

Haaparanta, Pertti; Spolander, Mikko

Working Paper

Policy asymmetries, endogenous market structure with multinational corporations and the pattern of commodity trade

Bank of Finland Discussion Papers, No. 24/1991

Provided in Cooperation with:

Bank of Finland, Helsinki

Suggested Citation: Haaparanta, Pertti; Spolander, Mikko (1991) : Policy asymmetries, endogenous market structure with multinational corporations and the pattern of commodity trade, Bank of Finland Discussion Papers, No. 24/1991, ISBN 951-686-304-3, Bank of Finland, Helsinki, <https://nbn-resolving.de/urn:nbn:fi:bof-201908081369>

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<https://hdl.handle.net/10419/211627>

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Abstract

The impact of asymmetries in trade and industrial policies on the market structure and location of firms and on the pattern of commodity trade are examined using a model in which firms have to take the decisions of other firms into account because of imperfect competition. This approach allows us to consider the implications of liberalization of trade and industrial policies. Among the main results are that liberalization of trade and industrial policies tends to concentrate firms (all active) in the same areas and when the locational decisions of some firms are aggressive in the sense that the position of other firms is made worse. Policy asymmetries increase competition in the markets. It is also argued that policy asymmetries tend to concentrate industries in the same places.

Pertti Haaparanta* – Mikko Spolander

Bank of Finland Economics Department
5.12.1991

POLICY ASYMMETRIES, ENDOGENOUS MARKET STRUCTURE WITH MULTINATIONAL CORPORATIONS AND THE PATTERN OF COMMODITY TRADE

Tiivistelmä

Tutkimuksessa pyritään selvittämään, millaisia vaikutuksia kansainvälisten maiden välillä harjoitettavan kauppapolitiikan eroilla ja toisaalta maiden harjoittaman teollisuuspolitiikan eroilla on markkinoilla olevien yritysten ja niiden omistamien tuotantolaitosten määrään ja sijaintiin sekä näiden välisen kaupan rakenteeseen.

Analyysissä kehitellään yksinkertainen yleinen tasapainon malli, jossa yritys on monikansallistumisen ja markkinoiden rakenteen määrättyjen endogeenisten yritysten tekemien tuotannon sijaintipäätösten perusteella. Mallissa oletetaan, että yritykset tekevät voitonsa valitun markkinoiden käyttäytymisen, jolloin ne kilpailevat keskenään näiden valitun markkinavoiman. Mallin avulla voidaan selvittää, miten kauppapolitiikan ja teollisuuspolitiikan harjoittamisen eroilla vaikuttaa yritysten määrään ja sijaintiin sekä näiden välisen kaupan rakenteeseen.

* Pertti Haaparanta, Department of Economics, Helsinki School of Economics, Runeberginkatu 22-24, SF-00100, Helsinki, Finland

ISBN 951-686-304-3
ISSN 0785-3572

Suomen Pankin monistuskeskus
Helsinki 1991

Abstract

The impact of asymmetries in trade and industrial policies on the market structure and location of firms and on the pattern of commodity trade are examined using a model in which firms have to take the decisions of other firms into account because of imperfect competition. This approach allows us to consider the implications of policy harmonization in contrast to overall liberalization of, for example, trade policies. Among the main results are that policy asymmetries can lead to equilibria where only firms (all active) of unequal size can coexist and where the locational decisions of some firms are aggressive in the sense that the position of other firms is made worse. Policy asymmetries increase competition in the markets. It is also argued that policy asymmetries push trade towards inter-industry trade while with symmetric policies intra-industry trade is observed. The welfare effects of policy harmonization are ambiguous. Inter-industry trade occurs because policy asymmetries tend to concentrate industries in the same place.

Tiivistelmä

Tutkimuksessa pyritään selvittämään, millaisia vaikutuksia toisaalta maiden harjoittaman kauppapolitiikan eroilla ja toisaalta maiden harjoittaman teollisuuspolitiikan eroilla on markkinoilla olevien yritysten ja näiden omistamien tuotantolaitosten lukumäärään ja sijaintiin sekä maiden välisen kaupan rakenteeseen.

Analyysissa sovelletaan yksinkertaista yleisen tasapainon malli-kehikkoa, jossa yritysten monikansallistuminen ja markkinoiden rakenne määräytyvät endogeenisesti yritysten tekemien tuotannon sijaintipäätösten perusteella. Mallissa oletetaan, että yritykset tietävät voivansa vaikuttaa markkinoiden käyttäytymiseen, jolloin ne kilpailevat keskenään tietäen toistensa markkinavoiman. Mallin avulla pystytään selvittämään, mitkä ovat esimerkiksi kauppapolitiikan harmonisoinnin vaikutukset verrattuna kauppapolitiikan yleisen liberalisoinnin vaikutuksiin.

Saamamme tulokset osoittavat, että epäsymmetrinen politiikka saattaa johtaa tasapainorakenteeseen, jossa markkinoilla toimivat yritykset ovat erikokoisia ja jossa tietyn yrityksen tekemää sijoituspäätöstä voidaan pitää kilpailevaa yritystä taloudellisesti vahingoittavana aggressiivisena eleenä. Poliitiikan epäsymmetrisyys vähentää yritysten monopolivoimaa ja lisää kilpailua. Epäsymmetrinen politiikka synnyttää kauppaa toimialojen välille (inter-industry trade), kun taas symmetrinen politiikka luo kauppaa toimialojen sisälle (intra-industry trade). Poliitiikan epäsymmetrisyys lisää toimialojen välistä kauppaa, koska epäsymmetrisyys keskittää kunkin toimialan tuotannon yhteen paikkaan. Poliitiikan harmonisoinnin hyvinvointivaikutukset ovat sen sijaan epäselvät.

