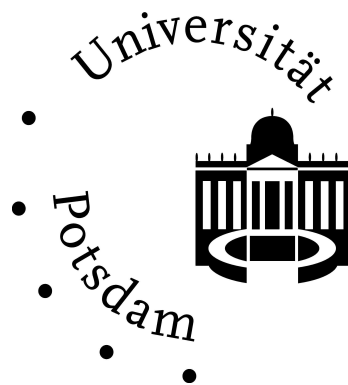# UNIVERSITÄT POTSDAM

WIRTSCHAFTS- UND SOZIALWISSENSCHAFTLICHE FAKULTÄT

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Do Truong Giang

Tariffs and export subsidies in a spatial economic model

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Tariffs and export subsidies in a spatial economic model

by

Do Truong Giang

Universität Potsdam

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Address of the author: Universität Potsdam, Wirtschafts- und Sozialwissenschaftliche Fakultät, Lehrstuhl für Volkswirtschaftslehre, insb. Wirtschaftstheorie, Postfach 900327, 14439 Potsdam

1   Introduction

„Die neuklassische Theorie hat die drei Grundprobleme des internationalen Handels teils gar nicht gelöst, teils ist ihre Lösung unhaltbar, und teils ungenau. Unterblieben ist die Lösung des Kombinationsproblems. Unhaltbar erscheint die Beantwortung der Frage nach der internationalen Arbeitsteilung. Zum mindesten ungenau ist das Transferproblem behandelt worden.“[1]

With this critique August Lösch (1939) has justified a another direction for the economic theory, which takes the factor "space" into consideration. In recent years different articles continuing Lösch´s discussion have been published. The subject-matter of these articles is to analyze the traditional economic objects like profit maximizing prices, total welfares, etc. in a spatial model, when different trade political measures are taken. Benson and Hartigan (1984) showed that trade policy has effects on the distribution of the consumers, when there is an oligopolistic interdependence between domestic and foreign firm and that import tariff may reduce the profit-maximizing price. The impacts of the tariffs on the consumer distribution and land rents are also investigated by Heffley and Hatzipanayotou (1991). Furthermore, Heffley and Hatzipanayotou (1993) investigate the impacts of tariffs under alternative conjectural variations and heterogenous goods. This analysis is extended by Hass (1996) to alternative types of spatial competition and to endogenous welfare maximizing tariff. The impacts of tariffs in a spatial model can also be found by Schöler (1990), Schöler (1997), Hass and Schöler (1999), etc. The researches up to now take only the political measures of one country into consideration. In the real world the measures of other countries are to be reckoned with, if one country goes in for trade policy.

This paper represents a model, in which the measures of two countries participating in international trade are considered. The paper is organised as follows: section 2 illustrates the assumptions of the model and the situation without tariffs. Section 3 represents the situation with tariffs and compares both situations to each other. Concludingly, in section 4 we discuss some political recommendations, which can be derived from the model.

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[1]Lösch, A. (1939), Eine neue Theorie des internationalen Handels, in: *Weltwirtschaftliches Archiv*, 50. Band, S. 324.

2 Free trade

In order to keep the model manageable, the following assumptions are employed:

A1. The domestic and foreign country are located on an one-dimensional market OR, whereas the border ist located at R_G.

A2. There are two firms, which produce the same product. The domestic firm is located at the beginning point of the market area (point O). The foreign firm is located at the end point (point R) of the market area. Location changes of the firms are excluded because of the short-term analysis.

A3. Consumers occupy the market area with a uniform density equal to 1.

A4. The foreign firm exports part of its production to the domestic country.

A5. Domestic and foreign consumers have the identical linear demand function: $q = 1 - p$. q is the demanded quantity of the product, p is the delivered price, which is paid by the consumers.

A6. To maximize their consumer surplus, consumers buy product of the firm with the lower delivered price. The competition boundary R_C is the point, where the delivered prices of both firms are identical.

A7. The firms maximize their profits under Löschian competition.

A8. The fixed and variable costs are assumed to be zero[2]

O ——————————————————————————————▶
               R_C R_G R
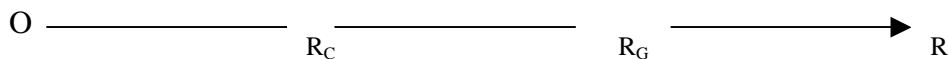
The model

The delivered price consists of mill price set by the firm and the transportation costs from the location of the firm to the residences of the consumers. To keep the algebra less cumbersome we assume the linear transport costs function and the costs of one unit product per unit of distance are 1. The delivered price of the product is: m + r. r is the distance from production place to the residences of the consumers. The demand function has the form: 1 – m – r. If we symbolize the mill price of the domestic firm with m_I, of the foreign firm in the foreign

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[2]When firms leave the market, fixed costs are sunk costs and must not be considered in the calculation. The assumption that the variable costs are zero is for keeping the mathematical expressions less cumbersome.

country with m_D, of the foreign firm in the domestic country with m_A, the demand functions read:

- The demand of the domestic consumers for domestic product: $q_{ii} = 1 - m_I - r$
- The demand of the domestic consumers for foreign product: $q_{ia} = 1 - m_A - D - r$
- The demand of the foreign consumers for foreign product: $q_{aa} = 1 - m_D - r$.

The domestic firm´s profit, which is made up of the profits of every points of the market area OR_C, is given by:

$$(1) \qquad \Pi_I = m_I \int_0^{R_C} (1 - m_I - r)dr.$$

In many cases the consumers are ready to pay more for the product than they have to pay. The difference between the readiness of payment and the price called consumer surplus is considered in this model. The surplus of the domestic consumers on the market area served by the domestic firm OR_C reads:

$$(2) \qquad CS_1 = \int_0^{R_C} 0{,}5(1 - m_I - r)^2 dr.$$

The surplus of the domestic consumers on the market area served by foreign firm $R_C R_G$ reads:

$$(3) \qquad CS_2 = \int_0^{R_G - R_C} 0{,}5(1 - m_A - D - r)^2 dr.$$

D symbolizes the distance $R_G R$, $D = R - R_G$. The foreign firm´s profit on the foreign market $R_G R$ can be expressed as

$$(4) \qquad \Pi_A^{[A]} = m_D \int_0^D (1 - m_D - r)dr.$$

m_D is the mill price set by the foreign firm for the foreign market. The foreign firm´s profit on the domestic market $R_C R_G$ reads:

$$(5) \qquad \Pi_A^{[I]} = m_A \int_0^{R_G - R_C} (1 - m_A - D - r)dr.$$

The total profit of the foreign firm on both market areas is

$$(6) \qquad \Pi_A = \Pi_A^{[A]} + \Pi_A^{[I]} = m_D \int_0^D (1 - m_D - r)dr + m_A \int_0^{R_G - R_C} (1 - m_A - D - r)dr.$$

