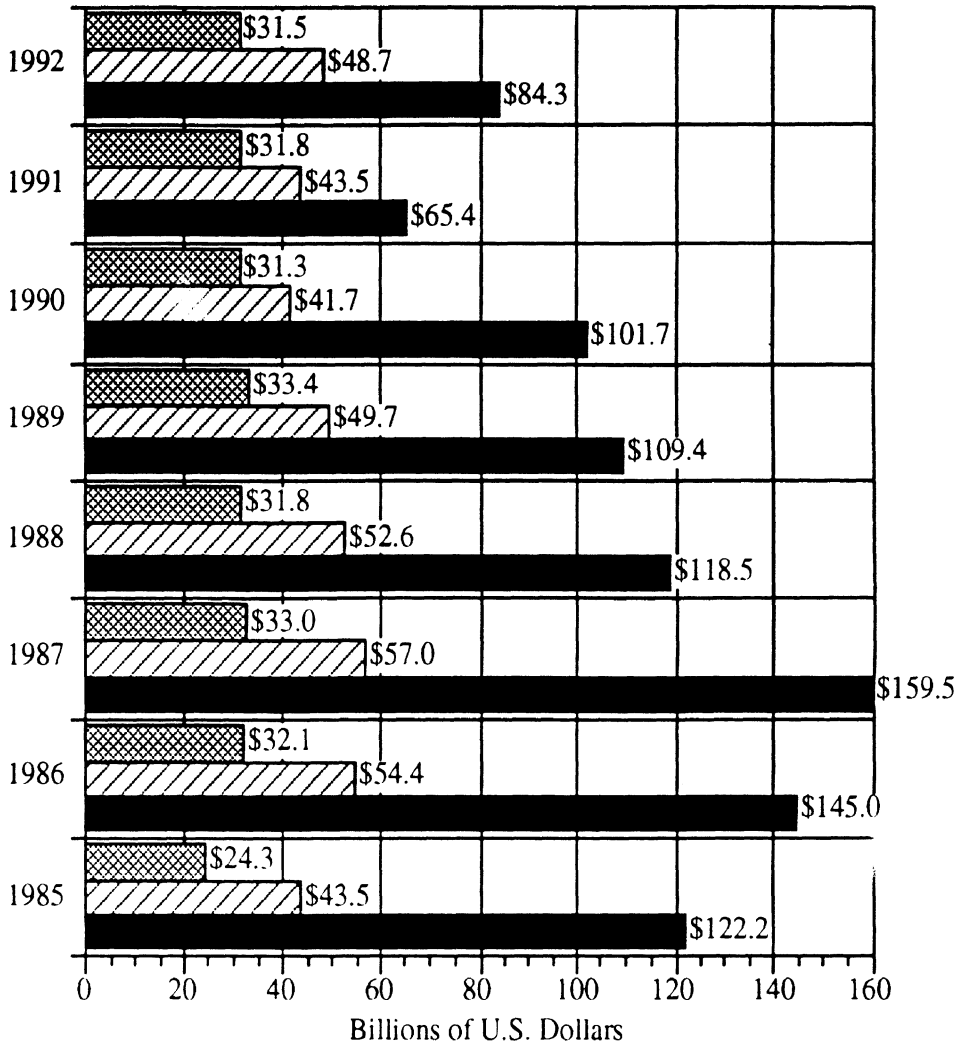


Source: U.S. International Trade Commission, 1993

The U.S. automotive trade deficit from 1985-1992 reveals an interesting pattern. The automotive parts share of the overall automotive deficit changes rather sharply; it rose from less than 16 percent in 1985 to 33 percent in 1989, but then dropping back to 19 percent in 1992. This pattern accounts for a major revision in our prior analysis of the trade deficit.

It is difficult to overestimate the importance of the automotive sector in overall U.S. trade performance. Figure 2 illustrates the relationship of three key deficits: the total merchandise trade deficit, the bilateral U.S.-Japan trade deficit, and the bilateral automotive trade deficit.

Figure 2
Relative U.S. Deficits
1985-1992



The overall trade deficit with Japan remains the largest single country deficit in the U.S. worldwide merchandise trade imbalance, and that fact explains much of the trade friction that has developed between the two nations. From 1985 thorough 1987, trade flows with Japan accounted for well over one-third of the total U.S. trade deficit. That proportion rose to above 40 percent from 1988 through 1990, and reached 67 percent and 58 percent in 1991 and 1992, respectively.

The automotive trade deficit accounted for 60 percent of the preliminary estimate of the total U.S. merchandise deficit of $84 billion in 1992. While this is only slightly above its 58 percent share in 1990, it suggests that the automotive deficit remains a serious impediment to the further reduction of the overall U.S. trade deficit. To be sure, the broader deficit is composed of thousands of bilateral specific surpluses and deficits, and we must be cautious about attributing specific cause and effect relationships among its constituent elements. However, the effort required to offset the automotive trade deficit through exports in other product areas would be enormous, and probably require an elaborate policy of picking "winners and losers" in U.S. trade and manufacturing in a world where free trade may still be more a goal than a reality. In our view, this justifies particular focus upon the automotive sector.

From 1985 through 1990, Japanese automotive trade with the United States accounted for over 50 percent of the total U.S. automotive deficit, but its share rose to 63 percent and 62 percent of that total in 1991 and 1992. As the broader automotive deficit has fallen some 20 percent from its 1989 high, the bilateral deficit with Japan has remained remarkably constant, resulting in its increased share of the total. No other U.S. bilateral automotive deficit reveals such consistency in the face of the broader decline.

The U.S.-Japan automotive trade deficit has historically accounted not only for a large share of the total U.S. automotive trade deficit, but also for an important share of the overall U.S.-Japan merchandise trade deficit. Preliminary estimates indicate that this broader, overall deficit may have increased by 12 percent from 1991 to 1992, reaching $48.7 billion. The bilateral automotive deficit has accounted for a range of 56 percent (in 1985) to 75 percent (in 1990) of the total bilateral trade deficit with Japan, and now stands at 65 percent It is not surprising that much of the trade debate between Japan and the United States has been concentrated on the automotive industry.

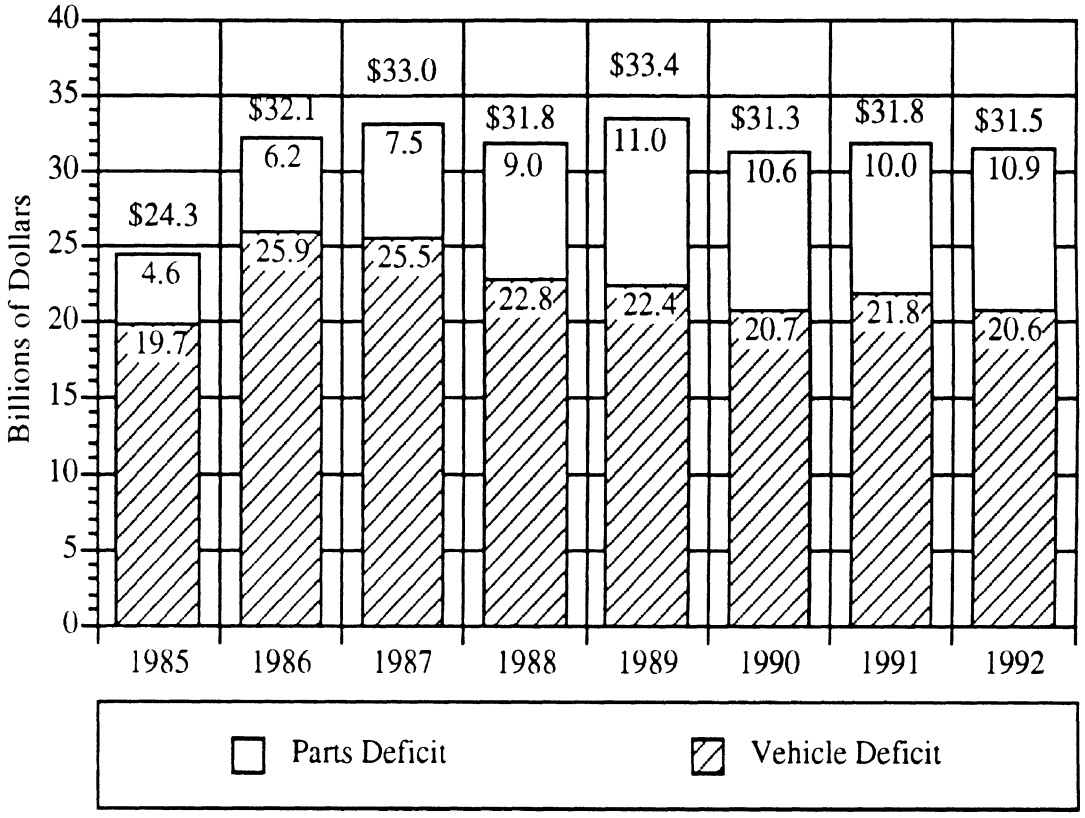
The bilateral automotive deficit with Japan accounted for 37 percent of the preliminary estimate of the total U.S. merchandise trade deficit in 1992. This suggests that serious efforts to reduce the U.S. trade deficit will have to be directed to this product- and country-specific deficit. We firmly believe that reduction of this deficit will require policy efforts on the part of both governments in trade and in other areas, and that both industries will have to pursue a broad range of private initiatives as well. The problem of

the bilateral automotive deficit is complex, and there are, unfortunately, no ready and simple solutions to it.

The U.S.-Japan Automotive Trade Deficit

Figure 3 displays the U.S.-Japan automotive trade deficit from 1985 through preliminary estimates for 1992. U.S. automotive trade with Japan generated a current dollar deficit of $31.5 billion in 1992, up 30 percent from $24.3 billion in 1985, but down about 6 percent from its $33.4 billion record in 1989. This increase in the deficit developed in a period that saw the yen/dollar exchange rate fall from a level of 238 in 1985 to 127 in 1992, a macroeconomic adjustment many expected to effect major decreases in this deficit.

Figure 3
U.S.-Japan Automotive Deficit
1985-1992



Source: U.S. International Trade Commission, 1993

An important development in the automotive trade imbalance with Japan is the growing contribution of the parts deficit to that overall bilateral deficit. In 1985, the parts deficit of $4.6 billion accounted for about 19 percent of the total U.S.-Japan automotive

deficit. The parts share rose to almost 23 percent in 1987, and continued to rise thereafter. The parts deficit in 1992 was $10.9 billion, or 35 percent of the total bilateral automotive deficit. In fact, the 1992 vehicle deficit is less than 5 percent above its 1985 level, and down some 20 percent from its 1986 high, while the parts deficit has grown nearly 240 percent Therefore, the increase in the total deficit since 1985 is largely concentrated in the parts sector.

Comparison of the data in Figure 3 with those of Figure 1 is illuminating. The 1992 U.S.-Japan automotive parts deficit accounted for 112 percent of the total U.S. trade deficit in auto parts. In 1992, U.S. trade in auto parts with the rest of the world generated a surplus of about $1.2 billion dollars, a sharp reversal from 1989's deficit of just under $10 billion. Over that period, the parts deficit with Japan fell 1 percent and Japanese parts exports to the United States peaked in 1992 at $11.9 billion, up from a level of $10.8 billion in 1991. In fact, while the total automotive deficit with Japan fell about 1 percent from 1991 to 1992, the parts deficit grew 9 percent.

The U.S. automotive trade deficit with Japan accounts for Japanese imports to the United States and U.S. exports to Japan. Growth rates in U.S. exports of automotive products to Japan since 1985 are impressive. However, this impressive growth is based upon very small initial amounts. Vehicle exports from the United States to Japan totaled less than $20 million in 1985, a total that grew to $696 million in 1992. Similarly, 1985 U.S. parts exports to Japan of $203 million increased to $925 million for 1992. Clearly, these trends are positive developments. However, it is also clear that they must be maintained for some period of time to reduce substantially the overall level of the U.S.-Japan automotive trade imbalance.

To be sure, U.S.-Japan automotive trade also affects a number of other specific deficits with Japan. This has become especially important with the construction and operation of over 260 Japanese affiliated automotive assembly and parts facilities in the United States, since these facilities purchase and use both Japanese and U.S. non automotive goods and services. Moreover, the expansion of Japanese automotive production in a number of other countries that trade with the United States means that U.S.-Japanese automotive competition may also influence bilateral deficits with these third countries. As the automotive industry continues to develop internationally, bilateral, product-specific analyses will inevitably tell a smaller and smaller portion of the

total story. Unfortunately, as these comparative statistics show, we have not yet reached that point in regard to the U.S.-Japan automotive trade deficit.

II. Method

The methods used for forecasting the future vary greatly, depending upon the analysts' disciplinary perspectives, technical skills, detailed understanding of the forecast topic, and the specific purposes of the forecast. Thus, a formal forecast of the U.S. economy by academic forecasters is likely to differ greatly in method, substance, and style from the forecast prepared by the economist of a particular company to anticipate company performance. Perhaps reflecting the interdisciplinary OSAT staff, our bilateral automotive trade forecasts seek to combine the particular strengths of different forecast methods.

Scenario-Modeling

As in our earlier forecasts, we use a "scenario-modeling method," a combination of accounting and regression models, to forecast the 1996 bilateral automotive trade deficit with Japan. We first develop scenarios of the 1996 U.S. automotive market that reflect our best judgments of likely developments by that time. That, in turn, requires forecasting the sales goals and achievements of the vehicle manufacturers, both Japanese and Big Three. We then link these projected sales patterns to the manufacturers' domestic- and foreign-vehicle sourcing patterns.

Two primary categories of goods constitute the direct automotive trade between the United States and Japan: finished, or fully built-up (FBU), vehicle units; and parts and components. These categories exhibit different patterns and reflect different dynamics over time. Consequently, we perform separate analyses of these two major categories of automotive trade, then combine the results to yield an overall forecast of 1996 U.S.-Japan automotive trade.

Vehicle Import Estimates Drawing on data supplied by the ITC, we first examine trends and patterns in trade of finished vehicles between the United States and Japan. We estimate likely market shares of Japanese produced vehicles in the United States, by segment, and then forecast the source of these segment sales from Japan and from U.S.-based Japanese operations. The likely use of captive imports and transplants by the traditional North American producers, and the export intentions of U.S.-based Japanese facilities, are two important considerations in this analysis. The vehicle trade

section of this study is a critical first step, both as an estimate of the likely 1996 vehicle deficit and as a source of information required for the forecast of parts trade.

We next tie these automotive scenarios to the vehicle categories underlying the official statistics on U.S. vehicle imports. Customs values for imported passenger vehicles are reported by engine size—four, six, and eight cylinders. For passenger cars, we assume that all small car import sales plus 75 percent of intermediate sales are sales of four cylinder cars. The balance of intermediate imports (25 percent) plus 75 percent of large/luxury sales are in the six-cylinder category, while the remaining 25 percent of large/luxury imports constitute the eight-cylinder category.

Vans and four-door sport/utility vehicles are both considered passenger vehicles for customs purposes, so we also allocate them to the four-cylinder (25 percent) and 6 cylinder (75 percent) categories.[1] However, we assume that 75 percent of these vehicles will still be imported in 1996, down only slightly from 1992, reflecting the assumption that these more profitable vehicles can more readily bear Japan's increased production costs as measured in dollars. The balance of light trucks is assigned the customs value reported by ITC for this category. These 1992 customs values are applied as 1992 dollar estimates of our 1996 vehicle deficits.

Parts Imports Estimates We next forecast the trade flows of automotive parts and components, reflecting the Japanese import sales and U.S. build assumptions in our vehicle forecast. Standard multiple-regression techniques are applied to parts trade data for the period 1985-1992. These techniques permit the use of appropriate controls and corrections for measured quantities, and allow for a formal estimate of automotive imports into the United States from Japan.

We restrict our analysis to the 1985-1992 period because pre-1985 data are now less useful in developing a forecast model of parts trade for a number of reasons. First, Japanese production in the United States continues to expand, a development that is largely post-1984. Second, the Japanese government now sets its own Voluntary Export Restraint (VER) limits, without the formal involvement of the U.S. government. Third, the Japanese producers now compete aggressively for sales in the large/luxury segments of the market.

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[1] The allocations for sport/utility vehicles and passenger cars are quite different. This is because of the different patterns characteristic of 1992, and engine displacements evident in the forward product plans for these two types of vehicles.

The linkage of these automotive scenarios to the parts deficit is based on the analysis of U.S. sales, build, fleet, and import data over the 96 months from January, 1985 through December, 1992. This analysis yields coefficients that link vehicle sales volumes, sourcing patterns, and vehicle build to the customs value of parts imports. These coefficients, characteristic of the 1985-1992 period, are applied to our 1996 scenarios, yielding predicted customs values, in constant dollars, of 1996 parts imports from Japan.

1996 Dollar Estimates We form the current 1996 dollar estimate for vehicle and parts imports by correcting these constant dollars to reflect increases in the consumer price index (CPI), vehicle prices, and the exchange rate. Our stable Japanese share scenarios reflect a smaller correction factor (10.46 percent) than our shrinking Japanese share scenarios (14.97 percent) because they differ in their assumptions of the yen/dollar exchange rate. The stable share scenarios assume a rate of 117:1, while the shrinking share scenarios assume a stronger yen, trading at 110:1.

Vehicle and Parts Exports Forecasting the 1996 automotive trade deficit with Japan also requires developing a scenario of U.S. vehicle and parts exports to Japan. We again tie the customs values of U.S. vehicle exports to Japan to our automotive scenarios. We project parts exports to Japan in two ways. First, we extrapolate the trend of the 1985 to 1992 period to derive an estimate for 1996. Second, we accelerate this trend in recognition of the rapidly changing economics of production and the commitments of the Japanese manufacturers to increase sourcing from the United States.[2] These procedures yield constant 1992 dollar estimates that are inflated to 1996 dollars by an estimate of the change in the CPI (14.41 percent).

[2]We simply do not have enough knowledge of the plans of the Japanese manufacturers to develop specific U.S. sourcing scenarios. Our projection is quite possibly optimistic, calling for nearly a tripling of the value of U.S. parts exports to Japan by 1996. However, that makes it conservative in estimating the trade deficit, because overestimating these parts exports introduces an underestimation of the parts deficit.

Four Automotive Scenarios

We rely on four automotive scenarios, grounded in the developing trends in the U.S. market thus far in the 1990s. These scenarios focus on two critical factors: the size of the 1996 U.S. market and the share performance of Japanese-produced vehicles in those markets, including the likely sourcing of those vehicles from Japanese and U.S. production facilities.

Market Size First, we develop two assumptions of market size: one of 15 million total, light duty vehicle sales, and another of 16 million. We label these markets *average* and *strong*, respectively. These markets are, in our judgment, equally plausible, primarily depending upon the assumptions one is willing to make about the speed and strength of U.S. economic recovery and the extent to which the downturn of 1991-1992 deferred necessary replacement sales until better times.

Japanese-Affiliated Vehicle Share Second, we develop two assumptions about Japanese share in the 1996 market. The first is the traditional forecaster's assumption of stability: Japanese manufacturers' production share remains stable at 28 percent of the light duty vehicle market. This assumption reflects the belief that the Japanese producers will defend against further loss of market share, successfully meeting the challenges of a strengthened yen, a vehicle mix shifting into the light truck segment, and the enhanced competitiveness of the Big Three. The second share assumption calls for Japanese manufacturers' production share to fall some 3.4 points to 24.6 percent of the U.S. market. This assumption primarily reflects the analysis by Fuss, Murphy, and Waverman of the effects of the yen moving sharply to 110 to the dollar.[3] Their analysis is consistent with our own strategic analysis of Japanese performance, basic assumptions and analyses of likely exchange rates, the corporate goals and strategies of the automotive producers, and the likely decisions of U.S. consumers. We label these assumptions *stable* and *declining* share, respectively.

We develop four alternative scenarios by combining these two factors. These are displayed in Table 1. There are ample grounds for honest and reasonable disagreement among analysts on each of the many assumptions and arguments that underlie any particular scenario. In particular, the assumption of market size is critical to any specific

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[3] *Competitive Survival: Private Initiatives, Public Policy, and the North American Automotive Industry*, UMTRI Report 92-3, The Office for the Study of Automotive Transportation, Transportation Research Institute, The University of Michigan, Ann Arbor, June, 1992, p. 166.

estimate of deficit size, and we feel that future U.S. market share of Japanese-produced vehicles is one of the major uncertainties facing the automotive industry today. To be sure, the presentation of these four scenarios will not satisfy all readers, but it should narrow the grounds of debate.

Table 1
Four Scenarios of the 1996 U.S. Market

	Market Size	
Japanese Produced Share	Strong (16,000,000)	Average (15,000,000)
28.0%	I	II
24.6%	III	IV

Data Sources

Our analysis relies on three essential types of data. The first is government statistics. The U.S. International Trade Commission (ITC) provided data on U.S. general automotive exports to and imports from Japan, including cars, trucks, and parts. The ITC provided monthly data, corrected for the January, 1989, conversion to "harmonized" codes for the calendar years 1985 through December, 1992, or a total of 96 months.[4] This monthly data set contains 77 parts categories and provides great detail on the import and export dollar values and vehicle quantities underlying the bilateral deficit.[5]

The second type of data is the published estimates of the industry media. Levels of actual monthly U.S. sales for the various trade categories of vehicles were collected from the annual *Automotive News Market Data Book*. Levels of traditional and transplant monthly U.S. production, by vehicle category, were taken from *Ward's Automotive Reports* for the January, 1985, through December, 1992, period. We combined these data with trade data to develop our model and to analyze factors that relate to the deficit.

For ~~this study~~, we also incorporate a third type of data. We interviewed knowledgeable manufacturers' executives to inform our automotive analysis, collecting their views on likely competitive developments; future market size, segmentation, and

[4]The data provided by the ITC are not identical to data provided for Trade II, hence the totals reported here may differ from the earlier report.

[5]The ITC vehicle and parts category lists are displayed in Appendix IV.

producer shares; and likely sourcing patterns and trade flows. Unfortunately, we were not able to obtain interviews at the leading Japanese manufacturers, although we were able to interview experts at each of the Big Three.

III. Trade Data and Definitions

Analysts and companies report a variety of numbers that intuitively appear related to the bilateral automotive trade deficit. Thus, a manufacturer may report the "U.S. content" of a particular vehicle, or report that it is a "domestic" vehicle under Corporate Average Fuel Economy (CAFE) standards. The manufacturers may also claim tariff-free crossing of the U.S.-Canadian border under the Free Trade Agreement, or report the total volume of "auto parts and materials" purchased for export to Japan. While all of these trade numbers do relate to the bilateral automotive trade deficit, they do so in different, and often complicated, ways.

It is important that readers recognize these definitional distinctions. Our analysis is based on trade data collected by the United States. Those data often do not have any direct or even necessary relationship to other data that bear on alternative meanings of "domestic," "import," or "export." Thus, reported changes in CAFE content levels over a particular period may have little if any relationship to changes in automotive sourcing, in trade terms.[1]

The trade data that we use in our analysis are all drawn from U.S. government sources. As such, they constitute the "official" data underlying the trade deficit. One of the frustrations in analyzing trade data is that the reports of one country's imports from another are rarely identical to that second country's report of its exports to the first. Most analysts assume that countries keep better data on imports than exports because of the revenue implications of imports. In the case of the United States and Japan, this general problem is exacerbated by the two countries using different methods for valuing imports. The United States formerly valued imports by including the cost of freight and insurance, but began to exclude these costs in 1989 as part of its harmonization effort. Japan appears to still include these costs; so even if both countries accurately tracked all imports and exports, there would be differences in the two national estimates reflecting each country's practices in regard to these "shipping" costs.

U.S. government numbers typically suggest lower exports of U.S. automotive parts and components to Japan than do the numbers often cited by Japanese companies and trade associations to demonstrate their commitment to higher levels of sourcing in the

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[1] UMTRI Report 89-18, op. cit., pp. 16-18, 63-85.

United States.[2] It is important to understand the differences between these sets of numbers in order to understand and monitor trade developments.

The United States and Japan initiated Market-Oriented Sector Specific, or MOSS, trade discussions and negotiations in 1986, and selected automotive parts as an initial agenda item. The Japanese government's Ministry of International Trade and Industry (MITI) and the Japan Automotive Manufacturers Association (JAMA) agreed to monitor and measure the purchase of U.S.-made parts by Japanese automotive firms on an annual basis. JAMA and MITI have since released these figures on a regular basis and are sometimes referred to as part of the "MOSS Data Collection." Figure 4 displays the published reports of these purchases on a Japanese fiscal year basis for 1986-1991 and the first half of 1992, as well as U.S. government totals for the full calendar years 1986-1992.[3]

Figure 4 shows the JAMA/MITI totals of Japanese manufacturer's total purchases of U.S.-made parts rising from a level of $2.49 billion in FY1986 to a level of $10.5 billion in FY1991, with an encouraging $6.7 billion for the first half of FY1992. We estimate, based on these figures, that automotive part and component exports to Japan from the United States rose from $400 million in FY1986 to a total of $2.08 billion in 1991, a gain of 520 percent.

However, the U.S. ITC reports that exports of automotive parts to Japan rose a less strong—but still impressive—411 percent, but from a lower base of $203 million in 1986 to $835 million in 1991. These two 1991 estimates are just about $1.25 billion apart, and undoubtedly bear on the different evaluations the two countries—and industry members—make about the rate and level of progress in opening the Japanese parts market to U.S. sales. While a small portion—perhaps under 10 percent—of this difference resides in the inclusion of freight and insurance in Japanese valuation of imports, we think most of the difference in these estimated exports to Japan is due to different definitions of automotive parts and components.

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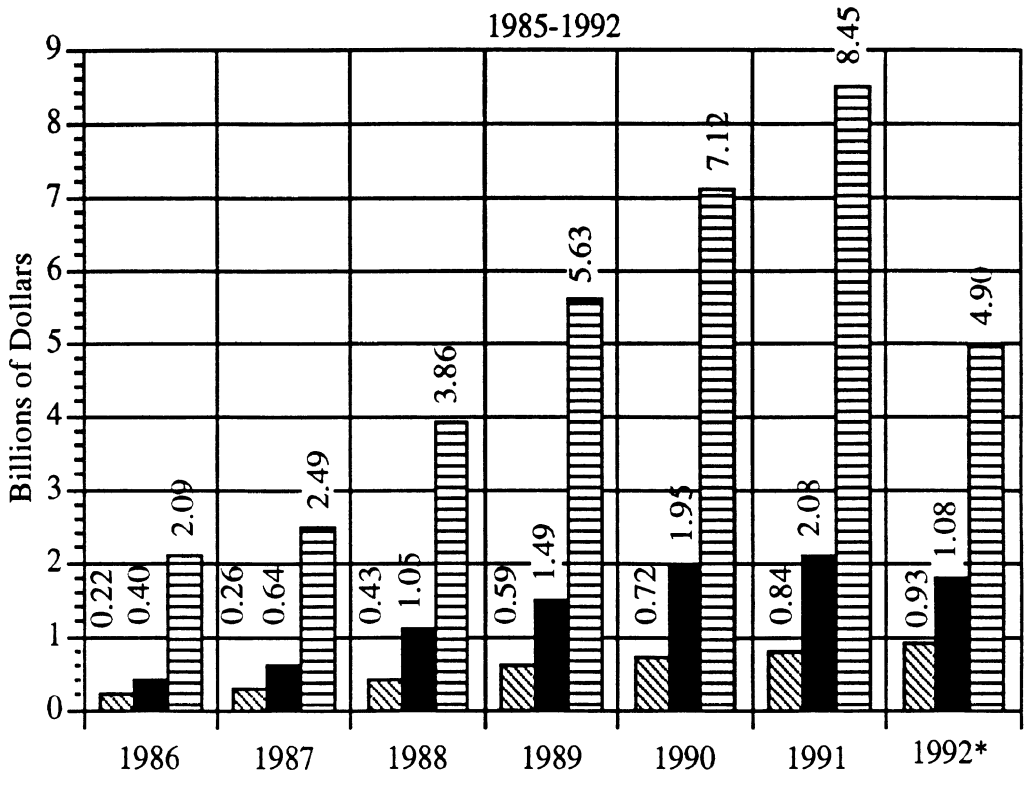
[2] "JAMA Confirms $13.6 Billion in U.S. Parts Purchases," *The Autoparts Report*, International Trade Services, p. 7, July 1, 1993; and "U.S. Sees Still More Parts Buys," *Automotive News*, Crain Communications Inc., June 7, p. 43, 1993.

[3] The Japanese fiscal year runs from April 1 through March 31, or the second through the first calendar quarters.

Figure 4

Japanese Purchases of U.S. Automotive Parts

1985-1992



* 1992 data: ITC figures are for entire year, JAMA figures are for 1st half.

ITC Exports to Japan (Calander Year) | JAMA Exports to Japan (Fiscal Year) | JAMA Local Use (Fiscal Year)

Source: Japanese Automobile Manufacturing Association, U.S. International Trade Commision

The definitions used by the ITC to report automotive parts trade are displayed in Appendix IV. For ITC purposes, an automotive part must be a discrete product, generally used in the final assembly of major automotive components or the vehicle itself. On the other hand, the JAMA/MITI—and Japanese manufacturer—definition of automotive parts appears to incorporate purchases of other goods and products by automotive companies.[4] These include both raw materials (such as aluminum ingots), paint, plastic resins, and other products (such as textiles for carpeting and leather for seat covers) that have many non-automotive uses. To be sure, these non automotive purchases and exports are recorded by the ITC, but in other product categories. Thus, such purchases count as

[4]JAMA recently released some detailed information on Japanese producers' purchases of U.S. parts. These purchases include raw materials, estimated at somewhat under 10 percent of the total.

U.S. exports in determining the overall bilateral trade balance, but they are not counted in the calculation of the specific automotive trade balance.

These differences in definition are not surprising, since they reflect differing concerns and information. From the view of a Japanese company, it makes perfect sense to record as an automotive purchase and export those materials and products that they buy for use in automotive production in Japan. From the view of the U.S. government, it is more efficient and accurate to simply record the product and categorize it by general use, rather than to make its categorization dependent on determining its final specific use.

However, these numbers do suggest a problematic pattern in the development of U.S. automotive-related exports. First, the ITC's more restrictive definition of automotive parts suggests that automotive exports to Japan have increased some 400 percent, reaching a level of over $800 million by 1991. Second, since we assume that the JAMA/MITI numbers typically include the trade flows reported by the ITC, we can recover an estimate of trade developments for automotive-related, but non automotive goods. Subtracting the ITC numbers from the JAMA/MITI numbers suggests that the exports of automotive-related goods have grown from some $200 million to $1.25 billion, or over 600 percent, from FY1986 to FY1991. ITC-defined automotive goods fell from 51 percent of the JAMA/MITI FY1986 total to 40 percent of the FY1991 total.

These non automotive goods are typically both lower value and lower value-added than automotive goods as defined by the ITC.[5] Moreover, they are often produced by companies less reliant on their automotive business than those that produce automotive goods as defined by the ITC. Therefore, the economic and industry implications of increased exports to Japan are quite different for the ITC and JAMA/MITI estimates.

While we think that most of the disagreement between ITC and JAMA/MITI export estimates is rooted in these differing definitions, we do think it is possible that JAMA/MITI numbers occasionally *double-count* purchases. For example, the purchase of steel in the United States that is used to fabricate a part or stamping in a U.S. facility may be properly counted as a domestic-use purchase. However, the full value of the exported part or stamping—including the value of the steel—may also be counted as an

[5]UMTRI Report 92-3, op. cit., p. 34.

export. Such double-counts are difficult to avoid, and thus would not be especially surprising if they in fact occur.