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*We are grateful to Titta Heikkilä for comments on an earlier draft of the paper.

1 Introduction*

Many aspects of international trade cannot be explained unless one allows for the possibility that competition in product markets is imperfect (Helpman and Krugman 1985). This means also that the effects of economic integration like the ongoing EC integration cannot be properly evaluated with the tools of traditional trade theory alone. For this reason, the impacts of EC integration have been evaluated by using models built on the foundations provided by recent advances in trade theory (Norman 1989, Smith and Venables 1988).

One problem with the existing models of trade with imperfect competition is that they have not included proper analysis of firms' locational decisions. The studies by Fei (1990) and Levinsohn (1990) consider locational decisions but they do it by arbitrarily imposing the market structure without locational decisions. The same remark applies to the work of Smith (1987). Ethier and Horn (1990) analyze the locational decisions in a framework in which product markets are perfectly competitive. The only work on imperfect competition in product markets which avoids the defect of arbitrary market structure is, to the best of our knowledge, Horstmann and Markusen (1990). In this paper, we extend their analysis to situations where trade and industrial policies can differ between countries.

Our motivation for this type of an analysis derives from the European experience. First, to evaluate the impacts of integration (including welfare effects) considerations of foreign direct investment may be of crucial importance (Jacquemin 1990). This is so especially because foreign direct investment has increased sharply in the EC area since the early 1980's. Secondly, in the GATT and EC, the process of harmonizing national trade and industrial policies has been given as much emphasis as has the overall process of liberalization (for an account see e.g. Hansson 1990). Harmonization is important since there is evidence that trade and industrial policies differ between EC countries (see e.g. Hamilton 1991) and between EC and EFTA countries. To evaluate the impacts of harmonization, one must have at hand a model which can be used to study the impacts of non-harmonized policies on trade and market structure. In addition we want to study how the pattern of commodity trade is

*We are grateful to Tiina Heikkinen for comments on an earlier draft of the paper.

determined together with foreign direct investment when national policies differ.

Quite apart from the European scene, the analysis has importance also when trying to understand what has happened to patterns of trade and direct investment in the world as a whole. For example, much of the work of GATT has been directed towards unification, along with a reduction of the degree of protection.

This paper proceeds as follows: In section 2 the basic model is presented, in section 3 the impacts of national trade policies on market structure are examined and in Section 4 industrial policies are considered; section 5 is devoted to welfare issues.

2 The Model

There are two countries, home (h) and foreign (f), three goods, Z, X and Y, (not all necessarily produced), one factor of production (labour), and in the sector producing X and Y two firms (both need not be active). Competition in the sector producing good Z is perfect and good Z is homogenous (identical wherever produced). Competition in the sector producing X and Y is imperfect; firms know that their decisions affect the market price. The markets for X and Y are modelled using the segmented markets approach of Brander (1981), Brander and Krugman (1983) and Venables (1987), Dei (1990) and Levinsohn (1990) (see Markusen and Venables 1988 for a comparison of this approach with alternative approaches; Venables (1990) presents a model where the degree of market segmentation is parameterized). One implication of this assumption is that the degree of competition depends not only on how many firms there are in the market but also on how many plants they have and where they are located. For example, if the firms have only one production site each, the degree of competition is higher if they are located in the same country than if they are in different countries, if transportation costs/tariffs are positive.

Consider first the home country (notation for the foreign country is differentiated by ') and the sector Z. Assuming that the production function for Z is

$$Z = L_Z \quad (1)$$

and that Z is the numeraire ($z = \text{price of } Z = 1$), the wage rate is also equal to 1.

Assuming that the demands for the goods are generated by the following utility function (the same for each country):

$$U(X, Y, Z) = aX - (b/2)X^2 + aY - (b/2)Y^2 - cXY + Z \quad (2)$$

$b, c > 0$, the inverse demand functions are linear:

$$x = a - bX - cY \quad (3)$$

$$y = a - bY - cX \quad (4)$$

where x and y are the prices of X and Y . The parameter c measures the degree of substitutability between X and Y , if $c = b$ the products are perfect substitutes, if $c < b$, they are imperfect substitutes.

Consider the profits of the home firm (the firm producing X), i.e. the firm owned by home country residents. We assume that there are fixed costs for both establishing a firm and for establishing a production site. This implies that it never pays to establish more than one plant in one country. If the home firm establishes two plants its profits are

$$P = (a - bX - cY)X + (a - bX' - cY')X' - m(X + X') - G - G' - F, \quad (5a)$$

where X = production and sales by the home firm in the home country, X' = production and sale by the home firm in the foreign country, m = marginal cost of production (constant, same in both countries), G , G' = country specific costs of establishing the production plant and F = cost of establishing the firm (assumed to be the same in each country). Y and Y' are defined analogously for the foreign firms, e.g. Y = sales by the foreign firm in the home country = production in the home country, if it has a plant there. Horstman and Markusen (1990) assume $G = G'$, while our purpose here is to analyze the impacts of differing national industrial policies, i.e. the case where $G \neq G'$, along with differing trade policies. Trade policies have an effect on profits if some sales abroad are made through exports rather than through production there. Thus, the home firm's profit, assuming it produces only in the home country, is

$$P = (a - bX - cY)X + (a - bX' - cY')X' - m(X + X') - s'X' - G - F, \quad (5b)$$

where s' = the sum of transportation costs and customs duties and their equivalents associated with exporting from h to f .

