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EC MEMBERS FIGHTING ABOUT SURPLUS:
VERS, FDI AND JAPANESE CARS

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Harry Flam

INSTITUTE FOR INTERNATIONAL ECONOMIC STUDIES
Stockholm University

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Institute for International Economic Studies
S-106 91 Stockholm
Sweden

EC MEMBERS FIGHTING ABOUT SURPLUS: VERs, FDI AND JAPANESE CARS*

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Harry Flam

Institute for International Economic Studies, Stockholm University
S-106 91 Stockholm, Sweden

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Abstract

The distribution of consumer and producer surplus among EC members of three different trade regimes – free trade, a voluntary export restraint (VER) and a VER in conjunction with foreign direct investment (FDI) – are derived and compared within the framework of a Nash–Cournot duopoly model. Free trade and a VER are likely to be first and third best for countries without import competing production, while the opposite holds for countries with import competing production. A VER–*cum*–FDI regime is second best for both. If the producing countries are in majority and set the common VER, while the power to allow FDI remains under national control, the policy equilibrium is one of a VER with or without FDI. A VER–*cum*–FDI outcome is third best for the EC as a whole.

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1. Introduction

Some EC countries have for many years curbed imports of Japanese motor vehicles by pressuring Japan to adopt so called voluntary export restraints (VERs). The EC and Japan agreed on July 31, 1991 to replace the different national restrictions by a restriction on overall sales of Japanese cars, off-road vehicles, light commercial vehicles and light trucks in the EC between 1993 and 1999. (See the *Financial Times*, August 2 and 5, 1991, for details.) The Japanese share of the EC market is allowed to increase from 11 per cent in 1991 to 16 per cent in 1999. All of the increase in market share is foreseen to come from local production by Japanese firms. The agreement includes "projections" and monitoring of exports from extra-EC sources to the French, Italian, Portuguese, Spanish and United Kingdom markets that puts the commonality of the VER into question. More ambiguity is introduced in a key appendix to the agreement – a "protocol of discussion". The EC negotiator states that the agreed maximum number of vehicles produced in the EC is based on forecasts of market growth, thereby signalling that the EC reserves the right to renegotiate if the market increases less. His Japanese counterpart responds by stating that the EC has agreed not to restrict Japanese production in the EC and the sales of locally produced vehicles. (The newsletter *Inside Europe*). The agreement has consequently been subject to different interpretations. My interpretation is that imports will be restricted for the EC as a whole to the present level in quantitative terms, and that no restrictions will apply to locally produced vehicles. Thus, the import share will fall to about 7 per cent in 1999, which is in line with the projections for France, Italy, Portugal, Spain and the United Kingdom. I base my interpretation on the fact that the VER is managed by Japan, while national governments make decisions about foreign direct investment (FDI) and perceive such to be very much in the national interest.

The new EC policy reflects conflicting interests within the EC. France, Italy, Portugal and Spain allow market shares for Japanese vehicles of 3.5 per cent or less, and

have been unwilling to liberalize their imports. Germany and the smaller EC countries with lesser or no stakes in the production of motor vehicles have argued for more liberal or free trade. The conflict also concerns FDI. Italy and France have been against Japanese FDI in the motor vehicle industry and have demanded at least 80 per cent European content for the vehicles to be freely traded within the EC. At present, the only Japanese firm to have started production is Nissan, which produces about 100 000 cars per year in the United Kingdom. More Japanese production is to follow, however. Honda (together with Rover) and Toyota are building plants in the United Kingdom with a total capacity of about 500 000 cars per year. Mitsubishi has acquired a third of the Volvo plant in Holland. Commercial vehicle production is planned in the United Kingdom by Isuzu (together with General Motors), in Spain by Nissan, in Germany by Toyota and Mazda (together with Ford), and in Italy by Daihatsu (together with Piaggio and Bertone). There is little doubt that the outburst of FDI has been prompted by the existing and expected VERs on Japanese exports. (A similar reaction can be seen in other manufacturing industries; Japanese FDI in the EC in 1986–88 was larger than in the previous 35 years according to Dunning and Cantwell, 1989.)