JAMA and MITI also report Japanese manufacturers' total purchases of U.S. automotive parts for use at their facilities in the United States. These purchases reached $8.45 billion in FY1991, up over 400 percent compared with FY1986 purchases. This estimate raises an immediate question: why has such an increase in purchases, culminating in such a high level, seemingly not affected the parts trade deficit? While these purchases are not exports, one might expect that to some extent they substitute for imported parts.

There are reasons why these JAMA/MITI domestic-use numbers seem so at odds with U.S. government reports of the bilateral deficit. First, the production of Japanese vehicles in the United States soared some 250 percent from 1986 to 1991, increasing the total U.S. purchases.

Second, we again undoubtedly face a definitional problem. These JAMA/MITI reports of domestic purchases include, we are confident, purchases that would be treated as "automotive" in an input/output analysis of the economy, while U.S. trade data include only discrete automotive parts. If we apply the same percentage figure that we calculated for exports in 1991, we would expect about $3.4 billion of this total to represent automotive parts and components as defined for trade purposes and general economic analysis.

Third, at least some of the Japanese companies include purchases from U.S. companies that originate outside the United States in their estimates of U.S. purchases. Thus, if the Japanese manufacturer sources parts from a GM plant for use in Japan, those are counted as U.S. exports to Japan—even if they come from GM facilities in Canada, Mexico, Europe, or Asia. This may be an important source of the differences in export numbers reported by JAMA and the U.S. ITC.

Fourth, in line with CAFE content calculations, U.S. assembly plants typically count as "U.S." content the full value of parts and components shipped from U.S.-sited plants, without determining the actual U.S. content of such shipments. Thus an air conditioner shipped from a component facility in the United States would be treated as 100 percent U.S. content by the automaker, even if most of its value is composed of an

imported Japanese component, such as a compressor.[6] Import content, as measured for CAFE purposes, is often lower than import content measured in trade terms.

Fifth, there may be some double-counting of purchases for strictly domestic use. If aluminum is purchased for the production of engine blocks or heads at a Japanese affiliated engine foundry, its value as a raw material is properly included. But that value may be counted again if the engine is sold to the assembly plant and also counted, at full value, as a domestic use purchase. Again, such double-counting would not be surprising.

Our estimate above assumed that the ratio of automotive parts to total purchases is the same for export and domestic consumption. However, we suspect that the sourcing of more restrictively defined automotive goods may in fact be somewhat higher for U.S. assemblies than for export to Japan. Such sourcing differences would make sense for bulky, heavy, and low-value parts: they would not be candidates for export from either country to the other. Can we estimate the proportion of these purchases that are automotive in the more restrictive sense?

We estimate the current dollar capacity of Japanese-owned, U.S.-sited supplier facilities at about $4 billion, based on estimated employment of 56,000 in 1991, and automotive supplier industry average output per worker of over $70,000. Of course, these facilities also sell to the Big Three, and many are experiencing severe problems of under-capacity. If we assume that as much as 80 percent of this capacity supplied Japanese-owned, U.S.-sited facilities, then these facilities might account for about $3.2 billion in U.S. purchases of automotive parts and components. Perhaps a more realistic estimate of 60 percent of capacity would suggest $2.4 billion in purchases.

Our 1991 trade report included an analysis of the 1990 sourcing patterns at the Japanese-owned U.S. assembly plant thought to have the highest levels of U.S. content—Honda's Marysville, Ohio plant. We estimated that traditional domestic suppliers accounted for just under $1,600 in value per unit at that time. While we recognize that the Japanese manufacturers have undoubtedly increased their sourcing of automotive parts from traditional U.S. suppliers, we doubt that this source had reached $1,600 on average by 1991, since Honda produces a more expensive vehicle. U.S. produced Honda cars are generally thought to have higher levels of U.S. content than the average of all

[6]Of course, the same situation applies to the Big Three. The proposed NAFTA content rules for duty-free treatment will require tracing of import content through the supplier chain.

new entrant assembly plants. However, if the average level of traditional U.S. supplier content is as high as $1,300 per unit, then 1991's Japanese-controlled production in the United States of 1.55 million vehicles would have yielded just over $2 billion in U.S. content. If traditional supplier content was still as low as $1,000 per unit, that would yield $1.5 billion in 1991 U.S. content.

The combined low and high estimates for Japanese-affiliated and traditional suppliers suggest that $4 to $5 billion in U.S. purchases of restrictively defined automotive parts and components is reasonable, while $8.45 billion is highly unlikely.

It is important to recognize that both sets of reports can be useful, although we think the utility of the JAMA/MITI series would be enhanced by a fuller account of the methods and procedures followed, such as is available from ITC. Unfortunately, the reports are quite different, and that sometimes creates confusion. Our analyses of the trade deficit rely on the official data from ITC, and that is appropriate to both our interests and purposes. The extent to which those data agree or disagree with the JAMA/MITI series should be a subject of research, rather than a basis of contention in the U.S.-Japan bilateral relationship.

IV. Evaluation of Past OSAT Forecasts

This is OSAT's third analysis and projection of the bilateral automotive trade deficit with Japan, and it is reasonable to ask how accurate our past forecasts have been. There were criticisms of our past two deficit forecasts, charging that they were in error, overestimating the size of the deficit.[1] The more recent critique is based on the actual 1992 trade deficit. This is indeed curious, since Trade I projected the U.S.-Japan bilateral automotive trade deficit for 1993, while Trade II projected it for 1994.[2] Because neither of these target dates has yet passed, it is difficult to evaluate fully our forecasts' accuracy.

Nevertheless, one can certainly ask whether our forecasts look reasonable in light of developments since their publication and in view of the 1992 trade results. However, that requires making some simple adjustments. One adjustment is based on the fact that the 1992 market was 12.9 million light vehicles, only 80 percent the size of the 16.0 million market we forecast for 1993, and then again—with growing if not complete awareness of the slow recovery—for 1994.[3] We would expect to overestimate the trade deficit based on this simple difference in market size, but that overestimate has little bearing on the accuracy of our underlying analysis and forecast, since market size is exogenous to the trade model.

Are we likely to see anything close to 16.0 in the next two years? Perhaps not, but, in any case, our intent never was to make a particular point estimate. The value of our analysis lies in its treatment of automotive competition and the relative trade balance. To ignore the analysis based upon its selection of particular macroeconomic variable values, the timing of the business cycle, or the size of the automotive market is to miss the point.

Another adjustment reflects the fact that our first trade forecast reflected two macroeconomic scenarios, and it is now clear that the alternative scenario came closer to reality. This scenario assumed a longer period of slow economic growth in the United States, a weaker economy in Japan in 1992-1993, and exchange-rate shifts that

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[1] "Aftermarket Overview Covering Selected Aspects of the U.S. Aftermarket," Lang Marketing Resources, Inc., July 15, 1991; and "Analysis and Review of 'The U.S.-Japan Bilateral 1994 Trade Deficit,'" The Boston Company Economic Advisors, October 25, 1991; and private communication from JAMA.

[2] Trade I refers to OSAT, 1989, while Trade II refers to OSAT, 1991.

[3] Incidentally, our work on Trade III has yielded average market size estimates for 1996 of 15.8 and 16.1. These estimates are based on interviews at the Big Three, and represent two different sets of assumptions about market development.

approximated more closely the actual levels and patterns to date than did our base economic scenario.

Our test year is 1992, when the US-Japan bilateral automotive trade deficit was $31.5 billion, made up of about $20.5 billion in vehicles and $11 billion in parts. Of course, critics should also consider both our Best Plausible trade case and our Most Likely scenarios, rather than focus on the one that appears less likely two and three years later.

Trade I predictions are summarized in Table 2.

Table 2
Trade I 1993 U.S.-Japan Bilateral Automotive Deficit,
Alternative Economic Scenario
(Billions of Current Dollars)

	Scenarios	
	Best Plausible	Most Likely
Vehicles	$27.79	$37.71
Parts	6.98	8.26
Total	$34.77	$45.97

We can perform rough calculations to evaluate these predictions. If we multiply these figures by 0.8 to adjust them to the size of the 1992 market, the Best Plausible figure falls to $27.82 billion, some 12 percent *below* the actual $31.5 billion, while the Most Likely scenario falls to $36.78 billion, about 17 percent *above* the actual 1992 figure.

Our alternative economic scenario assumed an inflation rate of about 5.5 percent per year. If we correct these 1993 estimates to 1992 dollars, within the parameters of our model, then our Best Plausible estimate falls to $26.29 billion, and our Most Likely estimate to $34.76 billion. These estimates are, respectively, 17 percent below and 10 percent above the actual 1992 results.

If 1992 is a serious test case, we bracketed it fairly well. Can a one year change in the deficit possibly make either of our projections for 1993 more accurate? As the market hit its record sales year in 1986, the bilateral automotive deficit jumped from $24 billion to $32 billion, a 33 percent increase in one year. Although we do not expect 1993 to yield sufficient market growth to raise the deficit by such a large amount, our Most Likely forecast is quite likely to fall within the range of normal forecast error. It may yet develop that our Best Plausible scenario was overly optimistic, rather than our Most Likely scenario too pessimistic, as our critics have charged.

However, this forecast appears likely to have erred in its suggested composition of the deficit. We forecast the parts deficit, adjusted for market size and 1992 dollars, at $5.28 billion in our Best Plausible case, and $6.24 billion in our Most Likely. These are, respectively, 20 percent and 18 percent of our total deficit projection. In 1992, parts actually accounted for 35 percent of the total bilateral automotive deficit. While the assumptions of our Best Plausible scenario reflect the expectation of newer, much more restrictive passenger car VER limits, neither of our scenarios predicts the actual growth in the parts deficit.

Our Trade II predictions are summarized in Table 3.

Table 3 Trade II 1994 U.S.-Japan Bilateral Automotive Deficit, Billions of Current Dollars

	Scenarios	
	Best Plausible	Most Likely
Vehicles	$18.49	$23.71
Parts	16.74	21.99
Total	$35.24	$45.70

Simply correcting these predictions to match market size—again at 80 percent—yields a Best Plausible of $28.19 billion and a Most Likely case of $36.56 billion. These are respectively 12 percent below and 14 percent above our 1992 test case. If we correct these 1994 dollars to 1992 dollars within the parameters of our model, the forecast totals fall to $25.86 billion for our Best Plausible case, and to $33.54 in our Most Likely, or 18 percent below and 6 percent above the actual 1992 figure. Can the deficit change enough

in the next two years to approximate our forecast values more closely? The answer is again yes, especially for the Most Likely scenario.

Again, our estimate of the composition of the deficit was in error, although this time we overestimate rather than underestimate the parts portion. Our Best Plausible scenario predicted a corrected level of parts imports for 1992 at $12.29 billion, and our Most Likely case expected $16.14 billion, or just about 48 percent of the total in each case. The actual composition of the 1992 total was 35 percent parts and components. However, this compositional error was more due to an underestimate of the vehicle deficit than it was to an overestimate of the parts deficit.

Moreover, Trade II relied on a more formal parts model than did Trade I. The build of Japanese-produced vehicles in the United States forms a critical input to this model. In 1991, we estimated that the 1994 build of these vehicles would reach 2.40 million in the Best Plausible case, and 2.61 in the Most Likely case, well beyond the 1992 production level of 1.69 million. These production assumptions, of course, reflected our estimate of a 16 million vehicle market and stronger-than-current Japanese share performance, in the Most Likely case. Moreover, the past two years have seen lower Japanese sales than we anticipated, decreasing the U.S. production of Japanese-affiliated vehicles.

The errors in estimating the parts deficit reflect more the exogenous assumptions as to market size, Japanese performance, and Japanese production in the United States than inherent weaknesses in the parts model itself. Since the parts model is driven by coefficients linking predictor variables to parts imports, simple adjustments will not fully correct the error of our assumptions about market size. Table 4 displays estimates of 1992 parts imports for our Most Likely and Best Plausible cases that are based on the model's coefficients.[4]

[4]UMTRI Report 91-20, op. cit., p. 104.

Table 4 Trade II Parts Import Model Predictions for 1992 (Billions of Constant Dollars)		
Scenario	Imports	Percent Difference from Actual
Most Likely	$13.266	+11.9%
Best Plausible	$10.653	-10.2%
Actual 1992 Imports	$11.856	NA

Both these forecast levels were measured in constant September, 1990 dollars. Therefore we inflated the two forecast estimates by actual changes in the U.S. CPI-U, a consumer price index. The CPI-U rose 4.2 percent in 1990-1991, and 3.0 percent in 1991-1992, or 7.3 percent for the entire period. Assuming that Japanese auto producers passed through the entire change to U.S. prices—thus maximizing the effects of such price changes—yields the comparisons displayed in Table 5.

Table 5 Trade II Parts Import Model Predictions for 1992 (Billions of Inflated Dollars)		
Scenario	Imports	Percent Difference from Actual
Most Likely	$14.234	+20.1%
Best Plausible	$11.431	-3.6%
Actual 1992 Imports	$11.856	

Our Best Plausible scenario provided the closer estimate. Of course, if we assume a lower pass-through rate, the estimates in Table 5 will be lower, and thus provide more symmetrical bounds to the actual 1992 results.

On balance, our prior forecasts, adjusted for exogenous variables and assumptions, yielded reasonable boundary estimates of the actual 1992 bilateral automotive deficit. In both reports, our Most Likely scenarios overestimated the actual figures, but fell within a tolerable forecast error and may prove even better fits when 1993

and 1994 results are known. On the other hand, our Best Plausible scenario underestimated actual results to a greater degree than our Most Likely overestimated them. In both forecasts, we erred in our expectations about the composition of the deficit, underestimating the role of parts and components in Trade I, and overestimating by about the same degree in Trade II.

Nevertheless, we used very high estimates of 1994 Japanese transplant production for our 1994 import parts forecast, and we think the Japanese manufacturers are unlikely to reach them in 1994. If they do not, our 1994 forecast of parts import will certainly come in too high. However, this is due not to a fla in the parts import forecast model itself, but the assumptions we imposed upon it.

V. Trade in Motor Vehicles

What will the bilateral vehicle deficit with Japan be in 1996? This section develops four alternative answers to this question, based upon four automotive scenarios. These scenarios detail vehicle flows between Japan and the United States, and estimate the U.S. vehicle sales of Japanese-affiliated U.S. production facilities. Section VI's analysis of the parts deficit relies on these New Entrant sales estimates in estimating parts flows. These combined vehicle and parts scenarios are then linked to the bilateral automotive trade deficit, relying on procedures discussed in Section II.

The development of these automotive scenarios requires analysis of economic, corporate strategy/performance, and political dimensions. The strengthening of the yen has had profound effects on the basic comparative business economics of producing automotive goods in Japan and the United States, and that should influence both Japanese producers' sourcing decisions and U.S. consumers' purchasing decisions. The 1996 sales goals, achievements, and sourcing patterns of both Japanese and Big Three vehicle manufacturers will set important parameters on the bilateral automotive deficit.

Moreover, continuing trade friction between the United States and Japan and the heightened focus on the automotive portion of the bilateral trade deficit—especially in the parts and components segment—suggest that the politics of trade will also exercise some influence on the Japanese manufacturers' sales goals and sourcing plans, and the development of U.S. vehicle exports to Japan. Therefore, our scenarios reflect our judgments of the political, as well as business, factors influencing the 1996 market.

Projected vehicle sales alone say little about likely trade flows, since both Japanese and Big Three manufacturers will rely on import and domestically produced vehicles to meet their U.S. sales goals. Analysis of trade flows requires allocation of these sales to domestic and foreign sources, and it is these sourcing patterns that will directly influence the vehicle deficit. Vehicle sales and sourcing patterns will influence the parts deficit indirectly as well, because Japanese vehicles produced in the United States contain a high proportion of parts imported from Japan and may require service and repair parts over their useful lives. The Japanese manufacturers' substitution of U.S. vehicle production for imported vehicles will not totally eliminate the value of foregone vehicle imports from the bilateral deficit. Rather, it will eliminate some of that value and shift some of it into the parts deficit. Thus the allocation of projected Japanese vehicle

sales to imports and U.S. production affects the composition as well as the size of the overall bilateral automotive deficit.

The production capacity in the United States of seven Japanese vehicle manufacturers will reach about 2.7 million vehicles by 1996, as displayed in Table 6.[1] Their combined sourcing decisions will be a powerful determinant of the level of parts imports from Japan. If they maintain current levels of Japanese import content as their U.S. production volumes increase, then imports of Japanese parts will correspondingly accelerate. If, on the other hand, these manufacturers increase their current levels of U.S. sourcing and decrease their reliance on parts imported from Japan, then the rise in parts imports sparked by increased volumes will be smaller. However, volume increases will almost surely result in some increase in total parts imports.[2] For example, if U.S.-sited Japanese assembly operations increase their 1996 production by 25 percent over their 1992 level of 1.5 million units, it would require a 20 percent dollar reduction in per unit import sourcing to maintain rough parity with their 1992 import dollar levels, holding all other factors constant.

Table 6
1996 Estimated Japanese Transplant Capacity
in the United States

Company	Location	Car	Truck	Total
Honda	Marysville and East Liberty, OH	510,000	80,000	590,000
Toyota	Georgetown, KY	400,000	100,000	500,000
Nissan	Smyrna, TN	300,000	150,000	450,000
NUMMI	Fremont, CA	200,000	150,000	350,000
AutoAlliance	Flat Rock, MI	240,000	0	240,000
Diamond-Star	Normal, IL	240,000	0	240,000
SIA	Layfayette, IN	80,000	100,000	180,000
Ford-Nissan	Avon Lake, OH	0	100,000	100,000
	U.S. Total	1,970,000	680,000	2,650,000

Source: Office for the Study of Automotive Transportation, University of Michigan, 1993.

[1] We include the capacity of Ford's Avon Lake plant, which is producing Mercury Villagers and Nissan Quests, because of the high Japanese content of these vehicles, including imported engines and transmissions. We exclude the capacity at Ford plants for the Navaho and small pick-up trucks for Mazda because of the low import content of these vehicles.

[2] To be sure, the bilateral deficit with Japan would also fall if the Japanese manufacturers shifted their sourcing for U.S. production from Japan to third countries, such as Malaysia or Taiwan, rather than to the United States. However, such a strategy would not reduce the overall U.S. auto parts deficit.

Automotive Developments

Three major automotive developments are likely to influence the bilateral automotive deficit by 1996. The first is centered on the changing competitive balance between the traditional Big Three automotive manufacturers and their Japanese rivals. The competitive gap is closing as the Big Three continue to improve product quality, design, and process efficiencies. Thus the Big Three eliminated 95 percent of the customer-defined 1981 Japanese defect advantage by 1991, and that year had lower prices in four of six segments against New Entrants, and in eight of nine against Japanese imports.[3] At the same time, the Japanese industry has found itself facing increased costs, as its capital advantage has withered, enhanced product mix has increased production costs, and the strengthened yen has driven up the dollar price of Japanese automotive products.[4] On balance, this suggests that the Japanese vehicle and parts share may well fall between now and 1996.

The second development reflects the changing pattern of vehicle sourcing by the Japanese manufacturers, as their U.S. facilities' share of total U.S. sales grows. We expect this to develop gradually over the next few years, driven in part by favorable production economics and perhaps in part by political considerations, including the newer, lower limit on Japanese exports. According to a recent analysis, the U.S. industry enjoyed a small production cost advantage—roughly five percent—in 1988, when the yen traded at 128 to the dollar.[5] We expect the yen to strengthen, and that, combined with higher rates of capacity utilization in the United States, should provide New Entrants—and the Big Three—with a level of cost advantage sufficient to maintain or perhaps even increase market and/or production share. Moreover, the increased quality and clear cost advantage of U.S. parts suppliers should increase the U.S. content of New Entrant vehicles. The industry functions on a four to five year product cycle, so these cost-effective parts can be designed into at least some vehicles for 1996. In an automotive market where Japanese vehicles face stable or declining shares, increased U.S. content should lower the volume of Japanese imports. However, continued strengthening of the yen will prevent dollar values from falling to the same degree that unit imports will.

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[3] *Competitive Survival: Private Initiatives, Public Policy, and the North American Automotive Industry*, UMTRI Report 92-3, Office for the Study of Automotive Transportation, Transportation Research Institute, The University of Michigan, Ann Arbor, June, 1992, pp. 74-75, 90.

[4] Ibid., pp. 102-104, 128-135, 161.

[5] UMTRI Report 92-3, op. cit., p. 85.

Third, the internationalization of the automotive industry continues. The Japanese automotive industry has established significant offshore production capability in Europe and Southeast Asia as well as in both the United States and Canada, and the anticipated signing of the North American Free Trade Agreement expands the production options of the traditional Big Three. Japanese production activities in the United States affect both the size and composition of the bilateral deficit. But increased sourcing options also mean that the bilateral focus of the current analysis and projection may become less relevant in the future, as manufacturers and suppliers in both nations find their sourcing options expanded. We would expect the bilateral deficit with Japan to decrease as a proportion of the U.S. worldwide automotive deficit, as both national industries pursue these alternatives.

Internationalization is likely to have another major effect. The import share of the Japanese market is remarkably small when compared with that of other major producing nations, and while it has shown impressive percentage growth for some years now, it still is less than 5 percent.[6] We do expect this to grow over the coming years, as the Japanese industry becomes more experienced in offshore production, and rationalization and efficiency concerns promote intracompany trade flows. In particular, we expect that these developments, combined with political concerns about the bilateral automotive deficit, will increase exports of vehicles from the United States to Japan.

Corporate Performance

Our 1991 Trade II report predicted a rather somber future for the Big Three. We noted their then continuing loss of production share, the failure of lower prices to reverse share loss to that point, continuing problems in winning younger and first-time buyers, and product plans that appeared unlikely to effect dramatic changes in the competitive situation vis a vis the Japanese manufacturers. We failed to appreciate fully both the strength and implications of the market's shift to light trucks, a development that has provided the Big Three with a substantial—although perhaps temporary—competitive boost against the Japanese producers.

However, we must now ask if the Big Three have already reaped the benefits of a stronger yen and their own increased competitiveness. Will they simply hold their 1992

[6]UMTRI Report 92-3, op. cit., pp. 52-53.

share, or will they see further increases, as problems continue to plague their Japanese competitors? Will the Japanese manufacturers shift more production and part sourcing to the United States, pursuing the benefits of the weaker dollar, or will they continue high levels of exports from Japan to preserve the social and business fabric of their production system? How much of the increased dollar price of the yen will the Japanese producers pass through to their U.S. customers, and how elastic is the demand for Japanese vehicles? How will developments in other markets influence the competitive decisions of both the Big Three and their Japanese competitors? The answers to these questions are important in shaping both the size and composition of the trade deficit.

The argument that Japanese automotive share will be stable is rooted in a respect for their past performance in overcoming competitive adversity. After all, these are manufacturers whose initial entry into the U.S. market was plagued by provincial design and inferior quality. Moreover, the yen rose some 50 percent in value during 1985 and 1986, and they overcame that shock quite rapidly, establishing and expanding U.S. operations and moving their import offerings upscale. Past performance lends credibility to the belief that the Japanese manufacturers will adjust their product offerings and sourcing patterns, building on their time-to-market and increased U.S. capacity advantages, and pursue price strategies as necessary to preserve current share levels.

To be sure, some Japanese manufacturers may experience share loss. The smaller manufacturers, like Subaru, may continue to experience severe difficulties through 1996, and Isuzu has already announced that it will cease making passenger cars. However, any share losses they experience may simply shift to the major Japanese players, like Honda and Toyota, rather than to the Big Three. While Chrysler is shedding its equity position in Mitsubishi and plans to decrease further its sourcing from Mitsubishi, that may simply provide Mitsubishi the vehicles to expand its own dealer network and to pursue share more aggressively under its own nameplate. The enhanced performance of Mitsubishi in Japan over the past two years may well portend improved performance here.

Honda will fight fiercely to reverse its share loss. The press has highlighted the sliding performance of the Accord, and Honda's passenger car share fell to 6.4 percent in the first five months of 1993, versus 9.2 percent for all of 1990. However, the new Accord will be introduced soon, and Civic sales are up much more than the market thus far in 1993. Toyota share has fallen from 8.4 percent in 1990, but is still a substantial 7.7

percent, and they will seek to maintain their lead as both the top selling import and New Entrant. Nissan's successful Altima has reversed its long market slide, and it is now gaining share. While Mazda has recently scaled back its share and sales goals, they are still aggressive, and will require increased U.S. share.

Moreover, the Japanese manufacturers have faced serious erosion of share in light trucks, including vans and sport utility vehicles. There are three reasons to expect a substantial strategic shift that will emphasize this segment. First, they must pursue this segment more aggressively simply because of its growth. As the world's leading volume producer, the Japanese industry cannot afford to maintain its current low share of the fastest growing segment of the world's largest market. Second, this segment offers high profit potential. The pressures of the strengthened yen will make profit more a strategic concern and less of a given for Japanese producers, including the majors. Third, this segment is also growing in importance in the Japanese market; thus, strong performance is important in defending the home market.

On the other hand, the argument that the Japanese manufacturers will lose share is rooted in the fundamental economics of automotive production, developments in the Japanese economy, and the increased competitiveness of the Big Three. First, it does appear that the strengthening of the yen beyond 125 to the dollar has raised the costs of production in Japan sufficiently to place Japanese production at a cost disadvantage compared to U.S. production. The current slim profits of the Japanese manufacturers may force them to pass through most of these cost increases to their customers, perhaps adversely affecting sales. The Japanese cost advantage was an important competitive weapon throughout their period of share growth in the 1970s and 1980s—a weapon that had already been somewhat neutralized by the increased efficiency of the Big Three. The reversal of this competitive advantage may well presage share loss, as the Big Three build on that base to recapture share.[7]

Moreover, some analysts suggest that the outstanding performance of the Japanese automakers in adjusting to the economic challenges of the mid-1980s was more apparent than real, and was rooted in the advantages conferred by the "bubble economy"

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[7]Many observers have criticized the Big Three for raising prices to reap profits, rather than recapturing share, when Japanese makers have been forced to increase their prices in the past. Ignoring the point that the Big Three need to make profit, and increasingly are experiencing losses, it merits mention that Big Three price increases for the 13 years from 1978 to 1990 exceeded the CPI only in 1986, matched it in 1987, and fell short of CPI gains in the other 11 years. In fact, in 1990, Big Three prices increased well below 40% of the CPI increase.

of the late 1980s in Japan. These advantages, such as cheap capital and vigorous market growth, masked developing problems with a stronger yen. Not only have these advantages now disappeared, but this is occurring just when the yen appears to be providing another shock to the production system.

Second, increased production costs in Japan have important strategic implications for Japanese automakers. They may be forced to move more production offshore to North America and Southeast Asia, and that might threaten the important social and business relationships that support the Japanese production system. It will likely accelerate their moves to more value-added and expensive cars, and that may depress their volumes.

If production economics undercut their strong performance in the entry-level segments, it may ultimately damage their vehicles' appeal to younger and first-time buyers. This has potential ramifications for years to come, as the Big Three discovered in the early 1980s. Moreover, as Japanese entry-level vehicles become more expensive, not only will the Big Three likely decrease their reliance on Japanese captives, but they may well compete in this segment more aggressively than they have in the past few years. For example, Chrysler will soon introduce a new subcompact—the Neon— targeted to this segment.

As discussed above, the Big Three have enormously improved their comparative quality performance, and now trail the Japanese fleet by less than half a defect per vehicle, down from about six defects per vehicle in 1981. Moreover, the price gap between Japanese and Big Three cars is growing. If the past few years suggest that the Japanese were able to command a premium price, it now appears that the Big Three may hold a price advantage against the Japanese. That should eventually influence the market.

Recent product introductions may break the negative view of Big Three vehicles' styling and value in the eyes of younger buyers. GM's Saturn, for example, appeals to younger buyers, and may counteract the image of a rather stodgy Big Three fleet held by many of these customers. Ford's Probe is outselling its Mazda MX-6 counterpart nearly four to one in the first five months of 1993, reflecting some combination of differences in price, incentives, marketing, styling, and number of sales points.

Moreover, the performance of the Japanese manufacturers might be weaker than many think likely. They have made mistakes in the U.S. market. The minivan segment

illustrates this point. After a number of failures, Nissan has developed a front wheel drive minivan with Ford to compete in this segment. Mazda's and Toyota's entries are good vehicles, but have posed little threat to Chrysler's domination of this segment. In fact, thus far in 1993, Chrysler's minivans hold about a nine to one edge over the combined sales of these leading imports.

While we think Honda will recover somewhat with the introduction of the new Accord, it still faces a fundamental product weakness, since it does not produce for the light truck market. At the same time, its passenger vehicles provide rather thin coverage of the increasingly targeted and segmented car market. While Honda plans to add vehicles, if any of their vehicles falter in the marketplace, they could lose share simply because they lack sufficient alternatives within their own line.

Toyota introduced its new pick up truck last Fall, and its sales have been disappointing. Most analysts feel it is simply priced too high, especially since it lacks a V-8 engine. This may reflect the cost pressures that even Toyota (the most efficient of the Japanese automakers) is experiencing, and may portend further price increases for an already expensive car line-up. The disappointing experience may also lead Toyota to source this truck in the United States, since it is subject to the 25 percent truck tariff as an import.

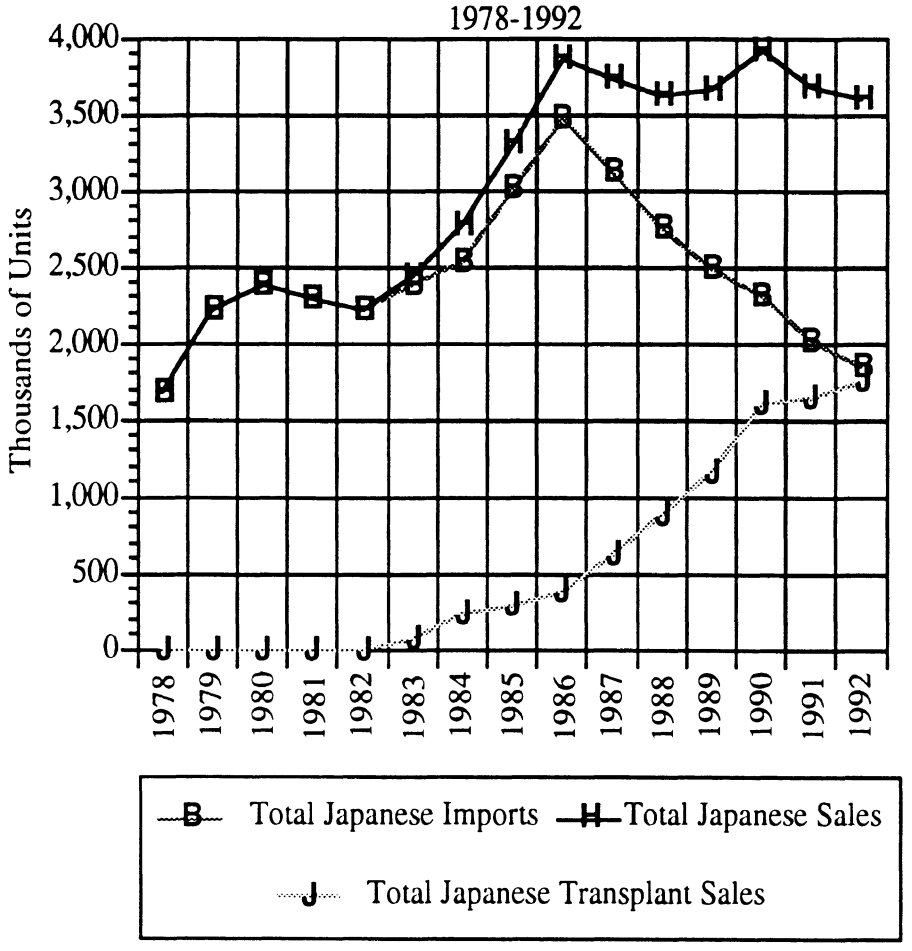
Nissan continues to experience difficulty in the Japanese market. Mazda passenger cars are increasingly targeted to higher-income buyers, and that market, while attractive, is small and fiercely competitive. Mazda's difficulties may best be illustrated by the fact that Ford has now taken a 50 percent investment in Flat Rock, which had been a sole venture by Mazda. Mitsubishi may lose captive sales through Chrysler and face difficulty in garnering those sales for its own nameplate. The share losses of these manufacturers and the "Little Four" may go to the Big Three, rather than be redistributed to some of the other Japanese makers.