Finally, if the home firm produced only in f , its profits would be

$$P = (a - bX - cY)X + (a - bX' - cY')X' - m(X + X') - sX - G' - F. \quad (5c)$$

Here, s = the sum of transportation costs and customs duties and their equivalents associated with exporting from f to h . Horstmann and Markusen (1990) assume that $s = s'$, whereas we examine the implications of $s \neq s'$ and thus the implications of trade policy harmonization.

The equivalents of expressions (5a)–(5c) are easily given for the foreign firm. What remains to be done is to specify the relations between firms in the imperfectly competitive sector. We assume that they make decisions in two stages. In the first stage the firms decide how many production plants they will establish and where they locate them. In the second stage they play a Cournot-Nash game in quantities.¹ We are naturally interested in the subgame perfect equilibria of this game.

¹ It is nowadays a commonplace to point out that the Cournot-Nash game can under some circumstances be regarded as equivalent to a two stage game where firms first decide on their capacities and then on their prices.

3 Asymmetries in Trade Policies, Market Structure and Commodity Trade Patterns

The most widely accepted theory of the internationalization of firms and foreign direct investment, Ownership-Location-Internalization-theory (OLI), (see e.g. Caves 1982), supports the view that trade barriers are among the locational factors which favor the expansion of firms through investment abroad rather than through trade (see also Horst 1971). This view of foreign direct investment as a substitute for commodity trade is also supported by the traditional Heckscher-Ohlin-Samuelson theory (Mundell 1957). These analyses, however, completely ignore the interaction between firms. The location decision may also have strategic value, and this is what we propose to examine here.

In this section we analyze the impacts of nonuniform national trade policies on the market structure and patterns of commodity trade. Without loss of generality we assume that $s \geq s'$ (the other case is, of course, symmetric). In order to eliminate all other influences on market structure we assume that $G = G' > 0$. This means that if all transportation and customs costs are 0, two market structures are possible: either there are two active firms, both of which have one production plant the location of which is indeterminate, or there is only one active firm with one production plant the location of which is indeterminate. Which of the alternatives materializes depends on the cost of establishing a firm. With high F only one firm is active, with lower F both firms are active when $s = s' = 0$. The latter case is more interesting to us, and we restrict our analysis to it. Analysis of the other case, with only one firm active, would essentially repeat the analysis of Horst (1971): with high enough tariffs it becomes profitable to produce behind the tariff wall. With differing national trade policies, it is profitable for a single firm to locate in the country with the highest tariffs.

In figure 1 the diagonal Oo (which represents the case of symmetric trade policies) is drawn under the assumption that at point 0 both firms are active with one production plant each. As tariff/transportation costs are increased along Oo , a point (1) is reached beyond which it pays for the firms to start producing in the other country also. Between 0 and 1 each firm has one production

plant, each in a different country; to be specific assume that the plant of firm Y is located in f , that of firm X in h . Transportation and trade costs give the firms with single plants greater monopoly power if they are located in separate markets than if they are both producing in the same country.

Take any point on the diagonal Oo between points 0 and 1 and consider what happens when s increases. With increasing s , it is clear that exports from f to h become less and less profitable compared to the alternative of shifting production to h , and sooner or later it becomes profitable to make the shift. The difference between the profits of firm Y when its plants are located in different countries as compared to when they are in the same country is

$$b\{B - [2bs/((2b-c)(2b+c))]\}^2 + b\{B + [cs'/((2b-c)(2b+c))]\}^2 - bB^2 - b\{B - [s'/(2b+c)]\}^2, \quad (6a)$$

where $B = (a-m)/(2b+c)$.

Firm Y is indifferent between having its single plant in f or h when (6a) equals 0. This gives the curve Oo in figure 1. It is easy to calculate the equivalent of (6a) for the domestic firm also:

$$b\{B - [2bs'/((2b-c)(2b+c))]\}^2 + b\{B + [cs/((2b-c)(2b+c))]\}^2 - bB^2 - b\{B - [s'/(2b+c)]\}^2. \quad (6b)$$

Thus, the domestic firm would always prefer to see the plants located in different countries. In fact, its profits would increase as home country tariffs increased if the plants were in different countries, since its market power would also increase. In this sense, the shift of production by the foreign firm to the home country is an aggressive move, a move disliked by the domestic firm.

