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An examination of Japanese import markets

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Iowa State University, 1991

An examination of Japanese import markets

by

Konomi Ohno

A Dissertation Submitted to the

Graduate Faculty in Partial Fulfillment of the

Requirements for the Degree of

DOCTOR OF PHILOSOPHY

Major: Economics

Approved:

In Charge of Major Work

For the Major Department

For the Graduate College

Iowa State University
Ames, Iowa
1991

To my parents

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INTRODUCTION

There have been debates on the trade issue between the U.S. and Japan. It is claimed that Japan exports too much and imports too little. Economic activities by Japanese firms in U.S. markets have been discussed in several articles. This dissertation investigates the economic decision rule for imports by Japanese firms.

Explanation of Dissertation Format

This dissertation is composed of two parts. Part I is an examination of the Japanese trade policy. Japan is one of most liberalized industrialized countries in terms of "visible" trade restrictions such as tariff rates or quotas. Regardless of that, Japan has been still criticized because of the closeness and those criticisms are based on "invisible" import restrictions. They are sometimes related to the economic structure which has been culturally developed in a long time of the history. It is important to clarify the characteristics of "invisible" restrictions. An attempt is made in Part I of this dissertation to identify the possible import restrictions which may be implemented in the Japanese economy and empirically to examine whether they actually exist. The possible cases considered are the presence of volume or ratio quota, distribution costs for imports, or threat by the government against imports. The theoretical

model is developed to predict how import price, which has significantly varied in 1980s, and domestic cost affect domestic economic variables under the hypothetical import restriction. The empirical testings are expected to reveal what type of "invisible" restrictions are actually implemented, after comparing the theoretical predictions. Sixteen commodities which show relative homogeneity between domestically produced goods and imports are selected. The additional findings for pass-through (i.e., how domestic price changes when exchange rate changes) coefficients, symmetry of tariff and exchange rates and exogeneity of import prices are also reported. In order to examine the role of market structure on the pass-through coefficient, an effect of production concentration ratio on domestic prices is tested.

In Part II, Bresnahan's idea to measure the market power coefficient is extended to marketing firms and applied to Japanese soybean markets. The data show unusually high price setting by soybean importers at wholesale level for the several years after the U. S. embargo in 1973. The statistical significance of the market power coefficient is used to examine the presence of the market power in the soybean markets. Analysis for welfare loss and exchange rate transmission is also presented.

PART I. PASS-THROUGH EFFECTS OF EXCHANGE RATES

AND JAPANESE TRADE POLICIES

I. INTRODUCTION

A. Preface

The widespread swings of the major currencies in the 1980s have triggered much concern about and research on exchange rate pass-through issues. The particular concern is centered around the degree of pass-through of the large currency fluctuation. Many economists have devoted considerable work to show that the degree of pass-through has been unexpectedly low and the conventional economic theory provides inadequate explanation of such a phenomenon. Several economists have discussed why transmission of the exchange rate changes into markets is incomplete under imperfectly competitive environment (Krugman, 1986; Mann, 1986; Dornbusch, 1987). They show that monopolistic foreign firms in the domestic market can squeeze (expand) their markups over the marginal cost when the domestic currency appreciates (depreciates). This adjustment occurs since the foreign firms perceive that the market demand is not perfectly elastic. Under such imperfectly competitive markets, foreign firms exercise their market power and practice price discrimination. This behavior has been named 'pricing to market' by Krugman (1986). Since then, there have been several articles which have revealed pricing to market behavior by Japanese exporters in American markets (Marston, 1989; Branson and Marston, 1989; Ohno, 1989; Mann, 1989). If this is true, Japanese products

may have been priced less abroad than in domestic markets.[1]
The Japanese internal price level of domestically produced
goods or imports has also attracted significant attention.
Some of the surveys[2] point out that many among selected
commodities which are produced in the U.S. or in third
countries are priced much higher in Japan than in the U.S.
The question is whether non-Japanese exporters are exercising
market power or whether internal systems in Japan are
preventing prices from adjusting to exporters' pricing. This
study is an attempt to analyze the latter question.

   B.   Particular Characteristics in the Japanese Economy

     Japanese visible import barriers, such as tariffs and
quotas, are minimal among industrialized countries. Hence,
the existence of "invisible" import barriers has been alleged
when difficulties to penetrate Japanese markets are complained
by foreign exporters. Conceptually, these barriers or
restrictions could be due to the government or to the private
sector.

     The role of the Ministry of International Trade and
Industry (MITI), which is in charge of trade issues, has been
controversial. The economic system implemented during the

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[1]However, Hooper and Mann (1989) found that Japanese
exporters have priced to market less that U.S. exporter have.

[2]Including Japan-U.S. price co-investigation requested in
the first Japan-U.S. structural Impediment Committee.

occupation era did not allow the bureaucracy to control the whole economy as was the case before the war, while many inferior economic conditions such as short capital supply, deficient technology and continuing trade deficit, necessitated a strong lead by the central government. Thus, the government started to share the powers with big business by consulting it on various occasions, and sending their senior bureaucrats into the board of directors of the influential industries. During the course of rapidly growing economy, especially after the liberalization became inevitable in 1960s, there was a time when too many protected enterprises in too many small factories engaged in too vigorous competition. Immediate liberalization meant that foreign competitors would eliminate the domestic industries. Altering the industrial structure, encouraging cartels, enforcing mergers on medium and small enterprises, by government loans and tax breaks seemed necessary. Obviously, these initiatives are possible by large scale cooperation among the Ministry of Finance, the Fair Trade Commission (an agency to enforce the Antimonopoly Law), bank Keiretsu (conglomerate groups) and the other industrialists. After the MITI failed to legalize the idea, a term "administrative guidance" appeared as a compromise. It refers to the authority of the government to issue directives (shiji), requests (yōbo), warnings (kēkoku), suggestions (kankoku) and encouragements (kanshō) to the enterprises within a particular ministry's jurisdiction. As a

result, administrative guidance is not based on any explicit
legal requirements to industries. However, this has an
advantage that it is very flexible and the government can
respond to situations very quickly. The lack of a clearly
defined range, and formal and clear procedures also allows the
government to abuse the power. For example, the government
uses investment coordination by which the size of investment
facilities and outputs is assigned to each firm during the
recession, promotes mergers in some industries (steel,
automobile), discourages attempts to introduce foreign capital
by strict foreign capital controls, and fosters the designated
industries. In the course of the history of this practice,
economically weaker firms tend to be good followers of the
administrative policy, while more financially sound firms,
which belong to major banking groups tend to be independent
from the interventions. The reason administrative guidance
can be a powerful tool is that Japanese businessmen feel that
the government directions should be respected and government
Ministries have a wide range of powers. A company which does
not follow their guidance in one area can be unfavorably
treated in another area.

For example, during the attempt by the MITI to stabilize
the price of steel in 1965, Sumitomo refused to accept the
assigned market share. The MITI retaliated by threatening to
restrict imports of coking coal according to the Import
Control Ordinance. In two months, this incident was

peacefully solved by the compromise that Sumitomo would follow the administrative guidance if their export quota was raised as an exceptional case.

The MITI took the initiative to give birth to the world's biggest steel maker via successful mergers, and sometimes led price regulations. In 1973, the MITI was involved with the oil cartel formed by petrochemical producers to fix the price and to assign the production level (Matsushita and Schoenbaum 1989, 35; Johnson 1982, 299). These activities should have run counter to the Antimonopoly Law, which was implemented in 1947 during the American occupation. The original law was modeled after the U.S. anti-trust laws. However, some provisions which provided for the dissolution of a large business because of its size were eliminated in 1952. Also, the provisions which allow certain cartels such as depressed industry cartels and rationalization cartels were added. This alteration differentiated it from the U.S. laws under which cartels are per se illegal.

During the occupation era, the old Zaibatsu (family-centered conglomerate) was dissolved. However, motivated by the capital shortage, firms tried to develop close ties with particular banks and groups emerged centering around each large bank. The "big six" came into being in the 1950s (Fuji, Sanwa, DaiIchi, Mitsui, Mitsubishi and Sumitomo). A typical group includes a big bank, several industrial firms and a general trading company. The bank provides the financial

capital and the trading company imports raw materials on
credit and promotes exports for produced goods. Moreover,
each group tends to create all the government designated
growth industries as its members. The MITI actively supported
the grouping of the industries. It is very common that member
firms in a Keiretsu are involved with cross-shareholding.

The Japanese distributional system, which has been
created along with the cultural and social development, is
another target of criticism as an invisible barrier to foreign
exporters. Some activities such as long-term processing of
payments, non-standardized rebate system, territory system
which strictly restricts sales regions of distributors,
"itten-ichōai-sei" (a system in which manufactures dictate to
wholesalers the retailers to whom they must sell) and return
of unsalable goods may not be compatible with foreign customs.

These aspects of the Japanese economy might have affected
trade conditions. What we are going to consider in Part I is
which aspects of the characteristics have influenced the
actual import level and to what degree. The large movement of
the yen in the 1980s enables us to examine the sensitivities
of domestic prices, import quantities or some other variables
to changes in import prices. We expect that this will lead us
to obtain some information about the market structure in
Japan.

II. LITERATURE REVIEW

There have been many recent developments in trade theory attempting to explain international trade under imperfect competition. Economies of scale, product differentiation, a relatively small number of firms in the industry, and wage and sales contracts are the sources of imperfect competition in these models. However, the models are difficult to test empirically. Large fluctuations in the dollar during the last decade have enabled tests of the models in terms of the pass-through issues.

An analysis of the pass-through of exchange rates is to examine changes in import prices in domestic currency or export prices in foreign currency when exchange rate changes. A starting point for this analysis is the law of one price: under the conditions of no transportation costs and no trade restrictions, perfect commodity arbitrage guarantees that prices of traded goods at home equal prices of similar traded goods abroad after the adjustment of exchange rate i.e.,

$$P = e \ P^*$$

where P is price of product in the domestic market in the domestic currency, P* is price at which foreign suppliers sell the product in term of foreign currency, and e is the exchange rate, the domestic currency price of foreign currency. If the exchange rate changes and foreign prices remain unchanged, domestic prices change correspondingly. In this case, pass-

through of the exchange rate change to domestic prices is one hundred percent.

A similar concept to pass-through is pricing to market, which is introduced by Krugman (1986). When domestic markets are thought large enough to influence world prices, domestic prices of imports may fail to fall as much as the appreciation in the currency. Since a decrease in e (appreciation) is partly offset by an increase in P* (an increased demand of the less expensive imports in the domestic market induces the world demand curve to shift out), the exchange rate change does not cause the domestic price to change proportionally even though the law of one price still holds. Since P* has changed from the original level but P* is charged in any foreign markets as world price, pricing to market according to Krugman is not occurring in this case. That is, the pass-through coefficient is less than unity, while the pricing to market coefficient is zero. Krugman suggests that this imperfect pass-through is not our interest and pricing to market is the measure instead of the pass-through if more concern is focused on the cases of price discrimination conducted by foreign exporters under imperfectly competitive markets.

Pricing to market is measured as a change in export-domestic price margin with respect to change in exchange rate. When the law of one price holds, pricing to market is always zero. Let us imagine the case in which Japanese firms import

soybeans from the United States. Also, let us assume that the yen appreciates by ten percent against the dollar. Then, it is expected that the domestic soybean import price from the U.S. should decrease by 10 percent if the dollar price stays unchanged. However, U.S. exporters may charge more for soybeans destined for Japan, and then the U.S. soybean price in Japanese markets declines by 10 percent, but rather (for example), by 5 percent. Pricing to market by the U.S. exporters is being exercised since they are charging different prices in different markets. This behavior can lead to the presence of black markets, because by the new distribution channels the U.S. soybeans can be sold less costly by five percent and the Japanese will buy them.

When a domestic market is not perfectly competitive, domestic wholesale price is above cost.

$$P = e \ P^* \ (1 + \tau) \ + \ M \ + \ C$$

where M is margin of domestic importers, C is domestic per unit marketing cost and τ is tariff rate. Here it is clear that a change in the import price may not be perfectly reflected in the domestic price under imperfect competition, since M can adjust even if C is constant.

The existence of the profit margin is explained by various imperfect competition models. One of the major streams of theoretical models to explain pass-through is based on profit maximization behavior by oligopolistic firms. These

oligopolistic firms face a downward-sloping demand curve and choose the import level at which marginal cost equals marginal revenue.

Krugman (1986) presents a broad idea about pricing to market modeling, including both static and dynamic models. In a static oligopoly case, two Cournot firms, (domestic and foreign) which are competing in a domestic market to maximize their profit functions are assumed. A domestic firm perceives that the larger is its market share, the less elastic is the demand it faces, so the price the domestic firm chooses to charge is higher for any given marginal cost. The larger is the foreign firm's market share, the higher is the elasticity of demand perceived by the domestic firm. Thus, the price is lower. When the domestic currency appreciates, the foreign firm's cost declines. Taking advantage of the reduced cost, it can expand its market share. The domestic price decreases, but this decrease in price is less than the exchange rate change, since the foreign firm perceives the market is becoming less elastic. Thus, the elasticity of price with respect to the exchange rate depends on the curvature of the demand curve.

Dornbusch (1985) also proposes the static model in which there are n domestic and n* foreign firms in the economy under the Cournot behavior. In the multiple domestic and foreign firms' case, the results are about the same as the ones in a single domestic firm and a single foreign firm case of

Krugman. It is shown that a domestic currency appreciation lowers domestic price and the larger is the share of importers, the more the domestic price decreases. Again, the pass-through coefficient heavily depends on the curvature of the demand curve. He analyses the market for homogeneous goods by using this model, since the Cournot model assumes perfect substitution between different suppliers. However, the question becomes whether commodities traded are always homogeneous enough to fit the Cournot model description. He examines the unit values of imports and exports for various commodity groups and shows that there are different price adjustment rules between the relatively homogeneous commodities (such as food and semi-manufactures) and more heterogeneous commodities (finished manufactures). That is, for the former group, export and import unit values move roughly in line with the expected direction when the exchange rate changes. For the latter group, export and import unit values always increase regardless of the exchange rate change, while exports follow the domestic price trend and imports show a much smaller increase. To explain this phenomenon of imports, he introduces the Dixit-Stiglitz model and the Salop model, and analyses the effect of the exchange rate changes on heterogeneous commodities.

In the Dixit-Stiglitz model, preferences are specified by a utility function, which depends on quantities of two commodities consumed. One of them has many varieties. The

utility function for these different varieties is assumed to be symmetrical and concave. Consumers maximize their utility functions subject to the budget constraints and choose their consumption level for each commodity. Firms maximize their profit functions given both the demand level for their products which is obtained by the utility maximization and the cost. The first order conditions give us their pricing rules. On the other hand, the Salop model assumes that consumer's tastes are uniformly spread over the unit circle. Each consumer is assumed to have a most-preferred brand specification. The distance from the most-preferred brand on the circle is thought as the utility cost. The consumer demand is decided such that a purchase of one unit from some brand is made if the maximized surplus of utility less price across brands is greater than the surplus from the other homogeneous good. Firms maximize their profits over the prices, given the demand level in terms of exogenous variables.

The Dixit-Stiglitz model predicts that when the currency appreciation occurs, prices of imported brands decline proportionately while prices of domestic brands stay the same since prices are determined by wages in the domestic currency. This strong prediction arises since there are no interactions between the prices of the import brands and the domestic brands under the assumption that a behavior of each supplier does not affect industry price. Thus, since the cost

increases, the price also increases proportionately, so that the profit margins for both the domestic firms and the foreign firms are not affected by any changes in the currency. Introducing strategic interaction by a parametric conjectural variation, a slightly different prediction, which is similar to the one in the Cournot model, is given from the revised Dixit-Stiglitz model. A weakness of the Dixit-Stiglitz model is the assumption that an individual buys at least one of each brand. The Salop model discusses the case in which each consumer buys only one brand. The model predicts that an appreciation lowers domestic price less than proportionately. A change in relative prices of imported goods is smaller, if the number of firms in the industry is smaller or the substitutability among brands is lower. Dornbusch's attention is focused on the static model in which the determinants of domestic prices and pass-through coefficients are analyzed both for homogeneous and heterogeneous commodities.

Krugman (1986) suggests that a dynamic treatment of pricing to market is essential, since the extent of pricing to market should vary due to whether economic agents believe that a change in the currency value is transitory or permanent. He presents three models which explain pricing to market in dynamic setting. The first model analyses the case in which pricing to market occurs from the supply side. When there are adjustment costs adherent to the speed of change in quantities sold by foreign firms, the extent of pricing to market depends

on how long the appreciation (or depreciation) lasts and on
how persistent it is expected to be. If foreign firms
perceive the appreciation (or depreciation) as a temporary
shock, then they are more likely to price to market. The
second reason for dynamics arises from slow adjustment of
demand. Let us suppose that a firm sells a good during two
periods. Because demand adjusts slowly to price change, the
second period demand function depends on the price both during
the first period and the second period. Then, there is a
trade-off between the lower price in the first period and
sales expansion in the second period. The question is whether
the price in the first period falls more if a currency
appreciation is expected in the second period than if it is
expected only for the first period. Finally, when foreign
firms do not want to hurt their reputation by changing their
announced prices in advance, they may not change the prices as
much as the exchange rate changes. If some customers who
favor their supplies decide to enter the market, their demand
function may be less elastic than one of general customers.
If the firms do not care about their reputation, they can
price somewhere along this less elastic demand function. The
firms which stick to the announced prices in spite of the less
elastic demand will have less incentives to lower their prices
when their marginal cost declines due to appreciation. This
price stickiness is the third reason for pricing to market.

Krugman's idea is left without theoretical completeness

in his article. Several economists have developed dynamics of
pricing to market issues along with Krugman's idea.