Vehicle Imports and Sales

Figure 5 displays Japanese light vehicle unit sales in the United States from 1985 through 1992, presenting import and transplants separately. Total Japanese sales receded after 1986, the largest vehicle sales year in U.S. history, but then achieved a new peak in

1990.[8] Since 1990, sales have again fallen in the face of smaller markets and loss of share that began to develop in 1991. Japanese sales in 1992 totaled 3.6 million units.

Figure 5
Japanese U.S. Vehicle Sales by Source
1978-1992



Source: Ward's Communications

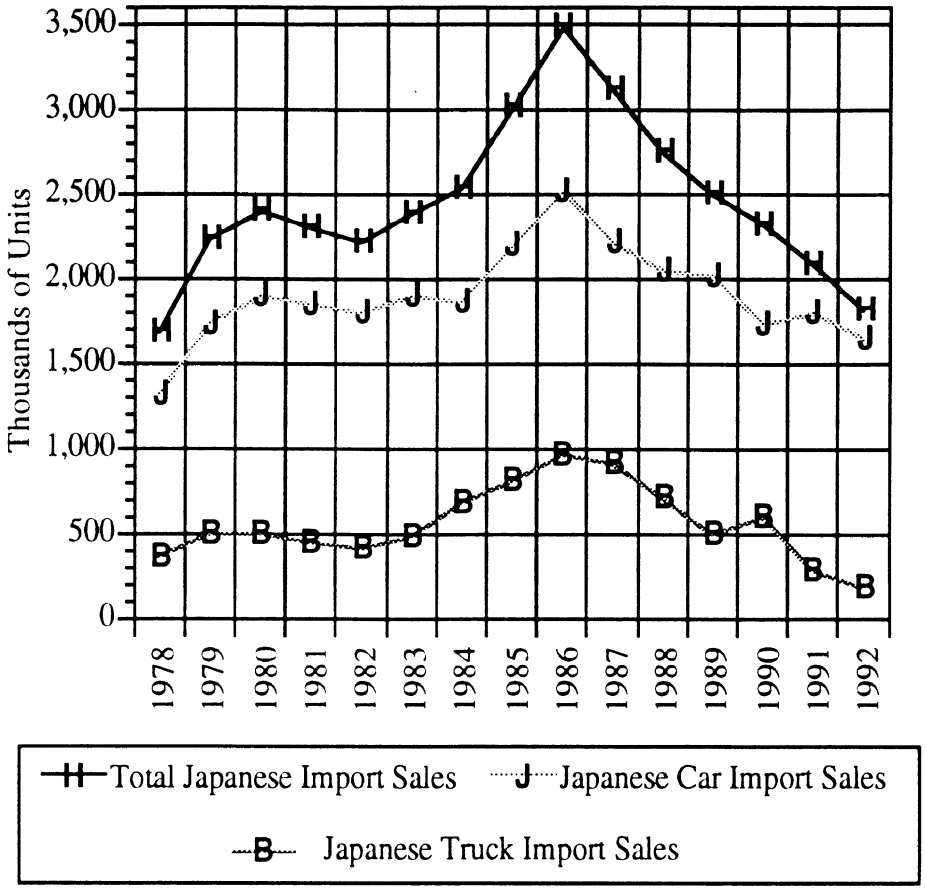
There has been a steady decline in vehicle imports from Japan, from just under 3.5 million in 1986, to under two million in 1990, but this decline has been offset by increases in Japanese production in the United States. These New Entrant or transplant facilities have increased output from under 400,000 in 1986 to over 1.5 million in 1992. As a result, the source of Japanese U.S. sales has shifted substantially, falling from 91 percent import in 1986 to just above 50 percent import in 1992.

Figure 6 breaks out Japanese exports to the United States by type of vehicle. Car imports peaked in 1986, at just about 2.5 million, and declined to about 1.5 million in

[8]This increase resulted from gains in share, as the 1990 total market was some 15 percent smaller than the 1986 market.

1992. Light truck imports reached almost 1 million units in 1986, but have fallen to under 400,000 in 1992. Passenger cars, as a percentage of total imports, have remained fairly stable, accounting for over 70 percent of total imports.

Figure 6
Japanese Vehicle Imports into the U.S.
1978-1992



Sources: 1978-1991; Ward's Automotive Yearbook. 1992; Ward's Automotive Reports, various issues.

U.S. Vehicle Exports

Automotive exports to Japan face relatively few formal, but numerous quasi-formal and informal, trade barriers. Establishing dealer networks is extremely expensive, and access to the existing Japanese nameplate dealers is virtually impossible. Homologation costs are high, partly because of particular product standards and partly

due to enforced product quality standards.[9] Many observers believe that imports face more severe hurdles in the *shaken* system of periodic inspections. In any case, the Japanese market is quite expensive and difficult to penetrate, compared with other major automotive markets.[10]

In fact, Japan stands out in comparison with other major producing nations more for its low levels of imports than for its high levels of exports. While the import share of the Japanese market has grown substantially over the past few years, it still totals less than 5 percent. Nevertheless, we expect this growth to continue and perhaps accelerate, as the pressures upon Japan to open the second largest automotive market in the world persist. The Japanese government and industry are in a position to relax some of these nontariff, informal barriers to the Japanese market, and we think it is likely that they will. Import share of the Japanese market may reach as much as 8 percent by 1996.

Import share growth in Japan should benefit U.S. exports for two reasons. First, many of the vehicles in Japan's current import fleet, perhaps especially the European luxury cars, are probably nearing some natural market limit. As the import fleet shifts downmarket, the United States should benefit because the Big Three can seek sales across a broader range of vehicle offerings. Second, Japan's automotive trade friction is largely centered on the relationship with the United States, since that remains its largest automotive trading relationship. Therefore we expect market-opening moves that assist U.S. exports will receive some priority.

The U.S. industry may have some advantages over European competitors in seeking Japanese sales, even though the European companies are generally more experienced in exporting. The Big Three manufacturers may secure additional sales points through their Japanese affiliates, as Ford has recently negotiated. The broad product offerings of the Big Three may make them attractive partners for some Japanese manufacturers, as exemplified in the agreement for Honda to retail Chrysler Jeeps in Japan. The Big Three have the added political incentive of making visible attempts to gain access to Japan's market, to rebut the charge that low U.S. exports simply reflect a lack of effort on their part.

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[9]Homologation costs are those incurred to make a product suitable to a market's particular regulatory and consumer demands.

[10]UMTRI Report 92-3, op. cit., pp. 147-156.

The Japanese subsidiaries in the United States have access to their parent distribution networks, providing them excellent market access. Since some vehicles will be produced only in the United States, transplants will pursue some exports to support product offerings in Japan. We also expect some symbolic exports by the transplants, to demonstrate that the Japanese market is indeed open to imports from the United States.

The growth rate of U.S. vehicle exports to Japan since 1985 has been impressive, as these exports have grown from some 1400 to almost 41,000. However, their total value is still well below $1 billion, and the costs of entry may continue to discourage pursuit of sales in Japan. Nevertheless, we expect on the order of 100,000 vehicle exports to Japan by 1996, as both the transplant manufacturers and the Big Three more aggressively pursue this market. Most of these exports will be passenger cars, although we expect some of the more upscale sports/utility vehicles may also be candidates for export.

The 1992 Case

Before examining these scenarios in greater detail, we present the 1992 market results, and provide some discussion of background developments pertinent to our analyses. Table 7 displays some statistics on the 1992 vehicle market and trade year. The year saw 8.3 million passenger vehicles and 4.6 million light trucks (including vans, trucks, and sports/utility vehicles). Light trucks continued to increase their share of the market, moving from 33 percent of the market in 1990 to nearly 36 percent in 1992. The 1992 market was one million vehicles smaller than 1990's, but the sales of light trucks were about the same each year, as virtually the entire decrease was in the passenger car segment. The 1992 passenger car market comprised three broad segments: small cars at 33 percent of the total, intermediates at 45 percent and large/luxury cars at 22 percent.[11] The 1992 market witnessed some shift in passenger car composition compared to 1990, as 2 percent of sales shifted from the small to the intermediate segment.

[11]Differing segmentations of the market exist, reflecting weight, wheelbase, interior space, price, engine size, etc. and combinations thereof. We collapsed the segmentation scheme of *Ward's Automotive Reports* to the three categories (roughly small, middle, and large/luxury). This segmentation emphasizes price and size, and permits the most direct conversion to the engine-based categories used in trade data. Examples would be Ford Escort and Tempo (small), Ford Taurus (intermediate), and Lincoln Continental (large/luxury). Our first forecast relied on a four-way segmentation of the vehicle market. We have reduced this to three-way to permit more ready transfer between these automotive market categories and the three-way classification approach relied upon for trade data.

Table 7
1992 U.S. Sales of Japanese Vehicles
(Units in Thousands)

Passenger Car Market

Segment	U.S. Segment Mix (percent)	Japanese Imports (units)	Japanese Transplant (units)	Total Japanese Sales (units)	Japanese Segment Share (percent)	Total Japanese Sales Mix (percent)	Japanese Import Sales Mix (percent)
Small	33%	780	540	1,320	47.5%	44.0%	52.0%
Inter-mediate	45	450	960	1,410	37.3	47.0	30.0
Large/ Luxury	22	270	0	270	14.4	9.0	18.0
Total	100%	1,500	1,500	3,000	——	100%	100%

Light Truck Market

Segment	Japanese Imports (units)	Japanese Transplant (units)	Total Japanese Sales (units)	Japanese Segment Share (percent)
Pick up Trucks	188	211	399	
SUV/Van	201	45	246	
Total	389	256	645	14.7%

Japanese imports, including captives retailed by the Big Three, captured some 1.5 million sales, or 17.2 percent of the passenger car market, while Japanese production facilities in the United States accounted for another 1.5 million sales, again including captive vehicles. Thus, Japanese manufacturers' combined sales of U.S. and Japanese produced passenger cars reached about 3.0 million, or 34 percent of the passenger car market, up about seven points since 1988, although down from 1991. Japanese shares were roughly 48 percent in small cars, 37 percent in intermediates, and 14 percent in large/luxury passenger cars. Japanese imports were predominantly small (52 percent), while 30 percent were intermediates, and 18 percent in the large/luxury segment. All U.S. production by Japanese manufacturers was in the small (36 percent) or intermediate (64 percent) market segments.

Two aspects of changes in Japanese vehicle sourcing merit comment. First, the Japanese share of the large/luxury market has almost tripled in the past four years, moving from 5 percent to nearly 15 percent This vehicle category is extremely important for the trade deficit because these passenger cars have high customs values. While the

Japanese manufacturers decreased their unit passenger car imports about 12 percent from 1990 to 1992 (from 1.7 to 1.5 million), they increased these high-value imports about 37 percent (from just under 200,000 to 270,000), raising this segment's share of Japanese imported cars from 11 percent to 18 percent. This has protected the Japanese industry's revenue flow from the United States to a certain extent, and prevented the dollar value of the bilateral vehicle deficit from falling proportionally to the decrease in import vehicles. Second, New Entrant production has substantially moved upmarket as well, with small vehicles accounting for 57 percent of production in 1990, and 36 percent in 1992.

U.S. light truck sales included 374,000 Japanese imports (for just over 8 percent market share) and an additional 308,000 (nearly 7 percent) U.S.-produced Japanese nameplates, reaching a total Japanese manufacturer share of just under 15 percent, down about 1.5 points since 1990.[12]

As discussed above, we forecast 1996 values through a combination of regression and accounting models. For vehicles, we project values by converting sales figures for passenger vehicles, sport/utilities, and vans to engine size categories, then associating unit customs values (provided by ITC) with the predicted number of units derived from the automotive scenarios. As displayed in Table 8, when these combined techniques are applied to "forecast" the 1992 vehicle trade deficit, the results are satisfactory, falling within 7 percent of the actual figures for 1992.[13] These results provide some confidence in the usefulness of the overall method.

[12]We exclude the Mazda Navajo, produced by Ford, from this calculation for the same reason that we include captive passenger cars manufactured by Japanese companies, but retailed by the Big Three: production share of sales is more directly related to the bilateral deficit, in both vehicles and parts, than is nameplate market share. We include the Mercury Villager and Nissan Quest because of their high import content.

[13]We exclude roughly $200 million dollars of the total automotive trade deficit in 1992 from scenario consideration This is for a category of non-passenger, non-tariff vehicles that are not part of the light vehicle market as we define it. Because of this, our total vehicle deficit in Table 8 is $20.4 million, rather than the full $20.6 shown in Figure 3.

Table 8 1992 U.S.-Japan Vehicle Deficit OSAT Model Trade Case				
U.S. Import of Japanese Vehicles				
Category	Units (in thousands)	Customs Value 1992 average	1992 Model Billions of Dollars	1992 Actual Billions of Dollars
4 cylinder	1,168	$ 9,363	$ 10.934	$ 10.411
6 cylinder	466	17,563	8.180	8 8.502
8 cylinder	68	29,914	2.019	0.943
Truck	188	7,230	1.359	1.230
Total	1,874	—	$ 22.492	21.086
Exports of U.S. Vehicles to Japan	40,816	$17,064	$ 0.696	$ 0.696
U.S.-Japan Vehicle Deficit			**$ 21.796**	**$ 20.390**

1996 Forecast Scenarios

The key factors for predicting the vehicle trade deficit are the size of the market, Japanese imports' market share, vehicle exports to Japan from the United States, and the value of traded vehicles. The key market factor for projecting the parts deficit is the total number of Japanese vehicles produced here, and the domestic/offshore parts sourcing for those vehicles. This section covers the 1996 market projections for both types of vehicles, although the tying of domestically produced vehicles to the parts trade deficit is covered in Section VI.

Our 1996 scenarios reflect both fixed and varying assumptions. First, all the scenarios reflect the assumption that light truck (pick ups, vans, and sports utility vehicles) share of the market increases slightly, from 1992's 36 percent to 37 percent.[14] This is consistent with our own expectations and those expressed by our Big Three respondents, and reflects the continuing share growth of that type of vehicle. Whether driven by image, value, or life-style factors, this segment has seen steady growth for some years now, and that growth seems likely to continue.

[14]This may prove conservative, since light trucks captured 40% of the U.S. market in the first half of 1993.

Second, we assume that sales of Japanese-produced passenger cars and light trucks will be sourced 55 percent in the United States and 45 percent in Japan. This reflects our own and the Big Three respondents' belief that the economics of production and the preferences of the major Japanese manufacturers will result in the crossover to preponderant sourcing from North American facilities.

Our past trade projections each included a fixed assumption about the size of the U.S. automotive market in the forecast year, reflecting macroeconomic assumptions about the state of the economy and a consensus of industry experts. We assumed a market of 16 million light vehicles for each of our prior forecasts. However, the lateness and length of the recent recession, combined with a weak recovery to date, make it unlikely that we will reach that large a market in either 1993 or 1994. Consequently, for the current forecast, we elected to develop two scenarios of market size. The first, based upon our interviews with the Big Three, is again a strong 16 million, reflecting a belief that the economy will strengthen and that at least some of the low sales of recent years have created pent-up demand, yielding a strong sales year by 1996. The second scenario calls for 15 million total sales, or an average market. This scenario is consistent with an earlier economic recovery and a strong market earlier than 1996, or with a continuing weaker market, reflecting concerns for demographic shifts and persistent weakness in personal income growth.

We think that a strong market will somewhat alter the segmentation of passenger vehicles sold, such that about 1 percent of sales will move upward from entry-level small cars to intermediates, and about 1 percent of intermediate sales will move upscale to large/luxury cars. In the average market, segmentation is 33 percent, 45 percent, and 22 percent, the same as in 1992. The relatively stable segmentation of passenger vehicles reflects the assumption that CAFE standards will not rise excessively by 1996, and that there will not be sharp increases in the price of fuel.

We also developed scenarios that reflect different assumptions about Japanese-produced vehicles' market share. The first calls for the Japanese-produced share to remain stable, at its 1992 level of 28 percent of the total vehicle market. This scenario is consistent with the expectation that Japanese-produced share loss thus far in 1993 is simply a temporary reversal, and that the Japanese manufacturers will emerge from their current adversity stronger and more competitive, retaking by 1996 any share losses they

might suffer in the interim. This scenario expects the yen/dollar exchange rate in 1996 to be about 117:1.[15] Some of our Big Three respondents subscribed to this stable scenario.

The second scenario calls for Japanese-produced share to decline 3.4 points, largely driven by the strengthening of the yen—to 110 per dollar— and the enhanced competitiveness of the Big Three. This declining share scenario is consistent with scenarios discussed by other Big Three respondents, although we set the Japanese share loss somewhat higher than they might. However, Japanese-produced share of light trucks actually increases slightly in the stable share scenario, moving from 1992's 14.7 percent to 16 percent. This reflects the larger share of light trucks in the overall market, stable Japanese car share, and our belief that Japanese manufacturers will compete more aggressively in this growing market. Similarly, Japanese light truck share falls 1.2 points in the declining share scenario, somewhat less than the overall 3.4 points. However, Japanese share of sport/utilities and vans increases in both scenarios—just over 3 points in the stable share scenarios, and about 1.25 points in the declining share scenarios.

We vary the level of U.S. vehicle exports somewhat between our stable-and declining share scenarios, based on the value of the yen. Thus we see 100,000 vehicle exports in our stable share scenario, but boost this to 120,000 in our declining share scenario, characterized by a stronger yen. The stronger yen, of course, lowers the yen price of U.S. goods and should make them more competitive.

Our scenarios, then, call for two factors—market size and Japanese share—to vary. The market is set at either 16 (Strong) or 15 (Average) million vehicle sales, and Japanese share is set at either 1992 levels (Stable) or falls 3.4 points (Declining). These two factors yield four scenarios. Scenario I calls for a strong market, stable Japanese share; scenario II portrays an average market with Japanese share again stable; scenario III describes a strong market, but one characterized by declining Japanese share; and scenario IV illustrates an average market and declining Japanese share. We turn now to consideration of the market scenarios and their trade implications.

[15]This assumes that the strengthening of the yen to the current level of roughly 110 to the dollar is a temporary fluctuation, and that the underlying trend will reassert itself.

I. Strong Market, Stable Share Table 9 displays the 1996 U.S. vehicle market implied by scenario I.[16] Total light vehicle sales reach 16 million, a near-record level, and Japanese share remains constant at its 1992 level of 28 percent. The 1996 strong passenger car market will reach 10.1 million units, with New Entrants taking 19.2 percent market share, and Japanese imports 15.8 percent, down less than a combined 1 percent from 1992 levels, but reflecting our assumption of higher transplant sourcing. Japanese segment share falls in small and intermediate vehicles, but increases in large/luxury. Total Japanese sales move upmarket, as the percentage of small passenger cars falls some seven points, while both intermediate and large/luxury increase.

New Entrants capture 8.8 percent and Japanese imports 7.3 percent of the 5.9 million light truck market, for a slightly increased 16 percent share. The portion of Japanese light truck sales that are sport/utilities rises from 38 percent to about 44 percent.

Table 9
1996 U.S. Sales of Japanese Vehicles
Scenario I: Strong Market, Stable Japanese Share
(Units in Thousands)

Passenger Car Market

Segment	U.S. Segment Mix (percent)	Japanese Imports (units)	Japanese Transplant (units)	Total Japanese Sales (units)	Japanese Segment Share (percent)	Total Japanese Sales Mix (percent)	Japanese Import Sales Mix (percent)
Small	32%	583	737	1,320	41.0%	37.4%	36.7%
Inter-mediate	45	637	1,203	1,840	40.5	52.1	40.1
Large/ Luxury	23	370	0	370	16.0	10.5	23.3
Total	100%	1,590	1,940	3,530	——	100%	100.1%

Light Truck Market

Segment	Japanese Imports (units)	Japanese Transplant (units)	Total Japanese Sales (units)	Japanese Segment Share (percent)
Pick up Trucks	120	417	537	
SUV/Van	310	103	413	
Total	430	520	950	16.0%

[16]It is important to remember that the market tables for each of our senarios focus on the sales of Japanese-affiliated manufacturing. Hence they are not directly convertible to nameplate market share, because of captive sourcing. Moreover, the balance of sales is not all Big Three, because imports from other countries, such as Germany and South Korea, will also capture sales in the U.S. market.

Table 10 displays the vehicle trade estimates consistent with our strong market, stable-Japanese-vehicle-share scenario. In 1992 dollars, the value of Japanese vehicle imports rises nearly 24 percent above the 1992 level, to just over $26 billion. Unit imports also rise, but at a more modest pace of just under 8 percent The sharper rise in the value of exports is due to the upscaling of Japanese imports, as small, lower-value vehicles fall from 52 percent to just under 37 percent of imported Japanese passenger cars, and more expensive sport/utilities rise from about 50 percent to over 70 percent of light truck imports. The constant dollar value of U.S. exports and export units both increase by some 145 percent to $1.7 billion. We assume that the added exports of lower-value passenger cars are compensated by increased exports of higher value sport/utilities, so that the export mix does not change.

The total vehicle deficit is $24.338 billion constant dollars, up some 19 percent in a market that rises 25 percent in unit sales. Exports are critical to restraining this deficit, as Japanese dollar value—but not unit—import growth is almost the same level as the unit market increase. The vehicle deficit reaches $26.817 billion 1996 dollars, taking into account the value of the yen, for an increase of over 31 percent.

Table 10
1996 U.S.-Japan Vehicle Deficit
Scenario I: Strong Market, Stable Japanese Share
Model Trade Case

U.S. Import of Japanese Vehicles				
Category	Units (in thousands)	Customs Value 1992 average	1992 Constant Billions of Dollars	1996 Current Billions of Dollars
4 cylinder	1,138	$ 9,363	$ 10.656	$ 11.771
6 cylinder	669	17,563	11.752	12.981
8 cylinder	93	29,914	2.767	3.056
Truck	120	7,230	0.869	0.960
Total	2,021	—	$ 26.044	$ 28.769
Exports of U.S. Vehicles to Japan	100,000	$17,064	$ 1.706	$ 1.952
U.S.-Japan Vehicle Deficit			**$ 24.338**	**$ 26.817**

II. Average Market, Stable Share Table 11 presents the 1996 U.S. vehicle market implied by Scenario II. Total light vehicle sales reach 15 million—a decent, but not great year—and Japanese share remains constant at its 1992 level of 28 percent. The 1996 average passenger car market is 9.45 million units, with New Entrants taking 19.3 percent market share, and Japanese imports 15.7 percent, down less than 1 percent from 1992 levels. Japanese segment share decreases in small and intermediate vehicles and increases in large/luxury are somewhat smaller than in Scenario I. Total Japanese sales move upmarket, as the percentage of small passenger cars falls, while both intermediate and large/luxury increases, again somewhat less than in Scenario I.

New Entrants capture 8.8 percent, and Japanese imports 7.2 percent, of the 5.55 million light truck market, for a slightly increased 16 percent share. The portion of Japanese light truck sales that are sport/utilities rises from 38 percent to about 44 percent.

Table 11
1996 U.S. Sales of Japanese Vehicles
Scenario II: Average Market, Stable Japanese Share
(Units in Thousands)

Passenger Car Market

Segment	U.S. Segment Mix (percent)	Japanese Imports (units)	Japanese Transplant (units)	Tota. Japanese Sales (units)	Japanese Segment Share (percent)	Total Japanese Sales Mix (percent)	Japanese Import Sales Mix (percent)
Small	33%	558	692	1,250	40.0%	37.9%	37.7%
Inter-mediate	45	612	1,128	1,740	41.0	52.7	41.3
Large/ Luxury	22	310	0	310	15.0	9.4	21.0
Total	100%	1,480	1,820	3,300	——	100%	100%

Light Truck Market

Segment	Japanese Imports (units)	Japanese Transplant (units)	Total Japanese Sales (units)	Japanese Segment Share (percent)
Pick up Trucks	109	393	502	
SUV/Van	291	97	389	
Total	400	490	890	16.0%

Table 12 displays the vehicle trade estimates derived from our average market, stable-Japanese-vehicle-share scenario. In 1992 dollars, the value of Japanese vehicle imports rises some 13 percent. to just under $24 billion. Unit imports increase, but only by 7,000 vehicles. The rise in the value of imports is due to the upscaling of Japanese vehicles, as in Scenario I. The value of U.S. exports and export units both increase by some 145 percent to $1.7 billion, under our stable share exchange rate assumption.

The total vehicle deficit is $22.212 billion constant dollars, up some 9 percent in a market that rises just over 17 percent in unit sales. The deficit increases to $24.468 billion 1996 dollars, taking into account the value of the yen, for an increase of 20 percent.

Table 12
1996 U.S.-Japan Vehicle Deficit
Scenario II: Average Market, Stable Japanese Share
Model Trade Case

U.S. Import of Japanese Vehicles				
Category	Units (in thousands)	Customs Value 1992 average	1992 Constant Billions of Dollars	1996 Current Billions of Dollars
4 cylinder	1,090	$ 9,363	$ 10.205	$ 11.273
6 cylinder	604	17,563	10.607	11.716
8 cylinder	78	29,914	2.318	2.561
Truck	109	7,230	0.788	0.871
Total	1,881	—	$ 23.918	$ 26.420
Exports of U.S. Vehicles to Japan	100,000	$17,064	$ 1.706	$ 1.952
U.S.-Japan Vehicle Deficit			**$ 22.212**	**$ 24.468**

III. Strong Market, Declining Share Table 13 displays the 1996 U.S. vehicle market implied by Scenario III. Total light vehicle sales again reach a strong 16 million, but Japanese share falls below its 1992 level to 24.6 percent. The 1996 strong passenger car market will reach 10.1 million units, and New Entrants will capture 17 percent market share, rather than the 19 percent of our stable share scenarios. Japanese passenger car imports take 13.8 percent, or two points less than in our stable share scenarios. Japanese segment share falls about 13 points in small vehicles, and less than half a point in intermediate and large/luxury. Total Japanese sales still move upmarket, as the percentage of small passenger cars falls, while both intermediate and large/luxury increases.

New Entrants capture 7.5 percent, and Japanese imports 6.1 percent, of the 5.9 million light truck market, for a loss of just over one point of market share to 13.5 percent. However, the portion of Japanese truck sales that is sport/utilities still rises from 38 percent to about 44 percent.

Table 13
1996 U.S. Sales of Japanese Vehicles
Scenario III: Strong Market, Declining Japanese Share
(units in thousands)

Passenger Car Market

Segment	U.S. Segment Mix (percent)	Japanese Imports (units)	Japanese Transplant (units)	Total Japanese Sales (units)	Japanese Segment Share (percent)	Total Japanese Sales Mix (percent)	Japanese Import Sales Mix (percent)
Small	32%	456	654	1,110	34.5%	35.7%	32.8%
Inter-mediate	45	614	1,066	1,680	37.0	54.0	44.2
Large/ Luxury	23	320	0	320	14.0	10.3	23.0
Total	100%	1,390	1,720	3,110	——	100%	100%

Light Truck Market

Segment	Japanese Imports (units)	Japanese Transplant (units)	Total Japanese Sales (units)	Japanese Segment Share (percent)
Pick up Trucks	95	351	446	
SUV/Van	265	89	354	
Total	360	440	800	13.5%

Table 14 displays the vehicle trade estimates for our strong market, declining-Japanese-vehicle-share scenario. In 1992 dollars, the value of Japanese vehicle imports rises 7.6 percent above the 1992 level, to under $23 billion. Unit imports fall just over 6.5 percent. The rise in the value of exports combined with a unit import decline is due to an even sharper upscaling of Japanese imports, compared to 1992. Small, lower value vehicles fall from 52 percent to just under 33 percent of Japanese passenger cars, and more expensive sport/utilities rise from about 50 percent to about 74 percent of light truck imports. The constant-dollar value of U.S. exports and export units both increase by nearly 200 percent to $2 billion. Again, we assume that the added exports of lower-value passenger cars is compensated by increased exports of higher-value sport/utilities, so that the mix does not change.

The total vehicle deficit is $20.640 billion constant dollars, up just over 1 percent in a market that rises 25 percent in unit sales. Exports are less critical to restraining this deficit, as Japanese dollar-value import growth is well below the level of unit market increase. The deficit reaches $23.741 billion 1996 dollars, taking into account the value of the yen, for an increase of some 16 percent.

Table 14
1996 U.S.-Japan Vehicle Deficit
Scenario III: Strong Market, Declining Japanese Share
Trade Case

U.S. Import of Japanese Vehicles				
Category	Units (in thousands)	Customs Value 1992 average	1992 Constant Billions of Dollars	1996 Current Billions of Dollars
4 cylinder	983	$ 9,363	$ 9.203	$ 10.580
6 cylinder	593	17,563	10.408	11.966
8 cylinder	80	29,914	2.393	2.751
Truck	95	7,230	0.683	0.786
Total	1,750	—	$ 22.687	$ 26.084
Exports of U.S. Vehicles to Japan	120,000	$17,064	$ 2.048	$ 2.343
U.S.-Japan Vehicle Deficit			**$ 20.640**	**$ 23.741**

IV. Average Market, Declining Share Table 15 displays the 1996 U.S. vehicle market implied by Scenario IV. Total light vehicle sales are 15 million, but Japanese share falls below its 1992 level to 24.6 percent The 1996 passenger car market generates 9.45 million unit sales, and New Entrants capture 17.0 percent market share, two points below our stable share scenarios. Japanese passenger car imports take 14 percent, nearly two points less than in our stable share scenarios Japanese segment share falls 12 points in small vehicles, about one point in intermediates and less than half a point in large/luxury. Total Japanese sales still move upmarket, as the percentage of small passenger cars falls, while both intermediate and large/luxury increases.

New Entrants capture 7.4 percent, and Japanese imports 6.1 percent, of the 5.55 million light truck market, as in the strong market, declining share scenario for a loss of just over one point of market share. However, the portion of Japanese truck sales that is sport/utilities again rises from 38 percent to about 44 percent.