This is not the end of the story, however. Point 1 is determined by the condition that both of the firms are indifferent between establishing the second plant and having just a single plant i.e.

$$P_x\{(2,2)[2,2]\} - P_x\{(1,2)[2,1]\} = 0 \quad (7a)$$

$$P_x\{(2,1)[1,2]\} - P_x\{(1,1)[1,1]\} = 0 \quad (7b)$$

where $P\{(i,j)[k,l]\}$ denotes the profits of firm X when there are k plants in h , l plants in f , the domestic firm has i plants and the foreign firm j plants. Similar conditions hold for firm Y. In this game, in addition to the assumption of uniform exporting costs, it is assumed that when firms have single plants they are located in different countries. Off the diagonal to the right of Ob this does not hold and hence the game is different. To the left of Ob the exporting costs between countries can differ. For the domestic firm, the game is the same here as in (7) and the differences (7a) and (7b) are both equal to

$$bB^2 - b\{B - [\theta s'/(2b+c)]\}^2 - G, \quad \theta = 2b/(2b-c) \quad (8)$$

and are thus independent of s . (8) is equal to 0 at point 1 and hence we know that to the left of Ob the domestic firm will have only one plant when s' is smaller than at point 1. For the foreign firm the equivalent of (8) is the same expression with s replacing s' . Thus when s is smaller than at 1, the foreign firm will have one plant in f ; when s is larger than at 1, it will have two plants, one in each country. Hence, the area between the diagonal and the curve Ob can be divided in two parts. In part A each firm has one plant, each in a different country; in part C the foreign firm has two plants, the domestic firm 1 plant. The domestic trade policy induces the growth of foreign firms and gives rise to asymmetric equilibria with firms of different sizes in the market.

To the right of Ob the decision of the domestic firm to establish a second plant is determined by the differences

$$P_x\{(2,2)[2,2]\} - P_x\{(1,2)[2,1]\} \quad (9a)$$

$$P_x\{(2,1)[2,1]\} - P_x\{(1,1)[2,0]\} \quad (9b)$$

(9a) is given by the expression (8) whereas (9b) is equal to

$$b\{B + [\mu s'/(2b+c)]\}^2 - b\{B - [s'/(2b+c)]\}^2 - G, \quad \mu = c/(2b-c). \quad (10)$$

It is easy to show that (9b) is always larger than (9a) when $s' > 0$. Since (9b) diminishes as s' diminishes, it is equal to 0 at a smaller

s' than (9a), which is 0 at s' at point 1. Let α be the value of s' at which (9b) is equal to 0. It is easy to see that α is at the point where the curve Ob and the line dividing areas A and C meet. Since the situation for the firm Y to the left of Ob is the same the area to the right of Ob can be divided in two parts, parts D and E. In part D both of the differences in (9) are negative and thus both firms prefer to have just a single plant located in the home country. In part E the game between the firms is the following:

		Firm X	
		1 plant in h	2 plants
Firm Y	1 plant in h	(m,m)	(n,p)
	2 plants	(p,n)	(r,r)

where in (i,j) i is the profit of the domestic firm and j the profit of the foreign firm. In area E, $n > m$ by definition and $r < p$. There are thus two equilibria: either the domestic firm has two plants and the foreign firm one in the home country or the foreign firm has two plants and the domestic firm one plant in h .

To complete the picture, it can be noted that with exporting costs higher than at point 1 both firms establish production behind both of the trade barriers and thus all trading in goods ceases.

There are several conclusions one can draw on the basis of figure 1. First, it is clear that asymmetries in trade policies can have profound effects on both the location and the size of firms. Asymmetric trade barriers can induce a pure shift of production from the country with low barriers to the country with high barriers (area D in figure 1). This shift is an aggressive move resisted by the firms operating in that country. With the harmonization of trade policies this production resumes.

Secondly, the asymmetries can induce a differential growth pattern on firms: the markets may be able to sustain only firms of unequal size even though the production costs are equal (areas C and E). Indeed, a tight trade policy by the home country may cause foreign firms to grow larger than the home firms (area C). Again, these asymmetries disappear when trade policies are harmonized.

Thirdly, it is obvious that the degree of competition increases with the general level of trade barriers as well as with the asymmetries in trade policies. Thus, the general liberalization and harmonization of trade policies will reduce competition in product markets. This is contrary to the general view of what happens with

trade liberalization. This may simply be the result of restricting the number of potential firms to two. Yet, with large enough F this is not a significant restriction.

Consider finally what happens to the commodity trade patterns when trade policies change. In this model, when trade policies are symmetric, all trade is intra-industry trade. The more asymmetric the trade policies are, the more likely it is that all trade is purely inter-industry trade. Thus, e.g. in area D, f trades Z in exchange for both X and Y ; in area A trade is intra-industry trade, with f exporting Y and h exporting X . This effect of trade policy asymmetries on commodity trade patterns has been neglected in the existing literature on intra-industry trade (see Greenaway and Milner 1986, pp. 177-179). It is notable that inter-industry trade can arise even when there are no considerations of comparative advantage involved: here the economies have identical structure, except for policy asymmetries. Inter-industry trade arises because of the locational decisions of firms: policy asymmetries tend to concentrate the production of a sector in one place. The observed rise in the share of intra-industry trade in the post-war period can thus be attributed partly to the harmonization of trade policies at which GATT and the various regional trade agreements have aimed.

4 Asymmetries in Industrial Policies, Market Structure and Commodity Trade Patterns

In this section we examine how asymmetries in industrial policies which show up in the costs of establishing a plant in a country affect the locational decisions of firms. We conjecture that many industrial policies when viewed from the point of view of a firm planning to start production actually can be seen as reducing the costs of building a production plant. For example, in many countries local authorities support the establishment of new plants in their jurisdiction by either selling or renting land at prices below the market.