Baldwin (1988) examines the supply-side effects in
dynamic setting. Sharp variations in the exchange rate in the
1980s may have caused parameter shifts in import price pass-
through equations. Baldwin introduces this hysteretic[3] change
after a large change in the exchange rate to explain the
imperfect pass-through. He shows that when there exist
considerable market entry sunk costs[4], a large swing in the
exchange rate can change market structure. Then, the change
in the market structure does not disappear even after the
exchange rate returns to the original level. He uses the
Dixit-Stiglitz framework to model the Chamberlanian imperfect
competition with the assumption that participants have perfect
information over the exchange rate path. The mechanics is as
follows. During a large appreciation of the domestic
currency, discounted future profits for foreign firms become
large enough to cover large market entry sunk costs, so that
the number of foreign firms to enter the market rises. The
foreign firms which can cover the costly entry expenses obtain

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[3]Hysteresis (which is a noun form of hysteretic) is a
failure to return to the original situation even after the
cause which induced the change is removed.

[4]Market entry sunk costs are defined as costs which are
not recouped when firms decide to retreat. They may be
necessary to set up a distribution and service network or to
bring the foreign product into conformity with domestic
regulations.

the market share from the domestic firms which suffer from competition without any cost reductions as the foreign firms can enjoy. Once they enter the market, in order for them to be viable, the anticipated profit path of the foreign firms does not have to be as large as the one before the entry decision. So if they can expect to cover their operating expenses, they will stay in business. As a result there are more (foreign) firms in the industry. That causes import prices to fall because of both the marginal cost reduction and the squeezed profit margin caused by more active competition. After the exchange rate moves back, the post-shock prices are permanently lower than the pre-shock prices even if the marginal costs return to the pre-shock level. Baldwin's hysteresis explains well the situation in the U.S. in the 1980s. That is why the former appreciation lowered real import prices, while the later depreciation only partially forced them back.

Froot and Klemperer (1989) point out that some foreign firms such as luxury German auto-makers exercised pricing to market behavior during the early 1980, such that when the dollar appreciated, prices of some imported commodities rather increased. As one of the attempts to analyze the behavior, they propose the model in which a future demand depends on a current market share. Since there are some reasons to believe that a current market share matters for future sales (such as consumers' loyalty), the market share function which depends

on a current price appears in the future profit function. For
example, an increase in current prices reduces market shares
in the current period, which also reduces the future profits
as well. Hence, firms price less when the market share
matters than when it does not.

The effects of the exchange rate change on prices are
composed of two elements: cost effects and real interest rate
effects. When the domestic currency appreciates, the foreign
firm's costs decline and that encourages the foreign firm to
reduce the import prices. On the other hand, the current
appreciation also makes the future profit less valuable than
the current profit, when the appreciation is expected to be
temporary, since the firm can not take advantage of cost
reduction in the future so that the marginal value of
acquiring the market share by aggressive pricing is not very
large. The return on market share investment declines.
Correspondingly the current prices tend to increase. The
former cost effect and the latter real interest rate effect
have the opposite effects on prices. Hence the effect of the
exchange rate change on prices becomes ambiguous. However, if
the value of the market share is large relative to costs, then
real interest effect can dominate cost effect. In that case,
the appreciation even increases prices. This may be the case
in which prices of luxury German cars increased in the U.S.
during the dollar appreciation. Compared to a temporary
exchange rate change in which the effect on the prices are

ambiguous, a permanent exchange rate change indicates an exact negative sign since real interest rate is canceled out. Therefore, the current prices decrease (increase) more when a permanent appreciation (depreciation) in the exchange rate is expected than when a temporary exchange rate change is expected.

Since the exchange rate change which is perceived as temporary can affect prices either positively or negatively in the model, the implication is not testable. What they show using data is that the degree of pricing to market depends on how the exchange rate change is perceived in terms of persistence. In early 1980s, expectations of unusually large future depreciation prevailed and lower pass-through was predicted. This means that import prices did not increase proportionately. However, the empirical testing does not show overwhelming evidence that the expected future depreciation influenced the degree of pricing to market.

The last two papers, by Baldwin (1988) and Froot and Klemperer (1989) extend the theoretical work of pricing to market in dynamic framework. There has been more empirical work to investigate actual behavior by domestic and foreign firms about this issue. Several of them are discussed below.

Mann (1986) examines the pricing behavior by U.S. exporters and foreign suppliers during the period 1977-85, using aggregate and disaggregate industry data. After estimating unit value of non-oil imports based on long-run

historical relationship between exchange rates and import
prices and comparing it to actual data, she finds that actual
import prices were sticky during the first half of the 1980s.
Profit margins of foreign suppliers rose substantially during
those periods. Exchange rate changes were passed through to
non-oil import prices more fully, but more slowly, when the
dollar depreciated. It suggests that the long-run
relationship between exchange rate changes and import (or
export) prices changed during the first half of the 1980s,
maybe because of buying worldwide by multinational firms,
newly established distribution networks in the U.S., and a
greater ability to hedge foreign currency risks in
international credit markets. Disaggregate data reinforce the
lower profit margin during the depreciation period and the
higher profit margin during the appreciation for importers.
On the other hand, both aggregate and disaggregate data
confirm that profit margins of U.S. exporters did not change
as much as exchange rate changed. This may have caused a
significant decline in U.S. competitiveness in the
international market. For some export commodities,
disaggregate data reveal that U.S. exporters increased profit
margins even when the dollar appreciated. Along with
industry-specific observation such as market structure or
trade barriers, macroeconomic factors such as inflation in the
source countries and relative growth in demand have affected
the pricing and profit margins.

Hooper and Mann (1989) test the impact of changes in the exchange rate on U.S. import prices. They use aggregate data for the top nine suppliers of U.S. imports of manufactured goods which account for more than 75 percent of these imports. All data such as import prices, exchange rates, foreign capacity utilization and costs are weighted by current import share for each country. The results show that 50 to 60 percent of the change in the nominal exchange rate is reflected in prices of manufactured imports with lags in the range of five to seven quarters, while short-run pass-through is about 20 percent. Separately, the bilateral trade between the U.S. and Japan is examined in the same framework. Running counter to the usual findings, the exchange rate pass-through coefficients for the Japanese exporters appear to be slightly higher than those for aggregate imports. The Japanese disaggregate data also show that the capacity utilization significantly affects import prices (in the U.S. from Japan), unlike the aggregate case, indicating that profit margins on Japanese exports respond to demand pressure at home and abroad.

When pricing to market occurs in imperfectly competitive markets, prices are set apart from marginal costs by markups. To examine the level of pricing to market, it is essential to know how markups fluctuate. Knetter (1989) proposes a model which make it possible to differentiate marginal costs or markups from prices by assuming that marginal costs are common

across export destinations during the same period of time and by using a fixed-effects regression model. Export prices are regressed on time effects, country effects and exchange rates. Under the competitive market assumption, only the coefficient of time effects, which may vary with changes in marginal costs should be statistically significant. On the other hand, the possibility of price discrimination is detected by country specific effects, while coefficients on exchange rates provide evidence on how elasticities change along the demand function in different destination markets.

He tests the model for U.S. and German exporters, using disaggregate data for several commodities. For the German exporters, the implication of stickiness of export prices to exchange rates is rejected and price discrimination to each market is confirmed. Whereas the U.S. exporters adjust dollar prices in a manner that amplifies the effect of exchange rate fluctuations on the local currency price, the German exporters stabilize the local currency price. In particular, this behavior by the German exporters is conspicuous in U.S. markets.

Ohno (1989) estimates pass-through coefficients for Japanese export manufacturing industries compared to U.S. exporters. The method is directly estimating a cost function with two inputs in price equations. The pass-through coefficients are obtained from export price elasticities with respect to the real exchange rate for both countries. He

finds that there existed significant gaps in the rates of technical change in favor of Japan from late 1970s or early 1980s through mid-80s and the U.S. had the pass-through coefficient of 0.95 while Japan had the coefficient of 0.78 on average. Some evidence for price discrimination by Japanese exporters are found, while no U.S. exporters are engaged in such behavior. Furthermore, Japanese exporters raise yen prices more readily when the yen depreciates than lower them when the yen appreciates. He also supports some structural break which might have happened in the early 1980s in Japan, even though this may not be explained by hysteresis since the yen was neither extremely high nor low during that period.

Giovannini (1988) clarifies the pricing policies of firms selling both domestically and abroad with volatile exchange rate under imperfect competition. He shows that how exchange rate uncertainty affects the law of one price depends on the currency of denomination of export prices and that deviation from the law of one price is explained by both exchange rate surprises and a price discrimination effect. Using data on Japanese domestic and export prices, exchange rate surprises are differentiated from price staggering and ex ante price discrimination. Price discrimination by Japanese exporters is reported.

Marston (1989) and Branson and Marston (1989) also examine the pricing behavior by Japanese manufacturers. Marston presents the model in which Japanese manufacturers

maximize their profit functions composed of total revenues from both domestic and foreign sales and costs. The ratios of the export to domestic prices of each good are regressed on several variables as an empirical counterpart of the derived equation from the profit maximizing rules. Nominal exchange rate surprises are differentiated from permanent real exchange rate effects. Using seventeen products in the transport and electrical machinery industries, pricing to market behavior by Japanese exporters is revealed. Branson and Marston find variable markups of Japanese exporters in order to limit the effects of exchange rate changes on output. This is incompatible with U.S. exporters who bore their currency appreciation by unemployment and underproduction.

The importance of exchange rate volatility as a determinant of export prices is analyzed by Mann (1989). In her model, exporters are assumed to maximize the expected utility of profits which is the sum of expected profits minus a function of the standard deviation of profits. The maximization of this expected utility yields the optimal price decision rules. It means that the higher the exporter's risk aversion is, the more likely it is that home-currency prices will increase with increased exchange risk, also the higher is the risk aversion of the importer, the more likely it is that the exporter absorbs some of the exchange risk. Several manufactured goods are chosen for U.S. , German and Japanese exporters. Exchange rates are calculated for individual

products using the destination weights. First, how export
prices in their currencies change with exchange rate changes
is reported. The U.S. disaggregate data show that U.S.
exporters may have increased export prices since the beginning
of 1985 for the markets where the effect of the dollar decline
is strongest (Europe), while overall trends are to pursue more
stabilization in the local currency prices where sharp
exchange rate movements against the dollar exist. German
exporters do not react to exchange rate changes, which may be
explained by their dependence on the European market where
they have strong buyer networks. These results are
inconsistent with Knetter's result. Export price increases by
the Japanese during the yen appreciation are most moderate
particularly in the U.S. and Asia where they are losing
competitiveness most rapidly. This may have been caused by
their export prices denominated by destination market
currencies. Secondly, the price competition by the Japanese
and German exporters is detected, especially while the U.S.
exporters charged much higher prices in the first half of the
1980s. Finally, the export prices are regressed on the
independent variables such as trends and standard deviations
of the exchange rates. The results do not yield strong
evidence that exchange rate trends or exchange risk affect
export prices. There is weak evidence that U.S. exporters
absorb some of the risk into their prices, which may be
because they engaged in trade more with the Latin American

countries. German and Japanese exporters do not appear to incorporate exchange risk into their pricing strategies.

As a whole, empirical findings suggest that world markets are imperfectly competitive and agents involved in the trade appear to vary their markups when exchange rate changes. The degree of pricing to market differs across the source countries. Japanese and German exporters tend to stabilize local prices to keep their competitiveness in the U.S. market. When the dollar invoice is common, the pass-through of the U.S. imports should be low. The denominated currencies may be playing a significant role. An evidence of hysteresis is found in Mann (1986).

In order to clarify how exchange rate changes have influenced import prices and quantities in the U.S., some work related to the U.S. trade deficit is helpful. When the domestic currency depreciates, the conventional "J-curve" theory predicts that a sluggish response of export and import volumes is at first outweighed by valuation effects so the trade balance worsens. However, it improves as the changes in prices of export and import affect the domestic and foreign demand volumes. After the early 1985 when the dollar began to depreciate, the U.S. trade deficit did not improve as fast as expected. There is some research done about how prices and volumes respond to the exchange rate changes. Moffett (1989) empirically examines this J-curve effect. He estimates import/export prices and quantities separately, and uses these

equations for inferring trade balance adjustment path in the
case of ten percent depreciation. The degree of exchange rate
pass-through appears about 50 percent in eight quarters. In
the regression of aggregate import volume on GNP and
import/domestic prices, the price elasticity of demand for
U.S. imports ranges between 0.59 and 0.69 in seven quarters.
Each coefficient has a predicted sign and it is statistically
significant. The adjusted R^2 for both price and quantity are
very high. The predicted trade balance of the import sector
shows that expenditures on imports typically increase
following the dollar depreciations. The primary reason seems
to be a result of relatively inelastic import volume. On the
other hand, export earnings have been seen to rise only
slightly during the same periods due to "increases" in export
prices and the subsequent reductions induced in export volume.
It is concluded that the long-run merchandise trade balance
adjustment path is not similar to a J, but a sine wave, which
returns to essentially pre-depreciation level.

Krugman and Baldwin (1987) also analyze the puzzle of the
U.S. trade deficit persistence. They point out that the U.S.
did not experience a J-curve at least until the last quarter
of 1986. Data of nonagricultural export and non-oil import
volumes in the U.S. present more rapid increase in import
volume and less rapid increase in export volume after 1985
rather than before 1985. Since the lags of the exchange rate
on quantity are statistically significant over nine quarters,

slow adjustment of quantity appears to explain why the J-curve did not happen by then. Since an empirical test shows that a demand shift due to expenditure change rather instantaneously affects import volume and price, the slow adjustment can not be supported by inelastic import supply curve in the short run[5]. However, the quick income effects and slow price effects can be readily acknowledged with a type of contracts: importers make long-term commitments about whom to buy from, but not about how much they will buy. This type of contracts appears to be realistic.

Krugman and Baldwin conclude that trade balance improvements did not start by the end of 1986 because price and quantity respond very slowly. However, the following year have shown very slow improvement in the trade deficit. Arguments focusing on the hysteresis to explain the persistent deficit has been emphasized. The hysteresis is introduced by Baldwin and Krugman (1989) to explain the feedback to the exchange rate itself. They assume that the exchange rate always moves to balance payments. As has been argued by Baldwin (1988), the dollar appreciation in the first half of 1980s, which followed a large capital inflow altered the market structure (i.e., this large appreciation enables foreign firms to compensate sunk cost for entry in terms of

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[5]Hooper disagrees in a sense that if firms predict income effects, but not price changes, then their findings are explained.

the future profit path and the market will be more competitive even after the exchange rate reversed). Due to the appreciation and more foreign firms in the domestic market, the total import value rises. In order to balance the payment the currency has to depreciate even beyond the original level of the exchange rate before the appreciation starts. Their view explains that a cause of the persistent current trade deficit is not just a matter of lagged effects of exchange rates. Rather, import structure altered after the large appreciation and this worked unfavorably for the U.S. trade deficit. The assumption used in Baldwin (1988) for perfect foresight of the exchange rate path is replaced with the i.i.d. stochastic assumption of the exchange rate, which seems more realistic. They also show that the hysteresis presented in Baldwin (1988) is applicable to the multi-industry case. That is, the aggregation does not reduce a large exchange rate shock effect.

Dixit (1989) extends the models of hysteresis by Baldwin (1986) and Baldwin and Krugman (1989). Baldwin assumes perfect foresight of real exchange rate, while Baldwin and Krugman treat that as a random variable which is independently and identically distributed. Dixit introduces real exchange rate with a Brownian motion, in which volatility of exchange rate can reveal a cause of hysteresis. In other words, the existence of exchange rate volatility reinforces hysteretic effects. His model is different from others in terms of

dealing with competitive market and proving the existence of hysteresis in that environment. The striking result is that the exchange rate pass-through to domestic prices is very close to one in the phases where foreign firms enter or exit and about zero otherwise.

Krugman (1989) discusses extensively why large exchange rate fluctuations have so little effect on economies. The reason seems obvious that foreign exporters exercise pricing to market. He agrees with Dixit's explanation; which is that the existence of sunk costs creates a range of exchange rates such as nothing happens if exchange rates stay in this range. Uncertainty concerning future exchange rates reinforces the effect, so that the range in which no firm enters or exits is even wider. This is similar to option pricing. In option pricing, the ratio of the market price at which an option is exercised to the strike price is higher, the greater is the market volatility. In the sunk cost model, firms wait and see to decide whether they enter (or exit), when expected future profit path is just as much as sunk cost (or variable cost) if exchange rate largely varies. As a result of large exchange rate shocks, a number of participating foreign firms is altered and hysteresis is induced.

III. OBJECTIVES AND METHODS

As we have seen in the last chapter, much research have
been concentrated on pricing to market behavior by exporters.
The research related to the import side has been limited to
hysteresis issue. While there has been considerable work on
exporters' behavior in imperfectly competitive circumstances,
it can not be well-explained that we find little research on
importers. This study shows how domestic economic variables
are affected when import prices change. Also, it is shown
that market structure in the economy and import restrictions
including a possibility of "invisible" restrictions influence
how these variables are affected.

We develop a model which describes factors that affect
import prices and quantities in Japan and to empirically
examine whether those factors are really influential. Players
in the models are domestic producers and importers. How they
behave depends on how each player perceives himself; as a
price-taker, as a member involved in the Cournot competition,
or a monopolist. Moreover, the players are subject to the
trade policies by the government or the private sector. The
players may observe their trade environments subject to the
implicit restrictions on import quantities or on import shares
in domestic markets, or the informal intention of the
government to impose import restrictions in the future if
import quantities go beyond a desirable level. These possible

cases are considered in the model and the model predicts how the internal economic variables should change with each assumption. A part of the predictions is empirically tested and the results are compared to the theoretical predictions. We expect that this will show the characteristics of the domestic economic environments.

As some studies in literature have shown, there are pass-through effects of exchange rate changes even though they are slow and imperfect. The large swings of the yen during the 1980s should have revealed the relations between domestic price, import quantities or market shares and import prices through the coefficient of import prices on the dependent variables.

In the next chapter, a model is presented. Data and empirical results are summarized in the following chapters. Finally, some comments will conclude Part I.