Table 15
1996 U.S. Sales of Japanese Vehicles
Scenario IV: Average Market, Declining Japanese Share
(units in thousands)

Passenger Car Market

Segment	U.S. Segment Mix (percent)	Japanese Imports (units)	Japanese Transplant (units)	Total Japanese Sales (units)	Japanese Segment Share (percent)	Total Japanese Sales Mix (percent)	Japanese Import Sales Mix (percent)
Small	33%	498	612	1,110	35.5%	37.9%	37.7%
Inter-mediate	45	532	998	1,530	36.0	52.2	40.3
Large/ Luxury	22	290	0	290	14.0	9.9	22.0
Total	100%	1,320	1,610	2,930	——	100%	100%

Light Truck Market

Segment	Japanese Imports (units)	Japanese Transplant (units)	Total Japanese Sales (units)	Japanese Segment Share (percent)
Pick up Trucks	90	327	417	
SUV/Van	250	83	333	
Total	340	410	750	13.5%

Table 16 displays the vehicle trade estimates derived from our average market, declining-Japanese-vehicle-share scenario. The value of Japanese vehicle imports rises less than 1 percent above the 1992 level, to just over $21 billion 1992 dollars. Unit imports fall more than 11 percent. Again, the upscaling of Japanese imports and a stronger yen maintain the dollar value of vehicle imports in the face of the unit decline. The constant dollar value of U.S. exports and export units both increase by nearly 200 percent to $2 billion.

The total vehicle deficit is $19.202 billion constant dollars, down nearly 6 percent in a market that is about 17 percent larger in unit sales. Exports are less critical to restraining this deficit, as Japanese dollar value import growth is well below the level of unit market increase. The deficit reaches $22.088 billion 1996 dollars, taking into account the value of the yen, for an increase of some 8 percent.

Table 16
1996 U.S.-Japan Vehicle Deficit
Scenario IV: Average Market, Declining Japanese Share
Model Trade Case

U.S. Import of Japanese Vehicles

Category	Units (in thousands)	Customs Value 1992 average	1992 Constant Billions of Dollars	1996 Current Billions of Dollars
4 cylinder	959	$ 9,363	$ 8.984	$ 10.329
6 cylinder	538	17,563	9.445	10.859
8 cylinder	73	29,914	2.169	2.493
Truck	90	7,230	0.653	0.750
Total	1,661	—	$ 21.250	$ 24.431
Exports of U.S. Vehicles to Japan	120,000	$17,064	$ 2.048	$ 2.343
	U.S.-Japan Vehicle Deficit		**$ 19.202**	**$ 22.088**

Summary Table 17 summarizes the vehicle trade deficits implied by our four scenarios. These deficits, measured in constant 1992 dollars, range from $19.2 billion to $24.3 billion. This is a wide range, but no larger than the actual range of the vehicle deficit between 1985 and 1992. We are reasonably confident that these estimates place likely boundaries on the 1996 bilateral vehicle deficit.

Table 17
Scenarios of the U.S. Market: Four 1996 Vehicle Deficits
(in billions of 1992 dollars,
1996 dollars in parentheses)

	Market Size	
Japanese Produced Share	Strong (16,000,000)	Average (15,000,000)
28.0%	24.338 (26.817)	22.212 (24.468)
24.6%	20.640 (23.741)	19.202 (22.088)

An average 1996 vehicle market, characterized by declining Japanese-affiliated vehicle share, yields our smallest deficit, a 1992 dollar decrease of nearly 6 percent. However, if the market achieves a strong 16 million unit sales, and Japanese share remains at its 1992 level of 28 percent, we expect the deficit to increase by just over 19 percent. Our mixed scenarios predict deficits that fall between these two extremes, with the average market, stable share scenario anticipating $22.2 billion, and our strong market, declining share scenario expecting $20.6 billion.

While it appears that market share has a larger effect on the deficit than market size, this is in fact the result of the ranges we elected to examine. Thus our market sizes—16 and 15 million—differ by less than 7 percent, while our Japanese share variable—28 percent and 24.6 percent— varies by about twice as much, at nearly 14 percent. Moreover, the assumption about the value of the yen boosts exports in the declining share scenario as well. Hence, the deficit differences are larger comparing our market share scenarios than they are comparing our market-size scenarios. In reality, of course, decreased Japanese vehicle imports and increased U.S. vehicle exports lower the deficit, whether they come about through enhanced competitive performance by the Big Three or smaller markets.

We note that all our vehicle scenarios assume passenger vehicle unit imports that fall well within the current VER of the Japanese government. While a more restrictive VER might lower the vehicle deficit, we think it unlikely that one will be imposed. The current limit seems to offer the Japanese manufacturers reasonable strategic options, while a more restrictive ceiling might create difficulties in its allocation among the producers.

What other factors might affect the level of the 1996 bilateral vehicle trade deficit? Our scenarios all assume that Japanese vehicle sales reach the crossover point, and are sourced 55 percent from U.S. assembly. If that proportion increases beyond 55 percent, the vehicle deficit would be reduced further in any of our four scenarios.[17] The control of such sourcing decisions lies in the Japanese manufacturers, albeit constrained by the market success of particular vehicles and the product allocation decisions of an earlier time. We lacked the time and the resources to expand our scenarios to examine variations in this pattern, but it represents a critical influence upon the likely deficit, and one well worth research and analysis effort.

These scenarios portray specific point estimates of market size and Japanese-affiliated market share. They are built upon a fabric of assumptions about the market, its segmentation, the performance of Japanese vehicles across those segments, and the sourcing decisions of the Japanese manufacturers. Our estimates of the 1996 dollar values of vehicle imports reflect a series of further assumptions about inflation and the exchange rate. We very much doubt that any one of these four scenarios and its supporting assumptions will in fact turn out to be exactly on target. There is simply too much room for error.[18]

Nevertheless, we think these estimates of the likely 1996 vehicle deficit are worthwhile, both because they portray possible futures, and because the underlying analysis suggests the factors that are important in deficit reduction. We turn now to examine the likely 1996 parts deficit, the other major component of the total bilateral automotive deficit.

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[17]To be sure, some of the value of the decreased vehicle imports would shift to the parts deficit, so the total automotive trade deficit would not decrease as much as the vehicle deficit.

[18]For example, Japanese share loss through the first half of 1993 already makes some observers feel that our assumption of Japanese share loss of 3.4 points may be conservative.

VI. Trade in Parts and Components

Parts trade with Japan has accounted for over 85 percent of the growth in the bilateral automotive deficit from 1985 to 1992. While the vehicle deficit is now some 5 percent higher, the parts deficit has risen nearly 240 percent over that period, and parts trade now accounts for about 35 percent of the total bilateral automotive deficit. Accurate analysis and projection of the bilateral automotive deficit more and more depends on the appropriate analysis of its parts trade element.

This chapter reviews recent developments that may affect parts trade, reports the results of a series of statistical analyses of parts import data using two alternative methods, and finally presents a forecast of U.S.-Japan automotive parts trade through 1996.

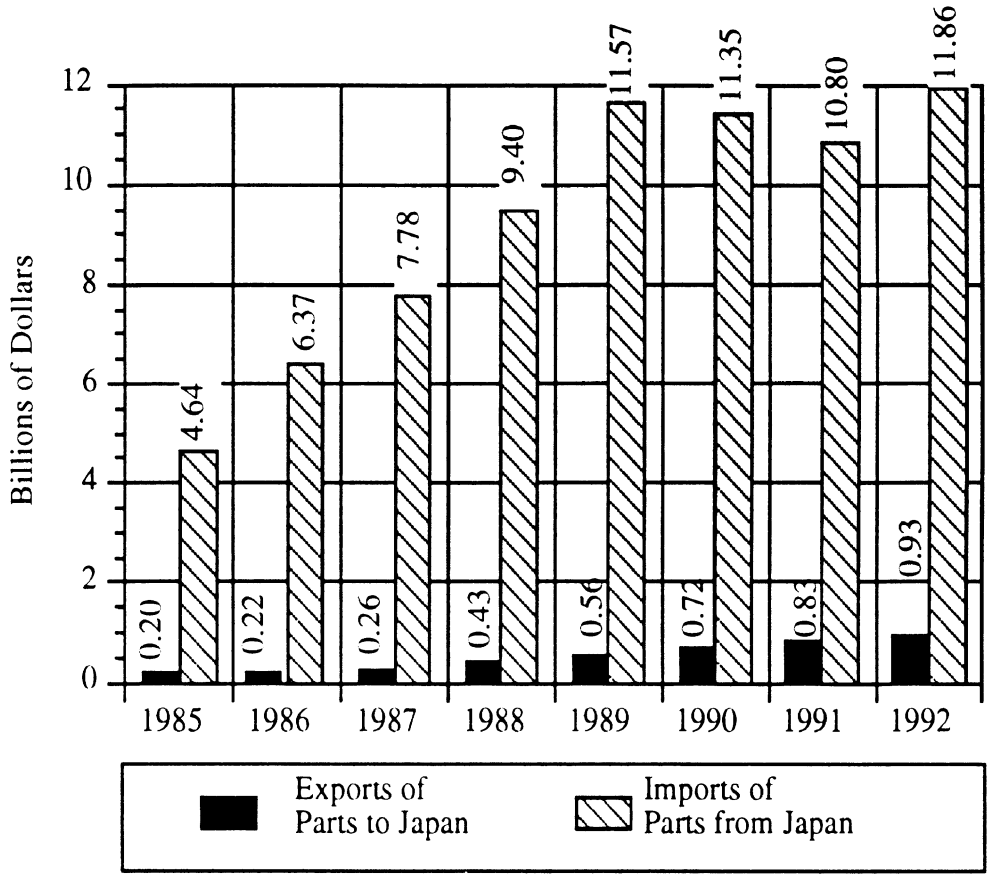
Recent Developments

Automotive parts trade between the United States and Japan may have reached a turning point in the early 1990s. Japanese parts exports to the United States totaled $1.3 billion in 1980, grew to $4.6 billion in 1985, and peaked in 1992 at $11.9 billion. Yet this recent peak represents an increase of just $300 million—less than 3 percent over 1989, the previous high for Japanese parts exports. On the other side of the ledger, U.S. parts exports to Japan totaled only $97 million in 1980, reached $203 million in 1985, and also peaked in 1992 at $924 million. The U.S. parts exports total for 1992 is just about $90 million above the previous high of $835 million in 1991, an increase of nearly 11 percent. Thus, while exports of U.S. parts to Japan grew at a healthy rate in 1985-1992, the rate of growth has slowed in recent years, as illustrated in Figure 7. The current level of U.S. parts exports is still small, particularly when measured in terms of the share U.S. exports take of the Japanese automotive parts market, the largest in the world.

There have been four important developments in the past few years that have probably influenced the reported levels of Japanese parts exports to the United States. First, there was a significant change in how the U.S. government categorizes and measures parts trade. Starting in January, 1989, the U.S. Department of Commerce began to code customs information on imports and exports using harmonized codes instead of the old codes that were based on the Tariff Schedule of the United States (TSUSA). This revision brought U.S. trade data into line with a widely used, international coding system, thus enhancing the comparability of U.S. data.

Moreover, both harmonization of the parts categories included in the automotive list and the revised customs procedures associated with its introduction probably increased the accuracy of the automotive import data. However, it also probably resulted in increased reported levels of parts imports, both because of the expanded categories and the more accurate recording of data.

Figure 7
U.S.-Japan Automotive Parts Trade
Exports and Imports
1985-1992



Source: U.S. International Trade Commision

At the same time, customs altered the method of valuing imports to exclude the costs of transportation and insurance. This change would lower the reported level of parts imports because of the restricted basis for calculating their value, offsetting the increases fostered by the expanded categorization of parts imports. It is difficult to estimate the combined effects of these upward and downward revisions in the value of automotive parts and components upon the recorded level of imports, and thus the parts deficit. In any case, the basis and nature of the measurement of trade flows changed after December, 1988. Whatever the merits of the changes, pre-harmonized parts trade data may not be comparable with post-harmonized data for analysis

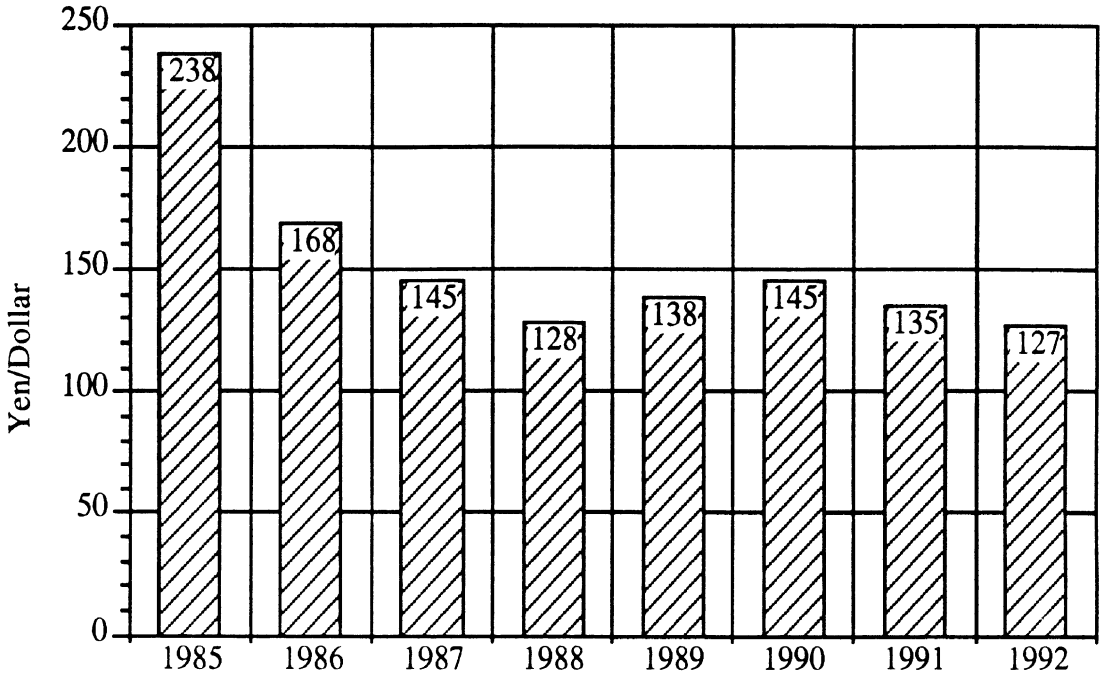
purposes. Trends and patterns may differ between the two periods simply due to these changes in the coding system.[1]

Second, U.S. automotive sales began to decline in the fall of 1990, resulting in low sales levels for both 1991 and 1992. The effect of the auto recession may have affected parts imports from Japan in the three major areas of parts demand: transplant demand, Japanese aftermarket demand, and captive-import-parts demand, or "Big Three demand." Growth in transplant production slowed in 1991-1992, probably depressing demand for imported parts and components used in local U.S. vehicle assembly by Japanese manufacturers. Sales of Japanese-affiliated import and domestic new vehicles fell, and combined with deferred maintenance and repair, may have reduced overall demand for replacement parts for these vehicles. Finally, U.S. production by the Big Three also fell sharply during this period, and that may have also reduced the demand for imported Japanese parts during 1991-1992.

Third, the competitive position of imported parts may have weakened during 1990-1992, especially in terms of relative cost. As displayed in Figure 8, the yen/dollar exchange rate fell from 145 to 127 yen to dollar in 1990-1992, strengthening the yen by some 14 percent against the dollar.[2] Moreover, this amplified an earlier increase in the yen's dollar value of some 64 percent between 1985 and 1990, for a total increase of 87 percent. Such increases may well have influenced parts sourcing decisions in recent years, as Japanese auto producers may have reacted to the higher cost of imported Japanese parts by sourcing their parts purchases to other countries or to traditional U.S. producers. If such sourcing changes have not yet influenced the actual trade flows, they are likely to soon, reflecting the altered basic economic fundamentals of automotive parts production in Japan and the United States. After all, the weakened dollar has certainly played a major role in converting the 1989 worldwide—excluding Japan—U.S. automotive parts deficit of just under $10 billion to a surplus of over $1 billion in 1992.

[1]ITC provides data "corrected" for this harmonization change. However, there are differences pre- and post-harmonization that may still be the result of this process. Some of these differences are discussed later in this section.
[2]The 9 percent increase in the dollar value of parts imports from Japan from 1991 to 1992 may simply reflect such price increases, rather than signal a substantial change in the pattern of parts imports.

Figure 8
Yen/Dollar Exchange Rate
1985-1992



Source: U.S. Federal Reserve Board

Finally, recent developments in trade negotiations may also have played a role. The Japanese producers made a series of widely publicized U.S. parts buying announcements at the time of President Bush's trip to Tokyo in January, 1992. Although there is dispute as to whether these constitute promises or goals for 1994, and the degree that they are tied to increased transplant production, they are ambitious announcements, and may already be influencing transplant parts buying behavior. Japanese transplant assemblers may be sourcing from a larger number of U.S. traditional suppliers and increasing production at their U.S.-based transplant parts operations. Both of these developments could result in lower imports of parts from Japan.

All of these reasons suggest that the imports of parts from Japan are falling, or soon will, while parts exports to Japan are likely to increase. This analysis suggests that we should expect some decline in the bilateral parts trade deficit by 1996. We now turn our attention to the important question of how large that decline might be.

Forecasts

This section presents a series of statistical analyses and forecasts of U.S.-Japan parts trade through 1996. We forecast Japanese automotive parts imports into the United States through the use of a special empirical model, but rely on two simpler forecast models to estimate U.S. exports of parts to Japan through 1996. The import and export forecasts are then combined to produce a forecast of the 1996 U.S.-Japan auto parts deficit.

Our analysis of parts imports hews closely to the results of our data analysis, and thus reflects developments to date, rather than possible future changes. We do provide a discussion of the likely effects of a major increase in U.S. sourcing by Japanese transplant manufacturers.

However, we incorporate two estimates of U.S. parts exports to Japan. One is a straightforward extrapolation of the current trend, and the other a speculative scenario that calls for a sharp increase in such exports. The current trend scenario is combined with our stable-Japanese-vehicle-share scenarios; the sharp-increase-parts-export scenario is combined with our declining-Japanese-affiliated-vehicle-share scenarios. The economic assumptions about the future value of the yen are consistent across the vehicle and part elements of these paired scenarios. The stable vehicle and trend parts-exports scenarios assume a 1996 yen that trades at 117 to the dollar, while the declining-vehicle-share and sharply-increased-parts-exports scenarios anticipate a yen at 110 to the dollar.

Three Investigations of U.S.-Japan Auto Parts Trade

We assume that there are three primary sources of demand—or *income* variables—for Japanese imported parts. First, there is transplant demand for Japanese produced parts for installation in U.S.-assembled, Japanese-affiliated vehicles. Second, there is Japanese aftermarket demand, the demand for imported Japanese parts for the repair and servicing of the operating fleet of Japanese-affiliated vehicles in the United States. Third, there is "Big Three" or captive import demand for parts imported from Japan for installation on Big Three vehicles produced in the United States. To be sure, there are other sources of demand for Japanese imported parts, but these are minor. These might include parts re-exported from the United States to other countries for production or aftermarket purposes, and Japanese import aftermarket parts for components installed in vehicles manufactured by the Big Three.

We performed two related empirical investigations of the patterns in Japanese auto parts imports to the United States. We also conducted a third analysis, a separate forecast for these parts imports into the United States through 1996. Three different statistical models underlie the analysis and forecast of Japanese imported parts through 1996.

Explanatory Model We developed an explanatory model to provide an estimate for the sources of demand and uses of imported Japanese automotive parts. However, this model is not a complete demand equation because it does not relate the quantity of automotive parts imports to the price of these parts. Estimation of such an equation is not possible because price and quantity data are not available. Nonetheless, the model incorporates the major factors determining the flow of imported auto parts and provides consistent trade coefficient estimates. These trade coefficients include such important policy parameters as the dollar level of import parts content contained in a transplant-assembled car or truck. We estimate the explanatory model so as to permit the determination of the change in this coefficient over time.

Almost all of the explanatory factors in the model reflect the fact that parts imports are a derived demand. Thus, we incorporate the number of Japanese and Big Three vehicles produced in the United States, the yen/dollar exchange rate, and leading indicators of automobile demand (such as the amount of outstanding automotive installment credit).[3]

Dynamic Adjustment Model We specified a dynamic model to identify the relationship between monthly changes in Japanese parts imports and short-term and long-term demand factors. This model compensates for any measurement error that may exist in the data and is independent of time and tariff schedules. One of the attractive features of this specification is its ability to reveal strategic interactions in the flow of parts imports. Thus it permits estimation of the relationship between monthly changes in parts imports and temporal shifts in transplant production, and the determination of both short- and long-term elasticities of selected demand factors.

Forecast Model The results of the explanatory model determined the selection of variables incorporated in the forecast model. We relied on a state space approach to generate the forecasts.[4] Hence, the generated forecast depends on the state or level of the explanatory variables.

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[3]For more details on factors affecting automobile demand see Charles A. Luckett. "Recent Developments in Automobile Finance," *Federal Reserve Bulletin*, Vol. 72 No. 6, June 1986.

[4]This method is closely related to the vector autoregression approach.

Analytic Variables

All three models incorporate a subset of six factors, which account for over 90 percent of the variability in the value of automotive parts imported from Japan. These factors include transplant production, aftermarket demand, Big Three production, the capacity utilization rate of the automotive industry, the level of outstanding consumer automobile installment credit, and the yen/dollar exchange rate. These are the economic *fundamentals* that drive the forecast.

Japanese Parts Imports We measure the dollar value of Japanese parts imports, our dependent variable, with data provided by the International Trade Commission. The series consists of 96 months of data, covering the period from January, 1985 to December, 1992. Monthly data provide a larger number of cases, permitting greater analytic precision compared with the smaller number of cases afforded by quarterly or annual data. This is the same series we analyzed in our 1991 report, but it is now augmented by an extra 27 cases. Figure 9 displays the monthly dollar values of these imports for the analysis period.

Figure 9
Japanese Automotive Parts Imports
1985-1992

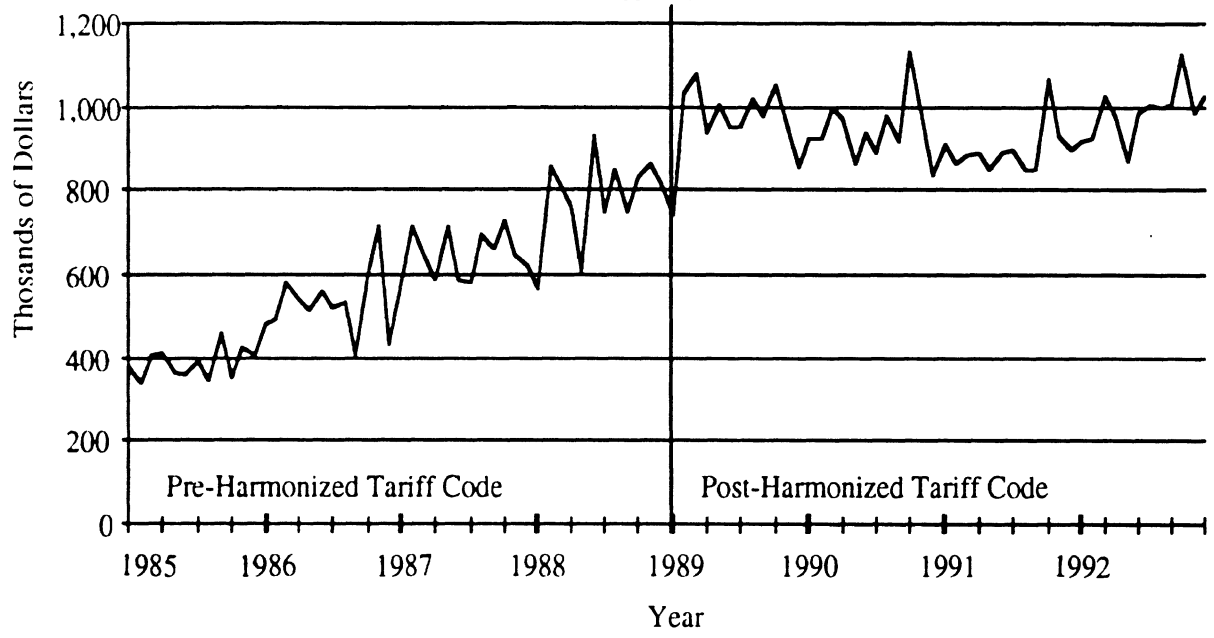
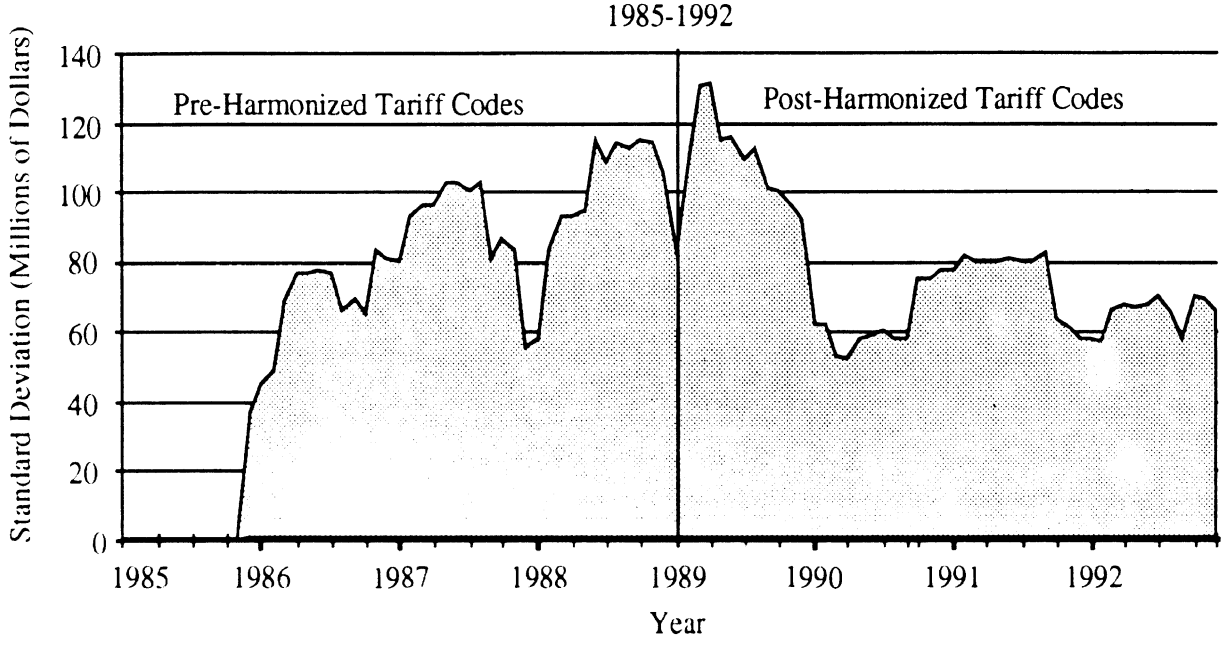


Figure 9 reveals the important effect of the implementation of the harmonized tariff code on January 1, 1989. It does appear that this tariff code captures a wider range of automotive

parts than the code used prior to 1989, indicated by the sudden sharp increase in imports coincident with its introduction. The net result is a virtual trade shock, as parts imports jump over 30 percent in just a few months, in spite of the exclusion of transport and insurance charges from the value of the imports after 1988. These changes may reflect the wider U.S. definition of automotive parts and the enhanced accuracy of its measurement of parts imported from Japan and elsewhere.

Perhaps one of the most important implications of this change is the possibility of substantial differences in measurement error between pre- and post-harmonization periods. Figure 10 displays the variability in the 12-month rolling averages before and after harmonization.[5] This comparison suggests that the volatility in monthly automotive parts imports decreased substantially in the post-harmonization period. This means that empirical models formulated for the pre-harmonization regime may differ from those formulated for the post-harmonization period and from those that span both periods.

Figure 10
Volatility of U.S. Automotive
Parts Imports from Japan
1985-1992

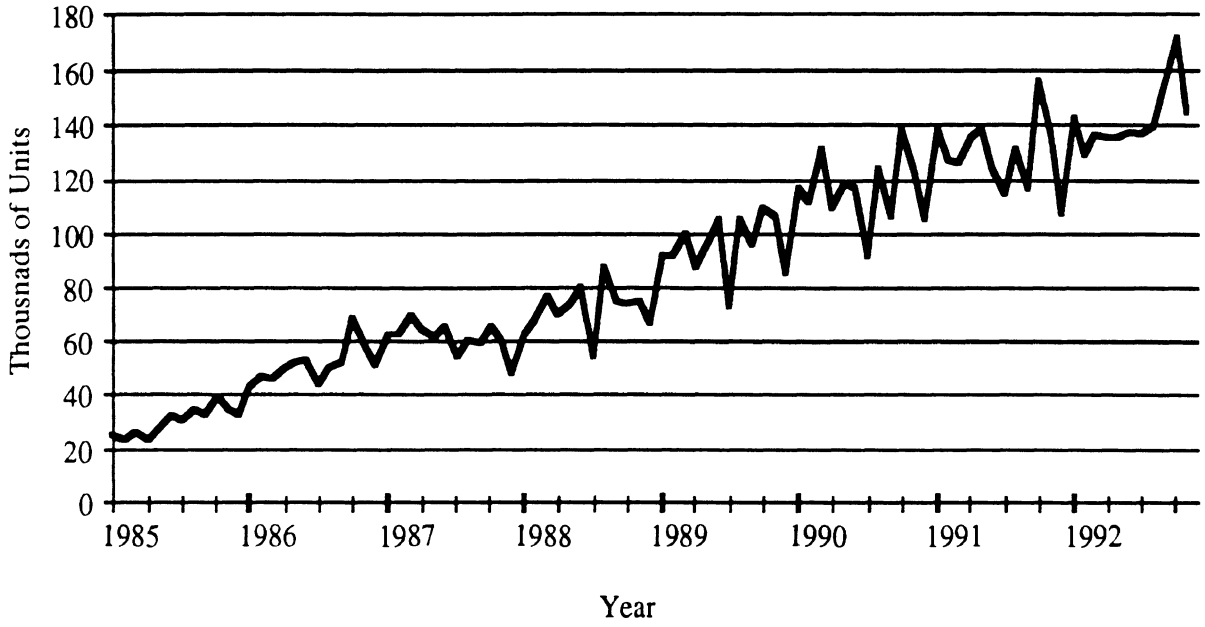


Transplant Production We measure monthly transplant automotive pr ction in thousands of units, including in this category Big Three-Japanese joint-venture plants managed by the Japanese.[6] Figure 11 displays these data. Transplants are perhaps the most readily

[5]The data-point for each month is the standard deviation for that month combined with the previous 11 months.
[6]Various issues of *Ward's Automotive Reports*, 1985-1993.