To concentrate on asymmetries in costs of establishing productive operations we assume that $s = s' > 0$. Since we still are assuming that $F > 0$, two market structures are possible when $G = G' = 0$. Either both firms are active with both having production in both of the countries or only one of the firms is active with production in both countries. In either case, there is no commodity trade. Since the situation is again otherwise symmetric, we can concentrate on the case where $G \geq G'$. In figure 2 we analyze the simplest case: under symmetry with low costs of building plants, both of the firms are active with two plants, while with higher costs they are both active but with one plant only. The most complicated case, in which the equilibria can be indeterminate for some values of G and G' even under symmetry, is given in figure 3. The analysis underlying figure 3 is, however, completely analogous to that of figure 2. Since all the general results to be derived are contained in figure 2 we confine our detailed analysis to it.

Take any point on the diagonal Oo between 0 and 1 (i.e. where both firms have two plants) and consider what happens when G increases. With sufficiently large G the gains from producing in h start to fall below the gains derived when the h market is served by exports from f . But if production were concentrated in f only, the firms would lose the monopoly power in h which one of them could enjoy if the other firm had no production in h . Thus as G increases the first new equilibrium is one in which one of the firms has two plants and the other has one plant. Which one will be larger cannot be determined in the present framework. For large enough G , it is obvious that none of X or Y is produced in h and thus the only

possible equilibrium is the one with both firms producing in f with single plants.

If the initial equilibrium with symmetric policies were such that both firms had one plant in different country, increasing G would eventually lead to a concentration of production to f . This will not happen with small asymmetries, however, since when there are transportation costs the degree of firms' market power is greater when they produce in different countries than when they produce in the same country. Finally, if in the symmetric equilibrium the costs of establishing production are high enough, then an increase in G can eliminate the other firm from the market.

There are again a number of conclusions one can draw from this analysis. First, again the asymmetries have large effects on both the market structure and the location of firms. The asymmetries have a pure location effect only if the number of production plants the markets can support is small, even without asymmetries; otherwise the market structure will also change.

Secondly, the policy asymmetries can, as in the case of trade policies, have a differential effect on the size of firms; markets may be able to support only firms of different size.

Thirdly, as in the case of trade policies, the degree of competition in the markets increases if the home country supports the establishment of new production there (read straight down from the diagonal in figure 2).

Overall, the policy asymmetries, whether trade or industrial policy asymmetries, tend to have similar effects on market structure and location. The same holds also for the pattern of commodity trade. From figure 2 it is clear that the larger the asymmetries, the more likely it is that trade is inter-industry trade while with symmetric policies, trade (if any occurs) is purely intra-industry trade.

5 Welfare Effects of Harmonization of Policies

Since policy asymmetries have substantial effects on market structure and location of firms, it is to be expected that the welfare effects of policy harmonization may also be large. Further, since we are obviously looking at a second-best situation, the direction of welfare changes is unpredictable. For example, we showed above that harmonization reduces the degree of competition in the markets, which tends to reduce welfare. This effect has to be weighed against the benefits derived from the more intensive exploitation of economies of scale in production.

The cases that could be analyzed are too numerous, and so we had to make choices. Perhaps the most interesting cases are the ones in which the asymmetries in policies do not change the number of production units but affect only their location. In figure 1, such a situation occurs between areas A and D when trade policy asymmetries increase. The welfare effect of this change in the structure of the economies seems to be unclear. First, the degree of competition in the domestic market increases when the foreign firm enters (area D). This reduces prices in the home market and thus increases welfare. Secondly, the profits of the domestic firm are lower in D than in A. Consumer income is thus lower, *ceteris paribus*, and so too is welfare. Finally, the home country loses tariff revenue when the foreign firm enters. Since we assume that all tariff revenues are handed back to the consumer as a lump sum, this effect leads to reduced welfare. The net effect here seems to be unclear. This is confirmed by the following expression, which gives the difference between the welfare levels of the representative consumer in the home country at the line between areas A and D (W = welfare if the foreign firm does not invest in the home country, W^* = welfare if the foreign firm establishes a production plant in the home country):

$$\begin{aligned}
 W - W^* = & [b/(2b+c)][(3\mu-\theta)+2B]s \\
 & + [1/(2b+c)^2][(b/2)(3\mu^2+\theta^2)-c\theta\mu]s^2 - \theta s^2/(2b+c) \\
 & - 2b\mu s'/(2b+c) + (\theta^2-1)s'^2/(2b+c)^2.
 \end{aligned} \tag{11}$$

Here s and s' must satisfy equation (6a). Even with this information, it is not possible to determine the sign of (11). To get an idea of the likely effects, we apply the numerical values used by Horstmann and Markusen (1990) and examine the sign of (11). This indicates that in the symmetric case the solution with single production sites is obtained if $a = 16$, $b = 2$, $c = 1$, $m = 0$, $s = 2$, $G = G' = 7$, $F = F' = 27$. From (6a), it is easy to show that the value of s' that is consistent with s with the economy on 0b in figure 1 is $s' = 1.89$. With these numerical values, $W - W^* = 2.1267$, and hence the home country welfare would decrease with the entry of the foreign firm. The home country consumers would gain from the increase in the degree of competition, as they would from the harmonization of policies. The calculations, however, show that the factor crucial to welfare improvement is the increase in tariff revenue when policies are harmonized. With harmonization, the foreign firm ceases production in the home country and the home country begins to import the product previously produced within its borders. Numerical examples can be used to show that the welfare effect can be reversed. It is thus possible to increase home country welfare by using tough trade policies to induce investment by foreign firms in the home country. This happens despite the fact that the profits of home-owned firms decline.