IV.   MODEL

There are two types of suppliers in the country (Japan),
domestic producers and importers. The number of each supplier
is n and f, respectively. Marginal costs of importers and
producers are assumed to be constant and expressed by $\bar{P}$ and C,
respectively. Both of them are in terms of the Japanese
currency. An inverse demand function is:

$$R \;=\; G \; (\, Q \,)$$

where R and Q are domestic wholesale price and quantity
demanded.
Homogeneity of imports and domestically produced goods is
assumed and total quantity consumed is a sum of imports and
domestic products, i.e.,

$$Q = \sum_{i=0}^{f-1} m_i + \sum_{i=0}^{n-1} q_i.$$

Then, profit functions for a representative importer and
producer are, respectively, defined below as π_m and π_q.

$$\pi_m = [G(m_0 + \sum_{i=1}^{f-1} m_i + \sum_{i=0}^{n-1} q_i) - \bar{P}] m_0 \quad (1)$$

$$\pi_q = [G(\sum_{i=0}^{f-1} m_i + q_0 + \sum_{i=1}^{n-1} q_i) - C] q_0 \quad (2)$$

where m_i and q_i are the i th importer and producer, respectively, when i=0,...,f-1 or n-1. Maximizing their profits in the Cournot competition and assuming symmetry among each group,

$$R^c = \frac{\varepsilon f}{\varepsilon f - s^*} \bar{P} \quad (3)$$

$$R^c = \frac{\varepsilon n}{\varepsilon n - s} C \quad (4)$$

$$S = \frac{nq}{Q}, \quad S^* = 1 - S$$

where ε is demand elasticity with respect to price. Combining (3) and (4),

$$S^c = \frac{\varepsilon f n \bar{P} + nC(1-\varepsilon f)}{f\bar{P} + nC} \quad (5)$$

$$R^c = \frac{\varepsilon (f\bar{P} + nC)}{\varepsilon f + \varepsilon n - 1} \quad (6)$$

Assuming a constant elasticity demand function, we find that

$$\frac{\partial S^c}{\partial \bar{P}} > 0, \quad \frac{\partial S^c}{\partial C} < 0, \quad \frac{\partial S^c}{\partial f} < 0, \quad \frac{\partial S^c}{\partial n} > 0,$$

and the sign of $\frac{\partial S^c}{\partial \varepsilon}$ depends on the sign of $(\bar{P}-C)$. Producers gain their market share when an import price or the number of producers rises, and when marginal cost or the number of importers falls. Also, the following inequalities show that the more competitive suppliers are, the less their profit margin becomes, which reduces the wholesale price.

$$\frac{\partial R^c}{\partial \bar{P}} > 0, \ \frac{\partial R^c}{\partial C} > 0, \ \frac{\partial R^c}{\partial f} < 0, \ \frac{\partial R^c}{\partial \varepsilon} < 0, \ \frac{\partial R^c}{\partial n} < 0$$

A lower cost to importers will expand importers' margin, and
thus they tend to decrease prices. Producers will find
themselves in disadvantageous position if their cost to supply
is higher compared to that for importers. Thus, they lose the
price competition and have to decrease their market share.
The wholesale price should decline. Since the wholesale price
decreases, the demand for both imported and domestically
produced goods rises; overall, q falls while m increases. In
the case of a decrease in costs for producers, the situation
is reversed. The decreased cost will raise producers' profit
margin and producers will decrease prices. Importers are now
at a disadvantage in the price competition vis-a-vis the
producers, and will lose the market share. Thus, q rises
while m falls.

Figure 1 presents the above argument. ℓ_1 and ℓ_2 are
importers and producers' reaction functions, respectively.
When import price rises, ℓ_1 shifts back to ℓ_1'. When domestic
production costs rises, ℓ_2 shifts back to ℓ_2'. The equilibrium
point moves to B or C. The elasticity of wholesale price
with respect to import price is less than one as follows.

$$\frac{\partial R^c}{\partial \bar{P}} \frac{\bar{P}}{R^c} = \frac{f\bar{P}}{f\bar{P}+nC} < 1$$

Under perfect competition or Bertrand competition, wholesale price level should be equal to either C or $\bar{P}$ depending on which is lower. This is observed from equation (3) and (4) if we substitute infinitely large ε. A slight decrease in import price will wipe away domestic production.[6] The elasticity of wholesale price with respect
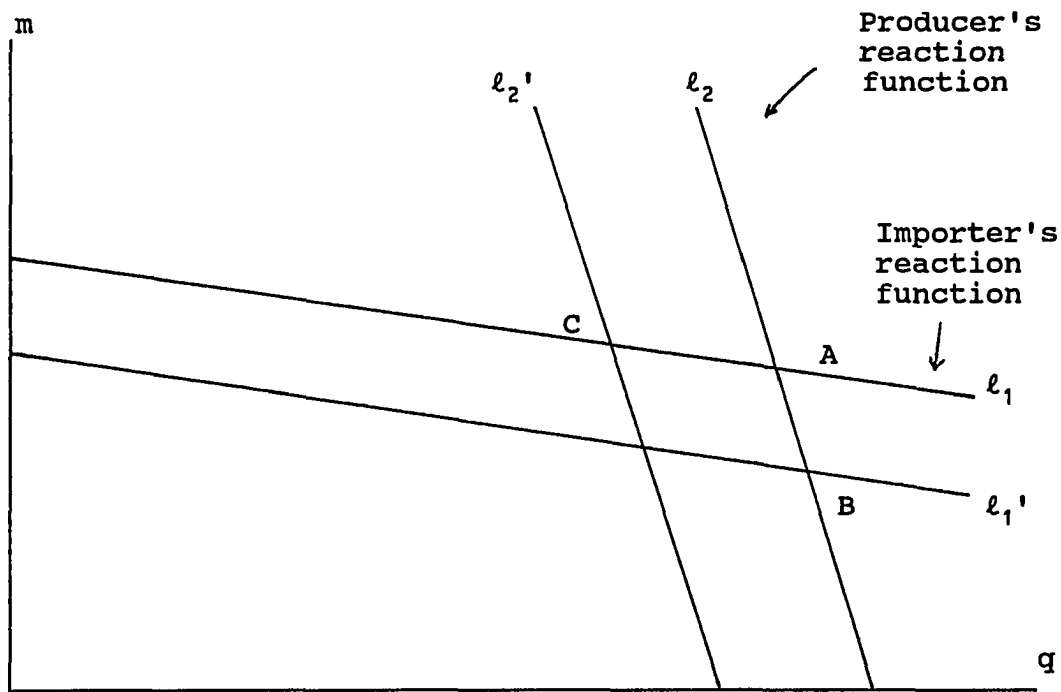
Figure 1. m (import) and q (domestic production) in the Cournot competition without any trade restriction

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[6]The arguments in this section are heavily based on the assumption of constant marginal cost of import and domestic production. If increasing marginal cost is assumed, a small change in import price does not cause a drastic change in market share. Consumption for imports and domestically produced goods under perfect competition, for example, will be determined at the point where marginal costs of each product are equalized, so both products will be consumed at the equilibrium.

to import price equals unity. In the case of importers and
producer's collusion the joint profit function becomes as
follows:

$$\pi^{J} = [G(m_0 + \sum_{i=1}^{f-1} m_i + q_0 + \sum_{i=1}^{n-1} q_i) - \bar{p}] \, (m_0 + \sum_{i=1}^{f-1} m_i)$$

$$+ [G(m_0 + \sum_{i=1}^{f-1} m_i + q_0 + \sum_{i=1}^{n-1} q_i) - C] \, (q_0 + \sum_{i=1}^{n-1} q_i) \, .$$

Their decision rule is the same as monopolist's. As in the
case of perfect competition, if import price falls, they
switch all domestic production to import. The first order
conditions give

$$R^{J} = \frac{\varepsilon}{\varepsilon - 1} \, \min \, [\, \bar{P}, \, C \,] \, .$$

Hence, market share function is very sensitive to import
price. Wholesale price does not depend on number of importers
or producers. If importers or producers collude within each
group, the solution simply become equation (3), (4), (5) and
(6) with f=1 or n=1 respectively. In the case that n (or f)
is endogenous, if there exists a profit for domestic producers
(importers), more firms will enter the market until the profit
becomes zero. So, the wholesale price level is

$$R = \min \, [\, C, \, \frac{\varepsilon f}{\varepsilon f - 1} \, \bar{P} \,] \, .$$

If f is endogenous,

$$R \; - \; \min \; [\; \bar{P}, \; \frac{\varepsilon n}{\varepsilon n - 1} \; C \;].$$

Again, only one of them, importers or producers, will dominate the market.

A.   Invisible Quota and Tariff

A government can restrict imports using quota or tariff. If there exists a quantitative restriction for import such as $\bar{m} \geq \sum_{i=0}^{f-1} m_i$, then the profit function for an importer becomes constrained while the profit function for a producer is the same as (2). The profit function for a importer is as follows with the constraint.

$$\pi_m \; - \; [\; G \; (\; m_0 + \sum_{i=1}^{f-1} m_i + \sum_{i=0}^{n-1} q_i \;) \; - \; \bar{P} \;] \; m_0$$

subject to

$$\bar{m} \geq \sum_{i=0}^{f-1} m_i. \quad (1)'$$

Maximizing both the Lagrangian function which is derived from an objective function for importers subject to the constraint, and (2), we obtain the first order conditions. When the constraint is binding, the import level is determined from the equation for the constraint. A typical importer is constrained such as $\bar{m} \geq f m_0$. The constraint and the first order

condition from (2) gives

$$R^\varrho(1 - \frac{1}{\varepsilon(R)} \quad \frac{Q(R)-\overline{m}}{nQ(R)}) = C. \quad (7)$$

This implies that the wholesale price is a function of n, $\overline{m}$ and C, which are exogenously given. Since q = { Q(R)-$\overline{m}$ }/n, q is a function of n, $\overline{m}$, and C. So is S, since S = nq/Q. Rewriting the above equation and assuming a constant elasticity of demand

$$R^\varrho = \frac{\varepsilon n}{\varepsilon n - S(n,\overline{m},C)} \quad C. \quad (8)$$

Then,

$$\frac{\partial R^\varrho}{\partial n} < 0 \quad \frac{\partial R^\varrho}{\partial \overline{m}} < 0 \text{ and } \frac{\partial R^\varrho}{\partial C} > 0.$$

Similarly,

$$\frac{\partial S^\varrho}{\partial n} > 0, \quad \frac{\partial S^\varrho}{\partial \overline{m}} < 0 \text{ and } \frac{\partial S^\varrho}{\partial C} < 0.$$

A quantitative import restriction separates variables of importers, such as $\overline{P}$ and f, from the domestic economy. Wholesale price, market share, demand, and quantities supplied by importers or producers are not affected by import price or by the number of importers. Figure 2 shows the mechanics. Importers simply do not have any choice. Producers decide the production level given $\overline{m}$. A reduction in m (to $\overline{m}'$) increases domestic production. An increase in domestic production cost shifts in producers' reaction function, which reduces

production level (A→D).

When $\bar{m}$ is binding, the domestic market share in the simple Cournot case, S^c, is less than S^Q which is the market share with quota ($\frac{\partial S^Q}{\partial \bar{m}}$ < 0). Domestic production with quota, q^Q, is larger than q^c without quota. Hence, profit margin of domestic producers with quota is greater than that in Cournot case from (4) and (8). The profit margin of import (per unit) with quota is also greater than that without quota while overall profit is ambiguous.

A tariff is another well-known method to restrict
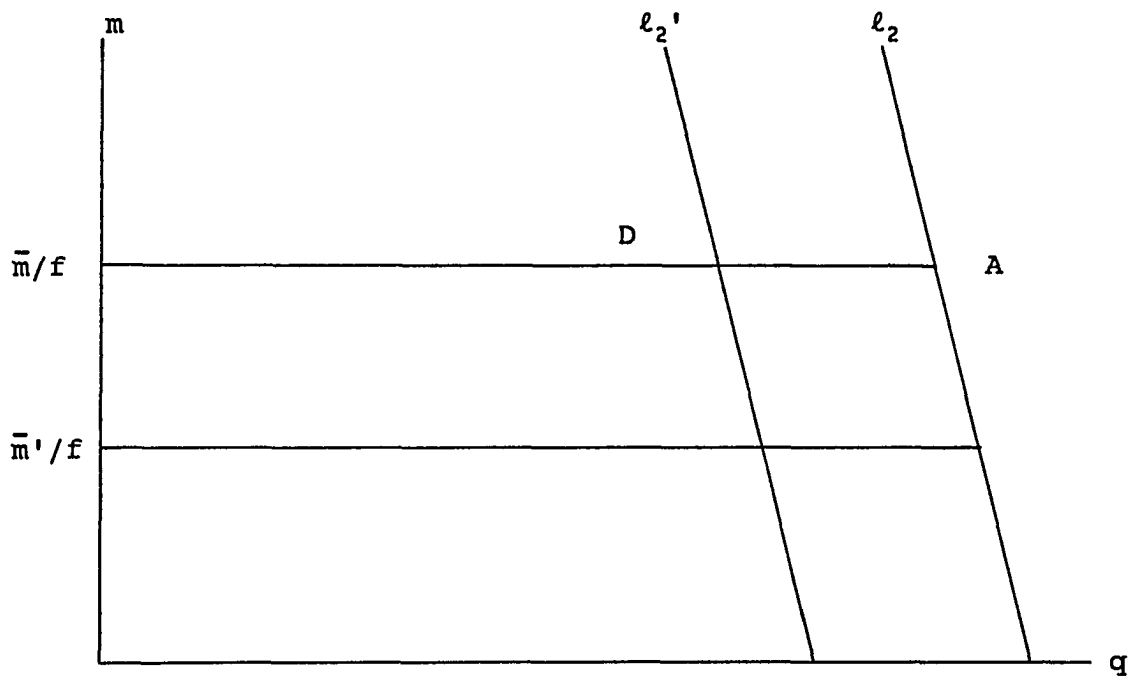
Figure 2. m (import) and q (domestic production) in the Cournot competition under the quantitative restriction where $\bar{m}/f$ is import level for each importer

imports. When the government imposes a tariff, τ, the profit function for importers becomes

$$\pi_m = [G(m_0 + \sum_{i=1}^{f-1} m_i + q_0 + \sum_{i=1}^{n-1} q) - \bar{P}(1+\tau)] m_0. \quad (9)$$

Maximizing (9) and (2) with respect to m_0 and q_0, we obtain the following first order condition.

$$R^t = \frac{\varepsilon f}{\varepsilon f - s^*} \bar{P}(1+\tau) \quad (10)$$

$$R^t = \frac{\varepsilon n}{\varepsilon n - s} C. \quad (11)$$

Combining (10) and (11),

$$S^t = \frac{\varepsilon f n \bar{P}(1+\tau) + nC(1-\varepsilon f)}{f\bar{P}(1+\tau) + nc} \quad (12)$$

and

$$R^t = \frac{\varepsilon[f\bar{P}(1+\tau) + nC(1-\varepsilon f)]}{\varepsilon f + \varepsilon n - 1}. \quad (13)$$

The market share function, (12) is an increasing function τ. So is (13). When τ rises, m declines and q rises. The arguments are similar to changes in m and q when $\bar{P}$ changes in the Cournot case. The profit margin for importers is less than that in the Cournot case, while the profit margin for producers is larger.

n or C affects market shares in either case (with quota or tariff). The magnitudes of changes in market shares are different under different type of the restriction. An

increase in C shifts back ℓ_2 to ℓ_2' in Figure 2, assuming that A is an original equilibrium for both cases (i.e., tariff and quota had the same effect). Under the quantitative restriction, the new equilibrium point is at D. With the tariff, an equilibrium point will be somewhere on ℓ_2' above D where ℓ_2' crosses an importer's reaction function. In both cases, market share falls but the degree is larger with the quantitative restriction. A fall in C shifts ℓ_2 outward, so that the constraint $\bar{m}$ is not binding any more in the case of quota. Hence, the equilibrium point is determined by two reaction functions. In that case, tariff and quota have the same effect on market share. When n falls, domestic producers become less competitive and lose their market shares. Market shares with quota are larger than those with tariff. There is no difference between quota and tariff when n rises.

The (non-) equivalence of tariff and quota in oligopolistic markets needs to be discussed. In the Bertrand case, import quota has very different effects than tariff. Quota prevents foreign firms from competing in the domestic market and enables prices and firms' profits to be larger than those with tariff (Helpman and Krugman, 1989; Krishna, 1989). Under Cournot competition, quota gives the same results as what happens with tariff except the distributional effect of quota rent. Hwang and Mai (1988) presents this issue using a conjectural variation approach and conclude that the domestic price is lower (higher) under quota if market is less (more)

competitive than the Cournot case.

If importers are perfectly competitive, tariff and quota are distinctively different. With a tariff, importers will import foreign products as much as they want and it will force domestic producers to decrease their production level up to the point where the marginal cost of domestic production is equal to the world price plus tariff. On the other hand, quota can not eliminate the market power by domestic producers. The domestic producers will maximize the profit by still choosing the production level at which their perceived marginal revenue equals the marginal cost after the demand for their products is cut off by the amount of quota, since imports as many as quota will be consumed in the domestic market. The tariff leads no market power of the domestic producers as long as there are any imports while the quota does not eliminate domestic firms' market power since the level of imports is predetermined independently of the price charged by domestic firms. Domestic prices with quota will be higher. Quota is obviously inferior to tariff.

Specifically in the Cournot case, a properly chosen τ can give us exactly the same effects with a quota, m. That is, equating S^q as a function of m to S^t in equation (12), we will obtain τ under which the market shares with quota and tariff are equalized. Then, from (8) and (11), wholesale price is the same, which gives us the same levels of demand. Accordingly, m and q are the same. This confirms Hwang and

Mai since the conjectural variation is assumed to be zero in the Cournot.