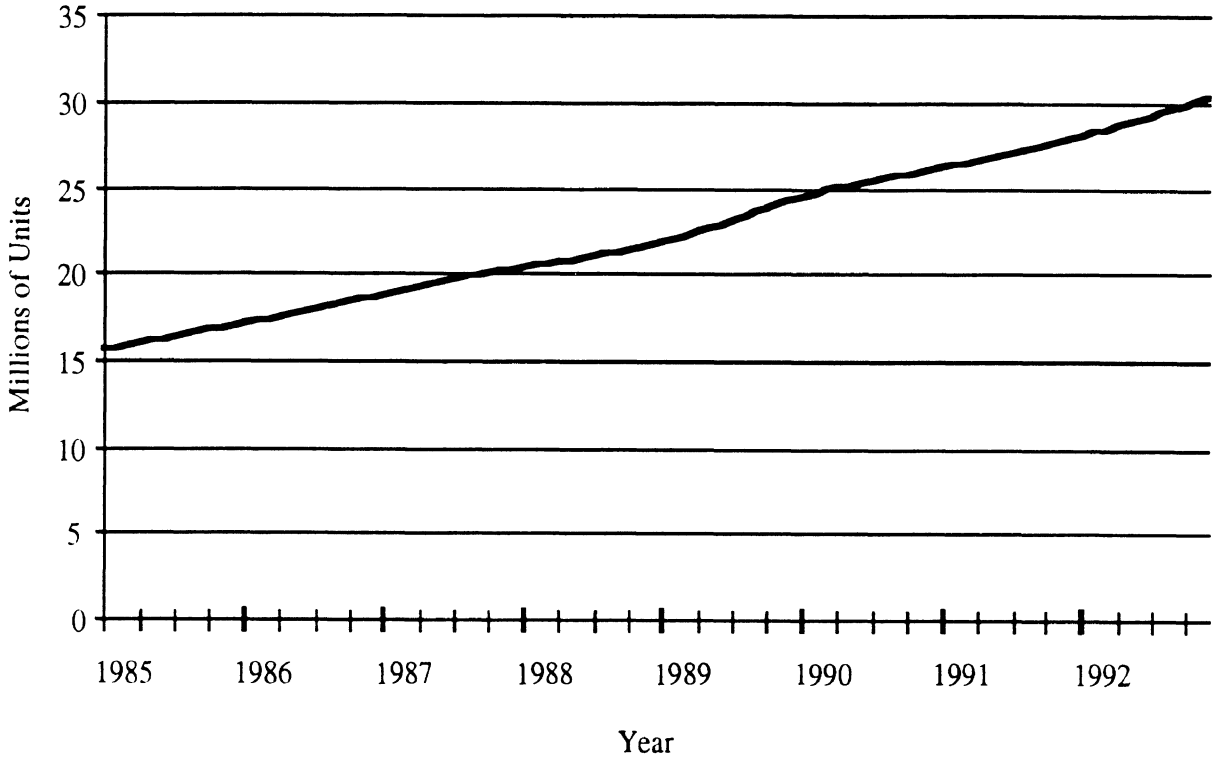
identifiable source of direct demand for Japanese parts imports, but they are also an important source of indirect demand for such parts. They represent a direct demand since they use these parts for their U.S. vehicle production. In addition, they provide some level of indirect demand because they source many automotive parts to U.S.-based Japanese parts manufacturers, often themselves substantial importers of Japanese parts for use in parts and components they supply to the manufacturers. Transplant manufacturers also source from U.S. traditional suppliers, who, in turn, may import parts from Japan. By including transplant production in the model, we estimate the combined direct and indirect demand for Japanese parts imports.

Figure 11
Total Transplant Light Vehicle Production
1985-1992



Japanese Aftermarket Demand We estimate this demand factor by measuring the stock of Japanese passenger cars in the United States, relying on fleet data provided by R. L. Polk, and presented in Figure 12, below.[7] This variable is measured in millions of units for analytic purposes. Since these data are only available in annual form, we converted them to monthly estimates through an interpolation procedure that maintains the informational integrity of the data.[8]

Figure 12
Japanese Affiliated Cars in Operation
1985-1992

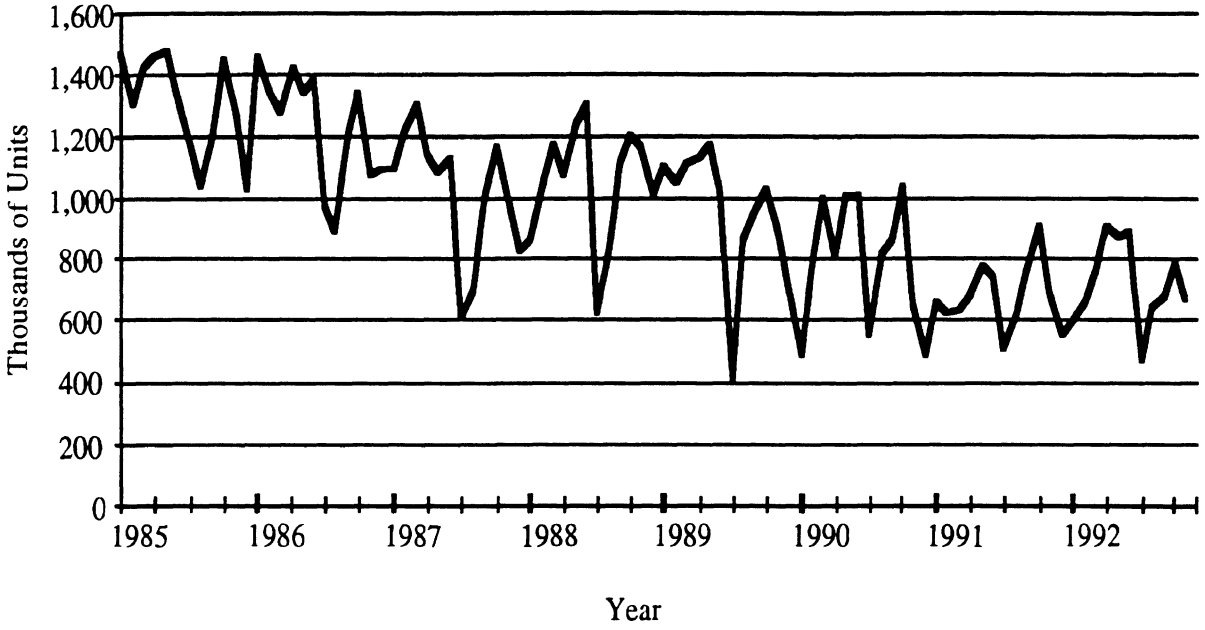


Big Three Production. We measure monthly Big Three automotive production in thousands of units.[9] As is the case for transplants, the Big Three automobile manufacturers are a source of both direct and indirect demand for Japanese imported parts, since they use such parts for their own U.S. vehicle production. Their level of indirect demand is probably somewhat below transplant indirect demand because they source proportionately more of their parts from traditional U.S. suppliers who have lower imports of Japanese parts than U.S.-based Japanese

[7]R.L. Polk & Co. Vehicles in Operation as of July 1, 1985-1991: Import Passenger Cars.
[8]In our 1991 analysis, our interpolation weighted the monthly estimates by the sales of Japanese vehicles, or fleet additions. For this analysis, we relied on an unweighted "spline" procedure.
[9]Various issues of *Ward's Automotive Reports*, 1985-1993.

suppliers. Big Three production captures both direct and indirect demand for Japanese parts imports, and is displayed in Figure 13.

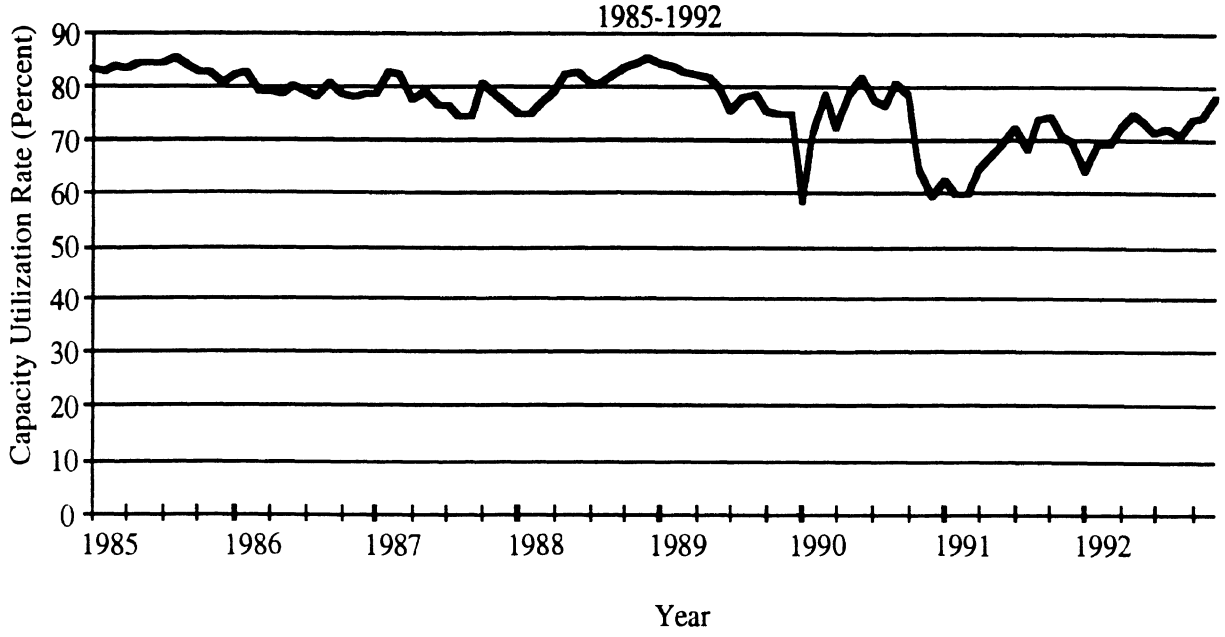
Figure 13
Total Big Three Production
1985-1992



Capacity Utilization Rates for Motor Vehicles and Parts This macroeconomic variable provides a measure of production activity in the U.S. motor vehicle industry, including parts manufacturing, and is presented in Figure 14.[10] Generally, if capacity utilization in the automotive industry is high, the automotive market is brisk, and one can expect an increase in imports to meet increased demand. This variable provides an indirect measure of other sources of demand for parts imports beyond Big Three and transplant production.

[10]The Federal Reserve Board generates these rates, which we collected from the monthly Citibase series published by Citicorp.

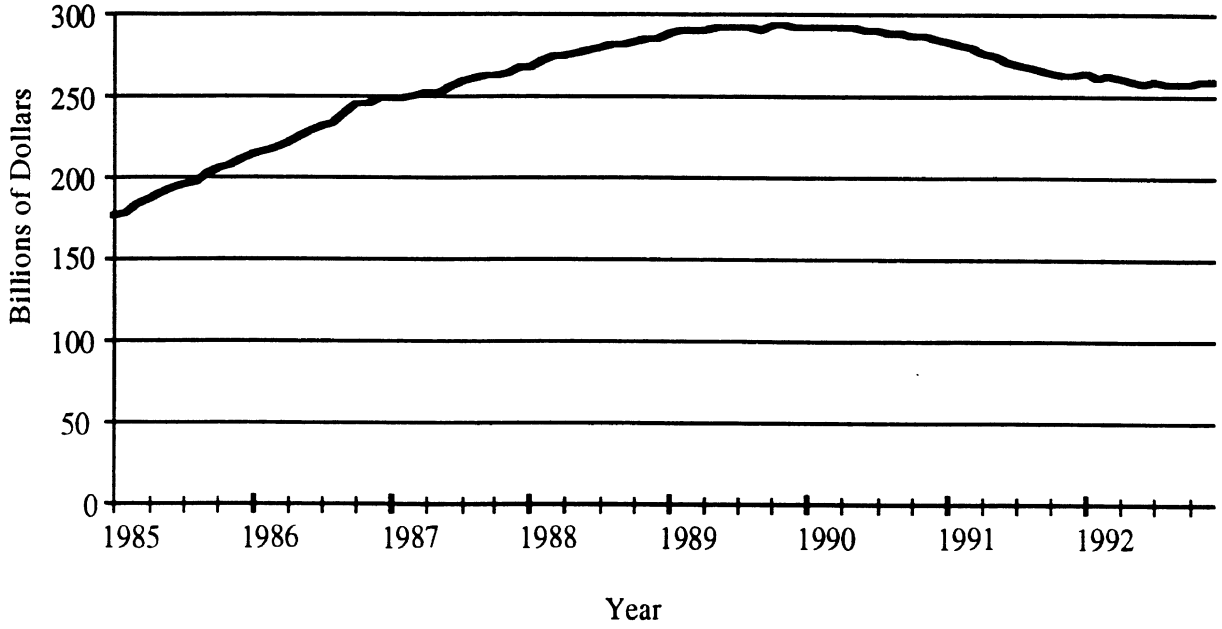
Figure 14
U.S. Capacity Utilization Rate;
Motor Vehicle and Parts Manufacturers:
1985-1992



Outstanding Consumer Automobile Installment Credit We measure this variable in billions of unadjusted dollars per month; the data are presented in Figure 15.[11] One major indicator of the derived demand for imported automotive parts is the financial situation of automobile consumers. Thus, for instance, we expect the rate of increase in this variable to slow in a sluggish economy, as consumers resist adding to their debt burden. This variable serves as a proxy for both new and used car sales, reflecting both the derived demand for automotive parts and aftermarket effects.

[11]This series is collected by the Bureau of Economic Analysis of the Department of Commerce, and was taken from Citibase data.

Figure 15
Consumer Automobile Installment
Credit Outstanding
1985-1992

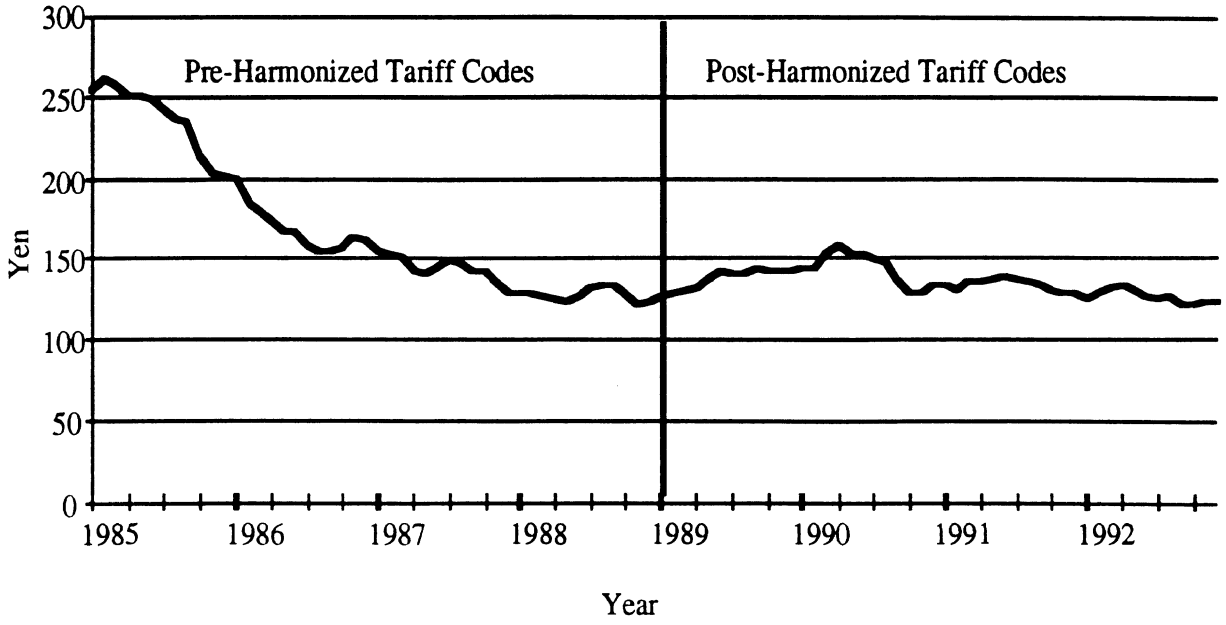


Yen/dollar Exchange Rate We measure this variable on a monthly average basis.[12] Figure 16 displays the number of yen required to purchase one dollar during each month of the analysis period. The yen-dollar exchange rate directly affects the dollar value of imported Japanese automotive parts, and when the yen strengthens—or dollar weakens—the dollar price of Japanese imports rises. However, there may be other pass-through effects that influence the extent of the increase in the value of imports. Importers may choose to pass through to consumers only a portion of the dollar price increase induced by altered exchange rates, in order to preserve market share or to avoid alienating customers. How long importers can restrain dollar price increases depends on the slack the old exchange rate afforded them in terms of their basic production costs and required profit margins. The exchange rate may also serve as a proxy for the relative price of imported versus domestic parts.[13]

Inspection of Figure 16 suggests that the yen was fairly stable in the post-harmonized regime and for much of the pre-harmonized period as well. Thus it is relatively flat for much of the sample period. This lack of variability may mean that it is empirically less powerful than theory would expect in explaining the variability in automotive parts imports from Japan.

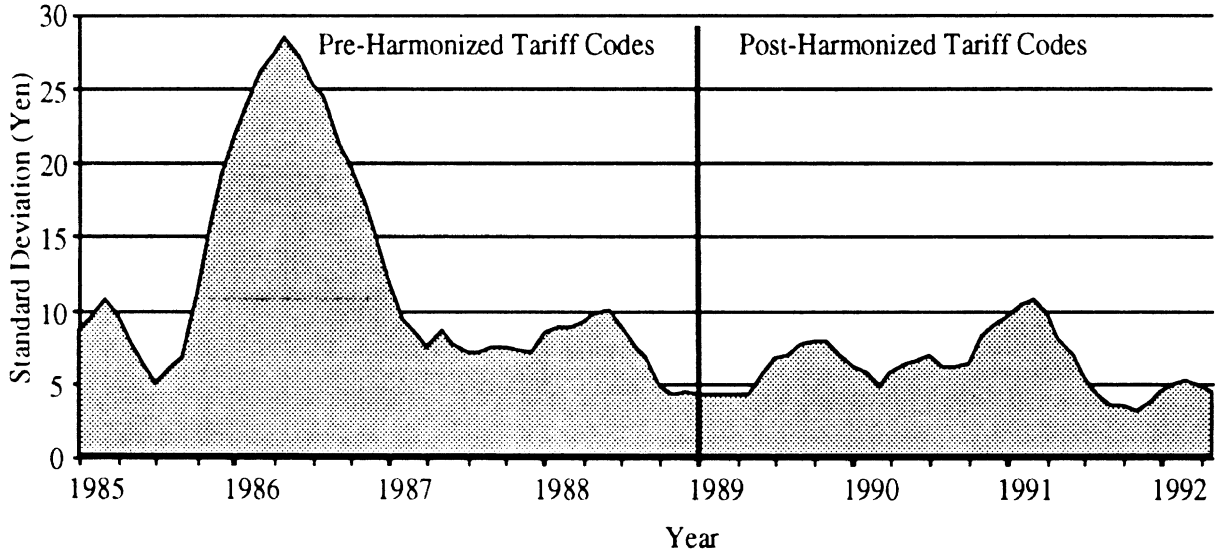
[12]This series was also taken from Citibase.
[13]Federal Reserve Board.

Figure 16
Yen/Dollar Exchange Rate
1985-1992



However, Figure 17 indicates that the yen was much more volatile in the pre-harmonized period. This raises the possibility of differential measurement error, since some of this volatility may have increased such errors in the pre-harmonized tariff code period. This could occur because importers priced goods, stored them, and then imported them—resulting in dollar values reflecting earlier yen rates. So, too, in a period of volatility, customs checks on declared values might be based on dated and thus erroneous information on exchange rates.

Figure 17
Yen/Dollar Volatility
1985-1992



Analysis Results

Explanatory Model In order to determine how U.S. imports of Japanese automotive parts are influenced by the set of explanatory variables, we performed a number of statistical evaluations of how well different models account for import data between 1985 and 1992. The general equation we evaluate is:

$$\text{Parts Imports from Japan} = B_0 + B_1\text{Transplant Production}_t + B_2\text{Aftermarket}_t + B_3\text{ Big Three Production}_t + B_4\text{Yen}_{t-1} + \text{Error}_t$$

where the error term is idiosyncratic and due to measurement error or other random sources.

All variables are considered for the same time period—indicated by the subscript "t"—except for the exchange rate. We enter the value of the exchange rate for the prior month, denoted by the subscript "t-1." This procedure recognizes that there is a time lag between the decision to import (reflecting a current exchange rate) and the actual importing of parts (perhaps reflecting a different exchange rate), and that there are frequent delays in recording.

Approximately 83 percent of the variation in imports is explained by transplant production and the nominal yen/dollar exchange rate for the prior period.[14] However, neither the aftermarket (measured by the level of Japanese automobile stock) nor Big Three production are reliably related to the level of imports of Japanese automotive parts.[15] In fact, levels of transplant production explain 77 percent of the variation in the value of imports, while the yen/dollar exchange rate explains somewhat under 6 percent. Thus, even if omitted variables could be identified, one could expect only an improvement of about 20 percent (17/83) in explaining the sources of variation in parts imports.

The coefficient for transplant production is approximately $3,345.00, after controlling for the yen/dollar exchange rate and Big Three production. This provides an estimate of the average Japanese import part content in U.S. assembled Japanese vehicles, and represents an increase of $311.00, compared to our estimate for 1990.[16] This is a 5 percent increase, compounded annually. If we assume a 3 percent inflation rate over the last two years and corresponding indexed wages, then there was virtually no change in transplant import content from 1990 to 1992. Moreover, the average value of transplant production increased over the same period, as

[14]See Appendix II for detailed reports of these analyses.
[15]It may well be that some of these parts are used in the outstanding stock of the Big Three automobiles as well. However, no data were available on the stock of U.S. made Big Three automobiles.
[16]UMTRI Report 91-20, op. cit., p. 103.

intermediate passenger cars rose from 43 percent to 64 percent of the production mix. These data, then, suggest that there probably has been some replacement of imported parts by domestic U.S. parts production.

Dynamic Adjustment Model We tested a dynamic adjustment model to provide parameter estimates for the long-run and short-run effects of our set of explanatory variables on Japanese automotive parts imports. For this analysis, short-run changes in parts imports are measured by the monthly growth rates of parts imports. The final model for short-run in imports is given by:

$$\begin{aligned}\textbf{Change in Parts Imports} = {} & B_0 + B_1\textbf{Time} + B_2\textbf{Harmonization}_t \\ \textbf{from Japan} \quad & + B_3\ \textbf{Adjustment Factor}_t \\ & + B_3\ \textbf{Big Three Production Change}_t \\ & + B_3\ \textbf{Transplant Production Change}_t \\ & + \Sigma\ (B_{5\text{-}10}\ \textbf{Long-term Effects}_{t\text{-}1}) + \textbf{Error}_t\end{aligned}$$

We included six, long-run, cyclical effects on imports of Japanese automotive parts. These again include transplant production, aftermarket, Big Three production, and the exchange rate. For this analysis we added the level of outstanding automobile installment credit, and an indicator of the condition of the Japanese financial market.[17]

Somewhat surprisingly, the introduction of the harmonized tariff code appears to have had little or no effect on the measurement of short-run changes in automotive part imports. Neither the Japanese economic situation nor the exchange rate influence changes in automotive parts import activity. However, short-run changes in automotive parts imports from Japan are quite elastic to the aftermarket, measured by the stock of Japanese passenger cars in the long-run, and to temporal adjustments in transplant production as well. As expected, the burden of outstanding consumer automotive installment credit affects the level of automotive parts imports in the long-run.

[17]This variable is measured by the average value of the Nikkei.

Import Forecasts for Four Scenarios

The model for generating the forecasts of Japanese automotive parts imports draws on the results of our explanatory and dynamic models. We employed a multiple time series approach, incorporating transplant production, Big Three production, automobile installment credit burden, capacity utilization in the automotive manufacturing industry, and the yen/dollar exchange rate as predictor variables.[18] This approach permits estimates of the value of imports under different scenarios by the assignment of predetermined values to any or all of the explanatory or control variables. For instance, one can build scenarios reflecting differing assumptions about the state of the economy at a future period and/or incorporate expert forecasts about a particular explanatory variable into the model. Thus, we can develop forecasts adjusted to differing market sizes, transplant build, and exchange rates.[19]

The 1992 Case Our parts forecast method is based on the results of a number of regression analyses, and it is useful to examine how well our method functions in "predicting" the level of automotive parts imports for 1992 before examining our 1996 forecasts. Table 18 displays the 1992 "predictions" consistent with each of our four future scenarios.

Our strong market, stable share scenario performs least well, overestimating the 1992 deficit of $11,856,043 by about 8 percent, while the other three scenarios all result in small—less than 2 percent—underestimates.[20] These results thus provide reasonable confidence in our method.

Table 18

1992 "Forecast" Scenario Matrix for U.S. Imports of Japanese Automotive Parts (in 1992 dollars)

	1996 Sales Scenario	
1996 Japanese Share of U.S. Light Vehicle Market	Strong (16 million)	Average (15 million)
Stable (28.0%)	12,814,247	11,632,704
Declining (24.6%)	11,716,490	11,621,523

[18]See Appendix II for a detailed description and discussion of the model.

[19] We used published yen/dollar projections and OSAT projections for the state of the automotive economy and the competitive status of the Big Three and Japanese producers.

[20]A fuller evaluation of the parts model is provided in Appendix II The strong, stable scenario is the only one that resulted in any overestimates of the deficit from 1985 to 1992.

We forecast the dollar value of automotive parts imports from Japan for each of four different scenarios, formed by combining our vehicle sales levels and market share assumptions. These scenarios are a strong market, stable-Japanese-share scenario; an average market, stable-Japanese-share scenario; a strong market, declining-Japanese-share scenario; and an average market, declining-Japanese-share scenario. The key factor for our parts forecast is drawn from our vehicle scenarios. This is the level of transplant build implied by our analysis of the levels of Japanese sales and the likely vehicle sourcing patterns to achieve those sales.[21] Each of these four sets of assumptions are used in the forecast model to generate a different estimate of constant dollar Japanese parts imports in 1996.

We rely on two different assumptions about Japanese price increases for converting our 1992 (constant) dollar forecasts to 1996 (current) dollars.[22] Our declining-Japanese-share scenario reflects the assumption that the exchange rate will strengthen to 110 yen to the dollar, driving up Japanese prices relative to our stable share scenario, with the yen trading at 117. Although higher prices will drive down unit sales of vehicles and parts from Japan, they will also drive up the price of those units that are still imported. Hence, the implications of the four scenarios depend upon whether 1992 or 1996 dollars are compared.

Scenario I: Strong Market, Stable Share This scenario forecast reflects a level of automotive parts imports that is consistent with a light vehicle market of 16 million unit sales in 1996, Japanese-affiliated market share at its 1992 level of 28.0 percent, and transplant production of 2.46 million units. This scenario probably portrays the highest plausible level of Japanese parts exports to the United States in 1996. The constant dollar total in this strong-and-stable scenario is $12.00 billion in parts imports, or 1 percent higher than the 1992 total of $11.86 billion. Our estimate of this scenario's current 1996 dollar value of parts imports is $13.25 billion, some 12 percent higher than the 1992 level.

Scenario II: Average Market, Stable Share This vehicle-trade scenario projects a total U.S. light vehicle market of 15 million, Japanese share again stable at 1992's 28.0 percent, and Japanese transplant build of 2.31 million cars and trucks. The constant dollar total in this scenario is $11.10 billion in parts imports, just over 6 percent lower than the 1992 total of $11.86

[21]We assume that the forecast sales level is the transplant build level. While there is some carry-over from year to year, we know of no way to reliably estimate this factor. Second, we assume that the unavailable data on transplant sales that are actually sourced from third countries, such as Canada, are compensated by not including an estimate for transplant build of vehicles that are exported.

[22]The complete method of calculating these price assumptions is described in Appendix III.

billion. Our estimate in current dollars is $12.25 billion in parts imports, some 3 percent higher than the 1992 level.

Scenario III: Strong Market, Declining Share This scenario expects a strong light vehicle market of 16 million units, but Japanese share declines to 24.6 percent, and Japanese transplants supply 2.16 million cars and trucks. The constant dollar import bill is $11.15 billion, 6 percent lower than the 1992 total of $11.86 billion. We estimate the current dollar total at $12.81 billion in parts imports, 8 percent higher than in 1992.

Scenario IV: Average Market, Declining Share This vehicle-trade scenario anticipates a total light vehicle market of 15 million, Japanese share losses to 24.6 percent, and Japanese transplant build of 2.02 million cars and trucks. This scenario depicts the market that is likely to produce the smallest level of imported automotive parts, as transplant build is quite low and the price of these parts high. Such a market will yield a constant dollar import bill of $11.08 billion, 7 percent lower than in 1992. However, our current dollar forecast is $12.74 billion in parts imports, about 7 percent higher than 1992's.

Discussion Table 19 portrays our four import parts scenarios for 1996 in both 1992 dollars and 1996 dollars. Our high forecast expects $12 billion in constant dollar imports of automotive parts in our strong-and-stable 1996 scenario, with its large market, continuing robust share performance by Japanese-affiliated vehicles, and a strong transplant build of nearly 2.5 million light vehicles. Our low forecast calls for parts imports of $11.08 billion in our average-and-declining 1996 scenario, with its smaller market, falling Japanese share, and a transplant build level some 450,000 lower. While the strong market, stable share scenario deficit is some 8 percent higher than our other scenarios, there is less than 1 percent variation across the three remaining scenarios.[23] This variation is well within the annual variability in parts imports from 1985 through 1992.

Figure 18 displays the constant dollar model estimates for our strong market scenarios—both stable and declining share—spanning the entire 1985 to 1996 period. A range of plus or minus $1 billion provides a rough 95 percent confidence interval around the annualized point estimates.

[23]Readers may be surprised that the average market, stable share scenario—calling for a build of some 150,000 more transplant units—yields a smaller parts import forecast than our strong market, declining share scenario. While transplant build is the major factor in our forecast model, the operation of other variables, and the "smoothing" effects of the Vector Autoregression procedure combine to produce this counterintuitive result.