The stands of the different EC members on VERs and FDI related to Japanese motor vehicles seem largely dictated by the perceived producer interest in countries with significant production, and by the consumer interest in the other countries. The producer interest is of course not necessarily equal to the national interest. One can expect a VER to benefit Japan, the exporter, and hurt EC, the importer, if markets are competitive. EC countries with domestic production will be hurt more than countries without, since a production distortion is added to the distortion in consumption. These welfare losses are reversed by subsequent FDI; FDI increases the supply and lowers the price of the restricted good (see e.g. Buffie, 1985; Dei, 1985; Neary, 1988). However, the welfare effects of a VER and of subsequent FDI may be the opposite if markets are imperfect. A VER shifts profits from foreign to domestic producers, and these gains

may outweigh the losses due to production and consumptions distortions. Moreover, if a welfare-improving VER is imposed by a customs union such as the EC, the interests of producing and non-producing countries will be opposed. I will show that FDI in the presence of a welfare improving VER can lower and not raise the welfare of the customs union as a whole and at the same time benefit non-producing and harm producing countries.

The fact that VERs and FDI tend to have opposite effects for the EC as a whole suggests that trade and investment policies should be coordinated. This is not done at present; EC trade policy on motor vehicles is determined by the council of ministers and implemented by the commission, while policies concerning FDI, which include permits, taxation and the availability of national regional subsidies, are determined by the national governments. This leaves room for conflicting policies, reflecting the different interests of producing and non-producing countries.

My paper models this conflict, provides a rationale for the new policy — a restrictive VER combined with freedom for Japanese firms to produce in the EC — and analyses the welfare consequences for the EC as a whole and for the conflicting parties. The main conclusion is that the policy may generate lower welfare for the EC than free trade or a VER without FDI. This is not an argument for policy coordination. Rather, it is an argument against strategic trade policy of relevance for customs unions such as the EC. The first part of the paper compares welfare levels for the EC and for its producing and non-producing members of free trade, of a VER and of a VER-*cum*-FDI. The second part derives the non-cooperative equilibrium trade and investment regime. Trade policy is assumed to be in the hands of the producing countries, while the power to bar FDI is in the hands of each national government. The conflict between the producing and non-producing countries is modelled as a three-stage, non-cooperative game, in which the producing countries choose between free trade and a VER at the first stage, the Japanese firms between investing or only exporting in the second stage, and

the non-producing countries between allowing or prohibiting FDI in the third stage. The producing countries make their decision under uncertainty about the true investment costs of the Japanese firms and therefore about the probability of FDI for any given VER. A common VER and freedom to invest is shown to be the non-cooperative equilibrium. This outcome is second-best for both the producing and the non-producing countries, but third-best for the customs union as a whole.

Section 2 of the paper describes the model and derives the welfare levels in free trade equilibrium. The welfare levels under a VER and a VER-*cum*-FDI are determined in sections 3 and 4. Section 5 gives conditions for FDI to take place and section 6 determines the non-cooperative equilibrium trade regime. Final comments are offered in section 7.

2. The model and the free trade equilibrium welfare levels

Consider a world economy consisting of two trading regions, the EC and Japan. The EC is a customs union and has only two member countries, Britain and France. We will study one particular market in this world economy, the market for cars. It has two producers, a Japanese firm called Nissan and a French firm called Peugeot. At the outset and in the absence of policy intervention, Nissan and Peugeot are located in Japan and France respectively. Peugeot supplies only the EC market. Exports to Japan are prohibited by trade barriers. Nissan supplies the Japanese market and exports to the EC. Later, when policy intervention is introduced, we will also consider the possibility that Nissan invests in the EC and supplies the EC and possibly the Japanese market from a plant located in the EC.

We model the product as homogeneous for simplicity. Demand is assumed to be linear, with inverse demand written as

$$(1) \quad p_i = a - bx_i,$$

where the subscript denotes region i ($i = E, J$). The regional markets are assumed to be segmented, i.e. the price may differ between the EC and Japan.