The foreign consumers have the surplus:

$$(7) \qquad CS_3 = \int_0^D 0{,}5(1 - m_D - r)^2 \, dr.$$

The firms set the mill prices, that maximize their profits. The profit-maximizing price of the domestic firm results from deriving its profit function (first derivation equals zero and second derivation is less than zero). When we derive the function (1) to m_I, we receive:

$$(8) \qquad \frac{\partial \Pi_I}{\partial m_I} = -\frac{R_C(4m_I + R_C - 2)}{2} = 0.$$

The second derivation to m_I equals $-2R_C$ and is negative, because there is no negative distance in this model.

Because the Löschian competition is assumed, the firms do not take the changes of the market areas as the result of the price changes as well as the price changes of the competitors into consideration, because they believe, that the competition border does not change by changing prices: $\frac{\partial R_C}{\partial m_I} = \frac{\partial R_C}{\partial m_A} = 0.$ The optimization of the firm´s profits occurs under considering their own mill prices, whereas the market areas are exogen. The competition border is achieved, because the firms have enough market information and set the right prices. The achieved equilibrium is stable, because each firm believes that it can not profit from the variation of the prices.

The profit-maximizing mill price of the domestic firm is:

$$(9) \qquad m_I^* = \frac{2 - R_C}{4}.$$

When we put (9) in (1), so we have:

$$(10) \qquad \Pi_I = \frac{R_C(R_C - 2)^2}{16}.$$

The same procedure is for the foreign firm. For the foreign firm there are two optimal prices on account of the discrimination pricing: one for the foreign market and one for the domestic market. In the foreign country the profit-maximizing price is determined by the condition:

$$(11) \qquad \frac{\partial \Pi_A}{\partial m_D} = -\frac{D(4m_D + D - 2)}{2} = 0$$

The profit-maximizing price of the foreign firm for the foreign market area is:

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(12) $$m_D^* = \frac{2 - D}{4}.$$

For the domestic market area the first profit-maximizing condition reads:

(13) $$\frac{\partial \Pi_A}{\partial m_A} = \frac{(R_G - R_C)(2D + 4m_A - R_C + R_G - 2)}{2} = 0.$$

The profit-maximizing mill price of the foreign firm for the domestic market area is:

(14) $$m_A^* = -\frac{2D - R_C + R_G - 2}{4}.$$

The following equation stems from the equality of the firms´s prices on the competition border:

(15) $$m_I + R_C = m_A + D + R_G - R_C.$$

The competition border arises (after putting (9) and (14) in (15)) as

(16) $$R_C^* = \frac{2D + 3R_G}{6}.$$

When we put (16) in (9) and (10), we have:

(17) $$m_I^* = -\frac{2D + 3(R_G - 4)}{24}$$

and

(18) $$\Pi_I = \frac{8D^3 + 12D^2(3R_G - 8) + 18D(3R_G^2 - 16R_G + 16) + 27R_G(R_G^2 - 8R_G + 16)}{3456}.$$

The profit-maximizing mill price of the foreign firm after putting (16) in (14) is:

(19) $$m_A^* = -\frac{10D - 3(R_G - 4)}{24}.$$

This expression shows that the profit-maximizing mill price depends on the distance between the domestic firm´s location and the border (R_G) and the distance between the foreign firm´s location and the border (D). This dependence on two independent variables makes the later comparison between two situations (free trade and trade policy) impossible, especially when the mathematical expressions become more complicated. To deal with this problem a further assumption is employed:

A9. The relation of the distance between the foreign firm and the border equals a third of the distance between the domestic firm and the border (D is a third of R_G):

(20) $$D = \frac{R_G}{3}.$$

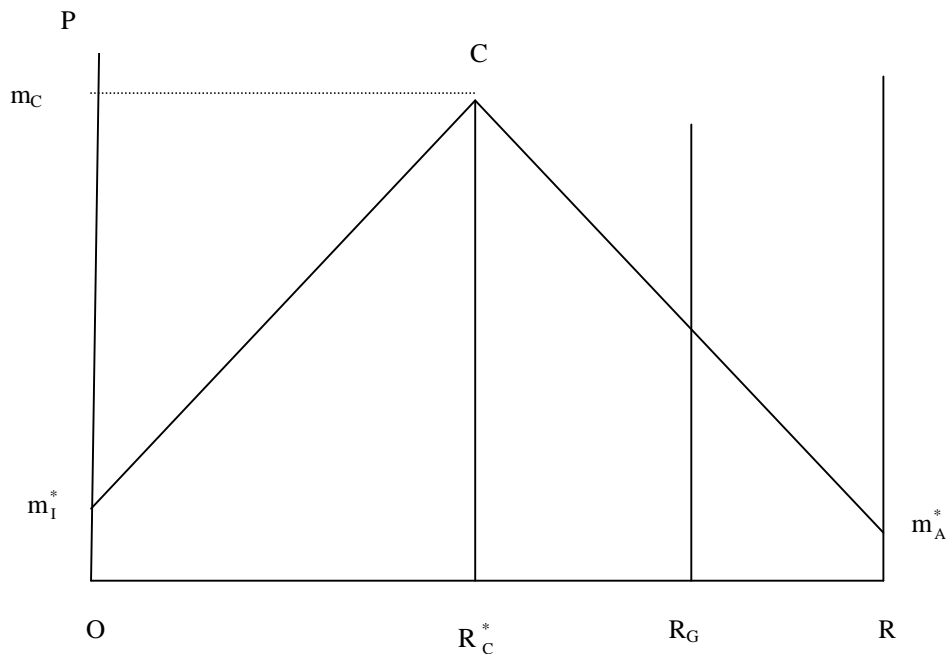m_A^*, m_I^* and R_C^* can be expressed as:

$$(21) \qquad m_A^* = \frac{36 - 19R_G}{72},$$

$$(22) \qquad m_I^* = \frac{36 - 11R_G}{72}$$

and

$$(23) \qquad R_C^* = \frac{11}{18}R_G.$$

Figure 1: Equilibrium by free trade

In the figure 1 the vertical axis OP symbolizes the delivered prices of the products. The horizontal line OR is the total length of the market. On account of increasing transport costs by increasing distance the delivered price of the domestic product increases along the line $m_I^* C$ from m_I^* to m_C. The delivered price of the foreign product increases along the line $m_A^* C$ from m_A^* to m_C. By the distance R_C^* (from the domestic firm´s location), where the delivered prices of the domestic and foreign firm are identical, the competition boundary of the firms is located. By free trade the domestic firm serves the market area $O R_C^*$.