Table 19

1996 Forecast Scenario Matrix
for U.S. Imports of Japanese Automotive Parts
in Billions of 1992 Dollars
(1996 Dollars in Parentheses)

	Sales Scenario	
Japanese Share of U.S. Light Vehicle Market	Strong (16 million)	Average (15 million)
Stable (28.0%)	11.996 (13.251)	11.096 (12.256)
Declining (24.6%)	11.146 (12.814)	11.077 (12.736)

Figure 18
1996 Scenario of U.S. Imports
Of Japanese Automotive Parts
(Strong Market)

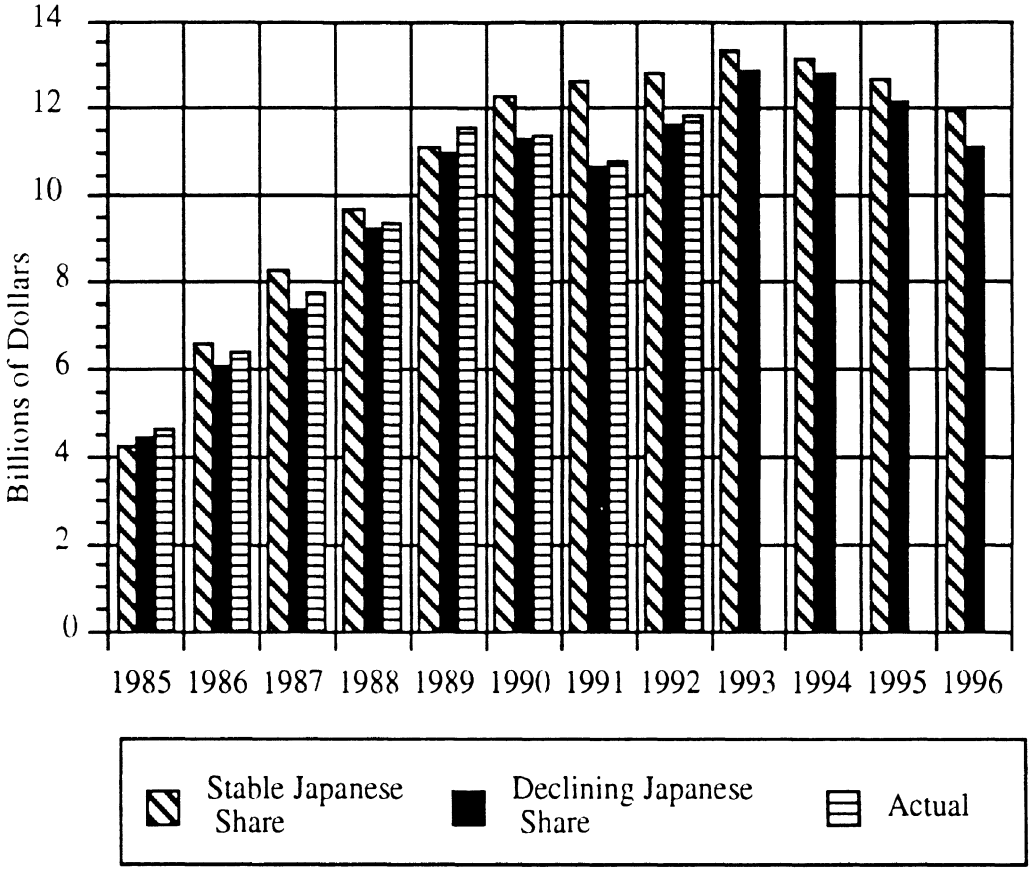
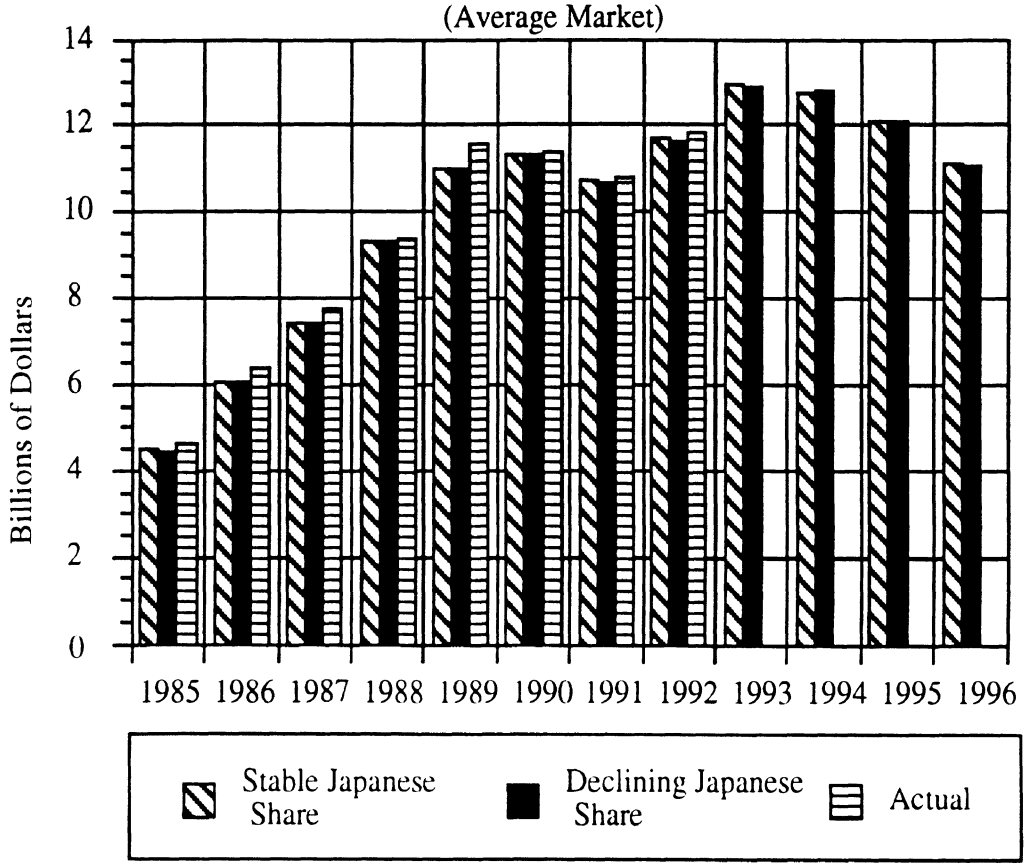


Figure 19 displays these constant dollar estimates for our average market scenarios, again including both the stable-and-declining share versions.

Figure 19
1996 Scenario of U.S. Imports
Of Japanese Automotive Parts
(Average Market)



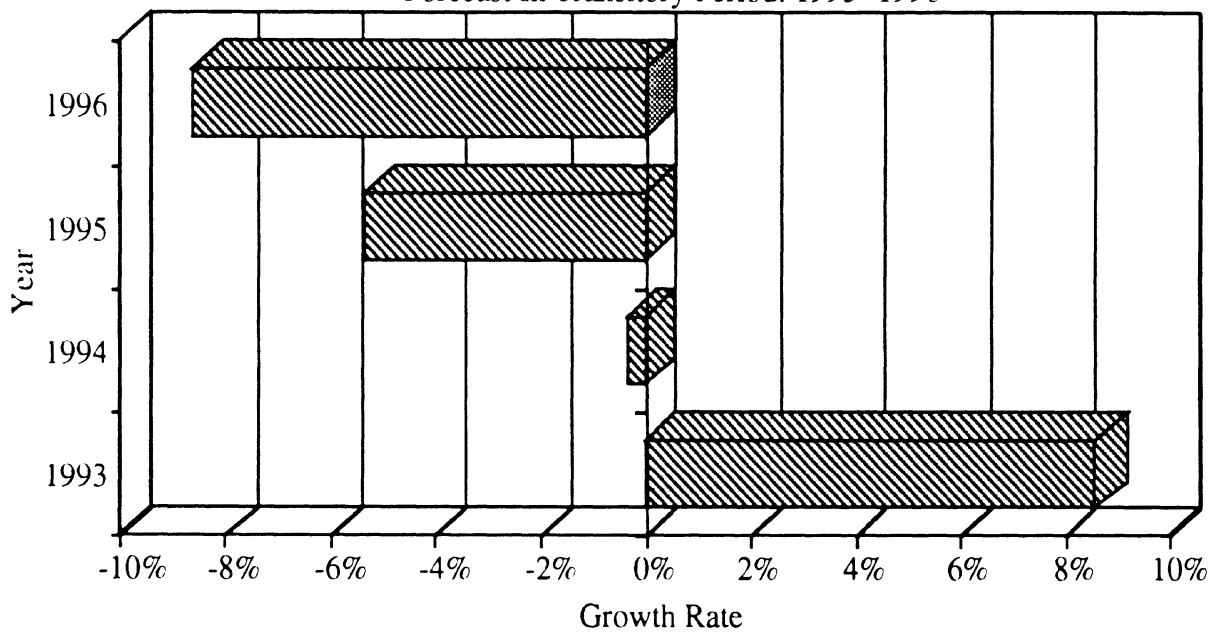
We forecast a level of $13.26 billion in current dollar, automotive parts imports in our strong-and-stable 1996 scenario, and a level of $12.26 billion in our average-and-stable 1994 forecast. Thus our low parts-import scenarios are different, depending on whether we compare constant or current dollars.

In 1992 dollars, the strong-and-stable scenario predicts a level of imported auto parts more than $500 million higher than the other scenarios, which differ among themselves by fewer than $100 million. However, if we compare 1996 dollars, the comparison alters somewhat. In this case, the strong market, stable-Japanese-share scenario still calls for over $400 million more imports than the mixed scenarios, but nearly $1 billion more than the average market, stable share scenario. Moreover, the average market, stable share scenario imports are nearly $500 million less than the mixed scenarios' imports.

The implications of these comparisons for the automotive industry and the government may differ. The industry and U.S. government would probably agree that a strong market characterized by declining Japanese share is the desirable, constant dollar scenario. However, might not the politics of trade make an average market and stable-Japanese-share—with its $500 million lower parts imports—attractive to the government in the current dollar world of 1996?

The value of automotive parts imports may have reached its high between 1990 and 1992. Many factors might account for this: the sluggish economy and depressed automotive sales; a marked decrease in measurement error after the implementation of the new harmonized codes; and the concomitant decrease in yen/dollar volatility. This plateau has a significant effect on attempts to forecast beyond 1992. It creates a recalcitrant time series with a downward drift that increases in intensity the farther into the future one forecasts. There are other possible influences that would decrease the level of parts imports as well. Perhaps most notable is the proposed increase in Japanese transplant sourcing of automotive parts to U.S.-based manufacturers, which would reduce demand for Japanese imports. However, the pace and substance of such changes may depend on numerous factors, ranging from the exchange rate, through economic conditions in Japan, to the competitive response of Japanese automotive parts manufacturers themselves.

Figure 20
Annual Growth Rate for Scenario III
Forecast In Transitory Period: 1993- 1996



Nevertheless, the results displayed in Figure 20 portray an average decrease of more than 1 percent in the value of imports over the transition period—from 1993 to 1996 inclusive—for our average market, stable share scenario.[24] The compounded annual growth rate of forecasts between 1993 and 1996 is approximately -1.6 percent. The level of automotive parts imports from Japan grows in 1993, remains roughly stable in 1994, but falls in both 1995 and 1996.

Forecast of U.S. Parts Exports

Forecasting the parts trade deficit requires forecasts for both imports from Japan and exports to Japan, since the deficit is the difference between these two trade flows. The level of U.S. automotive parts exports to Japan is extremely small compared to levels of imports from Japan. However, there has been a steadily increasing trend in exports since 1985, and we expect this trend to continue.

There are a number of reasons for this expectation. First, the strengthened yen has perhaps already altered the fundamental economics of producing automotive parts in Japan and the United States, and at least some U.S. automotive suppliers may now hold a significant cost advantage over their Japanese competitors. Second, reflecting the increased competitiveness of the U.S. industry on dimensions other than cost, we expect increased exports of automotive goods—including vehicles—from the United States to Japan. In fact, if U.S. vehicle manufacturers are successful in penetrating the Japanese market, parts exports could strengthen even more, as aftermarket demand for U.S.-produced vehicles might spur parts imports from the United States. Finally, the major Japanese vehicle manufacturers have all announced plans for substantially increasing their U.S. purchases of automotive parts for export to Japan, as well as for local use in their U.S.-based facilities.

Because of the possibility of—but continuing uncertainty about—sharp increases of U.S. parts exports to Japan, and the differential strengthening of the yen underlying our scenarios of lower Japanese-affiliated vehicle share, we provide two alternative forecasts of future parts exports to Japan. The first, a straightforward projection of the current trend, is used in conjunction with our stable share scenarios for Japanese-affiliated vehicles. The second permits a sharp rise in U.S. exports, and is used in conjunction with our declining Japanese vehicle share scenarios, because it too is premised on sharper price increases for Japanese automotive goods.

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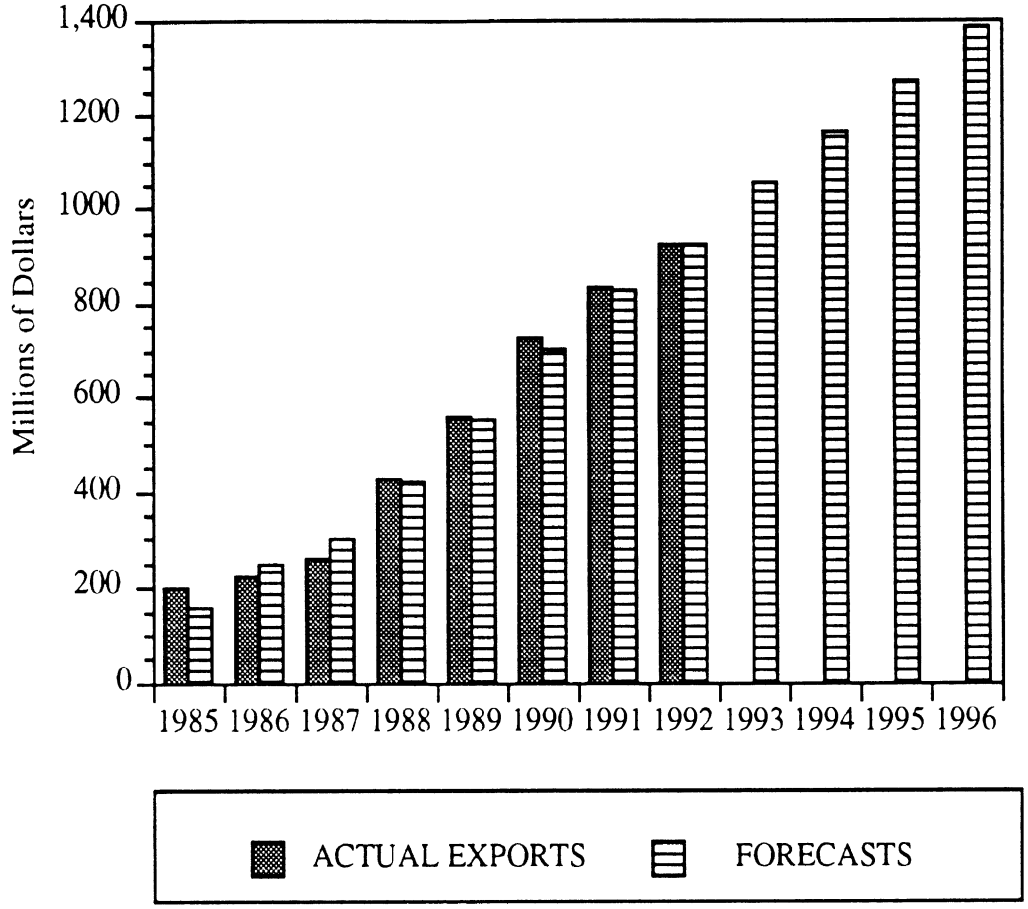
[24] Arithmetic mean.

Trend Forecast Exports of auto parts from the United States to Japan grew from a level of $203 million in 1985 to $925 million in 1992. Our univariate model forecast based on the 1985-1992 data yields a constant dollar level of exports of $1.39 billion for 1996. We use this level of parts exports to Japan in both our stable share scenarios as our forecast of constant dollar U.S. parts exports to Japan. We convert this estimate to a 1996 dollar forecast of $1.59 billion by multiplying it by 1.144, based on a CPI increase of 14.4 percent.[25] This forecast is displayed in Figure 21, as are the model values for all prior years.

Figure 21
Trend Forecast for U.S. Automotive
Parts Exports to Japan



Alternative Scenario Many of our arguments suggest a discontinuous, perhaps sharp increase in U.S. parts exports to Japan. Thus, the strengthened yen of our declining share vehicle scenarios will amplify a substantial prior increase in its value, forcing up Japanese prices. The

[25]See Appendix III.

U.S. industry has increased its overall competitiveness, and is already showing substantial share gain in the U.S. market. We suspect that diplomatic pressure on Japan with respect to its trade surplus will likely grow, rather than recede. The announced intentions of the Japanese manufacturers deserve full credit, especially in view of their aggressive recent moves in a depressed market.

U.S. parts exports to Japan may well grow by as much as 150 percent by 1996, even though the Japanese announcements call for roughly a 110 percent increase in automotive part purchases overall. For several reasons, we expect the growth in exports to be somewhat higher. One reason is rooted in Japanese sourcing practices and a reluctance on the part of Japanese manufacturers to risk diverging customer views of Japanese-affiliated vehicle quality. This will result in high levels of common sourcing for vehicles produced in both countries, and it will probably therefore require more than proportional increases in exports. Another reason is that JAMA reports of Japanese parts purchasing in the United States indicates that about 25 percent of such purchases are now exported.[26] If export parts and local use parts grow at the same rate, the share of exports parts will fall, and that, we suspect, is not politically desirable. If JAMA-reported exports grow at 150 percent, local use parts need only grow at 64 percent, and the share of exports remains just above 25 percent.

Our alternative 150 percent scenario is compatible with the assumptions underlying both our declining share vehicle scenarios. This alternative-parts-export scenario forecasts $2.31 billion U.S. parts exports in constant 1992 dollars, and $2.64 billion in 1996 current dollars. If our assumption strikes the reader as reckless, the low level of 1992 U.S. parts exports—$925 million—prevents the 1996 estimates from becoming enormous.

Table 20 displays the forecast of U.S. automotive parts exports to Japan for each pair of our market share scenarios. Measured in 1992 dollars, the trend forecast for our stable market share scenarios calls for a 50 percent increase in U.S. parts exports, while our alternative forecasts call for a much sharper increase of 150 percent. Our alternative forecast calls for constant dollar parts exports some 67 percent higher than the trend forecast.

[26]Expanding Procurement of U.S.-made Auto Parts, Mimeo, JAMA, March, 1993. Calculated from data in first table, p. 1.

Table 20

1996 Forecast Scenario Matrix
for U.S. Exports of Automotive Parts to Japan
(n Billions of 1992 Dollars
(1996 Dollars in Parentheses)

	Sales Scenario	
Japanese Share of U.S. Light Vehicle Market	Strong (16 million)	Average (15 million)
Stable (28.0%)	1.385 (1.585)	1.385 (1.585)
Declining (24.6%)	2.310 (2.643)	2.310 (2.643)

The 1996 U.S.-Japan Automotive Parts Deficit

The 1996 parts deficit is calculated by subtracting the constant and current dollar level estimates of U.S. exports of parts to Japan from the forecast levels of U.S. imports from Japan. These results are displayed in Table 21. The four parts deficits generated by our scenarios range from a high of $10.61 billion 1992 dollars to a low of $8.77 billion, covering a range of nearly $2 billion, or some 121 percent. This is considerably smaller than the range of actual parts deficits incurred from 1985 through 1992, and is, in fact, just about the extent of change from 1988 to 1989.

Table 21

1996 Forecast Scenario Matrix
for the U.S. Automotive Parts Deficit with Japan
in Billions of 1992 Dollars
(1996 Dollars in Parentheses)

	Sales Scenario	
Japanese Share of U.S. Light Vehicle Market	Strong (16 million)	Average (15 million)
Stable (28.0%)	10.611 (11.666)	9.711 (10.671)
Declining (24.6%)	8.836 (10.171)	8.767 (10.093)

We forecast a constant dollar parts deficit of $10.61 billion for the strong market, stable-Japanese-affiliated share scenario. This is our highest forecast, and represents a 3 percent

decrease from 1992. The average market, stable share scenario yields the next highest parts deficit, at $9.71 billion 1992 dollars, or a decrease of 11 percent compared with 1992's results. Our declining share scenarios produce quite similar parts deficits, at $8.84 billion for a strong market, and $8.77 billion in an average market of 15 million vehicles, or a 19 percent and 20 percent reduction from 1992 respectively.

The current 1996 dollar forecast for the strong market, stable share scenario is $11.67 billion, or a nearly 7 percent increase from 1992. The other three scenarios all result in 1996 dollar decreases from the level of 1992: a 2 percent decrease for the average market, stable share scenario; a 7 percent decrease in the strong market, declining share scenario; and an 8 percent decrease for the average market, declining share scenario.

Again, our export assumptions turn out to be critical. These scenarios produce forecasts of imports, displayed in Table 18 above, that differ substantially only in the comparison of the strong market, stable share scenario to the other three. Our forecast of higher exports in the declining market share scenarios effectively distinguishes these two scenarios from the average market, stable share scenario when we compare the parts deficits.

Discussion

The most significant finding in our current investigation and forecast of U.S.-Japan automotive parts trade is that Japanese parts imports will level off in 1994 and begin to fall during 1995-1996. This will occur in spite of projected, coincident increases in the size of the U.S. market for motor vehicles and the production of Japanese transplant vehicles. However, we expect to see somewhat higher levels of auto parts imports in both 1993 and 1994 compared to 1992 levels. Moreover, this eventual reduction in the U.S. automotive parts trade deficit during 1992-1996 is likely to be quite small, even in constant dollars. For example, our strong market, stable share scenario projects a constant 1992 dollar trade deficit of $10.6 billion for 1996, or $300 million below the 1992 level. Our most optimistic projection, the average market, declining share scenario, forecasts the parts deficit falling some $2 billion, to $8.8 billion in 1996. Thus, we forecast a decline in the parts deficit of 3 to 20 percent in constant dollars and an increase of 7 percent to a decrease of 7 percent when measured in current, 1996 dollars.

What effects might various public or private policies on parts trade have on the parts deficit? In particular, what effect would a major increase in the domestic sourcing of transplant

vehicles have on the parts deficit in 1996? Our explanatory model suggests an answer. We associated a level of $3,345 of imported parts with each transplant vehicle built in 1992. If this level of import content could be reduced by half in 1996, the parts deficit would presumably be reduced by $1,672.50 for each transplant vehicle assembly. In our strong market, stable-Japanese share case, this yields a decline of $4.11 billion, or 39 percent of our forecast parts deficit of $10.6 billion.[27] Our smallest, parts deficit forecast—in the average market, declining share scenario—would decline $3.38 billion, or 39 percent of our forecast deficit of $8.77 billion.[28] Thus, a halving of Japanese import content in transplant vehicles might reduce the bilateral parts deficit by roughly 40 percent.

Japanese import content of $3,345 per transplant unit represents the value of roughly two to three major vehicle components that are still exported from Japan to U.S. transplant assembly operations. A review of the categorical ITC information on parts imports reveals that the bulk of parts exports to the United States from Japan are indeed major components, such as engines, transmissions, or major parts for these components. Therefore, the reduction of Japanese parts content in transplant vehicles by 50 percent is not impossible, since it might require a few, rather than many, sourcing decisions. It could be achieved by sourcing a larger share of product value in the vehicle powertrain or drivetrain to U.S. operations, whether Japanese- or U.S.-owned.

[27]$1,672.50 X 2.46 million units transplant build.
[28]$1,672.5 X 2.02 million units transplant build.

VII. Bilateral Automotive Deficit Forecast

We now turn to our forecast for the total automotive deficit in 1996 and a brief discussion of some of the policy issues raised.

Total Bilateral Automotive Deficit

The total automotive deficit consists of both vehicle and parts deficits. Consequently, we combine our vehicle trade forecast from Table 17 and our parts trade forecast from Table 21 to yield our forecast of the total bilateral automotive trade deficit. This is displayed in Table 22, again reported in both constant 1992 dollars and current 1996 dollars.

Table 22

1996 Forecast Scenario Matrix
for U.S. Automotive Deficit with Japan
in Billions of 1992 Dollars
(1996 Dollars in Parentheses)

	Sales Scenario	
Japanese Share of U.S. Light Vehicle Market	Strong (16 million)	Average (15 million)
Stable (28.0%)	34.949 (38.483)	31.923 (35.139)
Declining (24.6%)	29.476 (33.912)	27.969 (32.181)

These forecasts range from a low of $28 billion to a high of $34.9 billion, measured in 1992 dollars. Our high forecast is some 25 percent above our low, a range well within year-to-year variation in the automotive deficit from 1985 through 1992, and somewhat below the percentage change from 1985 to 1986.

Our strong market, declining share scenario predicts the high deficit of $34.9 billion in 1992 constant dollars, up some 11.5 percent from 1992's deficit, and nearly 5 percent above the record deficit of 1989.[1] The average market, stable share scenario yields the next highest total deficit, at $31.9 billion 1992 dollars, for an increase of 2 percent compared with 1992's results. Our strong market, declining share scenario produces a deficit of $29.5 billion, down some 6 percent from 1992, while the average market, declining share scenario yields the low deficit of $28.0 billion, down nearly 11 percent from the 1992 level.

Measured in 1996 current dollars, these deficits all anticipate increases from the 1992 level, although the comparative ranking remains the same. The strong market, declining share scenario again expects the high deficit of $38.5 billion in 1996 current dollars, up some 23 percent from 1992's deficit, and about 15 percent from the record deficit of 1989. The average market, stable share scenario predicts the next highest total deficit, at $35.1 billion 1996 dollars, for an increase of 12 percent compared with 1992's results. Our strong market, declining share scenario generates a deficit of $33.9 billion, up some 8 percent from 1992; the average market, declining share scenario produces the low deficit of $32.2 billion, up nearly 3 percent from 1992.

Automotive parts continue to account for a substantial share of the total automotive deficit, ranging from over 31 percent in our average market, declining share scenario to 30 percent in the declining share scenario. The composition of these deficits is similar to recent years

Our results, then, suggest a decidedly mixed picture. Overall, we see the deficit growing by as much as nearly 12 percent or falling by as much as 11 percent. While none of our scenarios suggest that the automotive deficit will grow at anything like the 32 percent increase from 1985 to 1986, our strong market, stable-Japanese-share scenario suggests a substantial increase of over 11 percent in constant 1992 dollars.

These 1996 deficits fall nearer our 1994 Best Plausible case deficit projection of $29.4 billion than to our Most Likely case estimate of $38.1 billion.[2] The proportion of the 1996 deficit that parts account for is quite a bit lower than we had estimated for 1994.

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[1]We use a total 1992 deficit estimate of $31.321 for comparison purposes. This excludes roughly $200 million of the actual deficit that falls in a category of non-tariff, non-passenger vehicles. These play no role in our forecast scenarios, and consequently we exclude them from consideration.

[2]UMTRI Report 91-20, op. cit., p. 72. These are estimated in 1990:9 dollars.

Similarly, these 1996 deficits are well below our Most Likely 1993 projections, but our strong market, stable share assumption is quite close to our 1993 Best Plausible current dollar forecast. However, the parts share of the 1996 deficit is well above our earlier forecast for 1993.[3]

Both our stable share scenarios predict increases in the deficit, while both our declining share scenarios anticipate constant dollar reductions. We again caution the reader that the greater effect of our share scenario than that of our market scenario is due to the greater difference in the levels of the share scenario. If we compared scenarios of a 14 and 16 million unit sales market, and restricted our declining share scenario to a Japanese-affiliated share of 26 percent, the apparent strength of the two factors would be reversed. Again, reduced Japanese imports and transplant build have the same effect on the deficit, whether they result from smaller markets or are due to enhanced competition.

A comment is in order on the use of both constant 1992 and current 1996 dollars throughout our analysis. Economists generally prefer to compare constant dollars, because that prevents inflation from exaggerating the underlying comparisons. This is especially the case when one examines trade flows between countries with differing inflation rates, because these differing rates render meaningful comparisons in the two currencies quite difficult. However, industry participants and political leaders generally think in current dollars, and respond to events in a current dollar world. That is an important point, because, if any of our scenarios should prove to be right on target, the 1996 reactions of these different groups to the changes since 1992 may be quite different. For example, current 1996 dollars portray twice the deficit percentage increase that constant 1992 dollars do in our strong market, stable share scenario. While constant 1992 dollars yield a 6 percent decrease for our strong market, declining share case, current 1996 dollars describe an 8 percent increase.

Policy Implications[4]

The automotive industry is a key sector in the U.S. economy, and it will continue to play a major role in trade flows between the United States and Japan, and the United State's worldwide trade situation. The bilateral automotive trade deficit with Japan has

[3]See section IV above.

[4]The broad parameters of this discussion reflect work we performed for the Automotive Select Panel, although the inferences we draw are our own.

totaled nearly $250 billion dollars over the course of our study period, 1985 through 1992. Such a sum is unlikely to be balanced in other sectors, nor is it politically sustainable. At the very least, it raises the important economic and political issue of appropriate compensation and effective transitional adjustment for adversely affected Americans.

The health of the U.S. industry will reflect the forces of business competition, but these forces are themselves shaped by the policy framework that structures the competitive arena. That policy framework has two important dimensions: the private initiatives undertaken by the industry and its member companies, and the public initiatives undertaken by the two governments. We believe our results have implications for both private and public sector policy.

Private Initiatives There is little question that the traditional U.S. industry is more competitive today—across a number of performance dimensions—than it was in the early 1980s. It has closed the productivity and quality gap with the Japanese industry, and likely enjoys a production cost advantage. It is regaining U.S. market share, and currently holds a commanding lead in the growing—and profitable—light truck segment of the market.

However, it is not yet time to declare victory, nor will such a time likely ever arrive. We expect the competition between the Big Three companies and their major Japanese rivals will continue unabated well into the next century. The grounds of competitive advantage will shift, now favoring one industry, now the other. Moreover, this competition is more focused at the company level than was true of the last decade. Industry-wide rankings on performance dimensions such as quality and productivity no longer cluster all Japanese companies or all U.S. companies into discrete levels.

The Big Three and their traditional supplier base must continue to accelerate improvement across numerous competitive dimensions, striving to reach and defend world class performance levels.

Exports to Japan are an important key to deficit reduction in the long term. They constitute an important source of the variation across our forecasts of the bilateral deficit, at least partly because there is serious disagreement about the levels that are realistically attainable in the immediate future. We recognize the high cost and extended time requirements to penetrate the Japanese market and the numerous alternative uses companies have for these resources. Nevertheless, we feel it is imperative, not only for the deficit reduction benefits it might afford, but as a strategy in the increasingly global competition that characterizes the automotive industry. Gaining access to the world's largest parts market and second largest vehicle market provides an offensive incentive, while denying this secure base to the industry's major competitor confers a defensive benefit.

The Big Three and its traditional U.S. suppliers must continue and intensify efforts to penetrate the Japanese market for both parts and vehicles.

The Japanese manufacturers have established and rapidly expanded their U.S. production capacity, and now source roughly 50 percent of their U.S. sales locally. Unfortunately, while unit vehicle imports are down substantially since 1986, this development has had less effect on the vehicle deficit as measured in dollars, since the upscaling of Japanese sales has raised the average value of these imports. At the same time, the reliance on imported parts from Japan for U.S. assembly operations has substantially increased the parts deficit.

However, the major Japanese manufacturers have announced intentions to source much higher levels of transplant and export content in the United States, and evidence to date suggests that they are implementing these efforts. We view these local sourcing intentions as promising signs that the transplants intend to integrate themselves more fully into the domestic U.S. industry, and we encourage the broader and more rapid development of this trend. Local sourcing should decrease parts imports and, combined with increased parts exports to Japan through broadened market access, can yield significant deficit reduction.

Japanese transplants should expand their efforts to become part of the U.S. industry through increased local sourcing, and their parent companies should expand the opportunities for U.S. exports to Japan.

Public Initiatives Cogent arguments call for minimal government intervention in private markets, but there is ample evidence that the relationship between the United States and Japan in the automotive sector illustrates a market failure. Moreover, the central role of the industry in both the Japanese and U.S. economies suggests that there will continue to be political dimensions to the automotive relationship that go beyond the traditional economic competition of private markets. The automotive parts industry is among the largest, if not the largest, manufacturing industries in the United States, employing one million or more Americans. With the manufacturers, the parts industry has suffered greatly in recent years as automotive markets declined, shifted, and international competition increased.

Effective policy development and implementation require information that is germane, reliable, and consistent. When the policies are targeted to resolving bilateral disputes, it is critical that both governments agree on the information that defines the problem and determines its scope.

The U.S. government currently uses two official but different definitions of automotive parts trade between the United States and Japan. Although they share the same source—the U.S. Customs Service—the data kept by the International Trade Commission and the Department of Commerce are collated in separate offices, subject to frequent and apparently arbitrary revisions, inadequately described, and often do not agree. Moreover, these official definitions differ from definitions used by the U.S. Department of Transportation, the Environmental Protection Agency, and common industry usage. It is, therefore, very difficult—and sometimes impossible—to assemble comparable information on this important industry.[5] Japan appears to have multiple definitions as well. The Ministry of Finance relies on Japanese Customs data, while the Ministry of International Trade and Industry draws on data compiled by JAMA from company reports.

[5]Two other examples illustrate the paucity of U.S. government information important to understanding the automotive trading relationship with Japan. The Bureau of Labor Statistics (BLS) of the U.S. Department of Labor has the responsibility of measuring and estimating changes in prices of imported and exported trade commodities. Despite the long-standing significance of vehicle and parts imports from Japan, the BLS does not generate automotive import price series by national origin, precluding analysis of the demand for such imports. The Bureau of Economic Analysis (BEA) of the U.S. Department of Commerce has the responsibility for measuring and reporting on the economic activities of U.S. subsidiaries of foreign-owned corporations and the economic effect of significant bilateral trade deficits. BEA's output in both these areas can only be labeled tardy and incomplete.