B. Market Share Regulations

Market share regulations are often practiced to protect domestic industries. There are two types of the market share regulations considered here. A government can utilize a tariff to stabilize market share by domestic producers at a target level. In the first discussion, firms treat tariff exogenously, since the level is decided by the government. In the other case, the tariff is endogenously treated, after firms realize the government policy. First, let us assume that firms do not have information for the regulation and a current import market share is higher than a level which the government considers desirable. The government sets up a target market share after observing the current economic variables and imposes the tariff which can attain the target level. In other words, the level of tariff is always adjusted to changes in the other exogenous variables in order to keep a certain market share to domestic producers. Equation (12) shows that the tariff level, τ, changes the domestic market share. The government uses τ to keep S fixed, so that solving τ with respect to S and the other exogenous variable, we set,

$$\tau = \frac{S^T(f\overline{P}+nC) + \varepsilon fn(C-\overline{P}) - nC}{f\overline{P}(\varepsilon n - S^T)} \quad (14)$$

where S^T is a target level of the domestic market share. Plugging (14) back into (10), we have only one equation to determine wholesale price, i.e.,

$$R^{MSX} = \frac{\varepsilon n}{\varepsilon n - S^T} \, C. \quad (15)$$

In order to keep $dS^T = 0$, τ has to be adjusted whenever other exogenous variables such as $\bar{P}$, C, n and f change. The relationship between τ and these variables are obtained as S and τ move in opposite direction to keep S at certain level.

$$\frac{\partial \tau}{\partial \bar{P}} < 0, \quad \frac{\partial \tau}{\partial C} > 0, \quad \frac{\partial \tau}{\partial f} > 0 \text{ and } \frac{\partial \tau}{\partial n} < 0.$$

For example, if decrease in $\bar{P}$ intends to decrease S, then τ has to rise to discourage imports.

Since wholesale price R is expressed without $\bar{P}$ or f in equation (15), wholesale price is again separated from import market. That is, whether import price goes up or down, or whether import market is more or less competitive does not affect wholesale prices. Since the constraint is binding, the tariff increases with the objective to maintain S^T for domestic producers, which means that $\bar{P}$ or f does not matter as determinants of market share any more. Before the tariff is implemented, $\bar{P}$ was too low to exclude more imports from the domestic markets; so τ will adjust to increase import price after tariff to the level which can be compatible with domestically determined variables such as C or n. That is, only competitiveness in the producers' market and cost of

domestic products influence wholesale price. The more competitive producers are or the lower the cost of domestic producers is, the less costly it is to buy products in the wholesale market. The higher target of the market share of domestic producers will induce wholesale price to rise. Quota, tariff and this market share regulation with an exogenous τ can influence economic variables exactly the same way. Equations (8), (11), and (15) show that if the market share is the same in each case, wholesale price is also the same. Then, the demand for the sum of imports and domestic products stays the same and so does m and q since the market share is the same. By choosing proper τ and m, the three model results in the same level of endogenous variables, R, Q, S, m and q.

In the above case, the government alters a tariff level whenever the exogenous environments change in order to leave the market share stable. If all agents know the behavioral rule of the government, they use that information to maximize their profits. That is, if the government repeatedly implements a tariff such as above, every agent may recognize that market share should be kept at a certain level (or if a law directly limits imports as ratio quota (versus volume quota which was already discussed)), domestic producers' objective function will include total quantity supplied as a function of S^T and q, not m, assuming that the constraint is binding. Then, after observing domestic production level, the

government enforces the ratio quota on imports. As a result, domestic producers act as Stackelberg leaders while importers as followers.[7] The profit function for domestic producers becomes

$$\pi_q = [G(\frac{1-S^T}{S^T}(q_0 + \sum_{i=1}^{n-1} q_i) + q_0 + \sum_{i=1}^{n-1} q_i) - C] q_0 \quad (16)$$

$$since \sum_{i=0}^{f-1} m_i = \frac{1-S^T}{S^T} \sum_{i=0}^{n-1} q_i. \quad (17)$$

Maximizing (16) with respect to q_0,

$$R^{MSN} = \frac{\varepsilon n C}{\varepsilon n - 1}. \quad (18)$$

Producers know that if they increase their supply by one unit, then importers must increase imports by $\frac{1-S^T}{S^T}$. Their perceived marginal revenues are more steeply sloped, which decreases their supply. Total supply of producers decline. Again, wholesale price level is independent of $\bar{P}$, which shows that there will be no pass-through effects. Compared to the previous analysis in which τ was exogenously determined, the levels of q and m are lower.[8] This reduced supply increases wholesale price. Since wholesale price is higher, the profit margins for both producers and importers are larger. From

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[7]See Parks and Lapan (1991) in the case of simultaneous play and unbinding constraint.

[8]This result is consistent with Hwang and Mai (1988) and Mai and Hwang (1989).

(18), it is shown that wholesale price rises when cost rises or the number of producers declines. The effects of cost and competitiveness on wholesale price are larger in this case than in the previous case with an exogenous τ.

C. A Threat for the Future Import Restriction

Let us consider one more case. In order to protect domestic production, a government may impose import restriction in the future if the current import share is larger than a certain level. If the government has repeated such threat to importers, importers may have used the information to maximize their profit. The similar consideration in the case of voluntary export restraints (VERs) was contributed by Yano (1989). Yano analyzes how foreign exporting firms behave in the current period when they expect that importing countries may impose VERs in the future in order to protect domestic firms. The more common VERs become, the more likely it is that exporters take into account these expectations into their behavioral rule. If an exporting firm's share in the future after VERs are imposed, is assigned proportionately to it's current share, the competition to acquire market share in the current period becomes intensified since the foreign firm's marginal profit from an additional current sale increases as the expectation increases. Thus, the foreign firm will raise their current sales, while domestic firm reduces his sale. As a result, the

expectation of future VERs reduces the current profit of domestic firms. Hence, planned protection for domestic firms by VERs will be offset by lowered profit of domestic firms before VERs.

In our case, each importer expects that if the government implements import restriction in the future, its market share will be allocated proportionally to its current share. That gives some incentives to importer to increase the current import, while increased import may raise the probability that a quota is imposed on imports. Let us assume a two-period model. The probability of the government regulation in the second period is $\lambda(0 < \lambda < 1)$, which may be a function of quantities imported and domestically produced in the first period.[9] It is plausible that the larger is the level of imports in the first period, the more likely it is that the government will restrain that in the next period and vice versa for the domestically produced goods. The probable level of import restriction, $\bar{M}$ is defined as a function of imports in the first period. The larger is the level of import in the first period, the higher will be the level of import restriction. When the regulation is not implemented in the second period, importers and producers will maximize their

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[9]λ can be a function of the market share of foreign goods. In order to make a calculation simpler, λ is defined to be a linear function of
$$\sum_{i=1}^{f} m_i \text{ and } \sum_{i=1}^{n} q_i.$$

profits at the usual Cournot level. When the regulation occurs in the second period, their profit maximizing solution will be the same as when a quota is imposed. Their expected profit functions are as follows:

$$\pi_m = \pi_m^0 + \delta \ [\ \lambda\ (\sum_{i=1}^{f} m_i^0, \sum_{i=1}^{n} q_i^0)\ \pi_m^Q\ (\ \overline{M}\ (\sum_{i=1}^{f} m_i^0),\ \frac{m_j^0}{\sum_{i=1}^{f} m_i^0})$$

$$+\ [1-\lambda\ (\sum_{i=1}^{f} m_i^0, \sum_{i=1}^{n} q_i^0)\ ]\ \pi_m^C]\quad (19)$$

$$\pi_q = \pi_q^0 + \delta\ [\lambda\ (\sum_{i=1}^{f} m_i^0,\ \sum_{i=1}^{n} q_i^0)\ \pi_q^Q +\ [1-\lambda\ (\sum_{i=1}^{f} q_i^0, \sum_{i=1}^{n} q_i^0)\ ]\ \pi_q^C]\quad (20)$$

where δ is a discount factor for the second period and superscripts, 0, Q and C respectively signify the first period, quota, and Cournot, respectively. J is a representative importer. Taking derivatives with respect to m_j^0 and q_j^0, respectively,

$$\frac{\partial \pi_m}{\partial m_j^0} = \frac{\partial \pi_m^0}{\partial m_j^0} + \delta\ [\ (\pi_m^Q - \pi_m^C)\ \frac{\partial \lambda}{\partial m_j^0}\ +\ \lambda\ (\frac{\partial \pi_m^Q}{\partial \overline{M}}\ \frac{\partial \overline{M}}{\partial m_j^0} + \frac{\partial \pi_m^Q}{\partial MS}\ \frac{\partial MS}{\partial m_j^0})\ ] = 0\quad (21)$$

$$\frac{\partial \pi_q}{\partial q_j^0} = \frac{\partial \pi_q^0}{\partial q_j^0} + \delta\ [\ (\pi_q^Q - \pi_q^C)\ \frac{\partial \lambda}{\partial q_j^0}\ ] = 0\quad (22)$$

$$where \ MS = \frac{m_j^0}{\displaystyle\sum_{i=1}^{f} m_i^0} \ .$$

Let us assume that the second order conditions are satisfied. Since $\partial\lambda/\partial q_j < 0$, the second term of the right-hand-side in equation (22) is negative, which implies the first term to be positive. It means that quantity produced domestically should be smaller when the second period is taken into account. The inside of the first parentheses in equation (21) is negative. When a importer increases the supply, the sum of domestic products marketed will fall.[10] Hence, if more imports in the first period increase the possibility for import restriction in the second period, then the first term in the brackets is negative. The profit of an importer in the second period rises when he increases imports in the first period, holding the total imports constant (in order not to increase the probability of quota in the second period), since his assigned market share and the quota level itself in the future will increase. The second term in the brackets is positive. If the negative term dominates the positive term in the brackets, the first term of the right-hand-side has to be positive and imports will be smaller compared to the simple

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[10] $J(m_1, \cdots, m_f, q_1, \cdots, q_n) \equiv \partial\pi_m/\partial m_1 = R - \bar{P} + R'm_1 = 0$
Hence, $(\partial J/\partial m_1)dm_1 + \cdots + (\partial J/\partial m_f)dm_f + (\partial J/\partial q_1)dq_1 + \cdots + (\partial J/\partial q_n)dq_n = 0$
Defining $\partial J/\partial m_1 = \cdots = \partial J/\partial m_f = \partial J/\partial q_1 = \cdots = \partial J/\partial q_n$ by symmetry,
$\sum dq_i/dm_1 = -(\partial J/\partial m_1)/(\partial J/\partial q_1) < 0.$

Cournot case. If the second term in the brackets (positive)
dominates the first term (negative), imports will be larger.
In the former case, the perceived possibility of future import
restriction induces the reduction in the current production
and import. In the latter case, domestic production in the
second period falls, while import in the second period rises.
In Yano's model, the probability of quota imposition is not
dependent on the first period choice variables, but a simple
parameter. Hence, the ambiguity in the signs is eliminated.
However, when the difference in profits between when the quota
is enforced and when it is not is large, importers should
recognize the significant damage to increase the probability
of quota imposition by taking an aggressive strategy in the
first period. Therefore, they may take a less aggressive
strategy, i.e., they rather reduce the import quantity in the
first period.

Let us assume that the probability of the government
import restriction linearly depends on imports and domestic
production in the first period, i.e.,

$$\lambda - \lambda \left(\alpha \sum_{i=1}^{f} m_i^0 - \beta \sum_{i=1}^{n} q_i^0 \right)$$

where α and β are constant numbers.
$\sum_{i=1}^{f} m_i^0$ positively and $\sum_{i=1}^{n} q_i^0$ negatively affect the probability
of restriction. Then, the profit functions for an importer
and a producer are respectively,

$$\pi_m = R(\sum_{i=1}^{f} m_i^0 + \sum_{i=1}^{n} q_i^0) m_j^0 - \overline{P} m_j^0$$

$$+ \delta [\lambda (\alpha \sum_{i=1}^{f} m_i^0 - \beta \sum_{i=1}^{n} q_i^0) [R^Q (\overline{M}(\sum_{i=1}^{f} m_i^0) + \sum_{i=1}^{n} q_i^0) - \overline{P}] \frac{m_j^0}{\sum_{i=1}^{f} m_i^0} \overline{M}(\sum_{i=1}^{f} m_i^0)$$

$$+ (1-\lambda (\alpha \sum_{i=1}^{f} m_i^0 - \beta \sum_{i=1}^{n} q_i^0)) [R^C (\sum_{i=1}^{f} m_i^C + \sum_{i=1}^{n} q_i^C) m_j^C - \overline{P} m_j^C]] \quad (23)$$

$$\pi_q = R(\sum_{i=1}^{f} m_i^0 + \sum_{i=1}^{n} q_i^0) q_j^0 - C q_j^0$$

$$+ \delta [\lambda (\alpha \sum_{i=1}^{f} m_i^0 - \beta \sum_{i=1}^{n} q_i^0)] [R^Q (\overline{M}(\sum_{i=1}^{f} m_i^0) + \sum_{i=1}^{n} q_i^Q) q_j^C - C q_j^Q]$$

$$+ (1-\lambda (\alpha \sum_{i=1}^{f} m_i^0 - \beta \sum_{i=1}^{n} q_i^0)] [R^C (\sum_{i=1}^{f} m_i^C + \sum_{i=1}^{n} q_i^C) q_j^C - C q_j^C]] . \quad (24)$$

Maximizing (23) and (24) with respect to m_i^0, q_i^0, m_i^Q, q_i^Q, m_i^C, and q_i^C, we have the solutions as follows. m_i^Q, q_i^Q, and R^Q are the solutions with a quota. m_i^C, q_i^Q, and R^Q are those in the simple Cournot case. From the first order conditions with respect to m_i^0 and q_i^0,

$$R^R = \frac{\varepsilon f}{\varepsilon f - S^*} (\overline{P} + A) \quad (25)$$

$$R^R - \frac{\varepsilon n}{\varepsilon n - S}(C + B) \quad (26)$$

where

$$A = \delta\phi'\alpha(\pi_m^C - \pi_m^Q) - \delta\phi R^{Q'}\overline{M}' - \delta\phi(R^Q - \overline{P})\frac{1}{f}(\overline{M}' + \frac{f-1}{fm^0})$$

$$B = \delta\phi'\beta(\pi_q^Q - \pi_q^C),$$

and A > 0 and B > 0 are assumed. Equation (25) and (26) give us

$$R^R - \frac{\varepsilon f(\overline{P} + A) + \varepsilon n(C + B)}{\varepsilon f + \varepsilon n - 1} \quad (27)$$

$$S^R - \frac{\varepsilon f n(\overline{P} + A) + n(C + B)(1 - \varepsilon f)}{f(\overline{P} + A) + n(C + B)}. \quad (28)$$

If importers anticipate significant loss in their profits in the case when the government imposes a quota in the future, they will import less in the current period and that tends to increase the market share by producers. If producers anticipate considerable gain with the future quota, they will produce less in the current period and increase the probability of the quota, which will reduce the market share by producers. These behaviors by both importers and producer to supply less quantities in the current market push up the wholesale price level.

Tables 1, 2, and 3 summarize the results in the Cournot competition.

Table 1. Predictions for R in the Cournot case

	$\partial R/\partial \bar{P}$	$\partial R/\partial C$
no regulation	$\dfrac{\varepsilon f}{\varepsilon n + \varepsilon f - 1} > 0$	$\dfrac{\varepsilon n}{\varepsilon n - S(n, f, \bar{P}, C)} > 0$
volume quota	0	$\dfrac{\varepsilon n}{\varepsilon n - S(n, \bar{m}, C)} > 0$
tariff	$\dfrac{\varepsilon f(1+\tau)}{\varepsilon n + \varepsilon f - 1} > 0$	$\dfrac{\varepsilon n}{\varepsilon n - S(n, f, \bar{P}, C, \tau)} > 0$
ratio quota(exog)	0	$\dfrac{\varepsilon n}{\varepsilon n - S^T} > 0$
ratio quota(end)	0	$\dfrac{\varepsilon n}{\varepsilon n - 1} > 0$
threat	$\dfrac{\varepsilon f}{\varepsilon n + \varepsilon f - 1} > 0$	$\dfrac{\varepsilon n}{\varepsilon n - S(n, f, \bar{P}, C, x*)} > 0$

* x means several exogenous variables such as α, β, ϕ, δ, $\bar{\bar{M}}$.

Table 2. Predictions for market shares in the Cournot case

	$\partial s/\partial \bar{P}$	$\partial s/\partial c$
no regulation	$\dfrac{nCf(\varepsilon n+\varepsilon f-1)}{(f\bar{P}+nC)^2} > 0$	$-\dfrac{n\bar{P}f(\varepsilon n+\varepsilon f-1)}{(f\bar{P}+nC)^2} < 0$
volume quota	0	*
tariff	$\dfrac{nCf(\varepsilon n+\varepsilon f-1)(1+\tau)}{[f\bar{P}(1+\tau)+nC]^2} > 0$	$-\dfrac{n\bar{P}f(\varepsilon n+\varepsilon f-1)(1+\tau)}{[f\bar{P}(1+\tau)+nC]^2} < 0$
ratio quota(exog)	0	0
ratio quota(end)	0	0
threat	$\dfrac{n(C+B)f(\varepsilon n+\varepsilon f-1)}{[f(\bar{P}+A)+n(C+B)]^2} > 0$	$-\dfrac{n(\bar{P}+A)f(\varepsilon n+\varepsilon f-1)}{[f(\bar{P}+A)+n(C+B)]^2} < 0$

* As already explained, comparing this magnitude with tariff's case in which both cases originally give the same results (i.e., import with quota, m equals to import with tariff), the magnitude of $|\partial s/\partial c|$ is the same for both cases with quota and tariff when C increases from the original equilibrium where both cases give the same results. The magnitude of $|\partial s/\partial c|$ is less with quota.

Table 3. Predictions for import quantities in the Cournot case

	$\partial m/\partial \bar{P}$	$\partial m/\partial c$
no regulation	$\dfrac{2R'+qR''}{R'[(2r'+qR'')+(R'+mR'')]} < 0$	$\dfrac{-(R'+mR'')}{R'[(2R'+qR'')+(R'+mR'')]} > 0$
volume quota	0	0
tariff	$\dfrac{(2R'+qR'')(1+\tau)}{R'[(2R'+qR'')+(R'+mR'')]} < 0$	$-\dfrac{R'+mR''}{R'[(2R'+qR'')+(R'+mR'')]} > 0$
ratio quota(exog)	0	$\dfrac{1}{[(R''+qR'')+\dfrac{fs}{n(1-S)}(2R'+qR'')]} < 0$
ratio quota(end)	0	$\dfrac{1}{\dfrac{f}{n(1-S)}(2R'+\dfrac{q}{S}R'')} < 0$
threat	*	*

* The expressions for the explicit solutions are complicated. With some conditions the results maintain the same signs as ones in the case of no regulation.