From (21) and (22) it is recognizable that the foreign firm sells its product to domestic consumers at a lower mill price than the domestic firm. Under the same transport conditions the foreign firm has a wider market area (in the foreign and domestic country altogether) than the domestic one, as the equation (23) shows.

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Now the question can be raised, how long the distance from domestic firm ´s location to the border can be, so that the whole market is served. At the competition boundary the delivered price is the highest and the demand is the least. So that the whole market area is served, the demand at the competition border may not be negative:

(24) $$1 - m_I^* - R_C^* = 1 - m_A^* - R + R_C^* \geq 0.$$

Putting (22), (23) in (24), we get:

(25) $$1 - \frac{36 - 11R_G}{72} - \frac{11}{18}R_G \geq 0, \text{ it follows: } R_G \leq 12/11.$$

Since the countries of the world are differently large and the location choice of the firms depends on many factors (economic situation, political system etc.), it is useful to analyse the economic items like welfare, consumer surplus, profit etc. by different geographical sizes of the countries. All these economic items are showed dependently on R_G in figures. For simplification the asumption 2 is extended such that R_G varies between 0 and 1.

It follows from the equations (21) and (22) that the mill prices of the firms fall when the distance from the domestic firm ´s location to the border increases. By the location situation of this model the foreign firm always sets lower mill price than the domestic one. The profit of the domestic firm after putting (20) in (18) is:

(26) $$\Pi_I = \frac{11R_G(121R_G^2 - 792R_G + 1296)}{93312}.$$

The surplus of the domestic consumers on the market area served by the domestic firm (after putting (16) in (9) and in (2)) is:

(27) $$CS_1^* = \frac{11R_G(847R_G^2 - 2376R_G + 3888)}{559872}.$$

The surplus of the domestic consumers on the market area served by the foreign firm is:

(28) $$CS_2^* = \frac{7R_G(1279R_G^2 - 4104R_G + 3888)}{559872}.$$

The total surplus of the domestic consumers is:

(29) $$CS_1^* + CS_2^* = \frac{R_G(1015R_G^2 - 3048R_G + 3888)}{31104}.$$

The maximum profit of the foreign firm is:

$$(30) \qquad \prod_{A}^{*} = \frac{13R_G(211R_G^2 - 936R_G + 1296)}{93312}.$$

The foreign consumers make the surplus:

$$(31) \qquad CS_3^* = \frac{D(7D^2 - 12D + 12)}{96} = \frac{R_G(7R_G^2 - 36R_G + 108)}{2592}.$$

Since the foreign firm serves part of the domestic market, part of its profit is made in the domestic country. One can wonder, which welfare this profit belongs to. In the national accounting there are two possibilities to define the value added of a country. The domestic concept considers the value added of an geographical area, irrespective of whether the goods and services were produced by residents or not (see Frenkel and John (1993) p. 57). According to this concept this part of the profit would belong to the domestic welfare. The method on the basis of resident status considers the value added of the residents, irrespective of where the products and services were produced (see Brümmerhoff (1995) p. 34). According to this method this part of the profit belongs to the foreign welfare. In this paper we use the second concept. The domestic welfare, which consists of the profit of the domestic firm and the domestic consumer surplus, is:

$$(32) \qquad W_I^F = \prod_I^* + CS_1^* + CS_2^* = \frac{R_G(547R_G^2 - 2232R_G + 3240)}{11664}.$$

The foreign welfare, which consists of the profit of the foreign firm and the foreign consumer surplus, is:

$$(33) \qquad W_A^F = \frac{R_G(2995R_G^2 - 13464R_G + 20736)}{93312}.$$

The total welfare, which consists of the domestic and foreign welfare reads:

$$(34) \qquad W^F = W_I^F + W_A^F = \frac{R_G(3199R_G^2 - 16956R_G + 24300)}{69984}.$$

3 Trade policy: ad valorem tariff of the domestic country, export subsidy of the foreign country

Schöler (1990) shows that the ad valorem tariff I does not have any effect on the market expansion of the firms. The following questions are raised: does this result change if the foreign country takes measures in return and can the foreign state use the ineffectiveness of the domestic tariff to lead its country to a better welfare (if the ad-valorem tariff is ineffective). Since the mill price of the foreign good is the calculation basis for the ad-

valorem tariff, the delivered price of the good from the foreign country raises from the border by tm_A^P. The mill price of the foreign firm for the domestic market considering the tariff reads: $m_A^P(1+t)$. To maximize the profit $\prod_I^P = m_I^P \int_0^{R_C^P}(1-m_I^P-r)dr$ the domestic firm needs

the mill price $m_I^{P*} = \dfrac{2-R_C^P}{4}$.

The domestic consumers express their judgement of the firms and the politics of the government with their surplus on the area of the domestic firm $CS_I^P = \int_0^{R_C^P}0,5(1-m_I^P-r)^2dr$

and on the area of the foreign firm in the domestic country

$$CS_2^P = \int_0^{R_G-R_C^P}0,5(1-m_A^P(1+t)-D-r)^2dr.$$

The financial success of the domestic state's measures can be recognized by the tariff revenue $T = m_A^Pt \int_0^{R_G-R_C^P}(1-m_A^P(1+t)-D-r)dr$. The profit of the foreign firm

$$\prod_A^P = m_D\int_0^D(1-m_D-r)dr+(m_A^P+s)\int_0^{R_G-R_C^P}(1-m_A^P(1+t)-D-r)dr$$

is maximized by the mill prices $m_D = \dfrac{6-R_G}{12}$ and $m_A^{P*} = -\dfrac{2D-R_C^P+R_G+2(s(t+1)-1)}{4(t+1)}$.