Sales in the Japanese market may have two sources: Domestic production for the domestic market by Nissan, x_{JJ}^N , and imports from a Nissan plant located in the EC, x_{EJ}^N . Total sales in Japan are

$$x_J = x_{JJ}^N + x_{EJ}^N.$$

Sales in the EC may have three sources: French production, imports from Japan and production by a Nissan plant in the EC:

$$x_E = x_{EE}^P + x_{JE}^N + x_{EE}^N.$$

The total cost of production consists of a firm-specific fixed cost f^k ($k = N, P$) and a region specific and constant marginal cost c_j ($j = E, J$). This implies that the firms use the same assembly technology when they produce in the same market, assuming that inputs costs are identical.¹ Inter-firm differences in technology are captured by the firm-specific fixed cost. These assumptions will prove convenient but can be relaxed. A firm located in region j has a cost function of the form

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¹ By making these assumptions I deliberately neglect to consider policies that change foreign firms' costs by requiring them to change their input mix. Grossman (1981) analyses the effects of domestic content requirements in different market structures but without strategic interaction. Davidson *et al* (1985) instead employ a Cournot–Nash duopoly model, where one firm is domestic and uses locally produced inputs and one firm is foreign owned and uses cheaper, imported inputs. A domestic content requirement has the effect of raising the marginal cost of the foreign owned producer, thereby shifting profits to the domestic firm. The same type of model is used by Rodrik (1987) to analyse a minimum export requirement put on the investing foreign firm. Such a requirements alter the revenue of the foreign firm and thereby shifts profits between the domestic and foreign firms.

$$(2) \quad TC_j^k = f^k + c_j x_j^k,$$

where x_j^k ($k = N, P$) denotes the output of firm k located in region j . A more realistic cost function would differentiate between fixed costs for inputs into the firm's total activities, and fixed costs that are specific to a subset of those activities, e.g. to one of many different plants. For example, in the car industry costs for general research on fuel efficiency belong to the former activity, while the design cost for a particular model belong to the latter. Such a distinction may be important in a theory of the multinational firm, but is of no consequence here and is therefore disregarded.

Transport and marketing costs are also ignored.

Note that the assumption of a constant marginal cost makes the Japanese and EC markets independent on the supply side for Nissan. If instead the marginal cost were assumed to be rising, domestic production would eventually become less profitable than production abroad. There is no such incentive for FDI in our model. Instead, the incentive for Nissan to invest in the EC comes from the imposition of a VER on Japanese exports to the EC. We will return to the issue of location in section 5.

The two firms are assumed to be Cournot competitors in each market. Operating profits on sales by firm k in region j and producing in region i are maximized according to

$$(3) \quad \underset{x_{ij}^k}{Max} \pi_j^k = (p_j - c_i) x_{ij}^k, \quad j, i = E, J.$$

The optimal, free trade equilibrium sales in the EC are

$$(4) \quad \bar{x}_{jE}^k = \frac{1}{3b} [a - (2c_j - c_i)], \quad j = E, J; i = E, J; j \neq i,$$

and the operating profits

$$(5) \quad \tilde{\pi}_{jE}^k = \frac{1}{9b} [a - (2c_j - c_i)]^2, \quad j = E, J; i = E, J; j \neq i.$$

Nissan's profit-maximizing quantity in Japan, where it enjoys a monopoly position, is

$$(6) \quad \tilde{x}_{JJ}^N = \frac{1}{2b} (a - c_J),$$

and its operating profit

$$(7) \quad \tilde{\pi}_{JJ}^N = \frac{1}{4b} (a - c_J)^2.$$

Note that that there are no multi-market effects due to our assumptions of market segmentation and constant marginal cost.

The free trade equilibrium consumer surpluses in the EC and Japan are

$$(8) \quad \tilde{s}_E = \frac{1}{18b} (2a - c_E - c_J)^2$$

and

$$(9) \quad \tilde{s}_J = \frac{1}{8b} (a - c_J)^2.$$

3. Welfare levels under a VER

Consider next the situation in which Nissan's exports are restrained to below the free trade level. I will assume that Nissan's profit-maximizing level of exports under a VER is equal to the VER level, i.e.

$$(10) \quad \hat{x}_{JE}^N = \bar{x}_{JE}^N.$$

By substitution of (10) into (3) we obtain Peugeot's profit-maximizing sales under a VER as

$$(11) \quad \hat{x}_{EE}^P = \frac{1}{2b} (a - c_J - b\bar{x}_{JE}^N).$$

It is straightforward to derive the expressions for the EC's producer and consumer surplus:

