Implementing Market Access

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(Revised)

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Implementing Market Access*

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Abstract

The outcome of trade policies to increase access for foreign firms to the home country's market is shown to be sensitive to the implementation procedure used. The importance of the timing of moves between government and firms is highlighted by focusing on subsidies to implement minimum market share requirements. Subsidies chosen by the home government after firms have picked prices, create powerful incentives for firms to raise prices - effects that are similar in nature to those found with quotas/VERs. We also show that firm-specific implementation of minimum market share targets is more anticompetitive than aggregate industry-based enforcement.

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1 Introduction:

While policies to increase market access have received much attention in recent years, scant attention has been paid to the issue of implementation of these policies. Consider, for example, the persistent calls to ‘open up’ the Japanese market by negotiating ‘voluntary’ minimum market share targets for U.S. firms in Japan. Though there is still considerable debate about the desirability of instituting such voluntary import expansions (VIEs), the problem of implementation has never surfaced as being important. Irwin (1994, pg. 65) notes that ‘...the United States never seems concerned about the mechanism by which “voluntary” bilateral agreements are carried out and acts as if the foreign government can solve the problem by fiat.’

Since it is well understood that enforcement is critical to the success of any results oriented policy, it is somewhat surprising that implementation per se, has largely been ignored. While Ethier and Horn (1996) and Cronshaw and Markusen (1995), among others, examine results oriented policies, Greaney (1996a) specifically incorporates the problem of implementation in her analysis. In her model, the government enforces the market share agreement by threatening the home firm with a financial penalty in the event the import target is not met. Nonetheless, neither this, nor other studies of VIEs, examine alternative methods of implementing market share requirements.1 In reality, there are a number of ways of implementing a market share requirement, and the effects of the requirement depend critically on the details of the implementation procedure used.

Understanding these effects is important, since unlike voluntary export restraints (VERs), no obvious procedure comes to mind for implementing a VIE.2 An implementation procedure that is feasible for one market may not be viable for another. For instance, setting minimum physical requirements on the use of imported intermediate goods may be a viable method

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2The use of quotas is an obvious way to implement a VER since the exporting/importing country’s government can physically monitor the exact amounts of the good leaving/entering the country, putting an end to the outflow/inflow the moment the quantitative ceiling is reached.
of implementation when the number of purchasing firms is small. Such an implementation scheme would, however, be impossible to apply to the case of a final good demanded by many small agents, and even when feasible, such a mechanism may have undesirable effects.

In this paper, we examine the use of subsidies to enforce market share requirements. While there are a number of instruments that could be used, subsidies are feasible in a wide range of environments where direct control is not. The subsidy schemes that we consider reveal the importance of the sequence of moves between firms and the government, as well as whether the market share requirement is specified on an industry or firm-specific basis. In particular, we consider subsidies that are set before firms make their strategic choices, as well as those which are imposed only if market outcomes violate the market share requirement. In the latter case, we examine situations in which firms know that a violation of the market share target will, with some probability, trigger an import subsidy. In our static model, this timing assumption can be thought of as a way to capture multiperiod effects that result from the dependence of policies on past market outcomes.

The sequence of moves that we consider is motivated by some aspects of the U.S.-Japan semiconductor VIE stipulating that U.S. firms achieve a 20 percent share in Japan's domestic chip market. Irwin (1994, pg. 55) observes that '...MITI conducted extensive surveys of the purchasing plans of all semiconductor users to monitor and to evaluate progress toward the 20 percent target.' This suggests that MITI could forecast, to some extent, what the U.S. market share would be at the ruling prices, and, could, then, take appropriate steps if it anticipated violation of the market share target. While, according to Irwin (1994), in reality, MITI had to use '...moral suasion and administrative guidance with the implicit (or perhaps even explicit) threat of penalties...' to coax Japanese buyers to purchase more U.S. semiconductors,

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3Tyson (1992, pg. 111-112) suggests that this was what was done in the first semiconductor agreement.

4As noted by Greaney (1996a), the Japanese government had no legal authority to restrict Japanese sales, so that MITI was left with "moral suasion" or use of financial instruments to provide incentives for firms to meet the target.

5This probabilistic structure is needed for technical reasons, but it also allows us to capture aspects such as MITI's imperfect monitoring of the semiconductor VIE.

6Subsidy schemes with the timing we consider have been used in other contexts to increase market share. For example, the U.S. government has used export subsidies as a part of the Export Enhancement Program, a program designed to increase the share of U.S. wheat sales in the Egyptian market. See Goldberg and Knetter (1995) for an analysis.
we examine what would have happened, had a direct financial instrument - subsidies for U.S. products - been used to enhance demand for U.S. chips.

We show that a timing framework where governments choose subsidy levels to implement market share requirements after firms have made their strategic decisions imparts incentive effects to subsidy policy that are similar to those found with quotas/VERs. Such effects are absent from the existing literature on subsidy policy which, with the exception of Carmichael (1987) and Gruenspecht (1988), has consistently adhered to a timing structure where governments are first movers. In keeping with that tradition, Greaney (1996a) compares an import subsidy when the government moves first, with a VIE (enforced by a penalty threat) when the government moves second. She finds the two instruments have opposite effects on price, with the VIE raising prices. Our analysis suggests that this distinction is somewhat misleading since a VIE can be enforced by an import subsidy, and if the subsidy is triggered by a violation of the market share target, firms with market power will have an incentive to raise price.

We also consider whether a subsidy triggered by a violation of the market share requirement is less anticompetitive when it is implemented on a firm-specific or industry-wide basis. This part of the analysis is motivated by MITI's disenchantment with its firm-by-firm approach to enforcing the 1986 semiconductor agreement. Irwin (1994, pg. 55) notes that the process '...created so much tension between the industry and the government that MITI officials later swore never to adopt such explicit market share targets again.' Our analysis suggests that MITI would, in fact, have been better off with an easier (less costly) method of enforcement! In particular, we show that prices are higher when a market share requirement is enforced by a firm-specific subsidy than when a uniform subsidy is imposed. The intuition behind this result is that firms perceive themselves as subject to more competition (i.e., more elastic demand) in the latter case.

The paper is organized as follows. In the next section, we analyze the use of subsidies to enforce a VIE when governments can precommit to their policies, and we set the stage for our analysis of implementation when there are problems with precommitment—i.e. governments move after firms. Section 3

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7Carmichael (1987) is the first to investigate an alternative timing framework where firms' pricing decisions precede the government's choice of export subsidy levels. Citing evidence from practices followed by the U.S. Export-Import Bank to rationalize the sequence of government and firm actions, he shows that the rent seeking behavior of the firms yields positive export subsidies in equilibrium.
then identifies the kinds of incentive effects at work when governments are second movers. In order to clearly isolate the incentive effects of a subsidy on each of the firms, we first consider situations of one-sided market power and, later, combine the analyses to study the case of two-sided market power. When a subsidy on the U.S. product is used by the Japanese government to implement a minimum market share target, the U.S. monopoly firm has an incentive to raise price in order to trigger the subsidies. If monopoly power is on the Japanese side, the incentives are for the Japanese firm to raise price to reduce the amount of the subsidy granted or to eliminate it altogether. We then put the two sides together and show that since price increases are still matched by each firm, subsidies result in higher prices when firms have market power. In Section 4, we present a simple model to compare the incentive effects under an aggregate enforcement scheme with those under a firm-specific scheme. Section 5 offers concluding comments.