If the impact on the welfare of domestic consumers of changes in trade policies are ambiguous in the case just studied, the same holds for foreign consumers. First of all, they do not receive benefits from the increase in competition between firms as do consumers in home country, if both of the production plants are located in the same place, since they do not receive any goods duty free. Secondly and countering the first effect, the foreign tariff revenue increases, *ceteris paribus*, since the foreign country now imports all of the goods X and Y that it consumes. The exact formula for the change in foreign welfare at the line between areas A and D in figure 1 is

$$\begin{aligned}
 W' - W'^* = & \{ [1/(2b+c)[b(3\theta - \mu) + c(2-B)] - B \} s' \\
 & + [1/(2b+c)^2] [(b/2)(\theta^2 + 3\mu^2 - 4) - c(\theta\mu + 1)] s'^2 \\
 & - (\theta - 2)s'^2/(2b+c) + b \{ [\theta s/(2b+c)]^2 - 2\theta s/(2b+c) \}.
 \end{aligned} \quad (12)$$

It is clear that this expression cannot be signed unambiguously confirming the informal discussion above. The numerical example

used above gives $W' - W'^* = -2.6916$. In this case consumers in the foreign country would gain from the foreign direct investment induced by the tough home country trade policies. Thus, the country with more liberal trade policies would gain. In this case, it would not like to see the trade policies harmonized. There is thus a conflict of interest in trade policies between the two countries.

6 Conclusions

The main points reached are: 1) Policy asymmetries, whether in trade or industrial policies, give rise to equilibria in which active firms are of different sizes. Harmonization of policies thus tends to make the position of firms more symmetric. 2) Policy asymmetries also, quite surprisingly, tend to increase the degree of competition in the markets. The asymmetries in policies can induce locational decisions which are aggressive in the sense that the decision of firms to establish production in some country unambiguously deteriorates the position of firms already in that country. 3) Policy asymmetries also have a notable impact on the pattern of commodity trade: with asymmetries, trade tends to be inter-industry trade even when countries are otherwise identical, while with symmetric policies trade is intra-industry trade. 4) The welfare impacts of policy harmonization are ambiguous. While policy asymmetries can increase the degree of competition in the markets, and thus harmonization would reduce it, the profits of firms increase with harmonization as do the tariff revenues of the government, since firms no longer have an incentive for tariff jumping. Numerical examples show that harmonization can increase welfare. More interestingly, they also show that harmonization can have differing impacts on the different countries. They also show that foreign direct investment induced by trade policies may be either welfare increasing or decreasing. Thus, the result in Brecher and Diaz-Alejandro (1977) which examined foreign capital flows in a Heckscher-Ohlin perfect competition framework and found it to be welfare reducing in the importing country, is special. Similarly, the country from which the FDI flows may gain or lose from it if the FDI is induced by the tough trade policies of its neighbours.

The model we have used is based on the assumption of non-integrated goods markets as is much of the theory of international trade incorporating strategic interactions between firms. In further work, we plan to relax this assumption. Here we just want to point out that as such it may not be a bad assumption. For example, Geroski (1989) has argued that the European experience clearly shows how important local habits etc. are for creating markets for specific varieties. These non-integrated markets seem to persist even when formal barriers to the flow of goods are abolished. Similarly, the Japanese markets seem to remain closed even after trade is freed.

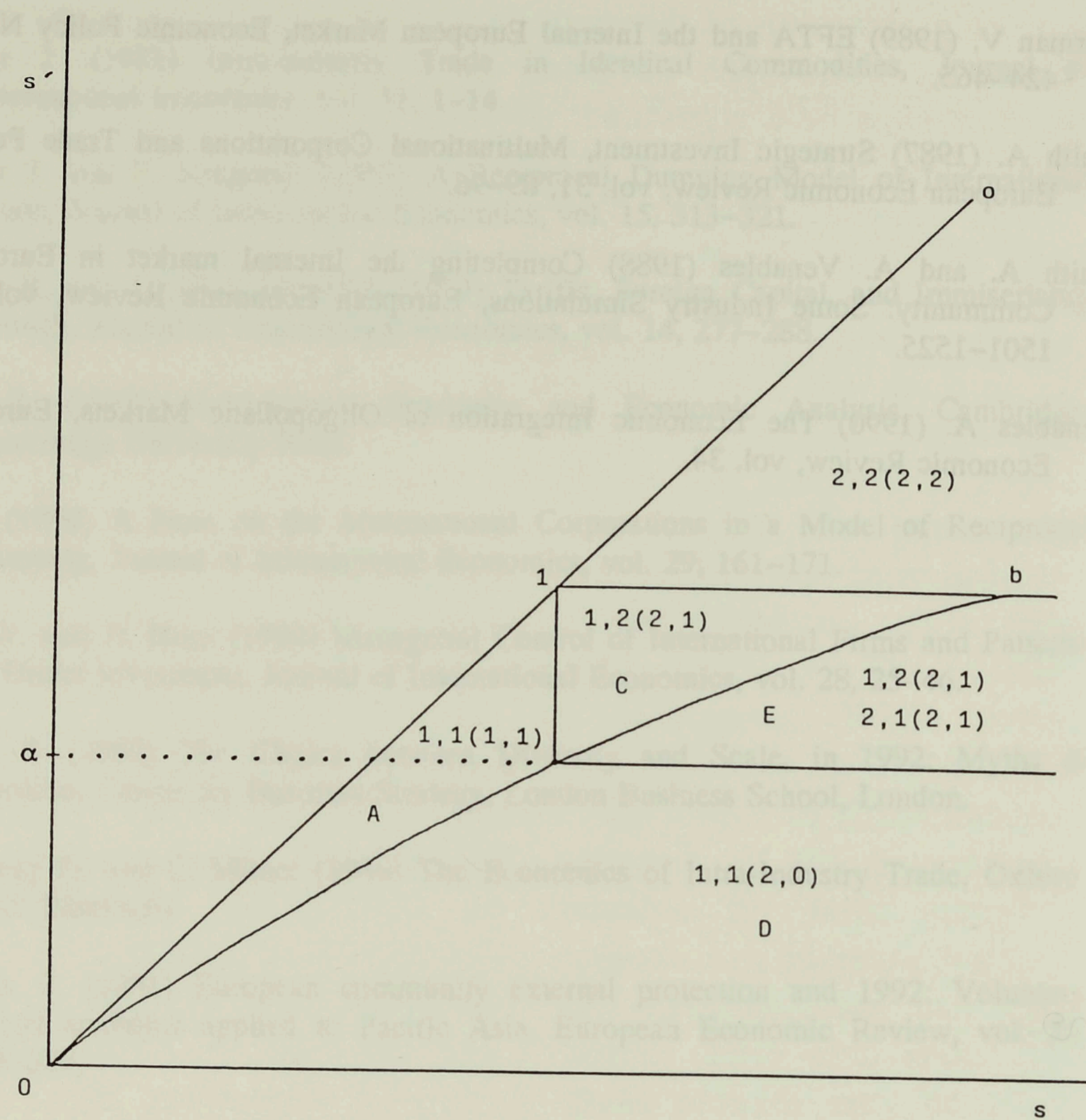
Since our numerical results showed that the countries may have different attitudes towards the harmonization of trade policies an interesting extension of the analysis would be to formulate the trade policies as some type of game between the governments. This would perhaps be a significant addition to the growing literature on endogenous trade policies.