$$(12) \quad \hat{\pi}_{EE}^P = \frac{1}{4b} (a - c_E - b\bar{x}_{JE}^N)^2,$$

$$(13) \quad \hat{s}_E = \frac{1}{8b} (a - c_E + b\bar{x}_{JE}^N)^2.$$

We can immediately see that the producer and consumer surplus are falling and rising respectively in the restricted export quantity. We would like to trace out the levels of consumer and producer surplus and of their sum, total EC welfare, over the maximum range of a VER. The extreme points are (a) when the VER becomes prohibitive and (b) when VER quantity is so large that Peugeot is indifferent between producing or not producing. The latter point can only be reached if Nissan is very competitive (has a sufficiently low relative marginal cost). An intermediate point is when the VER is set so that Peugeot produces the same quantity (again implying that Nissan is more competitive than Peugeot). We can calculate total EC welfare at the extreme points by setting $\bar{x}_{JE}^N$ or $\hat{x}_{EE}^P$ equal to zero in (11), calculate Peugeot's profit and the EC's consumer surplus, and sum them. EC welfare at the intermediate point can be found by first setting marginal costs equal in (4) to obtain the equal sales quantities for Nissan and Peugeot. The results are

$$(14) \quad \hat{\pi}^P + \hat{s}_E = \frac{3}{8b} (a - c_E)^2,$$

$$(15) \quad \hat{s}_E = \frac{4}{8b} (a - c_E)^2,$$

$$(16) \quad \hat{\pi}^P + \hat{s}_E = \frac{3}{9b} (a - c_E)^2.$$

EC welfare is lowest when the producers supply equal amounts, intermediate when the VER is prohibitive and highest when Nissan's supplies the whole market. As the VER becomes more restrictive, total supply falls and therefore the consumer surplus. The simultaneous increase in producer surplus for the EC is first less than the increase in consumer surplus and then becomes larger. EC welfare is actually at a minimum when the sales of the two firms are equal. We have

$$(17) \quad \frac{d\hat{\pi}_{EE}^P}{d\bar{x}_{JE}^N} + \frac{d\hat{s}_E}{d\bar{x}_{JE}^N} = -\frac{1}{4}(a - c_E - 3b\bar{x}_{JE}^N) > 0 \text{ as } \bar{x}_{JE}^J < \frac{1}{3b} (a - c_E).$$

The second condition is an equality when marginal costs are equal (cf. equation (4)). In other words, the change in EC welfare with respect to a change in the VER evaluated at equal sales is equal to zero.

It remains to characterize British and French welfare over the maximum effective range of a VER. In order to proceed by way of exact expressions we have to make an assumption about the division of the EC consumer surplus between Britain and France. We will henceforth assume that it is divided in half. This assumption is of course crucial for some of the following results, but not for the general conclusions of the analysis.

British welfare is equal to its consumer surplus and is therefore decreasing in the restrictiveness of the VER. French welfare consists of both consumer and producer

surplus. Its welfare when the VER is prohibitive (corresponding to (14) for the EC as a whole) and when it is sufficiently large to make Peugeot indifferent between producing and not producing (Peugeot is not competitive) is

$$(18) \quad \hat{\pi}_{EE}^P + \hat{s}_{E/2} = \frac{5}{16b} (a - c_E)^2 ,$$

$$(19) \quad \hat{s}_{E/2} = \frac{4}{16b} (a - c_E)^2 .$$

Unlike EC welfare, French welfare is higher under a prohibitive VER than under the maximum effective VER simply because the consumer surplus component of welfare is half of the EC's. Also unlike EC welfare, French welfare is minimized when Nissan's sales are larger than Peugeot's. The change in French welfare with respect to a change in the VER (compare with (17)) is

$$(20) \quad \frac{d\hat{\pi}_E^P}{d\bar{x}_{JE}^N} + \frac{d\hat{s}_{E/2}}{d\bar{x}_{JE}^N} = -\frac{1}{8} (3a - 3c - 5b\bar{x}_{JE}^N) > 0 \text{ as } \bar{x}_{JE}^N < \frac{3}{5b} (a - c_E) .$$

The results of this section are summarized in *figure 1*.

(FIGURE 1 HERE)

4. Conditions for FDI under a VER

I take as given that it is optimal for Nissan not to invest and produce in the EC under free trade. (The reason may be that marginal cost is lower in Japan, or that the fixed cost of investing in a new plant in the EC is too high even if the marginal cost is lower.) When a VER is imposed on Nissan's exports to the EC, Nissan's profits are reduced and it must reconsider its location decision. Three possibilities exist: (a) Nissan

can continue to produce solely in Japan and export a restricted amount to the EC, (b) Nissan can supply the EC market from a new plant in the EC and continue to export a restricted amount, or (c) Nissan can set up a plant in the EC to produce for the local as well as the Japanese market, in which case Nissan will discontinue production in Japan. Relative marginal cost, the fixed cost of investing in the EC, relative market size, and the restrictiveness of the VER determine which alternative is the most profitable.