The surplus of the foreign consumers does not change:

$$CS_3^P = \int_0^D 0,5(1-m_D-r)^2dr = \dfrac{D(7D^2-12D+12)}{96} = \dfrac{R_G(7R_G^2-36R_G+108)}{2592}.$$

The expenditures for the export subsidies of the foreign government read:

$$S = s\int_0^{R_G-R_C^P}(1-m_A^P(1+t)-D-r)dr.$$

From the identity of the prices on the competition border:

$$m_I^{P*}+R_C^P = m_A^{P*}(1+t)+D+R_G-R_C^P$$

the market of the domestic firm results: $R_C^P = \dfrac{11R_G-6s(t+1)}{18}$.

The domestic state maximizes the domestic welfare

$$W_I^P = \dfrac{R_G^3(6903t+4376)-18R_G^2(s(t+1)(182t+391)+4(381t+248))}{93312(t+1)}$$

$$-\dfrac{108R_G(s^2(t+1)^2(43t-26)-4s(t+1)(15t+41)-12(27t+20))}{93312(t+1)}$$

$$-\frac{216s(t+1)(s^2(t+1)^2(24t-11)-12s(t+1)+36)}{93312(t+1)}$$

with the tariff rate

$$t^* = -(\frac{2\sqrt{3019R_G^2 - 4632R_G + 3924}\,ABS(59365R_G^4 - 219020R_G^3 + 255532R_G^2 - 95376R_G - 10368)}{3(1816199R_G^5 - 9707950R_G^4 + 19805264R_G^3 - 19399008R_G^2 + 8992512R_G - 1492992)}$$

$$-\frac{2433293R_G^5 - 2(1300685R_G^4 + 7157012R_G^3 - 13542744R_G^2 + 6715296R_G + 62208)}{3(1816199R_G^5 - 9707950R_G^4 + 19805264R_G^3 - 19399008R_G^2 + 8992512R_G - 1492992)}.$$

The foreign state maximizes the foreign welfare

$$W_A^P = \frac{R_G^3(468t + 2995) + 18R_G^2(209s(t+1) - 4(54t + 187))}{93312(t+1)}$$

$$-\frac{108R_G(69s^2(t+1)^2 + 104s(t+1) - 12(9t+16))}{93312(t+1)}$$

$$-\frac{216s(t+1)(5s(t+1)+6)(7s(t+1)-6)}{93312(t+1)}$$

with the subsidy rate

$$s^* = -(\frac{\sqrt{3019R_G^2 - 4632R_G + 3924}(630425R_G^4 - 1195660R_G^3 + 759644R_G^2 - 221712R_G + 134784)}{88200(225R_G^4 + 240R_G^3 - 296R_G^2 - 192R_G + 144)}$$

$$\times SIGN(59365R_G^4 - 219020R_G^3 + 255532R_G^2 - 95376R_G - 10368)$$

$$+\frac{33177425R_G^5 - 88313170R_G^4 + 107043908R_G^3 - 70554936R_G^2 + 20022624R_G + 3794688}{88200(225R_G^4 + 240R_G^3 - 296R_G^2 - 192R_G + 144)}).$$

Considering the optimal tariff and subsidy rate the domestic firm sets the price

$$m_I^{P*} = -(\sqrt{(3019R_G^2 - 4632R_G + 3924)}SIGN(59365R_G^4 - 219020R_G^3 + 255532R_G^2$$
$$- 95376R_G - 10368) + 227R_G - 618)/1260$$

and the foreign firm sets the price

$$m_A^{P*} = -((1816199R_G^5 - 9707950R_G^4 + 19805264R_G^3 - 19399008R_G^2 + 8992512R_G$$
$$- 1492992)(\sqrt{(3019R_G^2 - 4632R_G + 3924)}SIGN(59365R_G^4 - 219020R_G^3$$
$$+ 255532R_G^2 - 95376R_G - 10368) - 13R_G + 102))/(120(\sqrt{(3019R_G^2 - 4632R_G}$$
$$+ 3924)|59365R_G^4 - 219020R_G^3 + 255532R_G^2 - 95376R_G - 10368| - 3940945R_G^5$$
$$+ 2(7931305R_G^4 - 11275442R_G^3 + 7777884R_G^2 - 3386736R_G + 1150848))),$$

so that the effects of the trade policy can be outlined in figure 2. Because of the tariff the price line of the foreign good in the domestic country goes on a higher level GC. The interrupted lines $m_I^* C'$ and $m_A^* C'$ are the price lines by free trade.[3]

Figure 2: Equilibrium by ad valorem tariff I and export subsidy
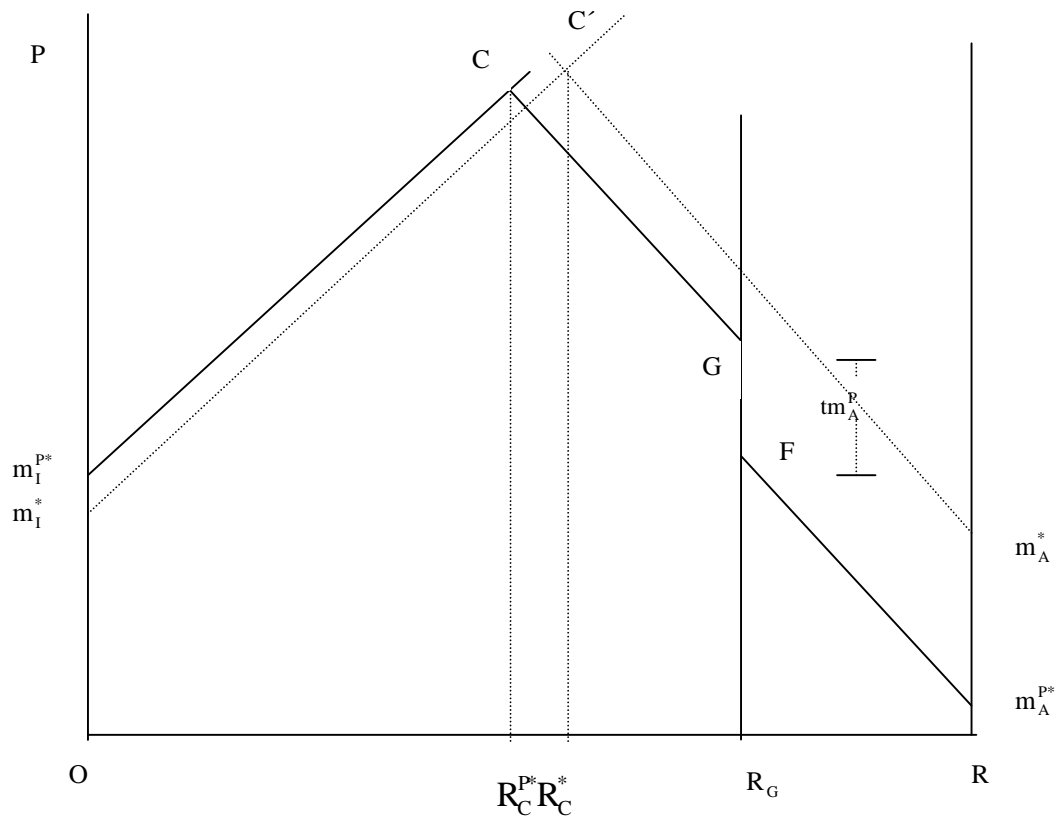
With the welfare optimizing behavior of the states the tariff and subsidy rate can be showed in figure 3.