We prefer the broader definitions and categories of automotive trade used by JAMA. They more closely approximate the approach of input-output analysis for measuring the relationship, linkages, and importance of an industry to the total economy than do the discrete part definitions used by the U.S. government. However, we are persuaded that there are numerous sources of error in their current use, as discussed in Section III. Common, consistent, and accurate measurement would make these data useful for cost-benefit analyses, and would facilitate agreement between the two governments on the nature, extent, and perhaps even seriousness of the trade problems they face.

The U.S. and Japanese governments should establish a shared and standardized definition of automotive and automotive-related goods and services, and ensure that automotive trade flows are measured accurately, reliably, and consistently.

The motor vehicle industry is a strategic industry, both in its economic centrality and its relatively long planning horizon. For strategic industries, companies can benefit from anti-competitive practices because economies of scale are important, entry barriers steep, long-term rents to survivors high, and the economic penalties often found in other sectors may not apply. Our nation's history of anti-trust litigation gives ample evidence of this reality, especially in the case of the motor vehicle industry. However, anti-competitive practices, such as dumping or reciprocal purchasing agreements, are serious threats to the national well-being. The current debate on automotive trade between the United States and Japan should explicitly reflect the strategic implications of trade practices on both sides.

The U.S. parts industry is competitive, and its market results in Japan and at the transplants appear to fall short of what one would expect.[6] To be sure, Japan has different economic laws and business practices than does the United States. However, generally accepted principles of fair competition suggest that it is inappropriate to discriminate against parts manufacturers on the basis of national origin and financial relationships. A dispute resolution panel, similar to that established under the terms of

[6]Several studies have been released that compare the performance of U.S.-owned and Japanese-owned automotive suppliers, typically finding the U.S. firms less competitive. However, these studies restrict respondents to a sample of Japanese vehicle manufacturing firms, and the Big Three vehicle manufacturers are not surveyed for their relative ratings of supplier firms. U.S. automotive parts firms that are relatively recent suppliers to the Japanese manufacturers are compared with experienced—and often affiliated—Japanese suppliers. The issue of serious bias must be raised regarding the conclusions of these studies.

the Free Trade Agreement between Canada and the United States, may offer a way to avoid punishing an entire industry through tariffs or content legislation for the practices of some of its members.

The U.S. and Japanese governments should establish a bilateral dispute resolution panel for the automotive sector, empowered to hear, investigate, and impose sanctions in cases of alleged discriminatory treatment of each nation's suppliers by the other's manufacturers.

The barriers to access characteristic of the Japanese automotive market are well documented and generally recognized. These barriers can be eliminated by a combination of public and private decisions in Japan, as discussed above. Failing that, we suspect that the U.S. government will continue its efforts to lower these impediments to U.S. entry and market development.

The major, private sector players do not completely control progress on the automotive deficit. There may be a time lag before U.S. consumers become aware of recent improvements by the domestic industry. Japanese vehicle firms cannot and should not simply order their major component suppliers to purchase more U.S. parts; Japanese consumers cannot be told to buy U.S. vehicles. But other, more systemic barriers and their supporting policies can be lowered or eliminated by the manufacturers and governments, and that makes the notion of deficit reduction targets sensible.

However, these targets should be established as ranges, rather than as fixed points, and they should allow trade-offs across different performance areas. Thus, a Japanese manufacturer that exceeds targets for U.S. content in transplant vehicles might be allowed more exports from Japan than the VER ceiling permits. Moreover, such targets should be frequently adjusted in light of changing circumstances—such as altered market conditions—to avoid damaging weaker companies. As circumstances change, so do reasonable expectations.

If this sounds like "managed trade," so be it, although we see it functioning in a less formal fashion. Perhaps the strategic nature of the motor vehicle industry, its size, and its importance makes some form of agreement on trade targets inevitable. The major conclusion of this study is that the U.S.-Japan automotive trade deficit will remain large for the forecast period and, therefore, a likely focal point of U.S.-Japan economic and political tension.

The U.S. and Japanese governments, in consultation with their national industries, should negotiate reasonable targets for deficit reduction, assuring that these targets can be reasonably adjusted and applied as circumstances warrant.

Any discussion of trade policy must include the topic of tariff policies, since all trade policies can be converted into "tariff equivalent" economic effects on the terms of trade. A focus on tariffs will almost certainly develop in the next few years if SII, MOSS, and MOCP efforts fail to achieve deficit reduction.[7] While tariffs are unappealing and bilateral tariffs are contrary to the General Agreement on Tariffs and Trade (GATT), we believe that the barriers to Japan will increasingly be treated as tariff equivalents, and countervailing tariffs increasingly viewed as the logical response.

The current U.S. tariff rate on imported vehicles from Japan is 25 percent for two-door commercial trucks and 2.5 percent for passenger vehicles, one of the lowest passenger vehicle tariffs in the world. The U.S. tariff rates applied to imported Japanese auto parts are typically in the 3.0 to 3.5 percent range, also one of the lowest automotive import taxes imposed by any nation. The U.S. automotive tariff schedule provides virtually no incentive for Japanese automotive firms to produce passenger vehicles in the United States. In spite of this, Japanese firms do assemble vehicles in the United States, and 50 percent of their sales are now sourced to transplants. However, the U.S. parts tariff provides little incentive for them to use domestically produced parts.

"Optimal tariffs" are a practical construct of international economic theory. Tariffs on imports can be set to maximize national welfare, reflecting increased employment, income, tax collections, and even tariff collections, as well as short-run consumer welfare. Optimal tariffs have been estimated for U.S. vehicle imports,

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[7]Respectively: Structural Impediments Initiative, Market-Oriented Sector Selective talks, and Market-Oriented Cooperation Plan. All three are bilateral negotiations with varying degrees of specific focus on the automotive sector.

generally falling in the range of 17-20 percent of customs value.[8] We are unaware of any attempt to calculate an optimal tariff rate for imported automotive parts.

An optimal tariff on imported auto parts should be set somewhat below that on vehicles, or the incentive for local assembly may be threatened. We expect the optimal rate on parts would be on the order of 9-10 percent. In effect, the higher vehicle tariff would serve as an incentive for local U.S. assembly, and a higher parts tariff would encourage local parts purchases. A 20 percent vehicle tariff and a 10 percent parts tariff produce a combined automotive tariff of roughly 16.5 percent.[9] We suspect that this tariff level would still fall short of the tariff equivalent measure of nontariff barriers to Japan's important automotive market.

The U.S. and Japanese governments should examine tariff and nontariff barriers as tariff equivalents, and negotiate their removal. If the U.S. government considers tariffs as responses to continuing nontariff barriers, it should calibrate U.S. tariff levels to the tariff equivalent levels of those barriers.

[8]Canada's maximum rate on vehicle imports is set within this range; our other proposed NAFTA partner, Mexico, reduced its tariff to 20 percent in 1989.

[9]Fuss, Murphy, and Waverman analyzed the economic effects of a blended 15 percent tariff on Japanese automotive imports for the Automotive Select Panel. Their model suggests a decline in Japanese automotive imports of about 9 percent, no significant change in the size of the U.S. market, and a permanent increase in U.S. auto employment of about 2 percent. The lack of change in market size indicates that welfare loss to consumers would be negligible.

Appendix I

Historical U.S. International Trade and
U.S.-Japan Bilateral Automotive Trade Data

U.S. Current Account Balance	
Year	Amount (billions)
1992	$-62
1991	-4
1990	-90
1989	- 110
1988	- 135
1987	- 161
1986	- 141
1985	- 115
1984	- 107
1983	- 46

Source: 1983-1989;U.S. Department of Commerce and Bureau of Economic Analysis. 1990-1992; Federal Reserve Bulletin, Vol. 79 p. A53.

U.S. Merchandise Trade Deficit	
Year	Amount (billions)
1992	$ -84.5
1991	-66.7
1990	-101.7
1989	-109.4
1988	-118.5
1987	-152.1
1986	-138.3
1985	-117.7
1984	-106.7
1983	-52.4

Source: U.S. Foreign Trade Highlights 1989, U.S. Department of Commerce, International Trade Administration, September 1990, p. 29. Domestic and foreign merchandise, f.a.s.; general imports, Customs value. 1990-1992; Survey of Current Business, Vol.73, No. 5 and Vol.72, No. 5.

U.S. Automotive Trade Deficit (in current dollars)				
Year	Total (billions)	Vehicles (billions)	Parts (billions)	Parts Percentage
1992	$ 50.4	$ 40.7	$ 9.7	19.2%
1991	50.4	40.7	9.7	19.2
1990	59.3	42.7	16.6	28.0
1989	62.9	42.0	20.9	33.2
1988	58.2	43.5	14.7	25.3
1987	58.7	45.6	13.1	22.3
1986	55.7	44.9	10.8	19.4
1985	42.5	35.7	6.8	16.0
Source: U.S. Department of Commerce, International Trade Administration.				

Automotive Trade Deficit as a Percent of Other Trade Deficits		
Year	Merchandise	Current Account
1992	59.6%	81.3%
1991	-	75.6
1990	58.3	65.9
1989	57.5	57.2
1988	49.1	43.1
1987	38.6	38.6
1986	40.3	40.3
1985	36.1	36.1

U.S. Automotive Exports to Japan (in millions of dollars)			
Year	Vehicles	Parts	Total
1992	$696.500	$925.400	$1,621.900
1991	500.457	834.645	1,335.102
1990	588.927	724.818	1,313.745
1989	336.677	558.950	895.627
1988	278.894	428.691	707.585
1987	74.677	261.262	335.939
1986	43.562	224.874	268.436
1985	19.577	203.293	222.870

U.S.-Japan Automotive Trade Deficit (in millions of dollars)			
Year	Vehicles	Parts	Total
1992	20,602.455	10,930.643	31,533.098
1991	21,851.344	9,968.027	31,819.371
1990	20,641.195	10,626.555	31,267.750
1989	22,395.288	11,008.326	33,403.614
1988	22,839.943	8,972.568	31,812.511
1987	25,508.185	7,523.708	33,031.893
1986	25,916.680	6,150.054	32,066.734
1985	19,666.201	4,435.535	24,101.736

U.S. Automotive Imports from Japan General Imports (in millions of dollars)			
Year	Vehicles	Parts	Total
1992	21,298.955	11,856.043	33,154.998
1991	22,351.801	10,802.672	33,154.473
1990	21,230.122	11,351.373	32,581.495
1989	22,731.965	11,567.276	34,299.241
1988	23,118.837	9,401.259	32,520.096
1987	25,582.862	7,784.970	33,367.832
1986	25,960.242	6,374.928	32,335.170
1985	19,685.778	4,638.828	24,324.606

1992 Trade Deficits and Change from 1991		
Deficit	**Amount (billions)**	**Percent of 1991**
Current Account	$ 62.0	%
Merchandise Trade	84.5	126.7
Automotive		
Sources: Fedreal Reserve Bulletin, Vol. 79 p. A53. Survey of Cuurent Business, Vol.73, No. 5 and Vol.72, No. 5.		

Japanese Automotive Imports to the United States (in current dollars)				
Year	**Vehicle Imports (millions)**	**Part Imports (millions)**	**Total Imports (millions)**	**Vehicle Value as a Percent of Total**
1992	21,298.955	11,856.043	33,154.998	65.3%
1991	22,351.801	10,802.672	33,154.473	68.7
1990	21,230.122	11,351.373	32,581.495	66.0
1989	22,731.965	11,567.276	34,299.241	67.0
1988	23,118.837	9,401.259	32,520.096	71.8
1987	25,582.862	7,784.970	33,367.832	77.2
1986	25,960.242	6,374.928	32,335.170	80.8
1985	19,685.778	4,638.828	24,324.606	81.6
Sources: U.S. Motor Vehicle Trade, U.S. Department of Commerce, International Trade Administration.				

Appendix II

Empirical Parts Trade Models

This appendix details and discusses the empirical models and estimation procedures used to generate the parts section of the study. Three sections comprise this appendix. Section I provides a brief description of the explanatory model; Section II discusses the main features of the dynamic model; and Section III provides a fairly detailed analysis of how the OSAT forecast model was constructed.

Explanatory Model

We estimate this model to provide the value of imported Japanese parts content per U.S. built transplant. In Table 1 we provide model diagnostics which show that approximately 83% of the variation in imports is explained by the inclusion of the variables (shown in Table 2) in the model. Table 2 provides details on the estimated coefficients. Here we control for Japanese aftermarket fleet and Big Three production and find that the import content is approximately $3,345 per U.S. built transplant.

Table 1

Analysis of Variance Table for Explanatory Model

Source	DF	Sum of Squares	Mean Square	F Value	Prob>F
Model		3.7231589×10^{12}	930789732584	108.857	0.0001
Error	89	760999374838	8550554773.5		
C Total	93	4.4841583×10^{12}			

Root MSE	92469.20987	R-square	0.8303
Dep Mean	769,949.27660	Adj R-sq	0.8227
C.V.	12.00978		

Table 2

OLS Estimates for Model with Dependent Variable U.S. Imports of Japanese Automotive Parts

Variable	DF	Estimated Coeff	Standard Error	t-statistic for H_0:Coeff=0	p-value Prob > |T|
INTERCEPT	1	609318	219484.51275	2.776	0.0067
AFTERMKT	1	0.006002	0.01109970	0.541	0.5900
BIG3PROD	1	0.046727	0.06170194	0.757	0.4509
TRANSPROD	1	3.345267	1.07677889	3.107	0.0025
YEN1	1	-2024.333829	371.70815227	-5.446	0.0001
Effective sample size N=95 out of 96					
White's Test of First and Second Moment. Specification: DF: 14; Chisq Value: 99035.571052; Prob>Chisq: 0.0000					

Table 3 below shows the results of a partial R^2 analysis. This procedure identifies which variable or subset of variables explain the maximal amount of variation in imported parts. Results show that transplant production is by far the single most important variable in the model. Even though the yen/dollar exchange rate explained some of the variation, it was comparatively low.

Table 3

Summary of Forward Selection Procedure for Dependent Variable USPARTIMP

Step	Variable Entered	Number In	Model R**2	R**2	Mallows C(p)*	F	Prob>F
1	TRANS PROD	1	0.7720	0.7720	29.5732	311.4972	0.0001
2	YEN1	2	0.0572	0.8292	1.5818	30.4662	0.0001
*Mallows C(p) Statistic is closely related to the R^2-statistic. It is a measure of model adequacy when C(p)=p, the number of parameters. See Draper & Smith, Applied Statistical Models, Wiley & Sons, 1984, for more details.							

Perhaps the two most interesting correlation coefficients in Table 4 are those between transplant production and aftermarket sales and Big Three production. The negative and statistically significant correlation between transplant production and aftermarket suggests that as the stock of Japanese cars in the U. S. depreciate, they *could be* replaced by transplant produced cars. Likewise, the statistically significant and negative correlation between transplant production and Big Three production suggests that the products of these companies are substitutes for each other. This has interesting pricing implications. For instance, consumer perceptions about quality (whether real or imagined) may be correlated with the price tag on new automobiles. If the yen rises (i.e. in our model, the nominal value decreases) then transplant production must decrease in order to offset the increase in the value of imports induced by the yen, other things

equal. However, one causal factor in decreased transplant production might be the decline in domestic demand due to price increases of Japanese automobiles.

Table 4
Correlation Matrix for Explanatory Variables

Variable	INTERCEPT	AFTERMKT	BIG3PROD	TRANSPROD	YEN1
INTERCEPT	1.0000	-0.9055	-0.7333	0.7112	-0.2877
AFTERMKT	-0.9055	1.0000	0.6195	-0.9337	0.0037
BIG3PROD	-0.7333	0.6195	1.0000	-0.4532	-0.1836
TRANSPROD	0.7112	-0.9337	-0.4532	1.0000	0.1711
YEN1	-0.2877	0.0037	-0.1836	0.1711	1.0000

Effective sample size N=95. Distribution of correlation is Normal (even for sample sizes as small as 8)
For H_0: corr=0 Fisher Z-stat=0 and Critical value@.05 level=±0.207755 Critical value@.01=±0.273038

Multicollinearity diagnostics are useful for ascertaining the stability of our results. The results in Table 5 show that there is a very large singular value (eigenvalue) relative to all others. This suggests, that one factor (in this case transplant production) is sufficient to explain the variation in the model. The variance proportions (Var prop) are quite small for almost all singular values except the last. However, the smallest eigenvalue has a variance proportion for aftermarket sales and the intercept that suggest these two are fairly collinear. Ironically, the results also suggest a near collinear relationship between the yen and Big Three production for the third singular value. This is an artifact of decreasing Big Three production and yen appreciation over the sample period. In any case, the result shows that, on average, the variables are not collinear.

Table 5

Diagnostics for Multicollinearity Checks

Number (singular value)	Eigenvalue	Condition Number	Var Prop INTERCEP	Var Prop AFTMKT	Var Prop BIG3PROD	Var Prop TRANSPROD	Var Prop YEN1
1	4.70830	1.00000	0.0000	0.0000	0.0010	0.0003	0.0011
2	0.25433	4.30259	0.0000	0.0005	0.0231	0.0167	0.0182
3	0.02698	13.21037	0.0007	0.0008	0.4610	0.0093	0.4145
4	0.00961	22.13122	0.0779	0.0227	0.0477	0.2062	0.5559
5	0.0007775	77.81934	0.9214	0.9759	0.4672	0.7674	0.0102

See Belsley, Kuh & Welch: *Regression Diaagnostics*, John Wiley & Sons, 1980 for more on interpreting this table.

Dynamic Adjustment Model (Growth Model)

We used dynamic adjustment model to provide parameter estimates for the long run and short run trade offs in imports. Here short run changes in imports (Δm_t) are the monthly growth rates of imports. In this set up the model for short run in imports is given by:

$$\Delta m_t = \beta_0 + \beta_1 t + \beta_2 D_t + \beta_3 (m-f)_{t-1} + \beta_4 \Delta b_t + \beta_5 \Delta f_{t-1} + \beta_6 b_{t-1} + \beta_7 f_{t-1} + \beta_8 a_{t-1} + \beta_9 s_{t-1} + \beta_9 y_{t-1} + \beta_{10} i_{t-1} + \varepsilon_t$$

where t is time, D_t is a dummy for harmonized tariff codes (1=Post; 0=Pre), (m-f) is the adjustment factor, Δb_t is change in Big Three production, Δf change in transplant production, and the lag values are the long run cyclical effects on imports for Big Three production, transplant production, aftermarket sales, Japanese financial market, yen/dollar relationship and the level of automobile installment credit, respectively.

Table 6

Explanatory Model for Short Run Changes in U.S. Imports of Japanese Automotive Parts

Variable	Coefficient	t-statistic	p-value
Intercept	-8.69	-1.621	0.1088
Time trend	-0.001	-0.482	0.6311
Harmonized Tariff Code	0.052	0.856	0.3947
Last period adjustment	-1.13	-10.639	0.0001
Change in Big Three Production	0.058	0.957	0.3414
Change in Transplant Production	0.315	2.758	0.0072
Transplant Production	-0.681	-3.937	0.0002
Big Three Production	0.124	1.817	0.0728
Aftermarket Sales	1.69	3.495	0.0008
Japan SMI	0.039	0.369	0.7128
Yen/dollar Exchange Rate	-0.142	-0.876	0.3838
Auto Installment Credit	0.772	1.910	0.0596

N=95, R^2=0.6341
All data is in log forms except for change and adjustment variables, which are expressed as rates.

Parameter estimates in Table 6 show that the imposition of the harmonized tariff code has no impact on the measurement of short run changes in imports. Similarly, the short run changes are independent of a time trend and the intercept at a .10 significance level. However, the model indicates that short run changes in U.S. automotive parts imports from Japan are quite elastic to long run aftermarket Japanese fleet and temporal adjustments in transplant production. Not surprisingly, the long run cyclical effects of consumer auto installment credit affects the level of automotive parts imports.

Forecast Model

This section provides a brief description of the benchmark model used to generate the "average sales-stable market" scenario and some description of the trend in the trade deficit. The forecast model provides an automatic adjustment for feedback effects between variables with parameter estimates significantly (statistically) different from zero, as displayed in Table 7. It generates forecasts by allowing for the simultaneous movement of exogenous variables.[1]

[1] In this model capacity utilization, the yen/dollar exchange rate, and automobile installment credit are treated as exogenous. Big Three production, transplant production, and imported parts are endogenous. In accordance with standard practice, lagged endogenous variables are treated as exogenous. Thus, the model as shown is a loose representation of these assumptions.

Table 7
Estimated Coefficients For Scenario II

Parameter	Est. Coefficient	Std. Dev	t-statistic*
F(1,1)	0.421403	0.072447	5.816712
F(1,2)	10395.14	2.644429	999
F(1,3)	- 1.03346	0.69651	-1.48376
F(1,4)	56.27898	2.644414	21.28221
F(1,5)	- 1.05029	0.534613	-1.96458
F(1,6)	- 0.18677	0.098145	-1.90298
F(2,1)	2.81E-06	1.73E-06	1.621507
F(2,2)	0.751124	0.057696	13.01876
F(2,3)	2.13E-06	0.000015	0.139314
F(2,4)	0.006308	0.013193	0.478083
F(2,5)	- 1.93E-06	0.00001	-0.18873
F(2,6)	- 1.87E-06	1.99E-06	-0.93938
F(3,1)	- 0.00545	0.004008	-1.36079
F(3,2)	112.5471	2.644015	42.56672
F(3,3)	0.960028	0.039401	24.36566
F(3,4)	- 35.5079	2.636617	-13.4672
F(3,5)	- 0.0508	0.029899	-1.69919
F(3,6)	- 0.00286	0.005468	-0.52247
F(4,1)	3.18E-06	4.79E-06	0.663764
F(4,2)	-0.09567	0.101471	-0.94286
F(4,3)	0.000022	0.000045	0.495572
F(4,4)	0.986839	0.02339	42.19036
F(4,5)	0.000021	0.000033	0.634608
F(4,6)	2.22E-06	6.17E-06	0.360666
F(5,1)	- 0.01077	0.007227	-1.49088
F(5,2)	- 180.864	2.644328	-68.3968
F(5,3)	- 0.01789	0.071016	-0.25187
F(5,4)	- 45.8399	2.642486	-17.3473
F(5,5)	0.804957	0.05382	14.95637
F(5,6)	0.003346	0.009775	0.34234
F(6,1)	- 0.0871	0.037841	-2.30169
F(6,2)	3379.902	2.644427	999
F(6,3)	0.023278	0.370164	0.062886
F(6,4)	- 1024.78	2.644379	-387.531
F(6,5)	- 0.19364	0.281111	-0.68884
F(6,6)	0.740668	0.05101	14.52014

* Significant at p = .05 if absolute value of t-statistic > 1.96

The model is given by $\mathbf{y}_{t+1} = \mathbf{F}\mathbf{y}_t + \mathbf{G}\mathbf{e}_{t+1}$, where $\mathbf{y}_t$ is the state vector such that:

$$\mathbf{y}_t = \begin{bmatrix} b_t & c_t & a_t & p_t^J & f_t & m_t \end{bmatrix}^T$$

where b_t is Big Three production, a_t is automobile installment credit, c_t is capacity utilization in auto manufacturing industry, f_t is transplant production, p_t^J is the yen/dollar exchange rate, m_t is the amount of automotive parts imports and $\mathbf{e}_t$ is a vector of innovations. Parameter estimates from this model are shown in the six equation system presented below.

$$b_{t+1} = 0.42b_t + 10395.14c_t + 56.28p^J_t - 1.05f_t + 0.19m_t \quad [1]$$

$$c_{t+1} = 0.75c_t \quad [2]$$

$$a_{t+1} = 112.55c_t + 0.96a_t - 35.51p^J_t \quad [3]$$

$$p^J_{t+1} = 0.99p^J_t \quad [4]$$

$$f_{t+1} = -180.86c_t - 45.84p^J_t + 0.80f_t \quad [5]$$

$$m_{t+1} = -0.09b_t + 3379.90c_t - 1024.78p^J_t + 0.74m_t \quad [6]$$

Note: *All parameter estimates are significant at the 5% level. Zeros correspond to structural parameters not significantly different from zero.*

This is effectively a VAR(1) model in which import forecasts (see equation 6 in matrix) increase when levels of Big Three production decreases, capacity utilization rates in the domestic U.S. auto industry increases, the yen appreciates and prior period imports increase.[2] Results indicate that auto installment credit (a strong indicator of U.S. demand for automobiles) and levels of transplant production affect import levels indirectly through capacity utilization and Big Three production (see equations **3**, and **1** respectively).

The model also indicates that capacity utilization in the U.S. automobile industry, the yen/dollar exchange rate, and the number of transplant vehicles produced last period are significant predictors of transplant production (see equation **5**). This relationship suggests that a significant time lag effect of one period exists between the yen/dollar exchange rate and levels of transplant production, and that the yen/dollar exchange rate does affect the level of transplant production. For instance, the model reveals that when the yen appreciates against the dollar, transplant production increases. Many factors may account for this relationship. However, one of the most important, suggested by equation 5, is that Japanese manufacturers may find it more cost effective to increase levels of transplant production when the yen appreciates against the dollar.

[2]Technically, the model was implemented as a state space model. See Andrew C. Harvey. *Forecasting, Structural Time Series Models and the Kalman Filter*, Cambridge University Press, 1989, for further details on the econometric theory that underlies this procedure.

Equation 4 highlights the so called unit root phenomenon in the yen/dollar exchange rate.[3] Basically this equation suggests that the yen/dollar relationship is a random walk with the prior period's rate as the best predictor of the following period's rate. Similarly, equation 2 suggests that capacity utilization in the automotive industry also exhibits the random walk chracteristics. However a closer look at the estimated coefficient suggests that there are no unit roots in this equation. Moreover, this may be an artifact of production planning in the automotive industry. For instance, automotive plant managers tend to operate on a ninety day planning cycle for setting production targets (i.e. capacity utilization) in response to market demand and or the stock of dealer inventory. Thus, the monthly data employed in the analysis do not capture this cycle. A three-month moving average might be a better vehicle for capturing the production planning effect in equation 2.

Interestingly, equation 3 shows that the yen/dollar exchange rate is a significant predictor of the level of auto installment credit in the economy. This suggests that models including both yen/dollar exchange rates and auto installment credit may find the yen to be insignificant, since it is embedded in auto installment credit. This analysis is also true for models in which transplant production is significant (see equation **4**) because the yen/dollar relationship is incorporated in this predictor as well.

Downward Bias and Deficit Trends[4]

This section provides the results of an econometric procedure used to identify the nature of the persistence in the trade deficit and to provide an explanation for the downward bias in the trade forecast.

Key elements of the debate about the U.S.-Japan bilateral auto parts trade centers on the causes of the persistence of the trade deficit and its impact on domestic industries. We employ a simple distributed lag model to test for persistence and to identify the nature of trends in the data. Not surprisingly, we find a strong unit root presence in the trade deficit. The results of this analysis is presented below. Here the trade deficit (LNDEF) is measured by the log of the difference between U.S. imports of Japanese automotive parts and U.S. exports of automotive parts to Japan.

$$\Delta LNDEF_t = 9.6488 + 0.0065t - 0.7445LNDEF_{t-1} + 0.1135\Delta LNDEF_{t-1}$$
$$\qquad\qquad (0.6480) \quad (0.0007) \quad (0.0495) \qquad\qquad (0.0211)$$

$R^2=0.9524$, SSE=2.01023, N=96

$$\Delta LNDEF_t = -0.1001 + 0.3940\Delta LNDEF_{t-1}$$

---

[3] Essentially unit roots reflect the persistence of an economic or financial variable over time.

[4] U.S. auto parts exported to Japan is so minuscule that the deficit series is virtually indistinguishable from the import series. Thus, the analysis of the deficit here is virtually indistinguishable from an analysis of imports in this case.

(0.0288) 0.0184)

R^2=0.8328, SSE=7.06943, N=96

Numbers in parenthesis are standard deviations

The null hypothesis posits that there are no unit roots in the data so that one might expect an autoregressive model of the first type with drift. Hence, the null hypothesis tests the significance of the coefficients of the time trend and the autoregressive component of the model. The F-statistic for this model is 113.2294 with (2,93) degrees of freedom. This is substantially greater than the critical value of the Dickey-Fuller Test Statistic of 8.73 for at p=0.01. Thus the null hypothesis was soundly rejected.[5]

The simple model does a good job of explaining the persistence of the trade deficit, but it does not provide any explanation for it. However, the implementation of harmonized tariff codes effective January 1, 1989 resulted in a shock to the automotive parts series which may simply be an artifact of the accounting process. This resulted in a "regime shift" in the data, as the import series after the harmonized tariff code became a relatively stationary series. The net result is a quadratic trend in the import series, underscored by the significance of the time variable in the model. Other analyses reveal that the quadratic trend is concave, thereby describing a decreasing trend in imported parts. Thus, the most recent observations will be weighted more than earlier ones resulting in a downward bias in the forecast.

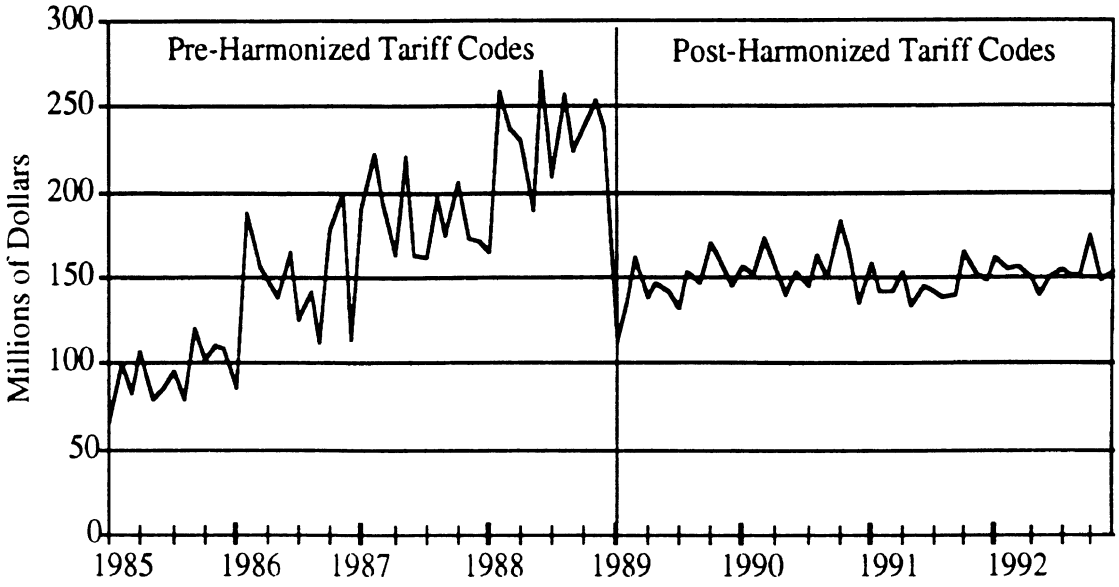
Measurement Error Effects

Residual errors in the ITC classification of imported automotive parts are captured by the parts category entitled 'Other Motor Vehicle Parts NSPF, in TSUS for the 1985 to 1988 pre-harmonization period tariff schedule of the U.S. (TSUS). Other Parts NESI in 8706-8708 of HTS is the category used for this purpose in the post-harmonized tariff schedule (HTS).