2 Setting the Stage: *Ex Ante* versus *Ex Post* Subsidies

While there may exist a number of different ways to implement market share requirements, we focus on the instrument of a subsidy as a natural policy to consider over a wide range of environments. Consider as an illustrative example the case where the U.S. negotiates a market access requirement with Japan. If a minimum market share for U.S. firms is the form of the market access requirement, a reasonable way to implement it may be to subsidize U.S. firms until their sales rise enough for the market share requirement to be met.

The behavior of firms when faced with this kind of subsidy is very different depending on whether they think and act like the level of the subsidy is given to them, or whether they think and act like the subsidy can be affected by their own behavior. In the former case, firms will not ask how changes in their behavior will change the subsidies offered by the government. In the latter case they will. The difference in the two cases can be thought of, at a

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8Since taxes are also applicable in a wide range of environments, we have also examined enforcement of a VIE by a tax levied on Japanese producers. While taxes and subsidies have opposite price effects if they are imposed before firms make their strategic choices, they have similar effects when applied ex post. Those results are available from the authors upon request.
formal level, as a difference in timing assumptions made. If the government chooses its subsidy level first – what we call *ex ante* policy – then firms who subsequently decide on their behavior must take the government’s choices as given. The government can look forward and take account of how its choices affect the choices made by firms. If on the other hand, firms decide what to do first, and then the government chooses its subsidy level – what we call *ex post* policy – the government must take the firms’ decisions as given while firms look forward and take account of how their behavior affects the government’s behavior.

If subsidies are set *ex ante*, the analysis is straightforward. Whatever be the market structure, the government looks forward and calculates the subsidy on U.S. firms which results in the market share requirement being met. If, for example, there is a single foreign and a single domestic firm competing in prices and producing differentiated goods that are substitutes for one another, and if demand is linear, then the best response functions of the U.S. firm $B_2(p_1)$, and the Japanese firm $B_1(p_2)$, can be depicted as in Figure 1. The equilibrium firm (and consumer) prices are given by the intersection of the best response functions, and their relative slopes are as shown to ensure stability of equilibrium. The combination of consumer prices which result in a market share for the U.S. firm at the free trade level can be depicted by an upward sloping line $EE$, going through the equilibrium price pair and lying between the two best response functions. If a larger market share for the U.S. is required by the market share rule, it can be depicted by a line to the right of $EE$ such as $MM$. This higher market share can be attained by giving a subsidy per unit to the U.S. firm which moves its best response function down and to the right through the point $A$.

Suppose, however, that the government is unwilling or unable to precommit to the subsidy which gives $A$ as the equilibrium outcome. One could argue that it is, in fact, natural to expect problems with precommitment in situations where governments resort to results-oriented (as opposed to

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9 As usual, the best response function for firm 1 (firm 2) is its profit maximizing price given the price chosen by firm 2 (firm 1).

10 In the case of linear demand, the locus of consumer price combinations $(p_1^C, p_2^C)$ satisfying a market share constraint of $k$ $(0 < k < 1)$ with equality is represented by the equation $p_2^C = \eta_0 + \eta_1 p_1^C$ where $\eta_0 = \frac{(1-k)b-c-k_d}{(1-k)b+c}$, $\eta_1 = \frac{(1-k)b+c}{(1-k)b+c}$, and the demand for good $i$ is $q_i(p_i^C, p_j^C) = a_i - b p_i^C + c p_j^C$; $b > c > 0, a_i > 0; i = 1, 2; j \neq i$. It is easy to verify that this is the equation of a straight line steeper than 2’s best response but flatter than 1’s best response.
instrument-oriented) policies. In these situations, there is considerable room for strategic behavior by firms. For instance, a government may announce that while it is serious about ensuring that the market share requirement is met, it will not intervene actively unless free market forces continue to violate the market share targets. In such settings, firms can exploit the fact that their actions influence the government's choice of policies. Much of the concern in the real world about the effect of market share requirements has to do with how their presence will influence the behavior of firms. Such issues involve considerations of strategic interaction and cannot be analyzed within the ex ante policy framework.

Indeed, this scenario seems to fit MITI's enforcement of the semiconductor agreement prior to 1992. The requirement that firms submit detailed reports of their 1989 purchasing plans can be viewed as a signal of MITI's intent to enforce the market share agreement. Nonetheless, the 20 percent market share was not reached until the last quarter of 1992. By all accounts, it was only after the failure to reach more than a 10 percent market share by late 1989 that MITI increased its pressure tactics on firms. This example may explain why Greaney (1996a) chose to analyze a VIE enforced by the threat of a financial penalty rather than by an ex ante subsidy. MITI's enforcement tactics also serve to motivate our analysis of ex post subsidies and firm-specific versus industry-wide enforcement.

Before proceeding, two points are worth noting. First, Greaney's analysis of a VIE and our analysis of an ex post subsidy differ, not only in the instrument used to enforce the market share target, but also in the timing of moves. In her model, a VIE is enforced by a penalty threat, but the government moves only after market shares have been observed. Thus, the VIE affects profits of the Japanese firm, but it does not affect the sales of either firm or profits of the U.S. firm. As she notes in an unpublished appendix, her timing is intended to reflect events during the last quarter of 1992 (when the 20 percent target was finally met). While our ex post subsidy also involves the government moving second, we allow the government to set the subsidy level after firms choose price, but before markets clear. Our intent is to capture the monitoring and pressure tactics used by MITI during the period 1989-1992. While it is tempting to model this process in a multi-

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11 An unpublished appendix to Greaney's (1996a) paper is particularly clear on this point. Similar points are also well documented by Irwin (1994) and Tyson (1992).

12 While she examines an ex ante subsidy, she chooses not to interpret it as an instrument for enforcing the VIE.
period framework, we choose a static framework which is simple enough to allow us to analyze, not only timing issues, but also firm-specific versus industry-wide enforcement.