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[3]The price increase of the domestic firm, the price reduction of the foreign competitor and the market area redistribution in favour of the foreign firm by trade policy, which can be seen in the figure, will be discussed later.

Figure 3: Optimal tariff and subsidy rate
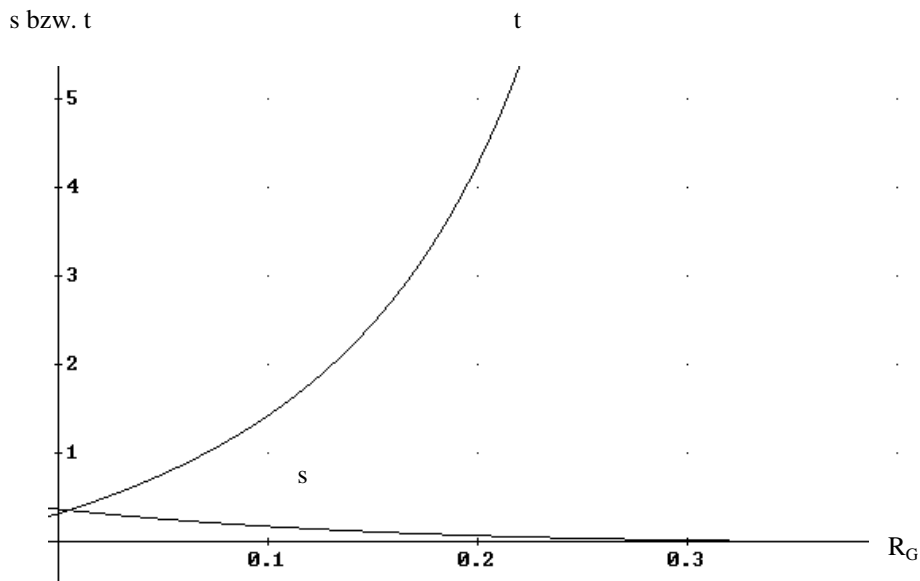
The checking the condition of the second order for the welfare maximizing shows, that there are only welfare maximizing tariff and subsidy rate, if R_G is smaller than 0.358. If R_G is more than 0.358, there are no combinations of s and t which maximize simultaneously the domestic and the foreign welfare.[4] That means, the states maximize the welfares because of the transport costs depending on the geographical sizes of the countries. If the countries are large, the states can not find the right tariff and subsidy rates. In other words, if the countries are large, the states can not intervene in the international trade. Figure 3 shows that the tariff rate is very high in comparison with the subsidy rate. The further away the location of the domestic firm is from the border, the higher the tariff rate and the lower the subsidy rate is. By R_G equals 0.358, the subsidy rate falls to 0 and the tariff rate rises to infinity. By very high tariff rate the foreign firm reduces its price to 0. Figure 4 shows, that the mill price of the domestic firm is by trade policy higher than by free trade.

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[4]Here the optimal tariff and subsidiy rates minimize the welfares of one or both countries.

Figure 4: Mill prices of the domestic firm by free trade and trade policy
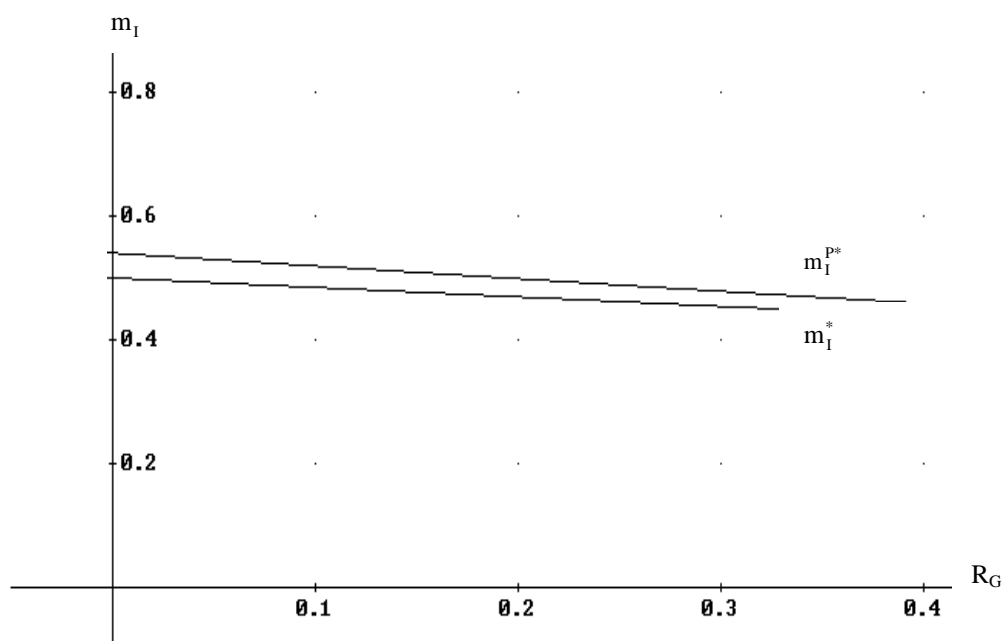
The changes of the mill prices depend on the price elasticity of the consumers. The domestic firm recognizes by trade policy, that its serving area shrinks and it loses the consumers living furthest away from its location. It analyses the price elasticity of its consumers and comes to the decision that it has to raise the price to make the maximum profit. The reasons for this decision are:

- The domestic firm serves a smaller market area and has less distance customers in comparison to the foreign competitor.
- The price elasticity of the demand for the domestic good, which depends on the distance, is not high.