One drawback to our analysis is that locational decisions are driven by policy asymmetries only. An interesting extension would be to reconsider the same problem in a framework where some other factors influencing location are active.

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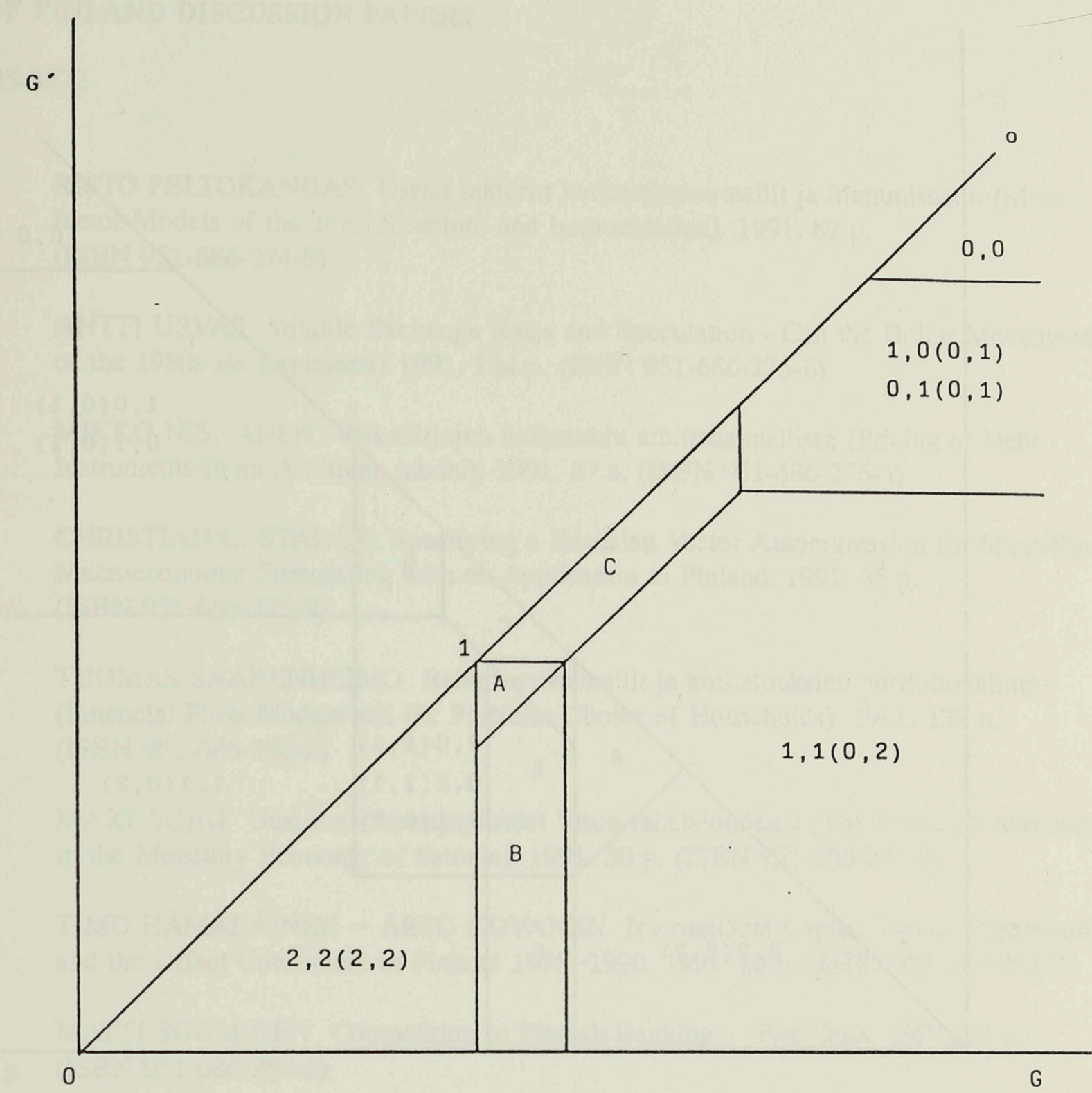
Figure 1.