Second, the equilibrium one would observe under Greaney’s VIE scheme is represented by point $C$ in Figure 1. Notice this is the equilibrium that would result if the government were to levy an *ex ante* tax on the Japanese firm. This equivalence occurs, in part, because the VIE leaves the U.S. firm’s behavior unchanged, an assumption which limits the scope for strategic effects of policy. On the other hand, her scheme has the decided advantage that the home government can implement the VIE with a minimum of information. In contrast, the *ex post* subsidies we consider impose substantial informational requirements on the part of the government. Thus, since the government moves after firms set prices but before market shares are realized, successful implementation necessitates, for instance, perfect information regarding the demand functions. However, the assumption that governments face no informational constraints is not uncommon and characterizes most of the literature on strategic trade policy, e.g., Brander and Spencer (1985).

3 Ex Post Subsidies:

The easiest way to develop some intuition about how *ex post* policy, geared towards implementing market share targets, affects firms’ incentives is to consider situations of one-sided market power, i.e., either the Japanese or the U.S. firm has market power but not both. For simplicity, we assume that demand is linear, products are differentiated, firms are risk neutral and that the perfectly competitive firms make identical products. There are, then, two simple combinations of policy regime and market structure considered in Sections 3.1 and 3.2:

(a) Subsidy policy with a U.S. monopoly firm and a competitive Japanese industry,

(b) Subsidy policy with a Japanese monopoly firm and a competitive U.S.

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13 As the tax results in the Japanese firm setting a higher price for any given U.S. price, this tax must move the Japanese firm’s best response function to the right to go through the point $C$.

14 We are grateful to Theresa Greaney for pointing this out.

15 See, also, Brainard and Martimort (1992) for a discussion of the high informational requirements of strategic trade policy.
industry.

These examples serve to show that even within such simple structures, *ex post* subsidies create important incentive effects that are absent in their *ex ante* counterparts. In Section 3.3, we put the two sides together.

### 3.1 Subsidy policy with a U.S. monopoly firm and a competitive Japanese industry:

First consider the incentive effects under (a). Recall that the goods made in the two countries are imperfect substitutes for each other and that the Japanese industry is behaving competitively and pricing at marginal cost. The U.S. firm has monopoly power and has a first mover advantage over the Japanese government. It understands that if it charges a price such that the demand for its product at this price violates the market share constraint, it will be given the subsidy per unit needed to meet the pre-specified market share. In this situation, the U.S. firm has an incentive to raise price as high as possible (to infinity) as there are no limits on its ability to exploit the government. To make the problem bounded, we assume the Japanese government announces that a violation of the market share target will, with some probability, trigger a subsidy on the U.S. good.¹⁶ Uncertainty helps to mitigate the U.S. firm’s rent seeking incentives because, intuitively, some degree of imprecision should reduce either firm’s power to strategically exploit the VIE target. This is trivially true for the U.S. firm in the case of a subsidy because, under certainty, it has an incentive to charge an infinitely high price.¹⁷ The introduction of uncertainty also allows us to capture MITI’s imperfect monitoring of the VIE target in the semiconductor case and yields equilibrium outcomes where the U.S. firm’s market share can (*ex post*) fall short of the mandated minimum (both of which are well documented in the

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¹⁶This can limit the U.S. firm’s rent-seeking ability since the incentive to charge an arbitrarily high price is dampened by the small probability of getting the subsidy.

¹⁷Further, even if an upper bound is placed on the U.S. firm’s price, complete certainty regarding that bound leads to excess strategic maneuvering by the Japanese firm when there is two-sided market power. For instance, if we use the Carmichael (1987) type of constraint where the subsidy is revoked with certainty whenever the U.S. firm prices above its ordinary best response, the Japanese firm chooses its ordinary best response for U.S. prices above the free trade level, but has an incentive to cut prices discontinuously for lower U.S. prices and charge a price infinitesimally smaller than the one that just triggers the subsidy.
Before proceeding to the formal analysis, some explanations regarding notation are in order. In this case, the competitive Japanese firm price $p_1$, is always equivalent to the consumer price $p_1^C$. However, the U.S. consumer price $p_2^C$ equals the firm price $p_2$ only when the subsidy is not realized. Otherwise, when the subsidy is triggered, $p_2^C$ equals $g_2(p_1)$, where $g_2(p_1)$ is the U.S. consumer price that makes the market share constraint just bind, given the Japanese firm price $p_1$. Hence, given firm prices, $(p_1, p_2)$, demand for the U.S. good is $q_2(p_1, g_2(p_1))$ if the subsidy is invoked, and demand equals $g_2(p_1, p_2)$ if the subsidy is not granted. The locus of prices, $(p_1, g_2(p_1))$, traces out an upward sloping line $MM$ (shown in Figure 3), such that the market access constraint is binding only for firm prices lying above (and to the left of) this line.

Now, let $f(p_1, p_2)$ be the probability of the subsidy being granted for any given price combination above $MM$. Assume that $f(\cdot)$ is nondecreasing in $p_1$ and nonincreasing in $p_2$. Then, given constant unit cost $r_2$, for price combinations $(p_1, p_2)$ above $MM$, we can define the U.S. firm's expected profits as

$$
\pi_2(p_1, p_2) = f(\cdot)(p_2 - r_2)q_2(p_1, g_2(p_1)) + [1 - f(\cdot)](p_2 - r_2)q_2(p_1, p_2)
$$

where $\pi_2^H(p_1, p_2)$ is its profit at subsidized prices while $\pi_2(p_1, p_2)$ is its ordinary profit function. $\pi_2^H(p_1, p_2)$ and $\pi_2(p_1, p_2)$ are depicted in Figure 2. Notice that for any given $p_1$, $\pi_2^H(p_1, p_2)$ is represented by a straight line with a constant positive slope of $q_2(p_1, g_2(p_1))$. Figure 2 also shows $\pi_2(p_1, p_2)$ for the special case of a constant probability of subsidy.

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18 Both Irwin (1996) and Greaney (1996a) discuss the continual seesawing of the U.S. market share below the 20 percent mark before finally climbing to just above the target in the fourth quarter of 1992.

19 Henceforth, $p_i$ will always denote the price charged by firm $i$ while the consumer price will be represented by $p_i^C$. Recall that firms in the competitive industry (Japanese firms, in this case) are identical in every respect and, hence, when good $i$ is competitively produced, $p_i$ refers to the price of the representative firm.

20 For instance, we could use $f(p_1, p_2) = 1 - h(p_2 - g_2(p_1))$ where $h \in (0, 1)$, and $h'(\cdot) \geq 0$ since we know that $g_2'(\cdot) > 0$. Henceforth, for simplicity, we shall assume $f(p_1, p_2)$ to be a constant.

21 Given any $p_1$, $q_2(p_1, g_2(p_1))$ is simply the demand for firm 2's product at the corresponding point on the market share line $MM$. $q_2(p_1, g_2(p_1))$ decreases continuously as $p_1$ increases and we move up along $MM$. 