It follows that by trade policy the demand for the domestic good is still price unelastic enough, so that a price increase leads to optimum profit.

The foreign firm knows, that its product is duty-paid from the border. It reduces the price to sell its product in the domestic country. Because of the high tariff rate the foreign firm has to reduce the price strongly to reduce the basis for the tariff calculation and the tariff revenue of the domestic country and to improve its situation. Figure 5 shows, that the foreign firm sets by trade policy lower price than by free trade. The larger the market area is, the higher the tariff rate and the lower the price of foreign firm is. The mill price of the foreign firm, the subsidy rate fall to 0 and the tariff rate increases to infinite, if R_G equals 0.358.

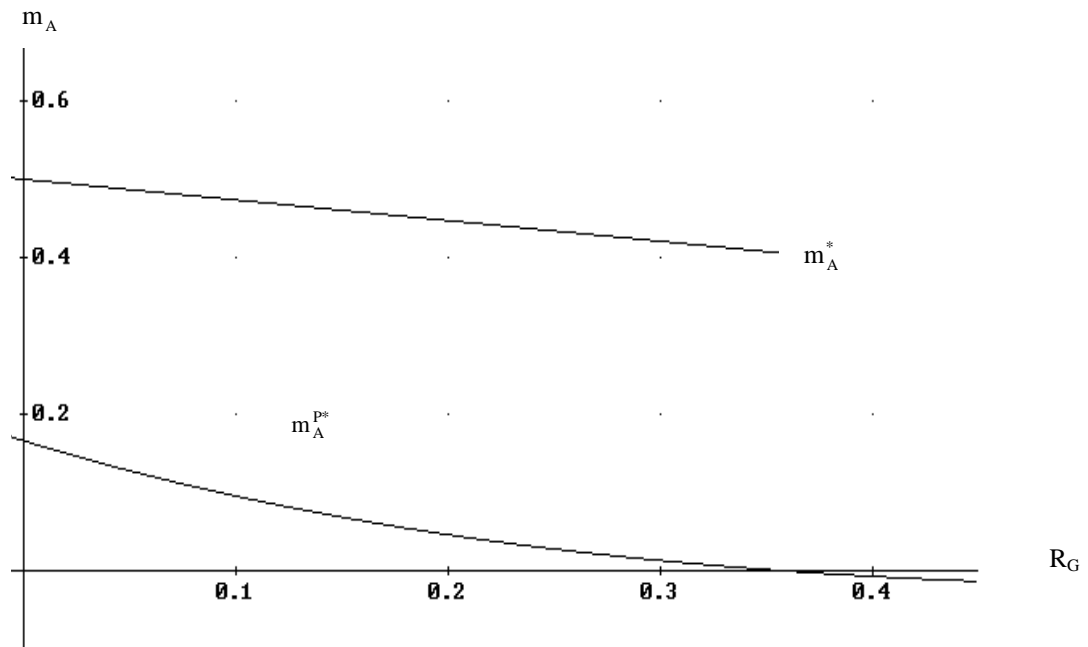**Figure 5**: Mill prices of the foreign firm by free trade and by trade policy

Figure 6: Market areas of the domestic firm by free trade and trade policy
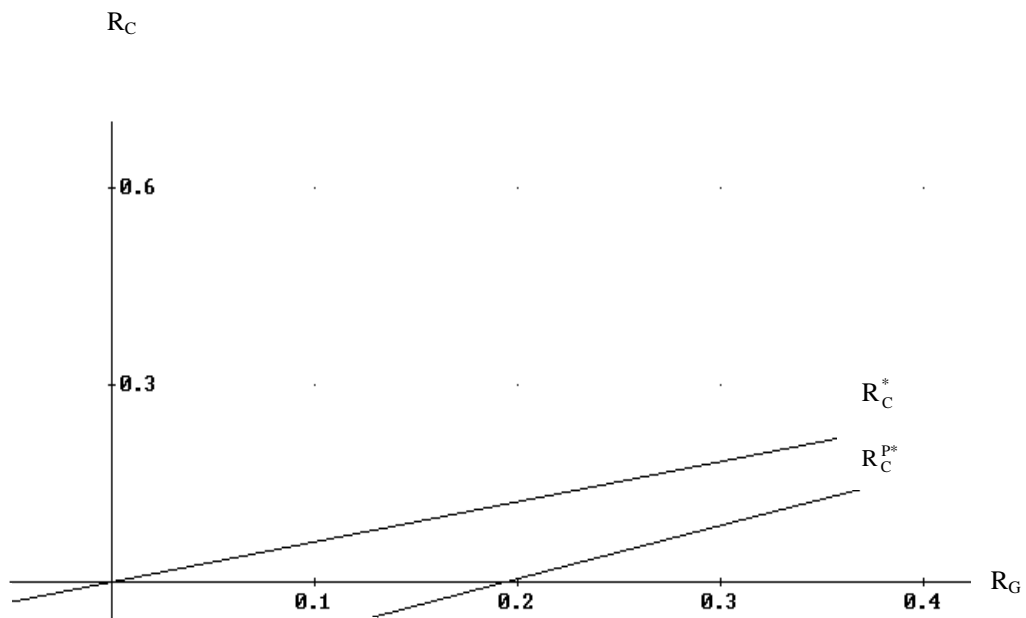

Figure 6 shows that the market area served by the domestic firm shrinks by trade policy. If the countries are small, the domestic firm does not have any market area. It is replaced by the

foreign competitor, because the mill price of the domestic firm is higher than the delivered price of the foreign firm at the domestic location.