Asymmetries in trade policies

- i,j(k,l): i = number of home-firm plants
- j = number of foreign firm plants
- k = number of plants in home country
- l = number of plants in foreign country

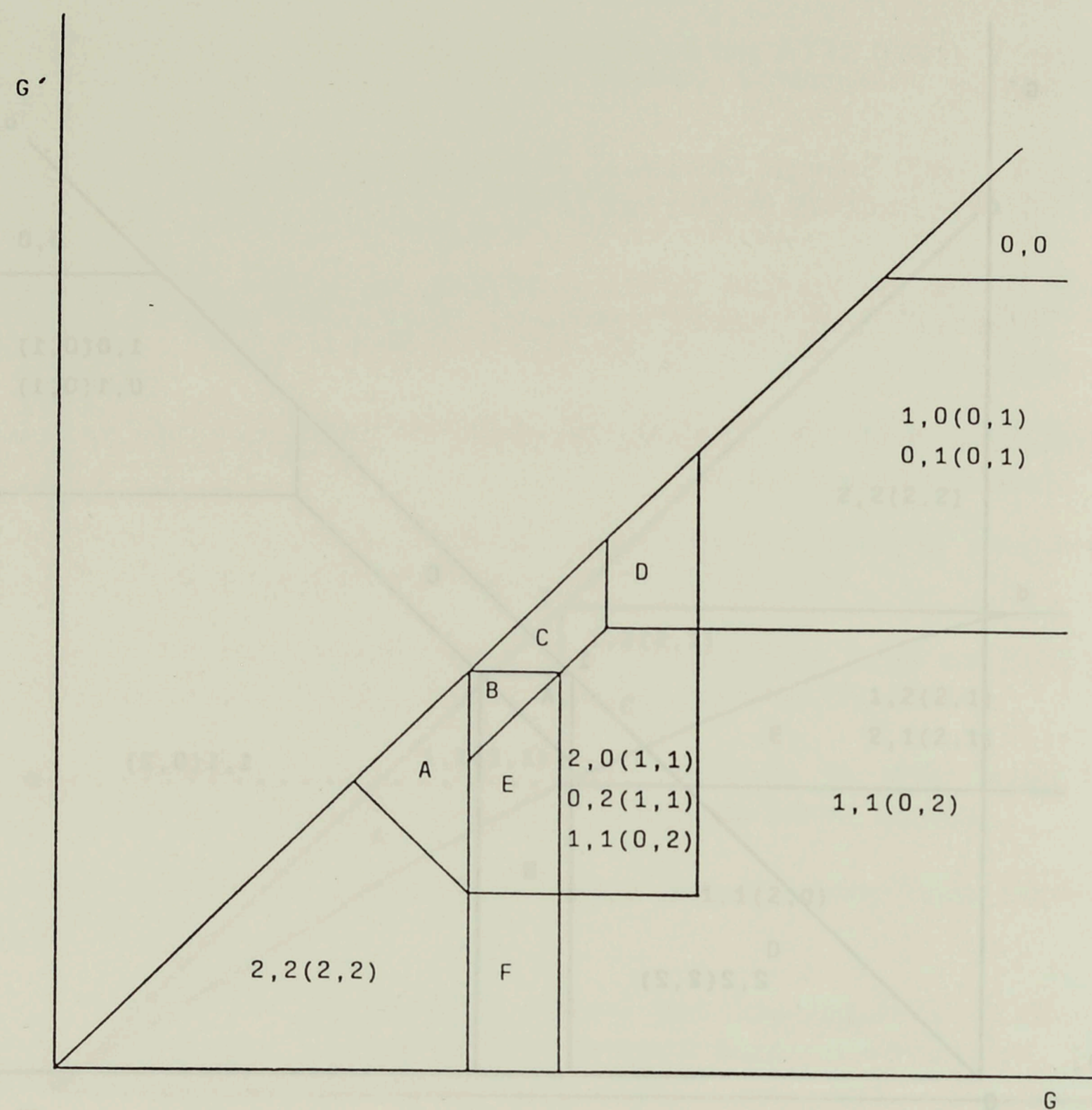
Figure 2.



- A : 2,1(1,2)
- B : 2,1(1,2)
1,2(1,2)
- C : 1,1(1,1)

Asymmetries in industrial policies

Figure 3.



A : 2,0(1,1) 0,2(1,1)	B : 2,0(1,1) 0,2(1,1) 2,1(1,2)	C : 2,0(1,1) 0,2(1,1) 1,1(1,1)	D : 2,0(1,1) 0,2(1,1)
E : 2,0(1,1) 0,2(1,1) 2,1(1,2) 1,2(1,2)	F : 2,1(1,2) 1,2(1,2)		

Asymmetries in industrial policies : case 2

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