10
Let $B_2(p_1)$ denote the U.S. firm’s ordinary best response in the absence of a market share constraint. Define $\overline{B}_2(p_1)$ as the interior maximizer of $\overline{\pi}_2(p_1, p_2)$ which we assume to be bounded and concave. If the market share constraint is binding, the relevant profit function is $\overline{\pi}_2(p_1, p_2)$. On the other hand, if the constraint is not binding, then the U.S. firm maximizes $\pi_2(p_1, p_2)$ as before. As $\overline{\pi}_2(p_1, p_2) = \pi_2(p_1, p_2)$ at $p_2 = g_2(p_1)$, the overall profit function is given by

$$\hat{\pi}_2(p_1, p_2) = \begin{cases} \pi_2(p_1, p_2) & \text{for } p_2 \leq g_2(p_1) \\ \overline{\pi}_2(p_1, p_2) & \text{for } p_2 > g_2(p_1) \end{cases}$$

In Figure 2, the bold line traces out $\hat{\pi}_2(p_1, p_2)$. Note that for prices to the right of the $p_2$ at which $\pi_2(p_1, p_2)$ and $\pi_2^H(p_1, p_2)$ intersect, the market share constraint is violated and $\overline{\pi}_2(p_1, p_2)$ is the relevant profit for these prices. Let the maximizer of $\hat{\pi}_2(p_1, p_2)$ be denoted by $\tilde{B}_2(p_1)$. Then, there are three possibilities to consider when deriving the U.S. firm's overall best response.

Given the Japanese price $p_1$, $\pi_2(.)$ and $\pi_2^H(.)$ may intersect at a $p_2$ where (i) both are increasing in $p_2$, (ii) both are decreasing in $p_2$, or (iii) $\pi_2(.)$ is decreasing and $\pi_2(.)$ is increasing in $p_2$. Recall that at $p_2 = g_2(p_1)$, $\pi_2(.) = \pi_2(.)$ and $\pi_2(.)$ has a larger slope than $\pi_2(.)$. Then, given the definition of $\hat{\pi}_2(p_1, p_2)$, we must have $\tilde{B}_2(p_1) = \overline{B}_2(p_1)$ in case (i) and $\tilde{B}_2(p_1) = B_2(p_1)$ in case (ii). In case (iii), $\tilde{B}_2(p_1)$ equals either $\overline{B}_2(p_1)$ or $B_2(p_1)$ depending on whether the peak of $\pi_2(.)$ is higher or lower than that of $\pi_2(.)$. Case (i) occurs when $B_2(p_1) > g_2(p_1)$, case (ii) corresponds to situations where $B_2(p_1) < g_2(p_1)$ while case (iii) occurs when $B_2(p_1) < g_2(p_1) < B_2(p_1)$. Note that Figure 2 is representative of case (i).

Figure 3 shows $\overline{B}_2(p_1)$, $B_2(p_1)$ and the market share line $MM$ in price space. Note that for $p_1$ less than $R^*_1$ (the $p_1$ at which $MM$ intersects $B_2(p_1)$) we are in case (i), while case (ii) corresponds to $p_1$ greater than $R^*_1$ (the $p_1$ at which $MM$ intersects $\overline{B}_2(p_1)$). Case (iii) occurs for Japanese prices in the intermediate range between $R^*_1$ and $R^*_2$. Hence, from the above analysis, we may depict the overall U.S. best response, $\tilde{B}_2(p_1)$, by the bold line in Figure 3 which assumes one switchover point $R^*_1$ at which $\tilde{B}_2(p_1)$ jumps down from $\overline{B}_2(p_1)$ to $B_2(p_1)$.

Now, let $R_1$ be any Japanese competitive price resulting in a free trade equilibrium point $A$, unconstrained by any market share target. If the market access requirement specifies a U.S. share greater than that in free trade, $MM$ must lie below $B_2(p_1)$ at $p_1 = R_1$, and so, $R_1$ must lie to the left of $R^*_1$ in
Figure 3. Clearly, this corresponds to case (i) and the U.S. firm maximizes its profit by picking a price $B_2(R_1)$, resulting in the equilibrium at point $C$. In equilibrium, there is a positive probability of a subsidy being granted and the U.S. firm charges a higher price compared to free trade.

3.2 Subsidy policy with a Japanese monopoly firm and a competitive U.S. industry:

Now, consider the incentive effects under (b) where the Japanese firm has market power. Analogous to the previous case, given firm prices $(p_1, p_2)$, demand for the Japanese good is $q_1(p_1, g_2(p_1))$ if the subsidy is invoked, and demand equals $q_1(p_1, p_2)$ if the subsidy is not granted. The Japanese firm knows that if the market share requirement is not met, a subsidy will be given, with some probability, to the U.S. firms. In this event, demand for the Japanese firm's product will fall, along with its profit. If, however, the Japanese firm were to raise its price, it could reduce or eliminate the subsidy given to the U.S. firms, and at least get a higher price in return for a lower demand. This is what creates incentives for price increases by the Japanese firm even when the U.S. firms are pricing competitively.

Proceeding similarly to the previous case, for any U.S. firm price $p_2$, let $g_1(p_2)$ be the Japanese consumer price that satisfies the market share constraint with equality. Then, given $p_2$, unit cost $r_1$ and the probability of subsidy $f(.)$, the Japanese firm's expected profit function for prices to the left of $MM$ is:

$$\bar{\pi}_1(p_1, p_2) = f(.) (p_1 - r_1) q_1(p_1, g_2(p_1)) + [1 - f(.)] (p_1 - r_1) q_1(p_1, p_2)$$

$$= f(.) \pi^T_1(p_1) + [1 - f(.)] \pi_1(p_1, p_2)$$

$\pi_1(p_1, p_2)$ is the Japanese firm's ordinary profit function while $\pi^T_1(p_1)$ is its profit at the subsidized prices $(p_1, g_2(p_1))$, and equals its ordinary profit at the corresponding point on the $MM$ line. For a given $p_2$, note that the first derivative of $\pi^T_1(p_1)$ is greater than that of $\pi_1(p_1, p_2)$ at $p_1 = g_1(p_2)$, i.e., on the $MM$ line, since demand at the subsidized prices is more inelastic than ordinary demand. Since $\bar{\pi}_1(p_1, p_2)$ is a convex combination of $\pi^T_1(p_1)$ and $\pi_1(p_1, p_2)$ and $f(.)$ is constant, the derivative of $\bar{\pi}_1(p_1, p_2)$ must also be greater than that of $\pi_1(p_1, p_2)$\(^{22}\). Figure 4 depicts $\pi^T_1(p_1)$, assumed concave,