V. ESTIMATION METHOD AND DATA

A. Method

Tables 1, 2, and 3 in the last chapter show how import price and domestic cost affect wholesale price, market share and import quantity under the Cournot competition. If there exist some type of quota such as ratio or volume quota, the variables characterizing import market such as number of importers or import price do not influence wholesale price nor market share. That is, a large appreciation (depreciation) which is revealed as a large decline (increase) in import price, $\bar{P}$, does not change wholesale price or market share. On the other hand, wholesale price is sensitive to a change in domestic cost under any trade restrictions. The negative relationship between import quantity and domestic cost is distinct under a ratio quota. Competitiveness in each market is measured through the number of domestic producers or importers. The more competitive a market is, wholesale price will be lower. If markets are competitive or collusive, wholesale prices are independent from the number of producers or importers.

Due to data shortage, possibility of invisible tariff (which is thought as distributional costs for imports) or threat for the future import restriction is not tested here. Wholesale prices used are indexed and how to measure a threat by the government is not considered. An import price, $\bar{P}$, can

be separated into three parts, since

$$\bar{P} = e\, P^* (1 + \tau)$$

where e is the yen value per unit of foreign currencies and τ is tariff rate. The following three equations are fitted.

$$Ln\ R = \alpha_0 + \alpha_1\, Ln\ P^* + \alpha_2\, Ln\ e + \alpha_3\, Ln\ (1+\tau) + \alpha_4\, Ln\ C \quad (29)$$

$$Ln\ S = \beta_0 + \beta_1\, Ln\ \bar{P} + \beta_2\, Ln\ C \quad (30)$$

$$Ln\ I = \gamma_0 + \gamma_1\, Ln\ \bar{P} + \gamma_2\, Ln\ C \quad (31)$$

where R is wholesale price in yen, eP^*, import price in yen, MS, market share by domestic producers, I, quantity imported, and C, nominal wage in each industry.

In competitive markets, $\alpha_1 = \alpha_2 = \alpha_3 = \alpha_4 = 1$. A market share will be very sensitive to changes in P^*, e, τ, or C. The expected signs are positive for β_1 and negative for β_2. The import demand curves coincide with the demand curves when eP^* is less than domestic marginal cost, or zero when eP^* is larger. Hence, $\gamma_1 < 0$ and $\gamma_2 > 0$. On the other hand, if importers and producers collude, they behave like one monopoly. Descriptions for the coefficients are the same as the above competitive case expect that $\alpha_0 > 0$ (if the data is not indexed). In both cases, numbers of importers and producers do not affect any economic variables.

Under oligopolistic market settings, we expect that $0 < \alpha_1$, α_2, $\alpha_3 < 1$, β_1, $\gamma_2 > 0$ and β_2, $\gamma_1 < 0$. When there is import restriction such as volume quota or ratio quota, import price

does not affect wholesale price or market share $(\alpha_1=\alpha_2=\alpha_3=\beta_1=0)$.

With any kind of quotas, import price does not change import

quantity (i.e., $\gamma_1=0$). A change in domestic cost clarifies

whether the quota is ratio or volume depending on the sign of

β_2 or γ_2.

The expected signs for each coefficient are summarized in

Table 4.

Table 4. Expected signs for coefficients

	α_1	α_2	α_3	α_4	β_1	β_2	γ_1	γ_2
Competition Collusion	1	1	1	1	+	−	−	+
Cournot	0-1	0-1	0-1	0-1	+	−	−	+
Volume quota	0	0	0	+	0	−	0	0
Ratio quota	0	0	0	+	0	0	0	−

As mentioned in the second chapter, the previous

researches show that there are time lags until a change in

exchange rates is transmitted to import prices. The slow

adjustment of wholesale price to import price is also

considered in this model.

A possibility of endogenous P^* can not be ignored.

Japanese market may be large enough to influence world market.

If P^* is exogenous, we expect that $\alpha_1=\alpha_2$. If not, the model has to be altered to a simultaneous system, defining both P^* and R as endogenous variables.

Feenstra (1989) finds the symmetric pass-through of tariff and exchange rate on U.S. prices of Japanese cars. Since there was significant change in Japanese tariff rates during the first half of 1980s after the Tokyo round, it is testable. Equation (29) is slightly changed.

$$Ln\ R_t\ -\ \alpha_0+\sum_{i=0}^{1} \delta i\ LnP^*_{t-i}+\sum_{i=0}^{1} \eta_i\ Lne_{t-i}+\alpha_3\ Ln(1+\tau)_t+\alpha_4\ LnC_t+U_t$$

where $U_t \sim$ iid $(0,\sigma^2)$, $\alpha_1^*\equiv\sum\delta_i$ and $\alpha_2^*\equiv\sum\eta_i$. The symmetry is tested by $\alpha_2^*=\alpha_3$. Lags, i's go from 1 through 1.[11]
Then, in order to test the symmetry

$$LnR_t=\alpha_0+\sum_{i=0}^{1} \delta_i LnP^*_{t-i}+ (\alpha_3-\sum_{i=0}^{1} \eta_i) Ln(1+\tau)_t+\sum_{i=0}^{1} \eta_i [Lne_{t-i}+Ln(1+\tau)_t]$$

$$+\alpha_4\ LnC_t+U_t.$$

The symmetry will be tested by a t-statistics with the hypothesis that $\alpha_3-\sum\eta_i=0$.

In the above arguments, we have ignored the role of f or

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[11]Following Feenstra, lags on tariffs are not considered. In his model, the revenue of Japanese auto-makers depends on expected exchange rate and the expected exchange rate is assumed to be a function of the current and past spot rates. In this paper, wholesale prices are determined from the profit maximization process with exogenously given import prices. It may have been appropriate to assume lags on tariffs along with lags on exchange rates because of the time lag for complete effects of both variables on wholesale prices.

n, assuming no entry or exit. It is tested for n, using production concentration ratio of the largest three producers. The larger (smaller) the ratio is, the less (more) competitive the market is. It is assumed that the production concentration ratio substitutes n in such way that if the ratio is large, then n are small. The available production concentration ratios for each commodity (commodity specific concentration ratios) are only for 1980. Industry concentration ratios (concentration ratios for groups of commodities) are available at three dates (1982, 1984 and 1986). Hence, we cannot exactly test the effects of the number of firms on wholesale price for each commodity. Because that requires the concentration ratio for every quarter. Hence, the following equation can not be directly estimated.

$$Ln\ R\ -\ \rho_0 + \rho_1\ Ln\ P + \rho_2\ CR_3\ Ln\ P + \rho_3\ Ln\ C$$

$$-\ \rho_0 + \xi\ Ln\ P + \rho_3\ Ln\ C$$

where $\xi \equiv \rho_1 + \rho_2 \cdot CR_3$ and CR_3 is the production concentration ratio of the largest three firms in the market for each commodity (or industry). Since ρ_1 and ρ_2 can not be identified from ξ if CR_3 does not vary in the above equation, combining all data across each commodity, the following equation is actually estimated.

$$Ln\ R_{it}\ -\ \rho_0 + \rho_1 LnP_{it} + \rho_2 CR_{3i} LnP_{it} + \rho_3 LnC_{it} + e_{it} \qquad (32)$$

where i and t are indicators for commodity and time, and i and t go from 1 through n and T, respectively. A change in wholesale price due to import price change is

$$\frac{\partial lnR}{\partial LnP} = \rho_1 + \rho_2 \, CR_3 > 0.$$

That is, wholesale price is expected to rise when import price rises with $\rho_1 > 0$ and $\rho_2 < 0$. The latter is because the more concentrated a industry is, the smaller the wholesale price response will be. $\rho_3 > 0$ is expected.

Equation (32) is estimated using the feasible generalized least squares estimator for both cross-section and time-series data. Our data are time-series data of sixteen commodities (or five industries). Each commodity seems to have large variation in the scales of all variables. The variance of e_{it} can be allowed to vary across i. Then, the model becomes heteroscedastic for each commodity. In equation (32), the error component, e_{it}, is decomposed. That is, $e_{it} = \varepsilon_{it} + \mu_i$. Thus, μ_i is random disturbance characterizing the i th commodity (or industry) and constant through time. The following conditions are assumed. $E[\varepsilon_{it}] = E[\mu_i] = 0$, $E[\varepsilon_{it}^2] = \sigma^2_\varepsilon$, $E[\mu_i^2] = \sigma^2_u$, $E[\varepsilon_{it} \, \mu_j] = 0$, for all i, t, and j. $E[\varepsilon_{it} \, \varepsilon_{js}] = 0$ if $t \neq s$ or $i \neq j$, and $E[\mu_i \, \mu_j] = 0$ [12] if $i \neq j$. Also, $E[e_{it}] = \sigma^2_\varepsilon + \sigma^2_u$, and $E[e_{it} \, e_{is}] = \sigma^2_u$ if $t \neq s$.

There are four steps to obtain the coefficients in

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[12]Here observations i and j are assumed to be independent. This assumption may not be plausible for individual commodity data.

equation (32). First, obtain the residual variance estimator in the within-units regression using the least squares dummy variable (LSDV) model.

$$LnR_{jt} = \sum_{i=1}^{n} v_{0i}d_i + v_1 LnP_{jt} + v_2 CR_{3j} LnP_{jt} + v_3 LnC_{jt} + \varepsilon_{jt}$$

where $d_i=1$ when $i=j$, otherwise $d_i=0$. J is each commodity and t is time. From the above model, $\hat{\sigma}^2_\varepsilon$ is obtained. Secondly,

$$\overline{LnR_{j.}} = \omega_0 + \omega_1 \overline{LnP_{j.}} + \omega_2 \overline{CR_{3j}LnP_{j.}} + \omega_3 \overline{LnC_{j.}} + \varepsilon^{**}_j \qquad (33)$$

is regressed to obtain the variance of the residual ε^{**}_j. The "dot" and "bar" notation means that they are the means. Since the variance of ε^{**}_j, σ^2_{**}, equals $\sigma^2_\varepsilon/T+\sigma^2_u$, σ^2_u will be calculated where σ^2_u is the variance of the residual across commodities (or industries). Thirdly, $\hat{\theta}$ will be obtained from $\hat{\theta}=1-[\hat{\sigma}^2_\varepsilon/(T\hat{\sigma}^2_{**})]^{1/2}$. Finally,

$$LnR_{it} - \hat{\theta}\overline{LnR_{i.}} = (1-\hat{\theta})\rho_0 + \rho_1(LnP_{it} - \hat{\theta}\overline{LnP_{i.}})$$

$$+\rho_2(CR_{3i}LnP_{it} - \hat{\theta}\overline{CR_{3i}LnP_{i.}}) + \rho_3(LnC_{it} - \hat{\theta}\overline{LnC_{i.}})$$

is estimated. Then, the coefficients will be reported.[13]

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[13]More careful explanation about the method is in Greene (1990).

B.   Data

Data sources are shown in Appendix. Sixteen commodities
are chosen for testing because of data availability and
relative homogeneity between imports and domestic goods.
Market shares are calculated as domestically consumed domestic
production (quantities marketed minus export) divided by sum
of domestically consumed domestic production and import. As a
measure of domestic cost, nominal wages for each industry is
used. For exchange rates, either effective exchange rates or
units of yen per dollar are used depending on whether import
markets are dominated by U.S. products. Statistics by the
MITI shows that 78.5 percent of all imports from any countries
to Japan are denominated in dollars. For products whose
origins are not the U.S., both variables for exchange rates
are tested and the results are very similar.

Quarterly data are used. About forty observations
(between 1978 and 1989, depending on data availability) are
tested. For the testing of production concentration ratios,
quarterly data between 1982 and 1987 are used. Data for
concentration ratios are not quarterly. They are the numbers
calculated at a certain time of the year by the source
institutions. Commodity specific concentration ratios are
ratios at a certain time in 1980. Concentration ratios for
groups of commodities are published every other year by the
Fair trade Commission and three series of data in 1982, 1984,

and 1986 are actually used.

Data for sixteen commodities are used. The items are acrylonitrile, ethylene, ureo (these are chemicals), cotton fabrics, synthetic fabrics, wool fabrics (these are textile fabrics), round bars, heavy and medium steel plates, sections, hot rolled sheets, hot rolled wide steel strips, wire rods (these are ordinary steel products), kraft liner, newsprint paper, white paper board (these are paper products) and soybeans.

A explanation for each commodity is added in the Appendix.

VI. RESULT

The following tables summarize the results. Table 5 presents the results of the regression for equation (29). The sum of the coefficients for lagged import prices in terms of foreign currency, α_1, the sum of the coefficients for lagged exchange rates, α_2, the coefficients for tariff rate and the coefficients for domestic cost are reported. Since each model has relatively large number of regressors, the R^2 is high. The corrected R^2 are reported and also "*" are marked when the F-statistics are significant at the 0.05 level. The ultimate time length until pass-through effects seem to last, l, are chosen at the point where the corrected R^2 are maximized for each commodity or the F-statistics are statistically significant.[14] Since we lose the degree of freedom because of

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[14]For example, in the case of ureo, the corrected R^2 is maximized when the model includes the eleven-lagged data. However, the F-statistics is significant when the model includes the three-lagged data. The difference of the corrected R^2 is less than one percent. In some cases like this, l are chosen at the point before the decreasing margin of the corrected R^2 starts to become large and the F-statistics is significant. Furthermore, the lag length is chosen to consistently represent the results of the hypothesis testings (presented in Table 6). For example, the results of the hypothesis testings for the model of ureo which includes up to the three-lagged data, are the same as the ones for the model which includes up to the six-, five-, four-, two-, or one-lagged data. When the model has the eight-, or seventh-lagged data, the F-statistics for the hypothesis that $\alpha_1 = \alpha_2$ is not statistically significant. With all of this consideration, the three-lagged model is selected for ureo. The lag lengths of ethylene, ureo, kraft liner and soybeans are chosen by the different criteria from the largest corrected R^2.

Table 5. Wholesale price as a dependant variable

	α_1	α_2	α_3	α_4	1	$\bar{R}^2$
Acrylonitrile	0.04	0.13	-1.6 (1.1)	$6.1*10^{-5}$ ($4.7*10^{-5}$)	9	0.98*
Ethylene	0.53	0.12	-2.4 (4.2)	0.12 (0.018)	9	0.99*
Ureo	0.19	0.90		-0.058 (0.044)	3	0.96*
Cotton fabrics	-0.64	1.0	15* (3.3)	-0.058 (0.15)	10	0.99
Synthetic fabrics	-0.075	0.54	0. 70* (0.24)	0.24* (0.029)	≥8	0.99*
Wool fabrics	-0.084	-0.23	-0.15 (0.15)	0.72 (3.7)	8	0.85*
Round bars	0.042	-0.49	39 (21)	0.41 (0.23)	≥11	0.84
Plates	0.46	0.33	-3.0 (4.2)	0.016 (0.016)	≥11	0.97*
Sections	-0.48	1.1	35* (15)	0.13 (0.072)	9	0.58
Sheets	0.53	0.35	14 (11)	-0.012 (0.031)	≥5	0.63
Strips	0.61	-0.069	-1.2 (4.9)	0.028 (0.016)	9	0.93*
Wire rods	1.3	0.11	9.0 (7.5)	0.014 (0.032)	10	0.85*
Kraft liner	0.60	0.54	3.2* (0.89)	-0.064 (0.065)	6	0.90*
Newsprint paper	0.79	0.81		0.027 (0.022)	4	0.95*
White paper board	-0.28	0.0070	1.3* (0.39)	0.043* (0.016)	10	0.97*
Soybeans	0.37	0.84		0.012 (0.076)	7	0.90*

For α_1 and α_2, the sum of coefficients for lagged variables are reported. Standard errors in parentheses. * shows that the statistics is significant at the 0.05 level. 1 is length of lags.

lagged data and large number of regressors, the time length at which the corrected R^2 are maximized are not obtained for three commodities such as synthetic fabrics, plates and sheets. For them, the corrected R^2 is still increasing at the point with the maximum time length.

Table 6 reports the results for some statistical testings. The t-statistics in the first column show the results for tariff and exchange rate symmetry testing (see page 63). Four of thirteen commodities subject to tariffs (ureo, newsprint and soybeans are tariff free) show asymmetry. The coefficient of tariff rate for sections is very large, and the magnitude seems implausible. The standard error is also very high. These factors are exactly symptoms of multicollinearity. The model in which tariff is an explained variable with the other explanatory variables is regressed (i.e., $Ln(1+\tau)$ is regressed on LnP^* Lne and LnC). The R^2 (0.96) of this regression which is not corrected is larger than the one (0.89) in the model with wholesale price as an explained variable. This shows that the multicollinearity is highly skeptical. For the commodities which showed asymmetry, cotton fabrics, kraft liner and white paperboard, the multicollinearity does not seem like a problem. The coefficients of the exchange rate are relatively very small, compared to the coefficients of tariff, and those coefficients of tariff are statistically significant.

The F-statistics in the second column are the results for exogeneity testing for import prices. The exogenous import prices are rejected for five commodities (i.e., ethylene, ureo, synthetic textile fabrics, white paperboard and soybeans) of sixteen commodities. The source countries of ethylene, ureo and synthetic textile are scattered. On the other hand, the large portion of imported white paperboard and soybeans comes from the U.S. In 1986, 98 percent of the imports was exported from the U.S. The U.S. data show that 46 percent of the exported paper for base stock for milk cartons and similar containers was shipped to Japan in 1986. 75 percent of the imported soybeans are from the U.S. This amount is about 20 percent of exported U.S. soybeans.

The F-statistics in the third column shows whether import price significantly contributes the model. The hypothesis is tested by whether $\alpha_1=\alpha_2=\alpha_3=0$. For round bars and sections, import price change does not influence wholesale price. The model for sections does not explain the data, since the corrected R^2 is not very large and the F-statistics is not significant. In round bars' case, it may be due to overwhelming market share of domestically produced bars. Small bars are ordered in small lots and the demand is complicated and changeable (see the Appendix B). These characteristics may make them inappropriate for large imports.