Figure 1 is a depiction of the extent to which the new HTS reduced measurement error. Here the nonstationarity in the NESI series can be seen prior to January 1, 1989 and the relative stationarity thereafter. This scenario has a profound effect on the forecast of the trade series. In fact, it suggests that U.S. imports of Japanese automotive parts has reached a plateau, so that a good benchmark forecast might be a univariate time trend based on the post-harmonization data only.

[5]See Dickey, David A. and Wayne A. Fuller, "Likelihood Ratio Statistics for Autoregressive Time Series with a Unit Root," *Econometrica*, Vol. 49, July, 1981, pp. 1,057-1,072

Figure 1
Residual Error in Parts Classification
1985-1992



Source: U.S. International Trade Commision

Further details on the diagnostics of the forecast model are shown in Tables 8-10.

Table 8

Estimate of the Transition Matrix

BIG3PROD(T:T)	CAPUTIL(T:T)	INSTALCR(T:T)	YEN(T:T)	TRANPROD(T:T)	IMPORTS(T:T)
0.421	10395.1	- 1.033	56.279	- 1.050	- 0.187
0.000	0.751	0.000	0.006	-0.000	- 0.000
0.005	112.547	0.960	- 35.508	- 0.051	- 0.003
0.000	-0.096	0.000	0.987	0.000	0.000
-0.011	- 180.86	- 0.018	- 45.840	0.805	0.003
-0.087	3379.9	0.023	- 1024.8	- 0.194	0.741

Table 9

Variance Matrix for Innovation

	E1	E2	E3	E4	E5	E6
E1	2.7937E10	320457.132	-709055601	642821.866	-1.02145E9	117267122
E2	320457.132	9.8012372	-11441.483	10.3396041	-14837.154	-10008.833
E3	-709055601	-11441.483	87437095.6	-85146.629	96076021.7	266036788
E4	642821.866	10.3396041	-85146.629	105.816421	-67246.514	-323882.1
E5	-1.02145E9	-14837.154	96076021.7	-67246.514	273684117	170581806
E6	117267122	-10008.833	266036788	-323882.1	170581806	7407232881

Ei corresponds to idiosyncratic error in i-th equation, i=1,..., 6

Table 10

Schematic Representation of Partial Autocorrelations, by month.

Name/Lag	1	2	3	4	5	6	7	8	9	10	11	12
BIG3PROD	+		+		-		+			+	+	+
CAPUTIL	+			+						+		
INSTALCR	+											
YEN	+											
TRANPROD	+											
IMPORTS	+	+	+	+	+	+						

+ is > 2*standard error, — is < - 2*stanard error, blank is between for p = .05

Appendix III

Prices

This Appendix details the assumptions we use to translate our constant dollar 1996 forecasts of U.S.-Japan automotive trade to 1996 current prices. The model we use is based on an assumption that price changes in Japanese imports reflect primarily changes in the yen-dollar exchange rate and the rate of U.S. price inflation. Slightly different assumptions

Imports from Japan into the United States

We assume that Japanese automotive producers will attempt to recover their costs of production for products sold in the United States on the basis of national origin of those costs. For example, this study estimates that 55 percent of Japanese affiliated vehicle sales in 1996 will be comprised of sales of vehicles assembled in the United States or Canada. Our previous study identified a maximum US content value (for Honda) for transplants of 62%. If we make the loose assumption that all Japanese transplant production will contain roughly this level of content by 1996, then approximately 34.1 percent (.62 X .55) of the value of Japanese vehicles sold in the United States will be U.S. sourced by 1996.

We rely on an outside estimate of the projected cumulative rise in the US CPI-U (or Consumer Price Index for Urban Consumers) of 14.42 percent for 1992-1996. If this price index serves as a fair proxy for the likely rise in U.S. costs of producing automotive product for Japanese firms during 1992-1996, than we can expect at least a 4.92 (341 X 14.42) percentage increase in Japanese automotive prices due to U.S. cost recovery.

If Japanese vehicles contain 34.1 percent US content in 1996, we assume that the remaining 65.9 percent is Japanese sourced. We forecast two yen-dollar exchange rates for 1996, 117 and 110, or a 8.4 percent and 15.25 percent increase in the value of the yen compared to the average level of 126.78 yen to the dollar in 1992. We assume that the Japanese will pass through this entire increase to the Japanese share of content contained in their U.S. vehicle sales. Japanese vehicle prices will reflect, then, an additional 5.54 (.659 X .084) or 10.05 (.659 X .1525) percentage point increases in retail prices, in addition to the 4.92 percentage point increase due to U.S. inflation.

Thus, Japanese automotive prices will increase during 1992-1996 by 10.46 percent (4.92% + 5.54% at 117 yen/$) or by 14.97 percent (4.92% + 10.05% at 110 yen/$), depending on the level of the yen-dollar exchange rate. We also assume that the Japanese will apply this price increases uniformly across their product lines regardless of sourcing of vehicles and parts. This is an unavoidable, but tenuous assumption. These two assumptions on price increases for Japanese automotive sales are multiplied by our constant dollar forecast estimates for vehicle and parts imports to yield current 1996 dollar imports levels.

Exports to Japan

Our trade forecast for current dollar levels of 1996 vehicles and parts exports to Japan result from multiplying our constant dollar 1996 estimates by a cumulative percentage increase in the CPI-U of 14.42 percent.

Appendix IV

U.S.-Japan Parts Trade by Part Categories

Compiled by the Office for the Study of Automotive Transportation
Taken from International Trade Commission data measured at custom value
All numbers reflect Post Harmonized Tariff Code in effect as of January 1, 1989
OSAT-UMTRI 2901 Baxter Road, University of Michigan, Ann Arbor, Michigan, 48109-2150
Tel: 313-764-5592 Fax: 313-936-1081

US IMPORTS OF AUTO PARTS FROM JAPAN with PARTS CATEGORIES
POST HARMONIZED TARIFF CODE PERIOD 1989:1-1992:12

Parts categories for US Auto Parts Imports/Exports to Japan	YEAR			
	89	90	91	92
	ANNUAL TOTAL $000s	ANNUAL TOTAL $000s	ANNUAL TOTAL $000s	ANNUAL TOTAL $000s
MV BOD & PARTS	217,416	238,999	242,261	234,471
MV BODY STAMPINGS	405,632	453,333	459,757	465,953
MV CHASSIS FITTED W/ ENGINES	31,679	34,130	22,506	15,521
MV BUMPERS & PARTS	101,106	86,524	73,304	69,986
MV SAFETY SEAT BELTS	92,793	167,400	159,343	111,835
MV WHEELS & PARTS	147,147	108,177	74,285	67,510
MV RADIATORS	16,628	17,887	16,837	14,717
MV MUFFLERS & TAIPIPESLPIPES	113,029	112,832	110,614	105,758
MV BRAKES & PARTS	301,252	352,346	379,152	485,745
MV TRANSMISSIONS & PARTS	1,632,353	1,485,310	1,321,036	1,608,925
MV SHOCK ABSORBERS	117,082	95,573	71,650	82,536
OTHER PARTS NESI IN 8706-8708 OF HTS	1,747,132	1,879,045	1,765,663	1,850,752
Electric Motors, Generators & Parts	244,563	234,133	196,842	258,636
Articles of Plastic	9,142	11,305	11,506	13,704
V-belts of Textile	363	223	273	383
Articles of Rubber	31,507	37,493	44,660	33,736
New Passenger Auto Tires	379,693	330,950	290,340	269,965
New Truck & Bus Tires	339,800	330,622	231,908	237,575
Tubes for Tires	5,023	3,192	1,209	932
Articles of Leather	83	25	26	32
Articles of Wood	90	67	69	67

US IMPORTS OF AUTO PARTS FROM JAPAN with PARTS CATEGORIES
POST HARMONIZED TARIFF CODE PERIOD 1989:1-1992:12

Parts categories for US Auto Parts Imports/Exports to Japan	YEAR			
	89	90	91	92
	ANNUAL TOTAL $000s	ANNUAL TOTAL $000s	ANNUAL TOTAL $000s	ANNUAL TOTAL $000s
Articles of Textile	216	101	241	171
Floor Coverings	207	139	213	236
Tempered Glass	NONE	18,583	17,996	16,231
Laminated Glass/Windshields	NONE	7,147	7,619	4,452
MV Mirrors	26,364	22,226	24,558	22,194
Other Automotive Glass Articles	368	245	320	298
Pipes, Tubes & Fittings	6,411	5,731	6,113	3,965
Stranded Wire, Cordage, Cables, Etc.	2,869	3,298	3,793	3,684
Fasteners for MV use	87,291	84,592	72,579	79,803
Springs & Leaves for Springs	22,998	18,350	18,226	13,367
Articles of Nickel	91	157	187	108
Articles of Aluminum	46	42	102	96
Articles of Tin	9	13	1	6
Locks, Hinges & Parts	169,185	198,682	199,898	244,032
Hood Ornaments	25	20	23	60
Flexible Tubing	1,031	1,128	1,165	1,503
License Plates	1,490	1,790	2,173	2,552
Piston-Type/Spark-Ignition Engines	1,680,026	1,263,178	1,111,771	1,451,882
Compression-Ignition Engines	1,837	4,691	4,122	3,034
Parts of Piston-Type/Sp.Ign. Engines	365,774	514,376	568,716	600,529
Parts of Compression-Ign. Engines	40,844	23,496	21,589	24,650

US IMPORTS OF AUTO PARTS FROM JAPAN with PARTS CATEGORIES
POST HARMONIZED TARIFF CODE PERIOD 1989:1-1992:12

Parts categories for US Auto Parts Imports/Exports to Japan	YEAR			
	89	90	91	92
	ANNUAL TOTAL $000s	ANNUAL TOTAL $000s	ANNUAL TOTAL $000s	ANNUAL TOTAL $000s
Fuel Injection Pumps & Parts	199,579	182,964	181,493	173,323
Air or Gas Compressors & Parts	380,481	357,193	345,294	326,508
Fans & Parts	34,150	29,351	24,470	25,967
Air-Conditioners & Parts	185,444	144,925	137,972	156,074
Refrigerating Equip. & Parts	93	39	24	71
Filters for Engines	86,763	90,644	81,956	89,796
Jacks, Hoists, Winches & Parts	9,433	7,860	7,436	8,173
Automotive Maintenance Machines	2,738	3,457	8,209	2,415
Taps, Cocks & Valves	111,016	165,306	155,510	210,185
Ball Bearings	116,924	98,605	96,871	98,749
Roller Bearings	54,011	44,057	39,199	40,891
Parts of Ball Bearings	28,913	35,891	28,832	44,836
Parts of Roller Bearings	17,086	9,342	7,079	6,607
Transmission Shafts	177,640	179,666	221,876	209,040
Lead-acid Storage Batteries & Parts	18,433	13,368	9,465	10,530
Spark Plugs	43,501	37,688	44,850	42,716
Electrical Ign. & Star. Equipment	388,691	369,031	293,119	323,167
Electrical Ligh. & Sign. Equip.	135,757	147,448	144,977	147,992
Windshield Wipers, Defrosters & Demiste.	16,869	23,806	29,746	36,726
Speakers, Amplifiers & Parts	16,594	15,014	12,453	13,305
Cassette Players	138,519	151,347	141,234	191,247

US IMPORTS OF AUTO PARTS FROM JAPAN with PARTS CATEGORIES
POST HARMONIZED TARIFF CODE PERIOD 1989:1-1992:12

Parts categories for US Auto Parts Imports/Exports to Japan	YEAR			
	89	90	91	92
	ANNUAL TOTAL $000s	ANNUAL TOTAL $000s	ANNUAL TOTAL $000s	ANNUAL TOTAL $000s
Laser Disc Players	81,449	90,293	104,083	118,754
CB Transceivers	3,683	2,850	2,415	2,334
Cellular Telephones	25,071	49,719	80,037	95,420
Radio-Tape Player Combinations	414,514	375,159	358,264	323,052
Other Radios, Etc.	63,908	99,677	125,107	175,669
Electr. Sound or Visual Sign. Equip.	48,350	44,115	69,442	53,387
Other Misc. Electr. Articles & Parts	29,828	34,314	33,747	33,750
Sealed Beam Lamp Units	3,028	2,532	2,152	3,354
Other Automotive Lamps	6,111	6,167	3,775	3,994
Ignition Wiring Sets	47,718	50,413	66,321	83,989
Trailers & Parts	950	648	653	957
Measure, Test & Control Instrum.	225,923	198,986	250,250	245,398
Clocks & Parts Thereof	63	391	364	539
Furniture for Automotive Use	113,452	141,551	159,361	155,538
Total All Groupings Shown	11,567,276	11,351,373	10,802,672	11,856,043

US EXPORTS OF AUTO PARTS TO JAPAN with PARTS CATEGORIES
POST HARMONIZED TARIFF CODE PERIOD 1989:1-1992:12

Parts categories for US Auto Parts Imports/Exports to Japan	YEAR			
	89	90	91	92
	ANNUAL TOTAL $000s	ANNUAL TOTAL $000s	ANNUAL TOTAL $000s	ANNUAL TOTAL $000s
MV BODIES	1,290	1,601	4,083	7,971
MV BODY STAMPINGS	596	690	1,541	4,181
MV CHASSIS FITTED W/ENGINES	108	13	514	1,037
MV BUMPERS & PARTS	11,208	6,774	29,909	64,887
MV SAFETY SEAT BELTS	586	961	1,059	1,706
MV WHEELS & PARTS	17,961	24,134	24,615	37,016
MV RADIATORS	586	1,379	6,589	1,158
MV MUFFLERS & TAILPIPES	32,342	108,601	47,672	21,864
MV BRAKES & PARTS	13,054	16,664	13,829	11,761
MV TRANSMISSIONS & PARTS	12,635	11,250	12,619	16,949
MV SHOCK ABSORBERS	1,933	2,991	3,887	3,199
OTHER PARTS NESI IN 8706-8708 OF HTS	77,082	123,881	135,451	177,595
Electric Motors & Parts	7,901	5,349	6,894	7,421
Articles of Plastic	2,635	2,572	2,354	2,175
V-belts of Textile	309	150	293	100
Articles of Rubber	6,076	9,955	11,041	13,081
New Passenger Auto Tires	165,052	168,863	143,806	149,683
New Truck & Bus Tires	6,977	8,819	18,849	19,606
Tubes for Tires	1,490	427	224	80
Articles of Leather	1,792	722	1,219	917
Articles of Wood	113	147	213	172

US EXPORTS OF AUTO PARTS TO JAPAN with PARTS CATEGORIES
POST HARMONIZED TARIFF CODE PERIOD 1989:1-1992:12

Parts categories for US Auto Parts Imports/Exports to Japan	YEAR			
	89	90	91	92
	ANNUAL TOTAL $000s	ANNUAL TOTAL $000s	ANNUAL TOTAL $000s	ANNUAL TOTAL $000s
Articles of Textiles	332	167	117	131
Floor Coverings	6,956	7,033	7,088	5,663
Tempered Glass	10,137	15,778	13,307	11,802
Laminated Glass/Windshields	9,698	10,117	9,486	6,788
MV Rearview Mirrors	163	665	202	250
Other Automotive Glass Articles	451	361	495	261
Pipes, Tubes & Fittings	836	847	1,127	898
Wire, Ropes, Cordage & Cables	564	249	293	500
Fasteners	1,448	1,574	1,358	1,385
Springs & Leaves for Springs	356	154	58	309
Miscellaneous Articles of Metal	676	631	558	703
Locks, Hinges & Parts	5,371	8,159	4,546	5,049
Hood Ornaments	18	41	77	19
Flexible Tubing	14	90	103	55
License Plates	54	19	64	53
Piston-type/Spark-ignition Engines	766	248	63	38,347
Compression-ignition Engines	3,172	1,009	1,730	1,396
Parts of Piston-type/Spark-ign. Engines	18,964	18,616	12,131	14,796
Parts of Compression-ign. Engines	5,962	3,662	3,829	5,928
Fuel Injection & Other Pumps & Parts	19,673	22,884	14,981	15,528
Fans, Blowers & parts	255	15	7	14

US EXPORTS OF AUTO PARTS TO JAPAN with PARTS CATEGORIES
POST HARMONIZED TARIFF CODE PERIOD 1989:1-1992:12

Parts categories for US Auto Parts Imports/Exports to Japan	YEAR			
	89	90	91	92
	ANNUAL TOTAL $000s	ANNUAL TOTAL $000s	ANNUAL TOTAL $000s	ANNUAL TOTAL $000s
Air or Gas Compressors & Parts	1,213	970	1,050	589
Air & Vacuum Pumps & Parts	1,314	1,533	2,357	1,699
Air-Conditioners & Parts	4,754	3,719	6,740	14,798
Refrigerating Equip. & Parts	467	422	400	245
Filters for Engines	8,832	14,439	151,780	98,043
Jacks, Hoists, Winches & Parts	2,865	11,228	5,202	3,710
Taps, Cocks & Valves	8,882	7,365	4,922	3,030
Ball bearings	3,046	3,536	4,483	4,063
Roller Bearings	3,958	4,012	1,165	871
Parts of Ball Bearings	135	143	320	586
Parts of Roller Bearings	515	640	595	800
Transmission Shafts	281	353	173	792
Lead-Acid Storage Batteries & Parts	323	191	1,045	869
Spark Plugs	2,023	1,498	1,643	1,422
Electr. Ignition & Start. Equip.	4,951	3,974	9,809	15,555
Electr. Lighting & Sign. Equip.	1,866	2,048	2,306	2,623
Windshield Wipers, Defrost. & Demisters	1,544	949	2,408	1,537
Speakers, Amplifiers & Parts	3,318	3,756	2,480	2,690
Cassette Players	611	190	97	118
Laser Disc Players	1,215	551	868	811
CB Transceivers	35	350	0	6

US EXPORTS OF AUTO PARTS TO JAPAN with PARTS CATEGORIES
POST HARMONIZED TARIFF CODE PERIOD 1989:1-1992:12

Parts categories for US Auto Parts Imports/Exports to Japan	YEAR			
	89	90	91	92
	ANNUAL TOTAL $000s	ANNUAL TOTAL $000s	ANNUAL TOTAL $000s	ANNUAL TOTAL $000s
Cellular Telephones	1,924	24,166	24,400	28,511
Radio-Tape Player Combinations	1,687	645	2,106	14,989
Other Radios, Etc.	747	96	100	83
Burglar Alarm, Safety & Indic. Equip.	1,241	2,867	3,278	2,911
Other Misc. Electr. Articles & Parts	15,878	12,646	26,536	22,728
Sealed Beam Lamp Units	4,244	2,884	1,240	750
Other Automotive Lamps	599	452	310	444
Ignition Wiring Sets	2,622	2,878	4,184	14,737
Trailers & Parts	3,328	716	454	186
Measuring, Test, & Control. Instrum.	22,413	21,924	23,121	22,920
Clocks & Parts	69	96	192	191
Furniture for MV Use	4,617	5,399	3,299	5,377
TOTAL	558,950	724,818	834,645	925,400

US EXPORTS OF AUTO PARTS TO JAPAN with PARTS CATEGORIES
PRE HARMONIZED TARIFF CODE PERIOD 1985:1-1988:12

Parts categories for US Auto Parts Imports/Exports to Japan	YEAR			
	85	86	87	88
	ANNUAL TOTAL $000s	ANNUAL TOTAL $000s	ANNUAL TOTAL $000s	ANNUAL TOTAL $000s
BODIES FOR MOTOR VEHICLES	269	450	1,966	1,473
CHASIS FOR MOTOR VEHICLES	246	248	593	1,539
MOTOR VEHICLE BODY STAMPINGS	122	64	118	260
MOTOR VEHICLE BUMPERS	21	23	735	344
MOTOR VEHICLE WHEELS	724	967	4,111	11,333
HUBCAPS AND WHEEL COVERS	20	8	19	454
MOTOR VEHICLE RADIATORS	45	42	417	918
MUFFLERS AND TAILPIPES	280	32	54	453
BRAKES AND PARTS	5,740	9,426	11,811	13,485
TRANSMISSIONS	25,608	19,068	22,469	30,788
SHOCK ABSORBERS	640	521	446	1,258
OTHER PARTS NSPF	105,626	118,991	100,182	136,055
COMPRESSION IGNITION ENGINES	3,856	2,706	2,262	2,496
PARTS COMP.-IGN. ENGINES	21,428	16,211	9,772	10,075
PISTON ENGINES	715	1,061	462	1,960
PARTS OF PISTON ENGINES	6,044	4,721	8,732	11,446
RADIOS INCL. TRANS.&COMBOS	502	1,212	744	2,542
TAPE PLAYERS AND RECORDERS	36	65	68	271
PARTS OF RADIOS&TAPE MACH.	96	108	144	156
IGNITION WIRING SETS	693	728	928	995
STARTER MOTORS	342	233	156	624

US EXPORTS OF AUTO PARTS TO JAPAN with PARTS CATEGORIES
PRE HARMONIZED TARIFF CODE PERIOD 1985:1-1988:12

Parts categories for US Auto Parts Imports/Exports to Japan	YEAR			
	85	86	87	88
	ANNUAL TOTAL $000s	ANNUAL TOTAL $000s	ANNUAL TOTAL $000s	ANNUAL TOTAL $000s
SPARK PLUGS	256	786	1,187	1,528
GENERATORS & ALTERNATORS	74	64	153	1,083
LEAD ACID STORAGE BATTERIES	1,948	2,968	1,628	2,616
START&IGN EQUIP. NSPF	703	1,024	2,387	2,468
ELECTRIC LIGHTING EQUIP	159	368	254	326
SEALED BEAM LAMPS	3,042	2,803	3,368	4,556
OTHER LIGHT.&SIGN. EQUIP.	818	650	706	450
ELECTRICAL MOTORS & PARTS	41	32	18	57
FOR MAKE&BREAK CIRCUITS	573	619	826	1,025
ELECTRONIC COMPONENTS	276	313	562	840
OTHER MISC. ELEC. ART.	931	1,104	1,151	1,539
NEW PASSENGER AUTO TIRES	7,670	18,338	55,273	130,987
NEW TRUCK & BUS TIRES	1,453	2,223	3,829	9,030
OTHER AUTO TIRES	131	93	230	341
TUBES	62	57	625	2,564
BALL BEARINGS	196	93	127	141
PARTS OF BALL BEARINGS	44	25	8	21
ROLLER BEARINGS	151	213	186	205
PARTS OF ROLLER BEARINGS	38	53	47	50
LAMINATED GLASS	5,470	7,556	10,455	15,125
TEMPERED GLASS	31	96	46	3,011

US EXPORTS OF AUTO PARTS TO JAPAN with PARTS CATEGORIES
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Parts categories for US Auto Parts Imports/Exports to Japan	YEAR			
	85	86	87	88
	ANNUAL TOTAL $000s	ANNUAL TOTAL $000s	ANNUAL TOTAL $000s	ANNUAL TOTAL $000s
AUTOMOTIVE MIRRORS	8	8	82	6
OTHER AUTOMOTIVE GLASS	39	17	23	56
SPRINGS & LEAVES FOR SP.	7	24	0	107
OTHER SPRINGS	7	25	1	107
FUEL INJECTION PUMPS & PARTS	1	6	95	39
OTHER PUMPS & PARTS	2,075	2,148	2,174	2,940
FANS & BLOWERS & PARTS	33	65	90	78
AIR COND. & PARTS	997	1,170	1,162	4,017
FURNITURE FOR AUTOS	649	1,149	2,357	1,501
JACKS AND PARTS THEREOF	252	341	348	1,127
MEASURE,TEST EQUIP. & PARTS	180	141	122	100
FLOOR COVERINGS FOR AUTOS	222	1,115	3,625	6,321
PIPES, TUBES AND FITTINGS	275	167	151	83
FASTENERS	490	501	599	515
LOCKS & HINGES FOR AUTOS	131	160	34	496
OTHER ARTICLES OF METAL	739	1,454	916	2,007
LINEAR HYDRAULIC MOTORS	43	69	77	53
ARTICLES OF RUBBER OR PLASTICS	124	61	83	2,447
CLOCKS & PARTS THEREOF	52	125	251	141
ALL COMMODITIES	203,293	224,874	261,262	428,691

US IMPORTS OF AUTO PARTS FROM JAPAN with PARTS CATEGORIES
PRE HARMONIZED TARIFF CODE PERIOD 1985:1-1988:12

Parts categories for US Auto Parts Imports/Exports to Japan	YEAR			
	85	86	87	88
	ANNUAL TOTAL $000s	ANNUAL TOTAL $000s	ANNUAL TOTAL $000s	ANNUAL TOTAL $000s
MOTOR VEHICLE BODIES	106,109	130,133	130,640	123,103
MOTOR VEHICLE BODY STAMPINGS	155,493	197,916	264,612	231,092
MOTOR VEHICLE CHASSIS	21,250	57,169	96,481	139,628
MOTOR VEHICLE BUMPERS	40,882	53,785	51,999	56,159
MOTOR VEHICLE WHEELS	71,093	109,322	108,841	129,241
MOTOR VEHICLE HUBCAPS AND WHEEL COVERS	6,858	11,023	13,848	5,729
MOTOR VEHICLE RADIATORS	23,293	33,184	28,567	40,196
MOTOR VEHICLE MUFFLERS AND TAILPIPES	30,228	52,094	67,127	89,667
MOTOR VEHICLE BRAKES AND PARTS THEREOF	66,799	92,634	129,428	199,845
MOTOR VEHICLE TRANSMISSIONS	252,207	513,128	616,840	855,427
MOTOR VEHICLE SHOCK ABSORBERS	25,476	29,460	66,212	77,474
OTHER MOTOR VEHICLE PARTS NSPF, IN TSUS	1,138,305	1,759,672	2,241,646	2,777,168
COMPRESSION IGNITION ENGINES FOR MOTOR	46,583	35,873	17,734	3,104
PARTS OF COMPRESSION IGNITION ENGINES	48,130	50,680	42,650	56,328
PISTON- TYPE INTERNAL COMBUSTION ENGINE	417,093	602,780	857,959	1,315,120
PARTS OF PISTON- TYPE INTERNAL COMBUSTI	140,639	196,138	300,796	371,056
RADIOS, INCL TRANS AND COMBOS	620,178	619,559	639,095	588,103
TAPE PLAYERS AND RECORDERS	65,094	102,110	85,304	74,972
PARTS RADIOS, PLAYERS, AND RECORDERS	22,718	21,859	19,720	18,386
IGNITION WIRING SETS	31,140	61,208	94,226	74,872
STARTER MOTORS	45,372	60,774	81,435	107,436

US IMPORTS OF AUTO PARTS FROM JAPAN with PARTS CATEGORIES
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Parts categories for US Auto Parts Imports/Exports to Japan	YEAR			
	85	86	87	88
	ANNUAL TOTAL $000s	ANNUAL TOTAL $000s	ANNUAL TOTAL $000s	ANNUAL TOTAL $000s
SPARK PLUGS	27,962	28,109	34,020	41,982
LEAD ACID STORAGE BATTERIES	5,484	6,740	1,486	1,176
OTHER ELECTRICAL EQUIP AND PARTS	64,733	117,788	116,591	131,380
ELECTRIC LIGHTING EQUIPMENT	29,206	37,014	46,752	63,083
SEALED BEAM LAMPS	3,161	2,618	1,879	3,605
OTHER LIGHTING EQUIP AND PARTS	4,159	5,869	5,942	7,727
ELECTRICAL MOTORS AND PARTS	7,483	7,098	6,533	12,556
ARTICLES FOR MAKE & BREAK CIRCUITS	3,589	4,315	5,747	7,288
ELECTRONIC COMPONENTS	19,442	25,222	18,199	22,741
OTHER MISC ELEC ARTICLES AND PARTS	55	50,569	113,357	50,833
NEW PASSENGER AUTO TIRES	207,712	240,812	255,548	347,471
NEW TRUCK & BUS TIRES	259,457	231,651	234,733	286,198
OTHER AUTO TIRES	10,578	10,706	12,245	16,160
TUBES	7,165	7,206	5,436	5,745
BALL BEARINGS	7,342	6,292	6,060	7,968
PARTS OF BALL BEARINGS	1,025	1,607	1,783	2,347
ROLLER BEARINGS	6,295	6,074	6,408	8,325
PARTS OF ROLLER BEARINGS	16,287	15,947	16,121	13,438
LAMINATED GLASS	6,163	15,716	12,186	11,538
TEMPERED GLASS	4,057	5,290	5,862	5,946
AUTO MIRRORS	236	320	382	355

US IMPORTS OF AUTO PARTS FROM JAPAN with PARTS CATEGORIES
PRE HARMONIZED TARIFF CODE PERIOD 1985:1-1988:12

Parts categories for US Auto Parts Imports/Exports to Japan	YEAR			
	85	86	87	88
	ANNUAL TOTAL $000s	ANNUAL TOTAL $000s	ANNUAL TOTAL $000s	ANNUAL TOTAL $000s
OTHER AUTO GLASS ARTICLES	385	336	331	211
SP & LV FOR SPRINGS	17,423	22,121	25,051	19,466
OTHER SPRINGS	118	144	164	198
FUEL INJECT PUMPS & PARTS	677	798	721	5,370
OTHER PUMPS & PARTS	41,391	59,359	61,473	95,732
FANS & BLOWERS & PARTS	8,891	16,937	24,671	30,723
AIR OR GAS COMP. & PARTS	138,275	188,072	250,808	296,261
AIR & VAC PUMPS & PARTS	0	0	0	0
AIR COND. & PARTS	144,022	174,269	191,176	177,571
REFRIG EQUIP & PARTS	29,974	33,201	30,161	32,539
FURNITURE FOR AUTO USE	61,863	102,784	149,524	146,095
JACKS AND PARTS THEREOF	33,955	28,209	22,904	14,782
MEASURE, TEST & CONTROL INST.	22,619	27,344	29,544	18,765
FLOOR COVERINGS	0	0	0	0
ARTICLES OF WOOD	0	NONE	NONE	NONE
V-BELTS OF TEXTILE	99	124	148	163
TEXTILES, EXC. FLOOR COVER.	0	0	0	0
PIPES, TUBES & FITTINGS	0	0	0	0
WIRE CLOTH & CORDAGE FOR AUTOS	0	0	0	0
FASTENERS	196	131	120	132
LOCKS & HINGES FOR AUTOS	44,138	67,691	83,715	94,176

US IMPORTS OF AUTO PARTS FROM JAPAN with PARTS CATEGORIES
PRE HARMONIZED TARIFF CODE PERIOD 1985:1-1988:12

Parts categories for US Auto Parts Imports/Exports to Japan	YEAR			
	85	86	87	88
	ANNUAL TOTAL $000s	ANNUAL TOTAL $000s	ANNUAL TOTAL $000s	ANNUAL TOTAL $000s
OTHER ARTICLES OF METAL	246	612	431	666
LINEAR HYDRAULIC MOTORS	182	202	279	370
CENTRIF., FILTER & PURIFY. MACH.	0	0	0	0
APPLIANCES FOR LIQ. & POWDERS	0	0	0	0
HANDLING & LOADING MACHINERY	0	0	0	0
TAPS, COCKS & VALVES	0	0	0	0
LUBRICATION FITTINGS	0	0	0	0
KITS TO REPAIR CYL., PUMPS OR CARBS.	6,027	7,134	6,871	8,342
MACHINERY, N.S.P.F.	0	0	0	0
LEATHER ARTICLES	0	0	0	0
RUBBERS OR PLASTICS, N.S.P.F.	0	0	0	0
CLOCKS & PARTS THEREOF	0	0	0	NONE
BATTERY CHARGING ALTS & GENS	21,828	28,000	44,446	77,765
ALL COMMODITIES	4,638,828	6,374,928	7,784,970	9,401,259