\(^{22}\)Formally, $\frac{\partial \bar{\pi}}{\partial p_1} = f \frac{\partial \pi^T}{\partial p_1} + (1 - f) \frac{\partial \pi_1}{\partial p_1}$, where $f \in (0,1)$ is a constant and $\frac{\partial \pi^T}{\partial p_1} > \frac{\partial \pi_1}{\partial p_1}$ at $p_1 = g_1(p_2)$.
The Japanese firm's overall profit function is given by

\[
\pi_1(p_1, p_2) = \pi_1(p_1, p_2) \text{ for } p_1 \geq g_1(p_2) \\
= \pi_1(p_1, p_2) \text{ for } p_1 < g_1(p_2)
\]

\(\pi_1(p_1, p_2)\) is shown as the bold curve in Figure 4. Note that, now, for prices less than the \(p_1\) at which \(\pi_1^f(p_1)\) and \(\pi_1(p_1, p_2)\) intersect, the market share constraint is violated and \(\pi_1(p_1, p_2)\) is the relevant profit. Let \(\tilde{B}_1(p_2)\) be the maximizer of \(\pi_1(p_1, p_2)\). Again, we have three cases to consider in deriving the Japanese firm's overall best response. Given U.S. price \(p_2\), \(\pi_1(.)\) and \(\pi_1(.)\) may intersect at a \(p_1\) where (i) both are increasing in \(p_1\), (ii) both are decreasing in \(p_1\), or (iii) \(\pi_1(.)\) is decreasing and \(\pi_1(.)\) is increasing in \(p_1\).

Then, from the definition of \(\pi_1(p_1, p_2)\), we must have \(\tilde{B}_1(p_2) = B_1(p_2)\) in case (i) and \(\tilde{B}_1(p_2) = \tilde{B}_1(p_2)\) in case (ii). In case (iii), \(\tilde{B}_1(p_2)\) equals \(g_1(p_2)\), i.e., the Japanese firm prices along \(MM\). Case (i) occurs when \(B_1(p_2) > g_1(p_2)\), case (ii) corresponds to situations where \(\tilde{B}_1(p_2) < g_1(p_2)\) while case (iii) occurs when \(B_1(p_2) < g_1(p_2) < \tilde{B}_1(p_2)\). Figure 4 corresponds to the situation in case (ii).

Now, consider Figure 5 which shows \(B_1(p_2), \tilde{B}_1(p_2)\) and the market share line \(MM\) in price space. As drawn, the Japanese firm's profit, as we move up along \(MM\), increases up to the point \(D\) (where an iso-profit curve is tangent to \(MM\)) and then decreases. For U.S. prices less than \(R_2\) (the \(p_2\) at which \(MM\) intersects \(B_1(p_2)\)) we are in case (i) and the best response is to choose \(B_1(p_2)\). For \(p_2\) greater than \(R_2\) (the \(p_2\) on \(MM\) corresponding to the price \(R_1\) which maximizes \(\pi_1^f(p_1)\)), we are in case (ii) and the Japanese firm is best off pricing along \(\tilde{B}_1(p_2)\). Note that for \(p_2 \geq R_2''\) (the \(p_2\) at which \(B_1(p_2)\) intersects \(R_1\) ), \(\tilde{B}_1(p_2)\) must lie to the left of \(B_1(p_2)\). Finally, for prices in the intermediate range between \(R_2\) and \(R_2', \pi_1(p_1, p_2)\) is decreasing in \(p_1\) while \(\pi_1^f(p_1)\) is increasing in \(p_1\) at \(g_1(p_2)\). Hence, \(\pi_1(.)\) may be increasing - case (iii) with \(\tilde{B}_1(p_2) = g_1(p_2)\) - or decreasing - case (ii) with \(\tilde{B}_1(p_2) = B_1(p_2)\).

Since \(\pi_1(.)\) is a convex combination of \(\pi_1(p_1, p_2)\) and \(\pi_1^f(p_1)\), it is likely to be increasing for prices close to \(R_2''\) but is likely to be decreasing for prices close to \(R_2'\). This, in turn, suggests that \(\tilde{B}_1(p_2)\) lies along the \(MM\) line for prices close to \(R_2\) and lies on \(\tilde{B}_1(p_2)\) for prices close to \(R_2''\). The overall Japanese best response depicted by the bold line in Figure 5 is drawn under the assumption that \(\tilde{B}_1(p_2)\) intersects \(MM\) at prices \((\tilde{R}_1, \tilde{R}_2)\).

In Figure 5, suppose the U.S. good is priced competitively at \(R_2\) and the market share target is greater than the free trade level. Then at \(R_2, MM\)
must lie to the right of $B_1(p_2)$ and must intersect $B_1(p_2)$ at some point $E$ as depicted. We are then in case (ii) and the Japanese firm prices along $B_1(p_2)$ resulting in an equilibrium at point $C$. Compared to the free trade equilibrium at $A$, the ex post subsidy policy yields a higher Japanese price and a (stochastically) lower consumer price for the U.S. good.\(^{23}\)

### 3.3 Ex Post Policy with Two-Sided Market Power:

The effect of two-sided market power can be thought of as combining the elements of the analysis so far. If, for example, we consider the implementation of a minimum market share using a subsidy on the U.S. firm, then two-sided market power can be thought of as superimposing the best response of a U.S. firm having market power, case (a) and Figure 3 above, on the best response function of a Japanese firm having market power, case (b) and Figure 5 above. This is done in Figure 6 where the best responses for the Japanese and U.S. firms are labelled $B_1(p_2)$ and $B_2(p_1)$ respectively. When the U.S. firm alone exercises market power it has an incentive to raise prices in the hope of triggering subsidies. On the other hand, when the power is on the Japanese side, there is an incentive to increase prices to reduce the amount of the subsidy, as well as to receive a higher price for its product should the demand lowering subsidy occur. Since price increases are still matched by each firm (strategic complements), putting both the sides together results in higher prices compared to the free trade equilibrium.

### 4 Aggregate vs. Firm-specific Implementation

This section examines the economic effects of a market access requirement that can be enforced by either firm-specific targets or by aggregate industry-based targets. Consider a VIE mandating that U.S. firms together achieve at least a $k\%$ share of a designated Japanese market. One way to enforce such a requirement is to use firm-specific subsidies that ensure a minimum $\frac{k}{n}\%$ market share for each of the $n$ (symmetric) U.S. firms in that market. Alternatively, the Japanese government can opt for a uniform subsidy that

\(^{23}\)If the competitive U.S. price lies between $R'_2$ and $R_2$, the ex post subsidy policy results in an unchanged U.S. price, a higher Japanese price and a zero subsidy in equilibrium.
is designed to yield an aggregate $k\%$ U.S. market share at the subsidized prices. The natural question that then arises is, which of these two schemes - aggregate or firm-specific - is better? When the government moves first, no such issue arises, but when firms move first, the distinction can be important.