The results of these testings are very sensitive to the length of the lags. For the exogeneity testing, the results

for ureo and soybeans are sensitive to the lags. For the symmetry testing between the exchange rate and tariff, the result for kraft liner is sensitive.

Table 7 summarizes the short-run and long-run pass-through effects of exchange rates (i.e., the coefficients of Ln e_i, $\sum \eta_i$) for each commodity. The short-run pass-through effects are equal to the effects up to the second quarter ($\eta_0 + \eta_1 + \eta_2$). The long-run effects are the sum of η_i where i goes from zero to 1. The long-run pass-through coefficients show the diversity among the commodities. For some commodities such as ureo, cotton fabrics, sections, kraft liner, newsprint, and soybeans, the coefficients are very large. On the other hand, for acrylonitrile, ethylene, plates, sheets, and wire, the pass-through results are very low. When import price fell mainly because of exchange rate changes, wholesale price of strips was very stable.

Table 8 and 9 summarize the regression results for equations (30) and (31). The coefficients and the corrected R^2 are reported. The hypothesis that the import prices do not influence market shares or import quantity is tested and the result is presented in the last columns. Import prices negatively related to market shares for kraft liner and they are statistically significant. The data show that when import price tends to decrease, the market share by domestic producers increases, while wholesale prices decrease. It seems that domestic producers significantly squeezed their

Table 6. Testings for wholesale prices

	$H_0:$ $\alpha_2=\alpha_3$	$H_0:$ $\alpha_1=\alpha_2$	$H_0:$ $\alpha_1=\alpha_2=\alpha_3=0$
Acrylonitrile	-1.5	0.70	7.9*
Ethylene	-0.58	22*	47*
Ureo		26*	230*
Cotton fabrics	4.0*	2.4	49*
Synthetic fabrics	0.66	35*	546*
Wool fabrics	0.12	0.55	8.7*
Round bars	1.9	0.11	0.61
Plates	-0.80	0.19	36*
Sections	2.2*	3.7	3.0
Sheets	1.2	0.47	11*
Strips	-0.28	0.085	15*
Wire rods	1.2	4.5	15*
Kraft liner	2.7*	0.24	31*
Newsprint paper		0.19	200*
White paper board	3.3*	15*	26*
Soybeans		70*	41*

The t-statistics for the first column. The F-statistics for the second and the third columns.

Table 7. Pass-through effects

	Short-run	Long-run
Acrylonitrile	0.20	0.13
Ethylene	0.31	0.12
Ureo	0.17	0.90
Cotton fabrics	0.50	1.0
Synthetic fabrics	0.40	0.54
Wool fabrics	-0.02	-0.55
Round bars	-0.51	-0.49
Plates	0.15	0.33
Sections	0.23	1.1
Sheets	0.12	0.35
Strips	0.10	-0.069
Wire rods	0.20	0.11
Kraft liner	0.02	0.83
Newsprint paper	0.31	0.81
White paper board	0.053	0.0070
Soybeans	0.58	0.84

profit margin to gain more market share when import prices were considerably falling. The coefficients of import prices for sheets also show negative sign, but the explanatory power of import prices is not statistically significant. For other commodities, signs for the coefficients of import prices are as expected. In Table 9, twelve of sixteen commodities support negatively slopped import demand function. The coefficients of import prices have the same sign as the coefficients of domestic costs for nine of sixteen commodities. This can not be explained in the model. As we can seen in Table 3, the signs should be reversed. However, the coefficients of domestic costs are not statistically significantly different from zero and the explanatory power of import prices is not statistically significant for the half of the commodities.

Table 10 summarizes Tables 5, 8, and 9. The mark "*" represents that import price or domestic cost statistically significantly influences wholesale price, market share or import quantity. The mark "?" means that the sign was contradictory to the expected one.

More specifically, the "*" in the column for $\partial R/\partial P$ should coincide with "*" on the third column in Table 6. The "*" on the columns for $\partial R/\partial C$, $\partial S/\partial P$, $\partial S/\partial C$, $\partial I/\partial P$, and $\partial I/\partial C$, respectively, reconcile the "*" for α_4 in Table 5, the last column in Table 8, β_2 in Table 8, the last column in Table 9 and γ_2 in Table 9. The blank cells mean that an impact of

Table 8. Market shares as dependent variables

	β_1	β_2	l	$\bar{R}^2$	$H_0:\beta_1=0$
Acrylonitrile	0.056	$-0.21*10^{-5}$ (-0.00013)	3	0.40^*	0.37
Ethylene	0.87	0.058 (0.042)	4	0.71^*	27^*
Ureo	0.57	0.052 (0.053)	4	0.91^*	230^*
Cotton fabrics	0.27	0.0062 $(0,041)$	4	0.96^*	60^*
Synthetic fabrics	0.073	-0.061^* (0.016)	1	0.75^*	16^*
Wool fabrics	0.94	-0.012^* (0.005)	5	0.78^*	13^*
Round bars	0.0015	-0.0059 (0.0038)	1	0.12	1.8
Plates	0.097	0.0055 (0.025)	6	0.69^*	0.79
Sections	0.014	-0.0071 (0.0033)	5	0.62^*	29^*
Sheets	-6.8	-0.41 (0.37)	5	0.75^*	4.1
Strips	0.62	-0.026 (0.031)	4	0.65^*	12^*
Wire rods	0.11	0.038 (0.019)	3	0.41^*	15^*
Kraft liner	-0.14	0.033 (0.022)	5	0.61^*	22^*
Newsprint paper	0.078	-0.029 (0.022)	6	0.68^*	2.3
White paper board	0.0061	0.010 (0.0057)	5	0.21	0.87
Soybeans	0.046	-0.040^* (0.0086)	5	0.71^*	10^*

Standard errors in parentheses. * shows that the statistics is significant at 0.05 level. The last column reports the F-statistics.

Table 9. Import quantities as dependent variables

	γ_1	γ_2	l	$\bar{R}^2$	$H_0:\gamma_1=0$
Acrylonitrile	0.27	0.0016 (0.0011)	6	0.51*	0.29
Ethylene	-0.97	-0.036 (0.14)	5	0.60*	48*
Ureo	-2.9	-0.39 (0.40)	4	0.82*	110*
Cotton fabrics	-1.1	-0.12 (0.21)	3	0.70	24*
Synthetic fabrics	-0.43	0.13 (0.28)	1	0.74	10*
Wool fabrics	-3.0	-0.19 (0.53)	4	0.89	27*
Round bars	-1.8	-0.52 (0.85)	2	0.71*	46*
Plates	0.21	0.20 (0.23)	6	0.96*	2.1
Sections	-2.8	0.87* (0.42)	5	0.81*	73*
Sheets	1.3	-0.0027 (0.25)	5	0.48	0.36
Strips	-1.3	0.34 (0.25)	8	0.28*	3.1
Wire rods	-2.7	-2.0 (1.1)	6	0.46*	1.4
Kraft liner	0.15	-0.16 (0.13)	4	0.35*	0.15
Newsprint paper	-0.49	0.42 (0.24)	5	0.81*	0.90
White paper board	-0.33	-0.51 (0.33)	5	0.31	0.68
Soybeans	-0.19	0.33* (0.043)	4	0.60*	15*

Standard errors in parentheses. * shows that the statistics is significant at the 0.05 level. The last column reports the F-statistics.

Table 10. The summary

	$\partial R/\partial P$	$\partial R/\partial C$	$\partial S/\partial P$	$\partial S/\partial C$	$\partial I/\partial P$	$\partial I/\partial C$
Acrylonitrile	*					
Ethylene	*		*		*	
Ureo	*		*		*	
Cotton fabrics	*		*		*	
Synthetic fabrics	*	*	*	*	*	
Wool fabrics	*		*	*	*	
Round bars					*	
Plates	*					
Sections			*		*	*
Sheets	*					
Strips	*		*			
Wire rods	*		*			
Kraft liner	*		?			
Newsprint paper	*					
White paper board	*	*				
Soybeans	*		*	*	*	*

* shows statistically significant relationship. ? means that the sign is wrong.

independent variable (P or C) on dependent variable (R, S, or I) is not statistically significant.

Equations, (29), (30), and (31) are estimated by ordinary least squares (OLS). Only when the hypothesis that the first order autoregressive disturbance is zero is rejected using the Durbin-Watson statistics for several commodities, feasible generalized least squares (FGLS) (or estimated generalized least squares) are used. For the hypothetical testing when the first-order autoregressive disturbance is serious, OLS are used after the data are transformed by the autoregressive model. Specifically, "Proc Autoreg" in SAS/ETS software is

used with output statement which identifies input data to be transformed.

The commodities can be classified into several groups. Some commodities such as soybeans and synthetic textile belong to the first group. Their market environments appear to be competitive. For example, in the case of soybeans, their wholesale price, market share and import quantity are sensitive to changes in import price and domestic cost. Furthermore, the pass-through coefficient was as high as 80 percent. A change in domestic cost does not affect wholesale price. This may be explained by very small market share by domestic producers (Table A2). Secondly, for some commodities such as ethylene, ureo, and cotton fabrics, the import prices influence the domestic economy while a change in domestic costs does not at all. For some other commodities, import price does not necessarily affect all of these three variables. A change in import price of strips and wire rods affects whole sale price and market share. A change in import price of acrylonitrile, sheets, plates and newsprinting paper affects wholesale price, but that does not affect market share or import quantity. A change in import price of bars affects import quantity while that does not affect wholesale price or market share. For these ten commodities, a change in domestic cost does not influence any variables. This can not be well-explained by the model. Table 4 shows that there should be still positive relation between wholesale price and domestic

cost, while there will be no effect of domestic cost on market share or import quantity under ratio quota. One of the possible explanations is that only labor cost for the estimation of production cost may not be appropriate.[1] Japanese producers may not perceive short-run fluctuations in labor cost as their prominent determinant to influence their decisions. Particularly, if we recognize the Japanese employment system as the "guaranteed employment" in which life time employment is still common, labor may be treated as a fixed cost.

Equation (32) is regressed both with production concentration ratios (only 1980) and industry concentration ratios (for 1982, 1984, and 1986). The results are respectively presented in Table 11. For the former case, the coefficient for the interactive term of ratio and import price, ρ_2, has a wrong sign and is statistically significant. It indicates that the more concentrated a market is, the larger the wholesale price response is, which does not make sense. The problem in this estimation is that the group mean regression in (33) may be heteroscedastic. For equation (32) with industry concentration ratios which are obtained every two years, the coefficient for domestic cost, ρ_3, has a wrong

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[1]Ohno (1989) showed that production cost in machinery and equipment industries is dominated by labor cost in Japan. Hooper and Mann (1989) used a weighted average of unit labor cost (0.65) and price index for raw material and energy inputs (0.35) for production cost in manufacturing industries.

sign but it is not statistically significant. The data do not necessarily support the role of the number of producers which is tested using production concentration ratios.

Table 11. The models for testing concentration ratios

	Equation (32) with production concentration ratios for each good	Equation (32) with industry concentration ratios for each industry
p_0	-0.11 (0.053)*	0.053 (0.035)
p_1	0.11 (0.019)*	0.79 (0.087)*
p_2	0.00022 (0.000059)*	-0.0010 (0.00014)*
p_3	0.013 (0.0085)	-0.041 (0.025)
R^2	0.28	0.33
F	50	61

Standard errors in parentheses. * shows that the coefficient is statistically different from zero at the 0.05 level.

VII. CONCLUSION

In order to investigate the Japanese trade policies, the model which differentiates several possible "invisible" restrictions is presented. Using sixteen commodities, whether the markets are competitive or quantitatively restricted is tested. Two commodities are reported to be probably competitive. Import prices of some commodities such as white paperboard and soybeans seem endogenously determined. The question, why domestic costs do not seem to affect the variables, remained to be well-explained. Since Japanese producers do not increase wholesale price when domestic cost increases, we can not simply conclude from the model that they try to maintain market share. It seems that domestic factors are not determinants to alter the system. A risk which is caused by a change in domestic cost may be diversified in the distributional system.

Furthermore, the following results are found. The magnitudes of the pass-through coefficients vary among the commodities. While some commodities which seem to be in competitive environments have very high coefficients, the coefficients for the other commodities are very small. The lag length for the pass-through odes not show special difference form U.S. data. The symmetry of exchange rates and tariffs is also tested. Four of thirteen data rejected the hypothesis. The test of the impact of number of domestic

producers using concentration ratios did not show clear
evidence for that role.

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IX. APPENDIX

A. Data Source

Quantities marketed/exported/imported, import/export prices
and wholesale prices
    Yearbook of Paper and Pulp Statistics
    Yearbook of Iron and Steel Statistics
    Yearbook of Textiles Statistics
    Yearbook of Chemistry Statistics
    (Compiled by Research and Statistics Department:
    Minister's Secretariat. MITI)

Wholesale price index
    Price Index Annual (The Bank of Japan)

Import/export value/quantities
    Japan Export and Imports (Japan Tariff Association)

Wage
    Japan Statistical Yearbook
    (Stat.Bureau Price Minister's Office)

Tariff
    Customs Tariff Schedules of Japan
    (Japan Tariff Association)
    Changes in Tariff Schedule (Japan Tariff Association)

Production/industry concentration ratio
    Yearly Report (the Fair Trade Commission)

Exchange Rate
    International Financial Statistics (IMF)

B. Description for Commodities

Among chemical products, acrylonitrile is used to

manufacture acrylic rubber and fibers, and ethylene is a

source of many organic compounds, in welding and cutting

metals. Ureo is used as a fertilizer. The 96.3 percent of

import of acrylonitrile is dominated by the largest six

general trading companies. For domestically produced

acrylonitrile, transactions among the same "Keiretsu" are overwhelming. Ureo industry has been designated as a depressed industry and applied to the depressed industry cartel. The largest four firms completely dominate the industry.

There are two types of wholesalers in steel industry: first wholesalers and second wholesalers. The former includes the large nine general trading companies and the other smaller specialized wholesalers (about 70-80 firms). The percentage of the quantities handled by the general trading companies was 56.7 in 1980. Each of the large steel producers has one particular general trading company as its main trading partner and it maintains business relationship on a smaller scale with the other wholesalers. Domestic products are handled by the first wholesalers, and go through the second wholesalers. In general, the first wholesalers do not handle imports, while the second wholesalers do because of less expensive prices. Heavy and medium steel plates and hot rolled sheets (both are represented as plates and sheets in tables) are used to manufacture automobiles and electric appliances. Demand for sheets and plates has expanded over the years along with the development of those industries. In Japan, the percentage of direct sales by steel-makers is small. The wholesalers have played a major role in the Japanese steel distribution. However, there have been a increasing trend for some users to access major domestic producers. Toyota and Nissan have been

requesting the type of direct sales and have restricted the activities by the general trading companies.

Small bars, which represent large portion of round bars, are used for construction. The demand for small bars is complicated and very changeable. The orders come in small lots with unspecified number from small construction firms. That can be symbolically shown in Table A1. A very large portion of small bars is distributed by the general trading companies and they overwhelmingly control the market (Kondo).

Plates, sheets, hot rolled wide steel strips (strips in the tables) and wire rods are produced by large integrated iron and steel manufactures. On the other hand, productions of sections and especially bars are much more scattered.

Table A1.   Production concentration Ratios (1980) by the largest three producers

Acrylonitrile	65.4
Ethylene	34.5
Ureo	63.9
Cotton fabrics	9.6
Synthetic fabrics	47.4
Wool fabrics	18.2
Round bars	14.6
Plates	70.7
Sections	45.0
Sheets	79.8
Strips	78.6
Wire rods	71.6
Kraft liner	29.3
Newsprint paper	63.9
White paper board	36.2
Soybeans (edible soybean oil)	54.2

In order to reduce trade friction with the U.S., Japan has been significantly decreasing tariffs on several paper products. A tariff rate for Kraft liner has fallen from 15 percent to 3.5 percent between 1978 and 1988, while one for White paper board from 10 percent to 2.5 percent during the same period. Kraft liner is used for a surface of paper board. White paper board is used mainly for containers of edible liquid such as milk, thick printing paper such as colored post cards, and printed boxes for cosmetics, pharmacies etc. and so on. Production of newsprint paper is more concentrated compared to production of kraft liner of white paperboard.

Data of some textile fabrics and soybeans are also used for empirical testing.

The following tables show ranges of the level of market shares of domestic products, and of relative changes in wholesale prices, R, import prices, $\bar{P}$, and domestic costs, C, during the tested period.

Table A2. Market shares by domestic products

Acrylonitrile	54.945-99.762
Ethylene	54.137-93.062
Ureo	56.254-99.312
Cotton fabrics	53.800-99.312
Synthetic fabrics	82.701-92.686
Wool fabrics	89.438-98.654
Round bars	96.420-100.00
Plates	76.662-99.662
Sections	96.652-99.984
Sheets	-11.751-75.320
Strips	68.855-99.549
Wire rods	86.424-99.996
Kraft liner	82.020-94.244
Newsprint paper	85.078-98.465
White paper board	96.977-99.434
Soybeans (edible soybean oil)	3.45-11.561

Table A3. A range of relative change of R and P
for each good, and C for each industry

Acrylonitrile	0.82-1.20	0.46-1.17	
Ethylene	0.72-1.02	0.32-1.06	
Ureo	0.55-1.02	0.24-1.0	1-1.46
Cotton fabrics	0.73-1.12	0.50-1.13	
Synthetic fabrics	0.76-1.05	0.40-1.03	
Wool fabrics	1.0-1.23	0.58-1.01	1-1.35
Round bars	0.68-1.43	0.91-52.3	
Plates	1.0-1.23	0.83-1.41	
Sections	0.92-1.24	0.45-1.44	
Sheets	0.97-1.04	0.88-1.15	
Strips	1.0-1.19	0.77-1.33	
Wire rods	0.99-1.22	0.65-1.32	1-1.48
Kraft liner	0.69-1.08	0.61-1.13	
Newsprint paper	1.0-1.32	0.82-1.44	
White paper board	0.98-1.25	0.85-1.63	1-1.44
Soybeans	0.87-2.32	0.69-2.08	1-1.29

PART II. MEASURING MARKET POWER FOR MARKETING FIRMS:

THE CASE OF JAPANESE SOYBEAN MARKETS

I. INTRODUCTION

Bresnahan (1982) introduced a measure of market power which can be econometrically estimated. This part extends his idea for marketing firms which have potential for price discrimination. Also, Japanese soybean markets are investigated with the model, suggesting an unusual price setting for several years after the U.S. soybean embargo. An analysis for welfare loss and exchange rate transmission is also presented.