When the marginal cost is lower in Japan it will always be profitable to continue to produce in Japan and export as much as the VER allows. However, investing in a new plant may still be profitable. This requires that the additional operating profits from the new output can cover the cost of investment and the loss on exports due to the price depressing effect of additional supply, i.e. that

$$(21) \quad (\tilde{\tilde{p}}_E - c_J)\bar{x}_{JE}^N + (\tilde{\tilde{p}}_E - c_E)x_{EE}^N - f^N > (\hat{p}_E - c_J)\bar{x}_{JE}^N,$$

where $\tilde{\tilde{p}}_E$ is the EC price in the VER–cum–FDI regime.

When the marginal cost is lower in the EC Nissan must compare the operating profits of its plant in Japan, which supplies both the Japanese and the restricted EC market, with the profits of a new plant in the EC that supplies both markets under no restrictions. Nissan will invest if

$$(22) \quad (\hat{p}_E - c_J)\bar{x}_{JE}^N + (p_J - c_J)x_{JJ}^N < (\tilde{\tilde{p}}_E - c_E)x_{EE}^N + (\tilde{\tilde{p}}_J - c_E)x_{EJ}^N - f^N,$$

where $\tilde{\tilde{p}}_J$ is Nissan's monopoly price in Japan when it produces in the EC at the lower EC marginal cost.

The location model outlined above is obviously simplistic. There exists much evidence that "tariff-jumping" constitutes an important, if not the most important motive for foreign direct investment in manufacturing in Europe, especially for Japanese

firms, see Caves (1982), JETRO (1989) and Watanabe (1988). However, there are other important motives as well. The literature on multinationals focuses on internalization of rents on firm-specific assets as in Dunning (1974) or on international but firm-internal specialization according to comparative costs as in the models by Markusen (1984) and Helpman (1984). The latter motive could be incorporated into our model by adding firm-specific fixed costs in addition to plant-specific costs, and to assume that some activities, such as management services or R&D that are firm-specific, can be located in another country than the production activity.

Our model is simplistic also because it disregards the fact that multinational firms usually produce many different products or varieties of the same product. To take a concrete example from the car industry again, the Nissan plant in Sunderland produces one version of one model, the sedan version of the Primera model. The most profitable way to jump a VER that does not discriminate among models may be to produce one model for *all* markets in the country imposing the VER, a strategy that Japanese car manufacturers seem to be adopting. Such a strategy may be profitable because it economizes on fixed costs *ex ante*. It may be profitable to produce in the market to which exports are restricted and to export to less restricted markets even if the marginal cost is lower in the latter. Several authors have analysed the *ex ante* location decision of a multinational firm faced with trade restrictions in one market, e.g. Horst (1971), Copithorne (1971), Svedberg (1979) and Smith (1987). These papers focus on the optimal trade policy on the part of the host country.

5. Welfare under a VER-cum-FDI

I will in this section assume that the EC imposes a VER on Nissan's exports that is sufficiently restrictive to make FDI the most profitable option. Nissan now maximizes profits on its European sales with respect to the output of its EC plant, taking the restricted export volume as given. Peugeot maximizes profits according to (3) as before.

The Nash–Cournot equilibrium quantities are

$$(23) \quad \bar{x}_{EE}^N = \frac{1}{3b} (a - c_E - 3b\bar{x}_{JE}^N) \text{ and}$$

$$(24) \quad \bar{x}_E^F = \frac{1}{3b} (a - c_E) .$$

Nissan's total European sales will be equal to Peugeot's, since the two firms by assumption have the same marginal cost of supplying the EC market.

Consider the VER–cum–FDI equilibrium as illustrated in *figure 1*. The equilibrium sales of Nissan and Peugeot are both equal to the distance AB . Nissan's sales consist of output from its EC plant and of exports from its plant in Japan. Nissan sells more in the EC than AB under free trade and Peugeot less (since its marginal cost is assumed to be higher). For FDI to become the most profitable alternative under a VER, the VER has to restrict Nissan's exports to a quantity less than AB . The differential output between AB and the restricted exports, which is given by (23), must provide sufficient operating profits to pay for the fixed cost of the FDI and compensate for the price depressing effect of the FDI output.