We address this question in the simplest possible extension of the model in section 3.1 by considering a competitive Japanese sector pricing at marginal cost and two U.S. firms choosing prices $P_2$ and $P_3$, respectively. To keep the analysis simple, we also assume a constant probability $\theta$ of the subsidy being instituted when the VIE target is violated. In this setting, we show that an aggregate scheme always dominates a firm-specific scheme in that implementing a VIE with an aggregate market share-based instrument yields lower prices compared to firm-specific enforcement.

The intuition behind this is best grasped by considering the symmetric case where both the aggregate and the firm-specific market share constraints are just binding. First consider subsidies based on the aggregate U.S. market share. If one of the U.S. firms, say firm 2, increases its price by $1.00, a subsidy of $0.50 to both the U.S. firms is needed to regain the initial aggregate U.S. market share. Thus, firm 2's $1.00 price hike under the aggregate subsidy increases its own consumer price by $0.50 and reduces firm 3's consumer price by $0.50, thereby resulting in a decrease in the quantity demanded of firm 2's product. However, note that this reduction in firm 2's demand is less than that which would have occurred if there had been no subsidy policy at all, i.e., firm 2's perceived elasticity of demand for price increases under the aggregate market share subsidy is less than its ordinary elasticity of demand. Thus aggregate market share subsidies reduce the intensity of competition and tend to raise prices. What about firm-specific market share subsidies? Now, a $1.00 increase in firm 2's price must be matched by a $1.00 subsidy to itself with no subsidy to the other U.S. firm in order to maintain firm 2's individual market share. In other words, under firm-specific enforcement, firm 2's demand when the subsidy is granted remains unchanged for own price increases! Thus, each firm's demand is completely inelastic for price increases under the individual scheme leading to an even greater reduction in the intensity of competition. This is what creates the incentives for higher prices when enforcement is carried out on a firm-by-firm basis relative to aggregate industry based implementation.\textsuperscript{24}

\textsuperscript{24}This suggests that the difference between the effects of the aggregate and firm-specific schemes will be greater, the larger the number of firms.
4.1 Aggregate Market Share Subsidies

First, consider the implementation of a market share VIE with an aggregate market share subsidy. As in section 3.1, \( p_1 \) denotes the price of the competitively produced Japanese product. However, now, we have two U.S. firms - firm 2 and firm 3 - choosing prices \( p_2 \) and \( p_3 \), respectively. The goods are symmetric substitutes and own price effects are assumed to outweigh cross price effects. In this setting, the government announces that whenever it anticipates violation of the aggregate market share target \( \frac{q_2(.) + q_3(.)}{q_1(.) + q_2(.) + q_3(.)} \geq k \), it will, with probability \( \theta \), grant to both the U.S. firms the per unit subsidy \( s(.) \) necessary to satisfy the aggregate market share constraint. The question is, how does this enforcement based on aggregate market shares affect the firms' strategic behavior?

Let \( g_2(p_3) \) be the consumer price for good 2 that makes the aggregate constraint just bind. Note that the Japanese price \( p_1 \) is also an argument in \( g_2(p_3) \) but since this price is always fixed at the level of marginal cost, we are dropping it for purposes of notational ease. It should be kept in mind that this is the convention we shall follow throughout the analysis. \( (g_2(p_3), p_3) \) traces out a downward sloping aggregate market share line \( MM \) in U.S. firms' price space, as shown in Fig. 7. This follows from the fact that an increase in one U.S. firm's price must be matched by an equal decrease in the other U.S. firm's price in order to keep the aggregate U.S. market share unchanged. U.S. prices above and to the right of \( MM \) violate the aggregate market share constraint. Hence, the free trade point \( F \) (in Fig. 7) at which the firms' ordinary best responses \( B_2(p_3) \) and \( B_3(p_2) \) intersect must lie to the right of \( MM \) because, by assumption, the constraint is binding under free trade.

Now, consider any \( p_3 \), say \( \overline{p}_3 \), and let firm 2 violate the aggregate constraint by charging a price \( p_2 > g_2(\overline{p}_3) \) above the \( MM \) line. If only 2 were to receive the subsidy then, similar to the monopoly case, the requisite subsidy would be the one needed to pull 2's consumer price down to \( g_2(\overline{p}_3) \), the corresponding point on \( MM \). However, since the subsidy, when invoked, is granted to both firms, it must be less than this amount and must yield consumer prices \( (p_2^C, p_3^C) \) given by \( (p_2 - s(.), \overline{p}_3 - s(.)) \) on \( MM \) to the left of \( (g_2(\overline{p}_3), \overline{p}_3) \). For instance, in the linear case shown in Fig. 7, for \( p_3 = F_3 \), if 2 charges \( p_2 = F_2 \), the aggregate market share subsidy would result in consumer prices at point \( E \) to the left of \( G \). Hence, starting from any point on \( MM \), an increase in 2's price results in a less than proportionate increase.
in the subsidy that it (and its rival, too) stochastically receives. Unlike the monopoly case where the U.S. monopoly's demand remains unchanged when the subsidy is given, here, violating the constraint reduces firm 2's demand with the subsidy (though by less than that in the absence of the subsidy).

Let us, now, derive firm 2's best response under the aggregate scheme. Assuming a common constant marginal cost of $r$ for both U.S. firms, firm 2's ordinary profit is \( \pi_2(p_2, p_3) = (p_2 - r)q_2(p_2, p_3) \) while its profit with the subsidy is \( \pi_2^S(p_2, p_3) = (p_2 - r)q_2(p_2 - s(\cdot), p_3 - s(\cdot)) \) It understands that \( s(\cdot) \) will be given with probability \( \theta \) whenever \( p_2 > g_2(p_3) \). Hence, its expected profit is a convex combination of its ordinary profit and its profit with a subsidy, i.e.,

\[
\pi_2(p_2, p_3) = \theta \pi_2^S(p_2, p_3) + (1 - \theta) \pi_2(p_2, p_3)
\]

Firm 2's overall profit is then given by

\[
\pi_2(p_2, p_3) = \pi_2(p_2, p_3) \quad \text{for} \quad p_2 \leq g_2(p_3)
\]

\[
= \pi_2(p_2, p_3) \quad \text{for} \quad p_2 > g_2(p_3)
\]

Examining the shape of firm 2's profit with a subsidy, we find that

\[
\frac{\partial \pi_2^S(\cdot)}{\partial p_2} = q_2(\cdot) + (p_2 - r)\left\{ \frac{\partial q_2(\cdot)}{\partial p_2} - \frac{\partial s(\cdot)}{\partial p_2} \left[ \frac{\partial q_2(\cdot)}{\partial p_2} + \frac{\partial q_2(\cdot)}{\partial p_3} \right] \right\}
\]

which reduces to

\[
\frac{\partial \pi_2(\cdot)}{\partial p_2} - (p_2 - r) \frac{\partial s(\cdot)}{\partial p_2} \left[ \frac{\partial q_2(\cdot)}{\partial p_2} + \frac{\partial q_2(\cdot)}{\partial p_3} \right].
\]