II. MEASURING MARKET POWER COEFFICIENTS FOR MARKETING FIRMS

The firm's profit maximizing rule is to set perceived marginal revenue equal to marginal cost. In a competitive market, any attempt by one firm to raise prices by restricting supply would result in increased supply by other firms so that no individual firm has any power to influence market prices. Hence, their perceived marginal revenue equals price and in equilibrium they equate their marginal revenue to marginal cost. When market power exists, both perceived marginal revenue and marginal cost are less than price.

Bresnahan (1982) argues that market power in an industry can be measured as a coefficient, λ, in the following relation between price (P) and quantity (Q):

$$P - MC - \lambda Q \frac{\partial P}{\partial Q}$$

This function postulates equality between perceived marginal revenue and marginal cost. When $\lambda=0$, the market is perfectly competitive. When $\lambda=1$, the market is monopolistic. In an oligopolistic market structure, λ lies between zero and unity. Let inverse demand and marginal cost be $P=G(Q,Y,\alpha)$ and $MC=C(Q,W,\beta)$, where α and β are parameters, while Y and W are exogenous consumer income and wages, respectively. Then the pricing relation becomes

$$P - C(Q,W,\beta) - \lambda Q \frac{\partial G}{\partial Q}(Q,Y,\alpha)$$

Treating P and Q as endogenous variables, the demand function
and pricing relation are simultaneously estimated to reveal
the market power coefficient, λ.

However, Bresnahan explains that the degree of market
power, λ, cannot be identified unless an additional
interaction between price and income is included in a system
of linear demand and marginal costs. If a change in the
exogenous variable on the demand side only, Y, causes a
parallel shift of the demand function, the hypotheses of
competition and monopoly can not be differentiated.

However, when characteristics of marketing firms and
their sales environment are recognized, Bresnahan's additional
variable can become unnecessary. For illustration, let us
consider a general formulation of the marketing problem. Let
us assume that firms buy from producers and sell the product
to human consumers and large scale processors. Further,
marginal revenues differ in the product markets due to
differences in demand elasticities and market power.
Marketing firm's costs arise due to material and processing
costs. Costs are also higher for the human consumption
market, owing to local distribution costs.

The following equation (1) shows that the demand for
direct human consumption depends on real price and real
income. Equation (2) tells us that the demand for processing
is determined by real margins to produce oil and meals from
soybeans or rapeseed, and the capacity of factories.

$$D_1 = \alpha_0 - \alpha_1 \frac{P_1}{CPI_1} + \alpha_2 \frac{Y}{CPI_1} \qquad (1)$$

$$D_2 = \beta_0 + \beta_1 \left(\frac{Y_s^o P_s^o + Y_s^m P_s^m - P_2}{CPI_2} \right) + \beta_2 \frac{M_R}{CPI_2} + \beta_3 C \qquad (2)$$

where D_i, P_i are quantity demanded and price in market i.[1] In turn, perceived marginal revenues depend on market power and the parameters of the demand functions:

$$MR_1 = P_1 - \lambda_1 \left(\frac{D_1 CPI_1}{\alpha_1} \right) \text{ and } MR_2 = P_2 - \lambda_2 \left(\frac{D_2 CPI_2}{\beta_1} \right)$$

where MR_i are perceived marginal revenues in market i.

A general formulation of the cost function specifies material and processing components and adjusts processing costs with wages (W):

$$C(Q_1, Q_2) = P^*(Q_1 + Q_2) + W\{ [\alpha_s(Q_1 + Q_2) + \frac{\beta_s}{2}(Q_1 + Q_2)^2] + [\alpha_{s1} Q_1 + \frac{\beta_{s1}}{2} Q_1^2] \}$$

where Q_i are marketing firms' outputs for market i. Notice that costs are higher in the local market of the human consumption when $\alpha_{s1} \neq 0$. Also, marginal costs are different and increasing when β_s and β_{s1} are positive.

Pricing relationships for both product markets can be developed from solutions to the profit maximization problem for marketing firms. The profit function is:

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[1]Additional variable definitions are given in Appendix.

$$\pi - P_1 D_1 + P_2 D_2 - C (Q_1, Q_2).$$

This function can be expressed in terms of D_i's by noting that $Q_1 = D_1$ and $Q_2 = D_2 + S$, where S is the change in ending stocks. Then the first order conditions for profit maximization are:

$$\frac{\partial \pi}{\partial Q_1} - MR_1 - \{P^*+W[\alpha_s+\beta_s(D_1+D_2+S)] + W[\alpha_{s1}+\beta_{s1}D_1]\} - 0$$

$$\frac{\partial \pi}{\partial Q_2} - MR_2 - \{P^*+W[\alpha_s+\beta_s(D_1+D_2+S)]\} - 0.$$

The implied pricing functions are:

$$P_1 - \frac{\lambda_1}{\alpha_1}(CPI_1 D_1) + (\alpha_s+\alpha_{s1})W+(\beta_s+\beta_{s1})(WD_1)+\beta_s(WD_2)+\beta_s(WS)+P^* \quad (3)$$

$$P_2 - \frac{\lambda_2}{\beta_1}(CPI_2 D_2) +\alpha_s W+\beta_s(WD_1)+\beta_s(WD_2)+\beta_s(WS)+P^*. \quad (4)$$

Let us check the necessary conditions of identification for the simultaneous equations. Rewriting (3) and (4),

$$P_1 - \phi_1(CPI_1 D_1)+\phi_2 W+\phi_3 WD_1+\beta_s(WD_2+WS)+P^* \quad (3)'$$

$$P_2 - \phi_4(CPI_2 D_2)+\alpha_s W+\beta_s(WD_1+WD_2+WS)+P^*. \quad (4)'$$

where $\phi_1 \equiv \lambda/\alpha_1$, $\phi_2 \equiv \alpha_s+\alpha_{s1}$, $\phi_3 \equiv \beta_s+\beta_{s1}$, and $\phi_4 \equiv \lambda_2/\beta_1$.

Now equations, (1), (2), (3)', and (4)' can be treated as usual linear simultaneous equations, ignoring some parameter restrictions. If these equations satisfy the necessary condition without considering the parameter restrictions, it means that they can be surely identified with the parameter

restrictions. Hence, we apply the ordinary order condition for each equation for identification and show that the each equation satisfies the condition. There are ten endogenous variables and five exogenous variables:

$$\text{endogenous}: P_1, P_2, D_1, D_2, \frac{P_1}{CPI_1}, \frac{Y_s^o P_s^o + Y_s^m P_s^m - P_2}{CPI_2}, CPI_1 D_1, CPI_2 D_2, WD_1,$$

$$WD_2 + WS$$

$$\text{exogenous}: \qquad \frac{Y}{CPI_1}, \frac{M_R}{CPI_2}, C, W, P^*$$

The criteria for identifying an equation is that the number of included endogenous variables less one must be less than or equal to the number of excluded exogenous variables. For instance, two endogenous variables are included in equation (1) (D_1 and P_1/CPI_1). Four exogenous variables are excluded. Thus, equation (1) is identified. Following the same rule, equations (2), (3)' and (4)' are also identified. Furthermore, λ_1 and λ_2 can both be determined from the first coefficient of the respective price equations and demand price response parameters (α_1 and β_1). Thus, the oligopoly solution is identified for marketing sectors with two product markets.

For subsequent empirical investigations, the capacity adjustments by marketing firms should also be included. Now the profit function is

$$\pi = P_1 D_1 + P_2 D_2 - [P^* \ (Q_1 + Q_2) \ + \ W \ (\alpha_s \ (Q_T - \tilde{Q}_T) \ + \ \frac{\beta_s}{2} \ (Q_T - \tilde{Q}_T)^2$$

$$+ \ \alpha_{s1} \ (\ Q_1 - \tilde{Q}_1 \ ) \ + \ \frac{\beta_{s1}}{2} \ (\ Q_1 - \tilde{Q}_1 \ )^2)]$$

where $\bar{Q}_T$ and $\bar{Q}_1$ are capacities, and $Q_T = Q_1 + Q_2$.[23] Now the pricing functions are

$$P_1 = \frac{\lambda_1}{\alpha_1} CPI_1 D_1 + (\alpha_s + \alpha_{s1}) \ W + (\beta_s + \beta_{s1}) \ WD_1 + \beta_s WD_2 + \beta_s WS - \beta_s W\tilde{Q}_T - \beta_{s1} W\tilde{Q}_1 + P^* \ (5)$$

$$P_2 = \frac{\lambda_2}{\beta_1} CPI_2 D_2 + \alpha_s W + \beta_s WD_1 + \beta_s WD_2 + \beta_s WS - \beta_s W\tilde{Q}_T + P^* \qquad (6)$$

where (6) is identical to (4) except one term, $-\beta_s W\bar{Q}_T$, and there are more additional terms in (5) compared to (3). The four equations (1), (2), (5), and (6) are still identified as are λ_1 and λ_2.

The cost structure of marketing firms is an empirical issue. Short-run marginal cost functions could be constant ($\beta_s = 0$) in both markets when capital stock (handling and storage equipment) is fixed and variable costs are proportional to labor and energy used for handling. Further, Thompson and Dahl hypothesize economies of scale in transportation, information network, risk bearing and storage

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[2]Capacities such as C in equation (2), $\bar{Q}_T$ and $\bar{Q}_1$ are obtained by connecting peaks of variables such as D_2, Q_T and Q_1, respectively.

[3]Instead of taking the difference of output and capacity, the ratio may be an alternative way.

space for U.S. grain exporters. As scale of operations increase and firms accumulate capital, marginal cost of marketing firms could decrease over longer run periods. The inverse relation between marginal cost and capacity in the above cost function potentially accounts for these long run cost adjustments.

Japanese Soybean Markets

Soybean markets in Japan seem well-suited for testing this model. There are two primary soybean usages in Japan. One is for direct human consumption as food (Tofu, Natto, etc.) except oil, and the other is for livestock feeds and oil. The former market accounts for 30 percent of all soybean consumption in the nation. More than 88 percent of soybeans are imported with the primary sources being the U.S., China, and Brazil. Crushing mills are located at the seacoast to take advantage of low transportation costs. Other imported soybeans are unloaded there and sent to urban areas where human consumption points are concentrated.

Figure 1 shows that import point prices and export prices from the U.S. adjusted by the exchange rate and transportation costs have behaved similarly. Similarly, Tokyo wholesale prices from the early 1970s and post 1979 period closely reflect import prices. However, there appears to be an episode of extremely high wholesale prices during 1973-1978 after the U.S. embargo in 1973. World-wide supplies were

short in 1973, and all import and wholesale prices increased.
However, domestic wholesale prices increased more than
proportionately and remained high even after world prices
declined. This period of high domestic prices may have been
triggered by the U.S. embargo. The soybean embargo was in
effect for five days beginning June 21, 1973. Afterwards,
export licenses were set at 50% of unfilled export contracts
until September 1, 1973 (Kost, et al.).[4]

Figure 2 represents soybeans processed for oil and meals,
(sold in market 2) and soybean consumed directly (sold in
market 1). Figure 3 shows changes in soybean ending stocks
for processors. These graphs suggest that there was an
inventory buildup in anticipation of the embargo. However,
consumption behavior does not seem unusual, i.e., there was a
consumption decrease in the presence of high domestic prices
during the high prices of the early seventies.

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[4]After the Tanaka government was established, the public
finance policy they implemented (pumping money) induced "crazy
prices" in 1973. The general trading companies speculated in
daily necessities and held them off the market in anticipation
of further price rises. The oil crisis followed and the
inflation which already existed was accelerated. During 1973,
the country experienced a 29 percent inflation rate.
Industrial cartels were making huge profits under these
circumstances. This specific economic environment in 1973 may
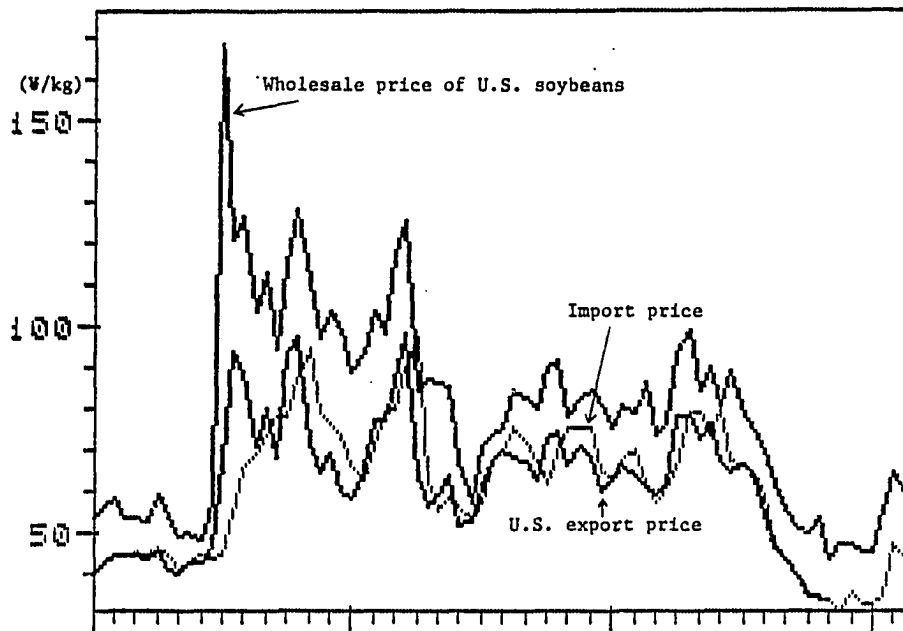be another possible explanation.

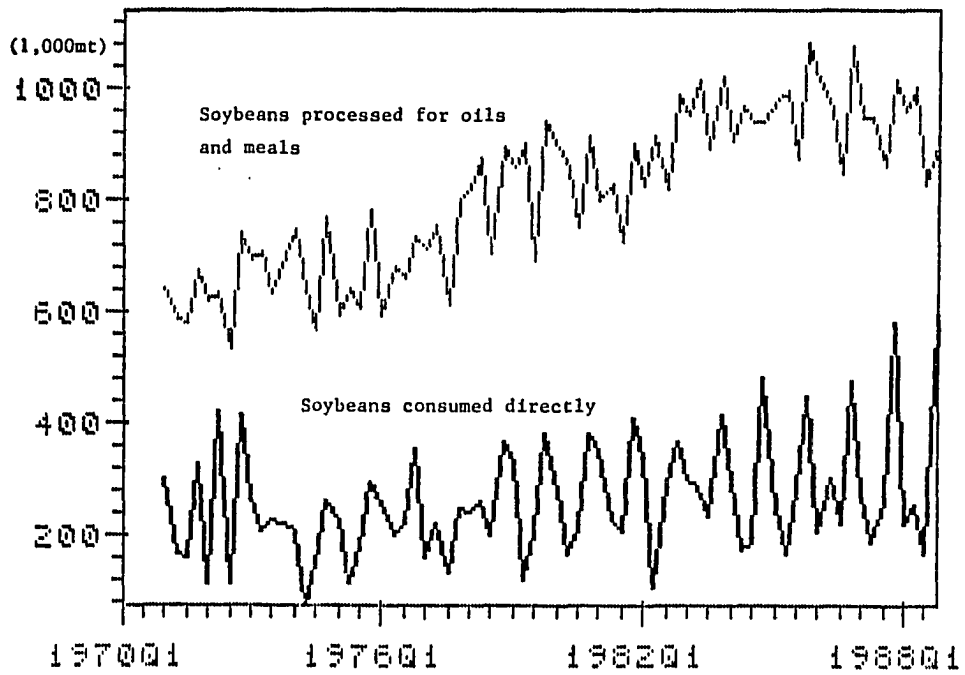**Figure 1. Wholesale price/import price/export price**

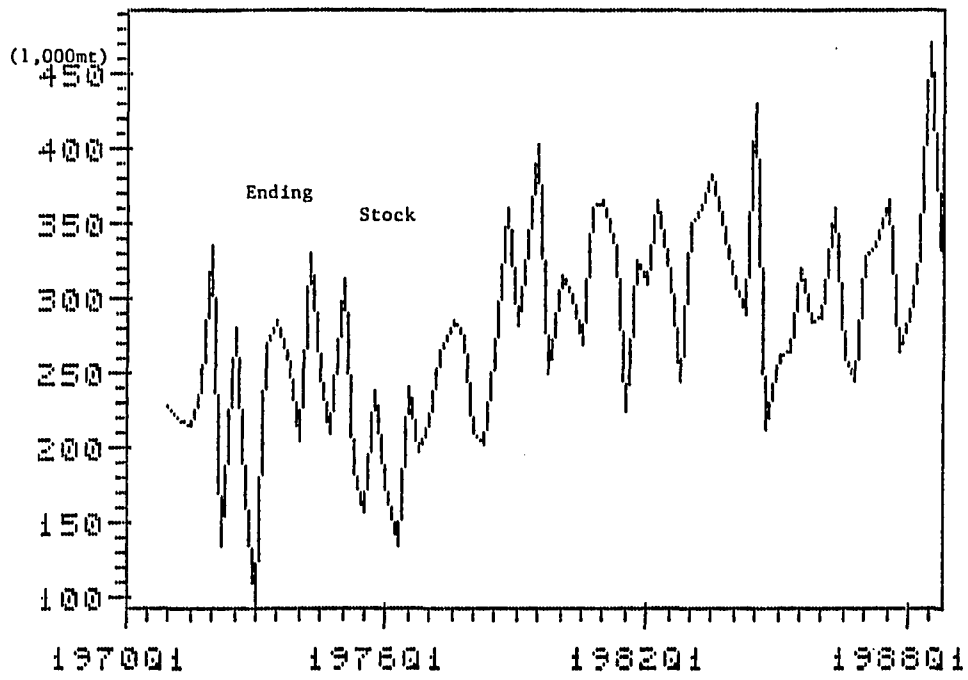**Figure 2. Soybeans processed for oils and meals/soybeans consumed directly**

Figure 3. Ending stock

III. DATA AND ESTIMATION FOR THE SOYBEAN MARKET

Specification of demand relationships in Japanese soybean markets and preliminary hypothesis testing produced a more precise system of demand and pricing functions. These functions are shown below as equations (7) through (10).