In terms of welfare, Britain's and France's interests are clearly opposed. France would like to see Nissan's sales reduced (unless Peugeot produces little and Nissan's sales are close to C , a possibility that I disregard). Britain wants to prevent any reduction, since it has no producer surplus. The welfare of the EC as a whole is minimized at B ; it should therefore be careful not to induce FDI. The result that FDI can be welfare-reducing in the presence of a VER is similar to a result by Levinsohn (1989), who showed that the welfare of the host country declines when imperfectly competitive foreign producers jump an import quota by FDI. In his model DFI dissipates quota rents, whereas in my model DFI shifts away some of the domestic firm's profit.

6. The equilibrium trade and investment regime

Three alternative trade and investment regimes exist: free trade with no FDI (free trade with FDI is ruled out by assumption), VER without FDI, and VER with FDI. Their welfare ranking is different for Britain and France. Both countries are assumed to have access to instruments by which they can influence the choice of trade regime. The question is what the trade and investment regime will be?

I will assume that the British and French governments maximize the sum of producer and consumer surplus. A more common approach in the political economy of trade policy is to assume that governments maximize only producer surplus on the grounds that producers carry more (financial) weight in the political process of trade policy formation, as in Hillman and Ursprung (1988). My assumption is natural in the context of the model, since Britain has no producer surplus (profits of domestic producers), but arguably not the most realistic. Perhaps more serious than the equal weights for producers and consumers is my neglect of the real world fact that Britain's inducement of Japanese FDI also is motivated by gains from decreased unemployment. Such gains are for example crucial in the model of tariff-jumping FDI and endogeneous FDI policies by Brander and Spencer (1987).

Figure 1 suggests that cooperation is likely to benefit the EC as a whole; a prohibitive VER without FDI is the best joint policy unless Nissan is very competitive, in which case free trade is best as long as Peugeot stays in the market. The history of EC trade and investment policies for the motor vehicle industry does not, however, suggest that the member countries act cooperatively to maximize joint welfare. I will assume that Britain and France use the instruments at their disposal to maximize the country's welfare with no regard to the other country. The assumption can be rationalized and history explained by the absence in the EC of instruments for redistribution that are linked to specific sectoral policies, such as trade and investment policies in a particular industry. Furthermore, I will assume that France has decisive

control over the trade policy instrument, a VER, by having a majority in the council of ministers, the trade policy body of the EC. The FDI policy instrument, the granting to Nissan of a permission to make FDI, is assumed to rest with the governments of Britain and France. In actual practise, there is no general prohibition on FDI, but national governments can effectively stop FDI by putting an impenetrable mass of red tape in the way of the foreign firm, e.g. by not giving work or residence permits to key managers and engineers, and by using local zoning laws. (National governments also induce FDI by giving access to existing regional subsidies. For simplicity, I will not take explicit account of this practise.)

Each country and producer is assumed to know the objective functions, market demands and marginal costs. France (and Britain) does *not* know the size of the fixed cost of FDI in the EC. Although past expenditures on fixed costs may provide some information, any new investment will involve new and to some extent firm specific technology and probably a new set of factor prices as well; Nissan's cost for building a new plant in the EC is only known by itself. Thus, for any given VER France does not know if Nissan will invest when permitted to. This presents France with the problem of, first, assessing the probability that a VER of a given size will trigger FDI, and, second, setting the VER that maximizes expected welfare. I will assume that France has a subjective distribution function $F(\bar{x}_{JE}^N)$ and maximizes expected welfare

$$(25) \quad \underset{\bar{x}_{JE}^N}{Max} E(w_F) = [1 - F(\bar{x}_{JE}^N)]w_F(\bar{x}_{JE}^N) + F(\bar{x}_{JE}^N)\bar{w}_F,$$

where $\bar{w}_F$ is the French welfare level at equal market shares for Nissan and Peugeot, i.e. under a VER with FDI. The first order condition can be written as