Now, since \( \frac{\partial s(\cdot)}{\partial p_2} > 0 \), own price effects are larger than cross effects, and \( \pi_2^S(\cdot) = \pi_2(\cdot) \) when \( p_2 = g_2(p_3) \), we get \( \frac{\partial \pi_2^S(\cdot)}{\partial p_2} > \frac{\partial \pi_2(\cdot)}{\partial p_2} \) along the market share line \( MM \). There are, then, only three possible cases to consider: (i) \( \frac{\partial \pi_2^S(\cdot)}{\partial p_2} > \frac{\partial \pi_2(\cdot)}{\partial p_2} \geq 0 \), (ii) \( \frac{\partial \pi_2^S(\cdot)}{\partial p_2} \geq 0 > \frac{\partial \pi_2(\cdot)}{\partial p_2} \), and (iii) \( 0 > \frac{\partial \pi_2^S(\cdot)}{\partial p_2} > \frac{\partial \pi_2(\cdot)}{\partial p_2} \). The first case is depicted in Fig. 8(i) where both ordinary profit \( \pi_2(\cdot) \) and profit

\[25\] Formally, \( s(\cdot) \) is defined by \( \frac{q_2(p_2 - s(\cdot), p_3 - s(\cdot)) + q_3(p_2 - s(\cdot), p_3 - s(\cdot))}{q_1(p_2 - s(\cdot), p_3 - s(\cdot)) + q_2(p_2 - s(\cdot), p_3 - s(\cdot)) + q_3(p_2 - s(\cdot), p_3 - s(\cdot))} = k \), implicit differentiation of which (along with the symmetry of the demand structure) yields \( \frac{\partial s(\cdot)}{\partial p_2} = \frac{\partial s(\cdot)}{\partial p_3} = \frac{1}{2} \).
with subsidy $\pi_2^*(.)$ are shown to be rising at their intersection point. Since expected profit $\bar{\pi}_2(.)$ is a convex combination of the two, it must also be rising at $g_2(p_3)$. Firm 2’s overall profit function is shown as the bold curve. Let us denote the maximizers of $\pi_2(.)$, $\pi_2^*(.)$, $\bar{\pi}_2(.)$ and $\bar{\pi}_2(.)$ by $B_2(p_3)$, $B_2^S(p_3)$, $\bar{B}_2(p_3)$ and $\bar{B}_2(p_3)$, respectively. Then, clearly, from Fig. 8(i), we must have $\bar{B}_2(p_3) = \bar{B}_2(p_3)$ and firm 2 charges a price that maximizes its expected profit. Note that this price is greater than its ordinary best response $B_2(p_3)$.

This case occurs for large $p_3$ for which firm 2’s ordinary best response violates the aggregate constraint. As $p_3$ falls we move into the second case as depicted in Fig. 8(ii). Here firm 2 compares its profit from its ordinary best response with that from charging $B_2(p_3)$ and picks the one yielding a higher profit. For even lower $p_3$, we get the third case shown in Fig. 8(iii) where it is clear that 2’s overall best response must be to pick its ordinary best response, i.e., we must have $\bar{B}_2(p_3) = B_2(p_3)$.

Assuming a unique switch-over point at which firm 2 switches from pricing along $\bar{B}_2(p_3)$ to charging its ordinary best response $B_2(p_3)$, and noting that firm 1’s strategic behavior must be exactly symmetric, we get a pure strategy equilibrium. This is depicted in Fig. 9 by the point $K$ where the firms’ overall best responses intersect above the market share line. Note that each firm charges a price greater than its free trade price and a positive subsidy is given with probability $\theta$.

4.2 Firm-specific Market Share Subsidies

Let us, now, turn to the case of firm-specific enforcement of a market share VIE. Recall that satisfaction of the VIE target requires that $q_1(.) + q_3(.)$ be greater than $k/2$. Clearly, if each U.S. firm’s individual share of the market were greater than $k/2$ the VIE target would be met. However, satisfaction of the aggregate market share constraint does not necessarily imply satisfaction of each firm’s individual market share constraint. For U.S. firm $i$, $i = 2, 3$, let $\frac{q_i(.)}{q_1(.) + q_2(.) + q_3(.)} \geq k/2$ be referred to as firm $i$’s individual constraint. Suppose the government announces that whenever it anticipates violation of either or both U.S. individual constraints it will stochastically give subsidies $s_2(.)$ and $s_3(.)$ to firms 2 and 3, respectively, such that each U.S. firm achieves an individual market share of at least $k/2$. How does this firm-specific enforcement scheme affect the firms’ incentives?

The analysis is complicated by the fact that $s_2(.)$ and $s_3(.)$ vary across different regions depending upon whether only one or both individual con-
straints are violated. For any \( p_3 \), define \( h_2(p_3) \) as the consumer price for which 2's individual market share constraint is just met without government intervention. Observe that firm 2's individual share of the market \( \frac{q_2(\cdot)}{q_1(\cdot)+q_2(\cdot)+q_3(\cdot)} \) decreases in own price but increases with an increase in firm 3’s price. Hence, starting from any point where 2’s individual constraint is just met, an increase in \( p_3 \) must be matched by an increase in \( p_2 \) to get its market share back to \( k/2 \). Thus, \( h_2(p_3) \) and, symmetrically, \( h_3(p_2) \) are positively sloped. Fig. 10 illustrates the individual constraint lines for the case of linear demand.

These individual market share constraint lines partition the price space into four different regions. Region \( R_1 \), defined by \( p_3 \leq h_3(p_2) \) and \( p_2 \leq h_2(p_3) \), has both firms charging low prices such that both individual constraints are met and no subsidies are needed. Note that in this region where both the market share constraints are satisfied, the aggregate market share must also be met. In region \( R_2 \), we have \( p_3 \geq h_3(p_2) \) and \( p_2 \geq h_2(p_3) \) such that high prices are set by both firms, and, interior points violate both the constraints. From Fig. 10, it can be seen that the requisite subsidies in this region must result in consumer prices \((E_2, E_3)\) defined by the intersection of the individual constraints. Region \( R_3 \), with \( p_3 \leq h_3(p_2) \) and \( p_2 \geq h_2(p_3) \) has firm 3 pricing low and firm 2 pricing high such that only 2's individual constraint is violated. Analogously, in region \( R_4 \), defined by \( p_3 \geq h_3(p_2) \) and \( p_2 \leq h_2(p_3) \), only firm 3's constraint is violated.