The demand function for the human consumption market (1) is a per capita function. Then population becomes a scaling factor for independent variables in the market demand function, as shown in equation (7) below. Also, separability for food consumption is assumed, so Y/CPI_1 and P_1/CPI_1 in equation (1) are the ratios of nominal household expenditure on food and nominal soybean wholesale price to a consumer price index on food (Phlips, p. 73). Finally, seasonal trends in soybean consumption are taken into account with dummy variables: one for both the second and third quarters, and the other for the fourth quarter.

In market 2, rapeseed margins are included as an exogenous variable in equation (8) since it is expected that soybeans would be replaced by this important substitute if rapeseed profitability increased. A capacity measure is also included as an explanation for the secular increase in demand.

The equations are estimated with three-stage least squares approach. The reason to use the simultaneous system is that the parameters are nonlinear and we need to test the statistical significance for the market power coefficient.

The SAS/ETS provides the methods to estimate parameters in a simultaneous system of nonlinear equations, i.e., SYSNLIN procedure. In the procedure, we specify both endogenous and exogenous variables, initial values of parameters to be estimated, and the model. In order to test several hypotheses, we first run the unrestricted model, and then run the restricted model, we specify the matrices (such as estimates of the true covariance of the equation errors) which are obtained from the unrestricted model (SAS/ETS manual 1984, 526). Finding the difference of the statistics labeled OBJECTIVE*N for both models, and using a Chi-square table to compare this difference with the Chi-square statistics, we conclude the results for the hypotheses.

Several preliminary specifications of pricing equations were also examined. In particular, the data supported the notion of constant marginal costs for both markets. That is, the coefficients β_S and β_{S1} were not statistically significant. With regard to market power, the coefficient λ_2 was not statistically significant. Similarly, the market power coefficient λ_1 was not statistically significant in some preliminary specifications. However, λ_1 was found to be statically significant when we specified "an episode" of monopoly pricing between 1973 and the first half of 1978. Hence, equation (5) is slightly changed as follows:

$$P_1 - \frac{CPI_1 D_1}{N\alpha_1} \; [\lambda_{11}d + \lambda_{12}(1-d)] + (\alpha_s + \alpha_{s1}) \, W + (\beta_s + \beta_{s1}) \, WD_1$$

$$+ \; \beta_s WD_2 \; + \; \beta_s WS \; - \; \beta_s W\tilde{Q}_T \; - \; \beta_{s1} W\tilde{Q}_1 \; + \; P^* \qquad (5)'$$

where d=1 between 1973 and 1978; d=0 otherwise.

Then the equations are simultaneously estimated and the hypothesis $\lambda_{12} = 0$, $\lambda_2 = 0$, $\beta_s = 0$ and $\beta_{s1} = 0$ is tested. The X^2 is 7.72, which is less than $X^2(4, .05)$. The hypothesis can't be rejected at the 0.05 level.

A typical system of estimation equations for Japan's soybean market is shown below:

$$D_1 - \alpha_0 N - \frac{\alpha_1 P_1}{CPI_1} \, N + \alpha_2 \frac{YN}{CPI_1} + \alpha_3 D_{23} N + \alpha_4 D_4 N \qquad (7)$$

$$D_2 - \beta_0 + \beta_1 \frac{MS}{CPI_2} + \beta_2 \frac{MR}{CPI_2} + \beta_3 C \qquad (8)$$

$$P_1 - \frac{\lambda_{11}}{\alpha_1} \frac{CPI_1 \cdot D_1}{N} \cdot d + (\alpha_s + \alpha_{s1}) \, W + P^* \qquad (9)$$

$$P_2 - \alpha_s W + P^* \qquad (10)$$

The list of variables, their definitions and data source are given in Table 1. Quarterly data for 1971 through 1988 are used for each variable. Most data come from domestic Japanese sources.

There are three factors which enabled us to identify the market power coefficients. They are the two market assumption, the demand specification (involving exogenous CPI

and N), and the marginal cost to be linearly homogeneous in prices which is derived after the hypothesis testing.

IV. RESULT

Table 1 summarizes the empirical results. Two sets of estimates are shown. One is a full system while the other includes only direct human consumption market. The latter system is reestimated because of concerns about the plausibility of the import unit value as an accurate measure of transactions prices in the processing market (P_2). Quantities of soybeans consumed in market 1 demonstrate a statistically significant negative relationship with relative prices of soybeans and a positive relationship with household expenditure on food. Statistically significant seasonal trends show that direct human consumption of soybeans is affected by seasonal factors, high in the fourth quarter and low in the second and third quarters. Food made from soybeans, such as tofu and aburaage, are largely consumed during the new year's celebration, the most important Japanese holiday, and high expenditure on food during the fourth quarter may be supported by the large additional income provided by December bonuses.

The estimation of equation (8) shows that quantities of soybeans processed in market 2 are positively related to soybean margins and capacity. There is a negative relationship between quantities and rapeseed margins but it is not significant.

In equation (10), the hypothesis that an intercept term

equals zero is not rejected. In equation (9), $\alpha_{s1} \neq 0$ with t = 7.2. These results specify the cost functions for the Japanese soybean marketing firms as

$$TC = P^*(Q_1 + Q_2) + \alpha_s W(Q_1 + Q_2 - \tilde{Q}_T) + \alpha_{s1} W(Q_1 - \tilde{Q}_1)$$

The statistically significant λ_1 (t=2.53 or 2.35) suggests that the wholesale market was not competitive between 1973 and the first half of 1978. The marketing firms might have exercised market power during this period.[5]

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[5]The increase in price in 1973 might be due to unusual circumstances. The model was tested excluding the four observations in the year, but λ_1 was still statistically significant. The results are reported in the last column of table 1.

Table 1. Estimation results for equations (7), (8), (9), and (10)

	Combined System		Human Consumption		Market Without 1973	
α_0	0.024	(1.5)	0.022	(1.4)	0.026	(1.6)
α_1	0.0047	(2.6)	0.0043	(2.4)	0.0054	(3.0)
α_2	0.41	(0.17)	0.69	(0.29)	0.13	(0.05)
α_3	-0.0049	(-2.0)	-0.0050	(-2.0)	-0.0047	(-1.9)
α_4	0.011	(2.3)	0.011	(2.2)	0.012	(2.4)
β_0	-150	(-1.6)			-150	(-1.6)
β_1	360	(1.8)			400	(2.0)
β_2	81	(0.36)			60	(0.26)
β_3	0.98	(13)			0.98	(13)
α_s	0.00019	(0.18)			0.00019	(0.18)
α_{s1}	0.021	(7.2)			0.023	(6.8)
$\alpha_s+\alpha_{s1}$			0.021	(7.6)		
λ_{11}	0.081	(2.5)	0.076	(2.4)	0.075	(2.7)

	R^2	D.W.
P_1	0.62	1.4
P_2	0.87	1.0
Q_1	0.58	2.4
Q_2	0.77	2.4

The insides of the parentheses are the t-statistics.

V. WELFARE ANALYSIS

In order to reveal the degree of the market power

coefficient effect, profit margins and consumer welfare losses

which are based on estimates of demand functions and market

power coefficients, are presented in this section. The

pricing behavior and loss of consumer surplus is shown in

Figure 4. The MR schedule depicts the firms' perception of

how revenue changes when price changes, which depends on λ_1.

The condition that MR=MC defines the equilibrium price and

quantity, P^0 and D^0. The competitive solution is given at B.

As λ_1 approaches zero, MR rotates to D. Then the price

reduces to marginal cost (δ) and consumption expands to D^c.

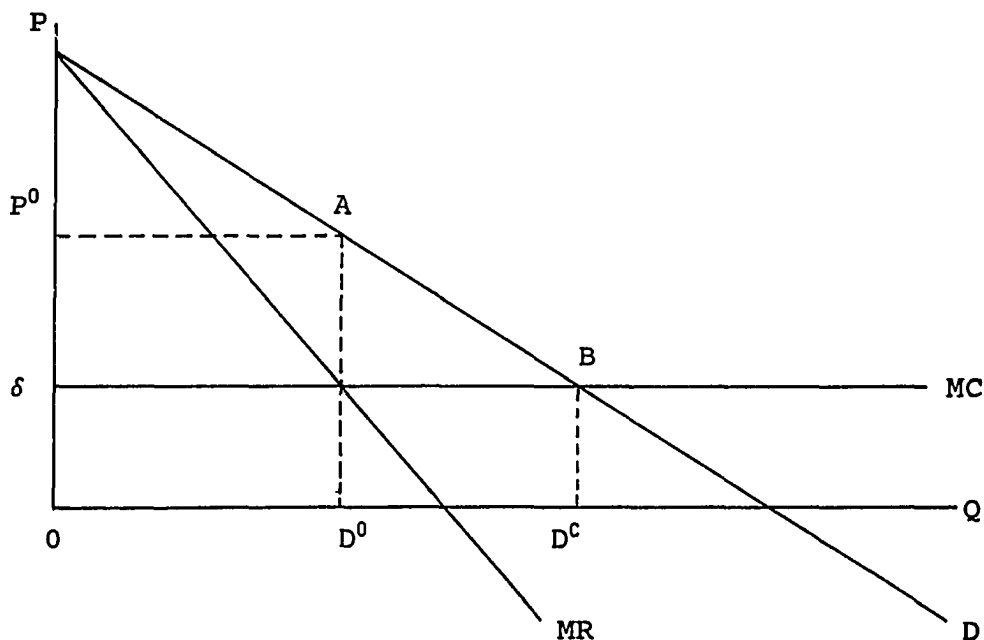The area of $P^0\delta BA$ is the consumer welfare loss. This area is

Figure 4. Demand, marginal revenue and marginal cost
curve

calculated from the values of P^o_t, MC_t, D^o_t and D^c_t for each period from 1973 through the first half of 1978. The estimated demand, marginal revenue and marginal cost functions enable us to specify profit margins and to algebraically calculate the loss of consumer surplus. The inverse demand, marginal revenue, marginal cost functions as given by equations (7) and (9) are:

$$P_{1t} = -\frac{CPI_{1t}}{\alpha_1 N_t} D_{1t} + \alpha_{dt}, \quad MR_t = P_{1t} - \lambda_1 \frac{CPI_{1t}}{\alpha_1 N_t} D_{1t}, \quad MC = (\alpha_s + \alpha_{s1}) W_t + P^*_t = \delta_t$$

$$where \quad \alpha_{dt} = \frac{CPI_{1t}}{\alpha_1} [\alpha_0 + \frac{\alpha_2 Y_t}{CPI_{1t}} + \alpha_3 D_{23} + \alpha_4 D_4]$$

and t shows that each variable depends on time. Each parameter follows the result in Table 2.

The values that define the welfare area can be calculated from the above marginal revenue, marginal cost and price functions. The appropriate prices and quantities are given below.

$$P^o_t = \frac{\alpha_{dt}\lambda_1 + \delta_t}{1 + \lambda_1}, \quad D^o_t = \frac{(\alpha_{dt} - \delta_t)\alpha_1 N_t}{(1 + \lambda_1) CPI_{1t}}, \quad and \quad D^c_t = \frac{(\alpha_{dt} - \delta_t)\alpha_1 N_t}{CPI_{1t}} \quad (11)$$

Profit margins are measured as $(P^o_t - \delta_t)/P^o_t$ for each period. The average was 22 percent. The loss of consumer surplus during the period was 376 million dollars, of which 361 million dollars were transferred to marketing firms and the rest was wasted as dead-weight loss.

VI. EXCHANGE RATE TRANSMISSION

Another aspect of competitiveness in the markets is the degree of exchange rate transmission to the wholesale price. A perfectly competitive market has an elasticity of wholesale price with respect to exchange rate of unity, assuming that the pricing of soybean exporters is not affected by the exchange rate change, there are no transaction costs from import points to wholesale markets, and the country is not large enough to influence world market. Under these assumption, an incomplete exchange rate transmission is explained by profit margin adjustment in oligopolistic market structures. When there exist transaction or transportation costs from import points to wholesale markets, incomplete exchange rate transmission occurs even under competitive markets as can be seen below.

Let us suppose that marketing cost (δ) includes the product of the export country price and the exchange rate, P^* = P $\cdot$ e where P^* and P are import prices in yen and in dollars, and e is the exchange rate (yen per dollar). Then, any changes in the exchange rate are perceived through changes in import prices in terms of yen. When the exchange rate changes, import price in terms of yen will be affected as well, which will influence importers' marginal costs. Figure 4 suggests that the level of P^0 is determined by a combination of demand, marginal revenue and marginal cost functions. The

argument through equation (11) clarifies that P^o_t depends on demand conditions, marginal cost and market power. An exchange rate transmission elasticity is obtained,

$$\frac{e}{p}\frac{\partial p}{\partial e} = \frac{e}{P}\frac{\partial P}{\partial \delta}\frac{\partial \delta}{\partial e} = \frac{1}{1 + \dfrac{\alpha_{dt}\lambda_1 + (\alpha_s + \alpha_{s1})W_t}{e_t P^e_t}} \quad \textit{where } 0 < \lambda < 1$$

where p^e is export price of American soybeans, assuming that American exporters do not change their prices as a result of the change in exchange rate (i.e., $\partial p^e/\partial e$ is zero).

The elasticities from 1973 through the first half of 1978 were calculated for each period. The average is 60.4 percent. Elasticities for the same period with an assumed competitive structure ($\lambda=0$) are 86.7 percent. The exchange rate transmission was incomplete in 1973-1978 while the yen was in a long appreciating trend against the dollar and was relatively stable.

VII. CONCLUSION

Bresnahan's method to measure a market power coefficient was applied for marketing firms in which case an interactive exogenous variable with prices was not necessary. This two-market model was tested for the Japanese soybean markets. The data are consistent with an episode in which prices were not set at a competitive level in the Japanese soybean wholesale market from 1973 through the first half of 1978. The statistically significant level of the market power coefficient in the model does not directly lead to the conclusion that there existed market power in the Japanese soybean wholesale market during the period. The high price setting may have been caused by other reasons such as speculative pricing by middlemen during the notorious "crazy" prices or marketing risks enlarged by the U.S. embargo in 1973. The estimates suggest that consumers lost 376 million dollars during this episode, most of which were transferred to the importers. Also, the average of exchange rate transmission was 68.9 percent.

The episode ceased in late 1978 and the market has been competitive since then. This could be explained by increased domestic supplies and imports of soybeans from China in the late 1970s.

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IX. APPENDIX

Variable	Definition/source/unit
D_1	Soybean utilization for direct consumption. Developed from production + import + change in stocks from the previous period/ Oil and Fats Monthly Reports (Yushi Geppo)/ 1000t
D_2	Quantity processed soybean use meal and oil/ same/1000t
S	Quantity processed soybean use meal and oil/ same/1000t
$P_1{}^6$	Price in market 1. Average of wholesale prices of Japanese, American and chinese soybeans/ (1)Wholesale price from Tokyo Commodity Exchange (2)Market share from Daily Reports of Soybeans (Daizu Nippo): Journal of Food Industries/¥/kg
P^2	Price in market 2. Unit value of imported soybeans/ (1)Japan Exports & Imports: Japan Tariff Assoc. (2)Monthly Statistics of Agriculture, Forestry and Fisheries: Ministry of Agriculture, Forestry and Fisheries/¥/kg
P_R	Rapeseed price to large processors/same/¥/kg
M_S	Soybean margin $(=Y^O{}_S*P^O{}_S+Y^M{}_S*P^M{}_S-P_2)$/Derived/¥/kg
M_R	Rapeseed margin $(=Y^O{}_R*P^O{}_R+Y^M{}_R*P^M{}_R-P_R)$/Derived/¥/kg
$Y^J{}_I{}^7$	J yield from one ton of I/ Oil and Fats Monthly reports (Yushi Geppo): Japan Oil and Fats Association/0-1

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[6] $P_1 = P^{US} * MS^{US} + P^J * MS^J + P^C * MS^C$ where MS represents market share and superscripts US, J, and C respectively represent US, Japan, and China.

[7] Meal and oil yields for soybeans and rapeseed are calculated by dividing soybean oil or meal production by soybean use by processors for every quarter between the first quarter of 1971 and the fourth quarter of 1988 and regressed on the time from 1 through 72.

P^J_I Wholesale price of IJ (I: soybeans or rapeseed; J: oil or meal)/
National Conditions of Oil and fats (Wagakuni no Yushi Jijo): Ministry of Agriculture, Forestry and Fisheries/¥/kg

P^* Export price of American soybeans adjusted freight & exchange rate/
USDA for export price, freight adjustment from the International Wheat Council, exchange rate from IMF/¥/kg

CPI_1 Consumer price index for food/
Annual report on National Accounts: Economic Planning Agency/
1980=100

CPI_2 Consumer price index/IMF/1970=100

N   Population/IMF/million

Y   Nominal per person consumption of food, beverages & cigarettes/
(1)Annual Report on National Accounts
(2)Reports on National Accounts based on 1980 (Kokumin Keizai Hokoku): Economic Planning Agency/
¥1000

C   capacity to process soybeans for oil or meal calculated from Q/
Derived/1000t

W   Nominal wages in food industry/
Japan Statistical Yearbook: Stat. Bureau Prime Minister's Office/¥1000

GENERAL SUMMARY

We have intended to clarify the characteristics of the
Japanese "invisible" import restrictions in the paper. For
several commodities, the markets appear to be fairly
competitive. For the other commodities, the domestic economic
variables do not move in any way to coincide with what the
theoretical model predicts under the specific hypothetical
import. This is because domestic cost changes do not seem to
affect those variables, while changes in import prices affect
them. Furthermore, we can not find the clear evidence for the
role of the number of producers.

It may be left for the future research to investigate how
Japanese firms diversify the risk due to an increase in
domestic cost.

ACKNOWLEDGMENTS