$$(26) \quad -F'[w_F(\bar{x}_{JE}^N) - \bar{w}_F] + (1 - F)w_F' = 0.$$

The optimum size VER balances the loss in welfare from an increase in the probability that the welfare gain from the VER without FDI will not materialize, the first term, and the gain in welfare from the marginal decrease in the size of the VER, the second term. The optimum VER may be prohibitive if the probability of FDI increases at a sufficiently low rate relative to the increase in welfare as the VER is made smaller. For example, consider the change in expected welfare at a VER equal to French sales. At this point the difference within brackets in the first term in (26) and of $F(\cdot)$ are zero. Hence, the first order condition is positive, $w'_F > 0$. Assume now that $F'(\cdot)$ is constant, i.e. that the density function is uniform, and make the VER prohibitive. The first order condition will still be positive for a sufficiently small value of $F'(\cdot)$. I will for simplicity assume that this is the case, and, thus, that the optimal VER for France is prohibitive.

The stage is now set for a non-cooperative three-stage game. The starting point of the game is free trade, where Peugeot produces only for the EC market and Nissan produces in Japan for the home and EC market. France is assumed to make the first move; it chooses between free trade and a VER. It assigns the probability ρ that the (prohibitive) VER will make FDI profitable. If France chooses free trade, the other players do nothing and the initial situation remains unchanged. Nissan makes the second move when France opts for a VER; it chooses between making or not making a FDI. If it decides to make a FDI it has to seek permission from Britain. (It does not seek permission from France, since it knows that the FDI will never be in France's interest.) Britain then makes the third move, choosing between granting or not granting Nissan the permission to invest. The game is depicted in *figure 2*. The pay-offs have been calculated for a prohibitive VER and by setting $a = 10$, $b = 1$, and $c = 4$.

(FIGURE 2 HERE)

France has incomplete information about Nissan's fixed cost, f^N . We may transform the game from one of incomplete information into one where France has imperfect information about the initial action of a first player, "nature". The probability that nature has chosen a fixed cost such that investment is profitable is ρ and the probability that it has not is $(1-\rho)$. Backward induction tells us that a VER-cum-FDI is a dominating strategy in the former case, and a VER without FDI in the latter. Thus, France will always choose to introduce a (prohibitive) VER; doing so must raise welfare compared to free trade. Britain will always grant Nissan a permission to invest since this is second best to free trade. A VER without FDI is the worst possible outcome for Britain. The EC as a whole is likely to gain from a prohibitive VER without FDI, and will certainly lose if Nissan invests; a VER with FDI is the worst possible outcome for the EC.

These results are obtained under the assumption that the marginal cost of supplying the EC market is higher when production takes place in Japan than in the EC. The assumption makes for easy calculations, but may actually not be the most realistic. Auto workers are better paid in Japan than in many of the EC countries, including Spain and the United Kingdom. Nissan claims that productivity in its United Kingdom plant will be similar to productivity in Japan. If we instead assume that the marginal cost is lower in the EC, the VER-cum-FDI regime will be third-best for the EC and France, and *first*-best for Britain. Nevertheless, the same policy equilibria as shown in *figure 2* will result, provided that the expected pay-off for France from adopting a VER is higher than the free, no FDI pay-off.

7. Final comments

I have constructed a rather special model to show that non-coordination of trade and investment policies in a customs union such as the EC can give rise to a Pareto inferior outcome for the customs union and actually minimize its welfare. (The result

that non-coordination in a customs union can be detrimental to the union as a whole can, I argue, be obtained from a more general model.) One should not draw the conclusion from my exercise that the EC, or any similar organization, should coordinate policies to raise its own welfare by lowering the welfare of outsiders. On the contrary, the exercise demonstrates yet another requirement for such policies to be successful that is relevant for a customs union, a requirement that is hard to meet. Thus, it should be seen as adding to the list in Helpman and Krugman (1989) of conditions that have to be met for strategic trade policies to achieve their aim.

VERs and FDI may minimize or at least lower EC welfare, but may nevertheless be preferred over policy coordination and higher welfare for the EC as a whole whenb considerations of equity are taken into account. Policy coordination calls for a system of transfers from producer to consumer countries. Transfers are determined by the political process and administrative measures, are highly visible, and consequently carry administrative and political costs. Transfers made via markets, as in the trade regime of VER-*cum*-FDI, may therefore be preferable. They may even be less inefficient when all costs are taken into account.

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FIGURE 1

FIGURE 2