The profit of the domestic firm is, despite higher price, less than by free trade. The domestic firm loses many consumers by trade policy, so that its price increase can not compensate this loss. If the countries are small, the domestic firm does not make any profit, because it does not come up to the market. With the tariff the domestic state misses the protection of the domestic industry. The domestic firm is at a disadvantage by the tariff of its own government, if the foreign government responses with export subsidy. If the countries are small, the trade policy makes it possible for the foreign competitor to oust the domestic firm from the market.

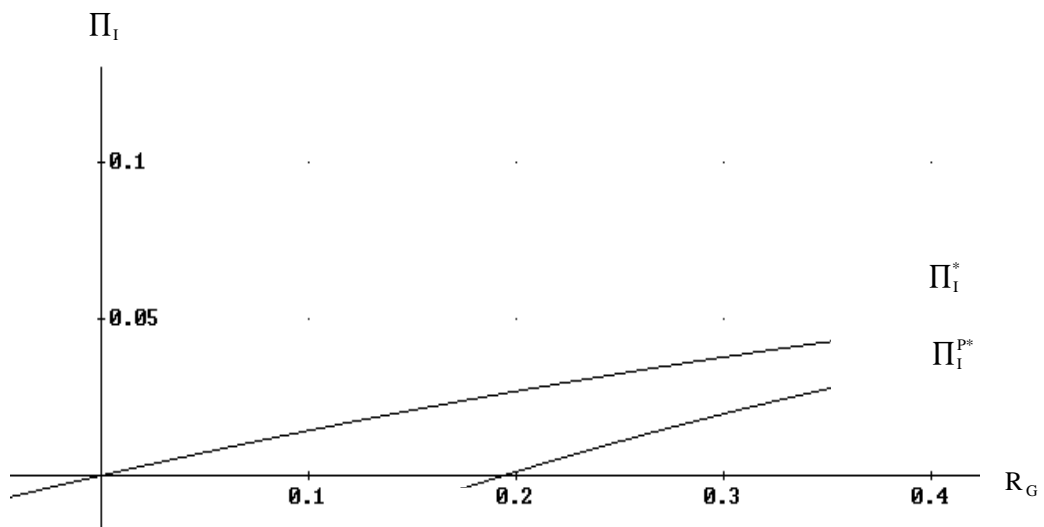**Figure 7**: Profits of the domestic firm by free trade and by trade policy
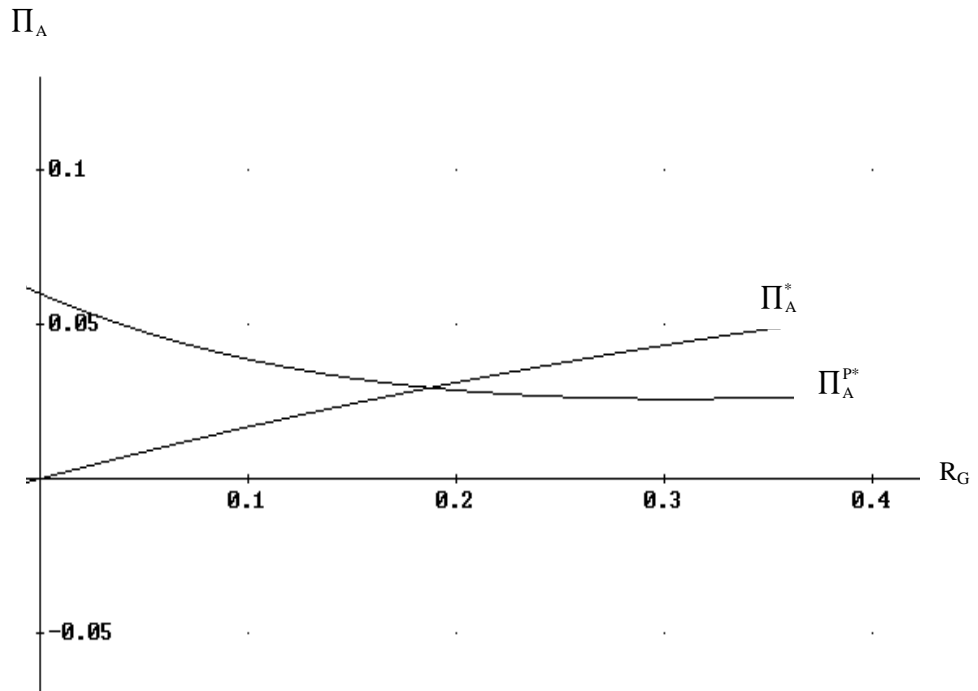
**Figure 8**: Profits of the foreign firm by free trade and by trade policy

The profit of the foreign competitor is by trade policy, despite larger market area, less than by free trade, because it sells the good at very low price. By R_G equals 0.358 the foreign firm makes no profit on the domestic market, only on the foreign market. In all both firms are at a disadvantage by trade policy. The domestic firm loses its consumers. The foreign firm has more consumers, but can only sell its product at a very low price.

Figure 9: Surplus of the consumers on the market area served by the domestic firm
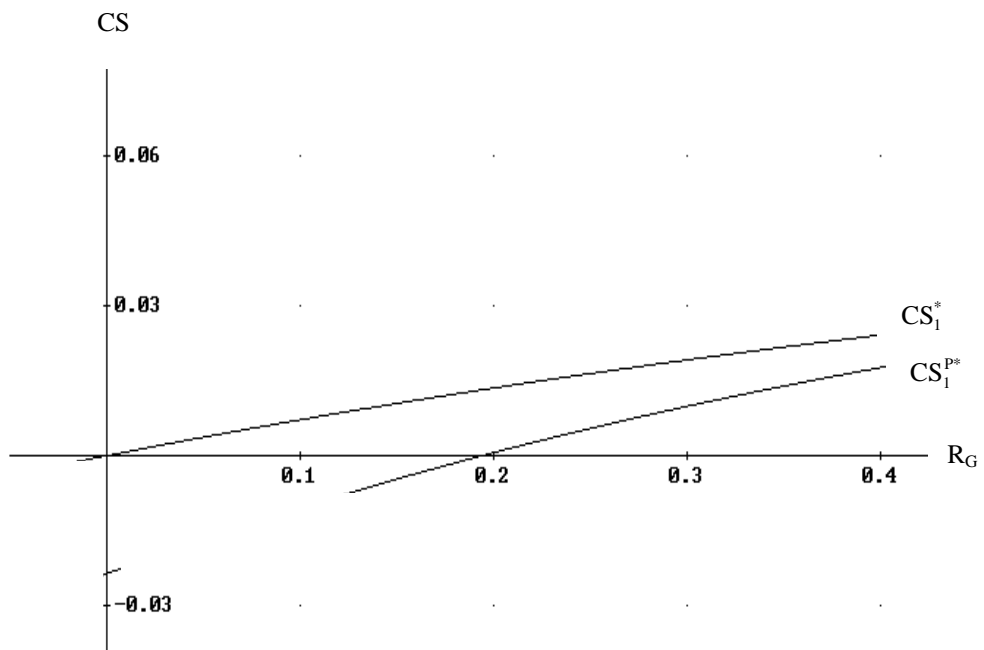
The consumers on the market area served by the domestic firm make by trade policy less surplus than by free trade, since they have to pay higher prices. The domestic consumers on the market area served by the foreign firm profit from the trade policy, because they have to pay lower prices. The total surplus of the consumers is by trade policy better than by free trade, because the profit of the domestic consumers on the area served by the foreign firm overcompensates the loss of the domestic consumers on the area served by the domestic firm.