Consider firm 2's best response under firm-specific market share subsidies. To keep matters simple, we shall sketch out an intuitive and graphical explanation of the incentive effects under firm-specific subsidies. Consider Fig. 10 and let firm 3 charge a low price such that \( p_3 \leq E_3 \). In this case, firm 2 has the incentive to charge a high price (in region \( R_3 \)) that violates only its individual constraint so that only 2 receives the subsidy stochastically. In this region, similar to the monopoly case, the subsidy pulls 2's consumer price down to that on its individual constraint line yielding a demand of \( q_2(p_3, h_2(p_3)) \). Hence, its profit with the subsidy increases continuously in its own price at a constant rate, and, as in the monopoly case, its best response is to charge a price greater than its ordinary best response because expected profit (a convex combination of ordinary profit and profit with the subsidy) is increasing at \( p_2 = B_2(p_3) \). It should be easy to see that this strategy dominates choosing a price in region \( R_1 \) (where no subsidies are required) or \( R_4 \) (where only firm 3 gets a subsidy).

What about the case where 3 charges a high price, i.e., when \( p_3 > E_3 \)? First, note that if 2 charges a low price with \( p_2 \leq E_2 \) we are in region \( R_4 \)
where only 3's individual constraint is violated and only it has a positive probability of getting a subsidy. The requisite subsidy here would lower 3's consumer price to the corresponding point on \( h_3(p_2) \) and would result in 2's profit with the subsidy being equal to its ordinary profit at this point. Since this profit is increasing in \( p_2 \) as we move up along 3's individual constraint line and since 2's ordinary profit is also increasing in this region, its expected profit must be increasing in own price such that firm 2 will never have the incentive to charge such a low price. So, 2 must set a price greater than \( E_2 \).

Next, note that when \( p_2 > E_2 \), regardless of whether \((p_2, p_3)\) falls in region \( R_4 \), \( R_2 \), or \( R_3 \), consumer prices with subsidies must always equal \((E_2, E_3)\). This occurs because for \( p_2 > E_2 \) and \( p_3 > E_3 \), even when only one individual constraint is violated (in region \( R_3 \) or \( R_4 \)), the subsidy required to satisfy only that specific constraint results in consumer prices lying in \( R_2 \) where both constraints are violated. Thus, only subsidies resulting in consumer prices \((E_2, E_3)\) are feasible. In other words, firm 2's profit with a subsidy increases at a constant rate, as shown in Fig. 11, and its best response is to charge the price that maximizes its expected profit.

Combining the above analyses, we can depict the best responses as shown in Fig. 12 with the symmetric equilibrium at point \( L \). Note that, in equilibrium, each firm charges a higher price compared to free trade.

### 4.3 Comparison of Aggregate and Firm-specific Schemes

The aggregate scheme yields lower prices than the firm-specific scheme. This is depicted in Fig. 13 where the superscripts \( a \) and \( f \) refer to the aggregate and firm-specific schemes, respectively. The reasoning for this result is as follows. Consider \( K = (K_2, K_3) \), the equilibrium under aggregate market share subsidies and let \( p_3 = K_3 \). Then, we already know that \( p_2 = K_2 \) maximizes firm 2's expected profit under the aggregate scheme. Observe that at these prices firm 2's profits from subsidies are equal under either scheme, i.e., \( \pi_2^a(K_2, K_3) = \pi_2^f(K_2, K_3) \). This property holds for all prices on the 45-degree diagonal.\(^{26}\) Since ordinary profits \( \pi_2^a(K_2, K_3) = \pi_2^f(K_2, K_3) \) always holds, expected profits (a convex combination of ordinary and subsidy-ridden profits) are also equal at these prices. However, since the firm-specific subsidy profit \( \pi_2^S(K_2, K_3) \) increases more steeply than \( \pi_2^a(K_2, K_3) \), firm 2's expected profit must still be rising at \( p_2 = K_2 \) implying that its best

\(^{26}\)Obviously, this would not be the case if the Japanese price changed.
response is to charge a price higher than \( K_2 \). Thus, \( \hat{B}_3'(K_3) > K_2 \) must hold. The reasoning for the other U.S. firm proceeds analogously such that in equilibrium firm-specific subsidies must yield higher prices compared to aggregate market share subsidies.

5 Conclusion:

The U.S. preoccupation with negotiating minimum market share targets with the Japanese government has raised many questions regarding the economic consequences of these targets. However, recent work to analyze these questions has paid little attention to the implementation aspect, even though it is well understood that enforcement is critical to the success of any results-oriented policy. This paper explicitly considers subsidy instruments to implement minimum market share agreements and demonstrates that their effects depend critically on the sequence of moves between government and firms. In particular, when the home government can move only after firms have made their strategic choices (ex post policy), these subsidies create powerful incentives for firms to raise prices - incentive effects that are absent in the traditional ex ante timing framework.

Under subsidy policy with monopoly power on the U.S. side, the incentives are for the U.S. firm to raise price and trigger the subsidies. If monopoly power is on the Japanese side, the incentives are for the Japanese firm to try and ensure that the subsidies are not triggered since such an occurrence lowers sales without a compensatory high price. Thus, it raises price to prevent subsidies (and reduce their amount) to the U.S. firms. In either case, under the ex post timing structure, subsidies create incentives to raise prices.

The same types of effects can be shown to occur if the minimum import requirement is implemented by an ex post tax on the Japanese good. If market power is on the U.S. side, then the incentives are for the U.S. firm to raise its price, triggering taxes on the Japanese good, which in turn enhances demand for the U.S. firm's product and increases its profit. If power is on the Japanese side, then the incentive is always to prevent taxes from being invoked by charging higher prices. Here, too, a timing structure with government as second mover produces incentives that result in higher prices. Thus, both tax and subsidy schemes, in the presence of market power, are anticompetitive in their effects. These incentive effects, while well documented for quotas/VERs, are not found in the literature on tax/subsidy policy.
As shown in Section 4, these anticompetitive effects are mitigated to some extent if the government’s enforcement is not done on a firm-by-firm basis. While our analysis of this issue focused on subsidies when there is more than one U.S. firm, similar results can be shown when the VIE is implemented by taxing Japanese firms. In particular, when the U.S. industry is perfectly competitive and there is more than one Japanese producer, a uniform ex post tax on Japanese firms will raise prices less than a firm-specific tax. With both subsidies and taxes, firm-by-firm enforcement lessens competition to the extent that it lowers firms’ perceived demand elasticities.

Finally, given the anticompetitive nature of the tax and subsidy instruments considered so far, the natural question that arises is: ‘are there situations in which an import target can be implemented without raising prices?’ While this issue is beyond the scope of this paper, situations in which this is possible are examined elsewhere by Krishna, Roy and Thursby (1996) and Krishna and Morgan (1996).

6 References:


Figure 1
slope = q_2(p_1, g_2(p_1))

Figure 2
Figure 3
Figure 4
Figure 5
Figure 7
Figure 9
Figure 11
Figure 13