Figure 10: Consumer surplus on the domestic market area served by the foreign firm
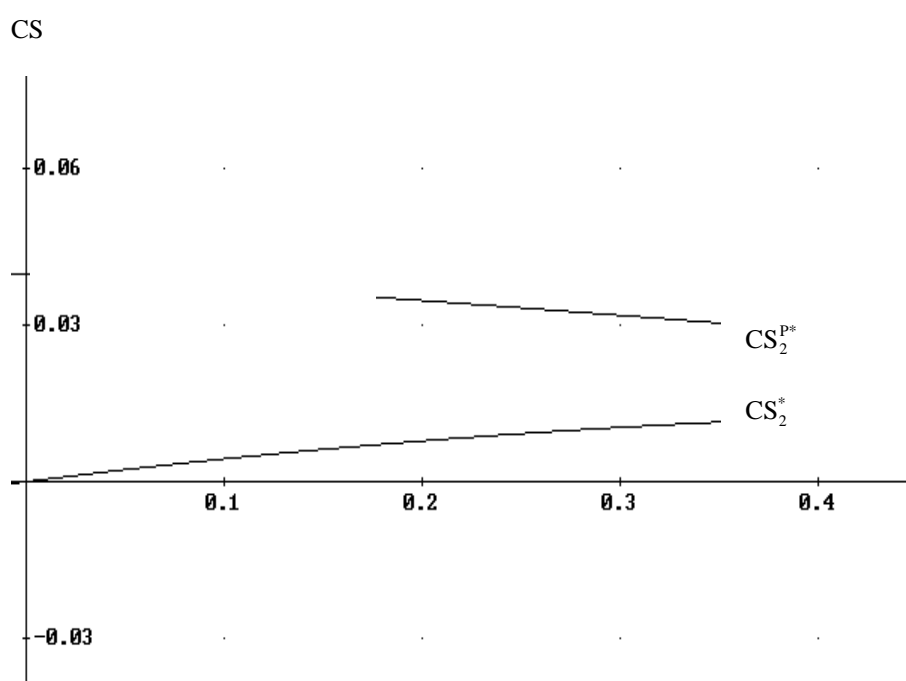

The trade policy of the states causes a redistribution from firms to part of the consumers. For the gorvernments it is important to consider which target has to be achieved or which social group has to be favoured. By this politics a social group is favoured and a other group is at a disadvantage.

Figure 11: Tariff revenue and subsidy expenditure

S bzw. T
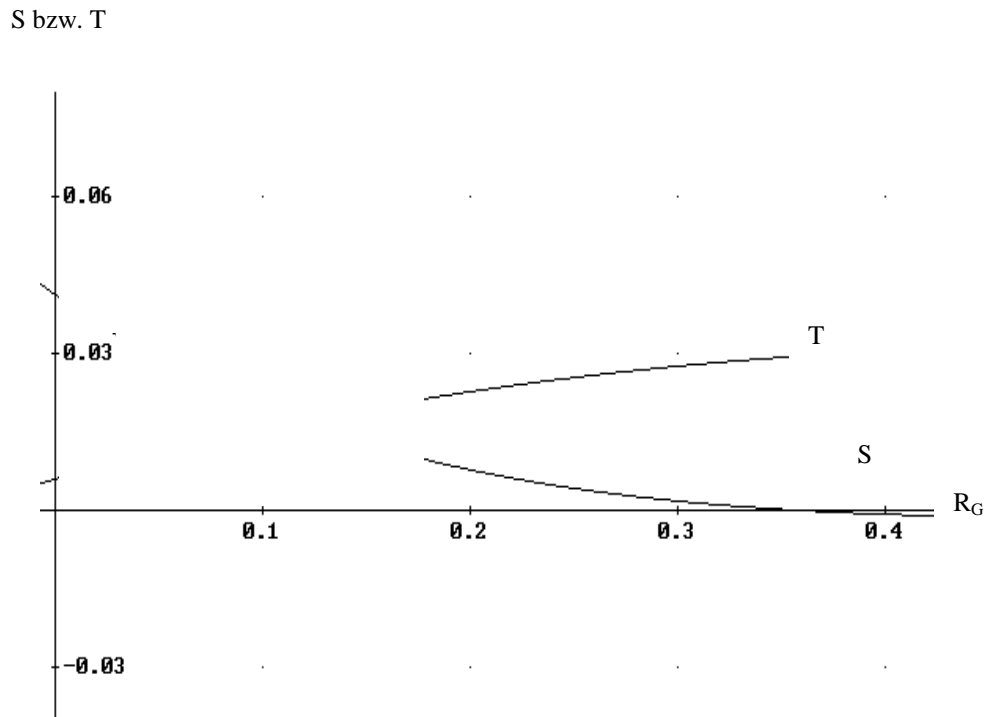
The subsidy expenditures of the foreign government are less than the tariff revenue of the domestic gorvernment. If the countries are large enough ($R_G = 0.358$), the foreign state does not have to subsidize.

Figure 12: Domestic welfare by free trade and trade policy

W_I
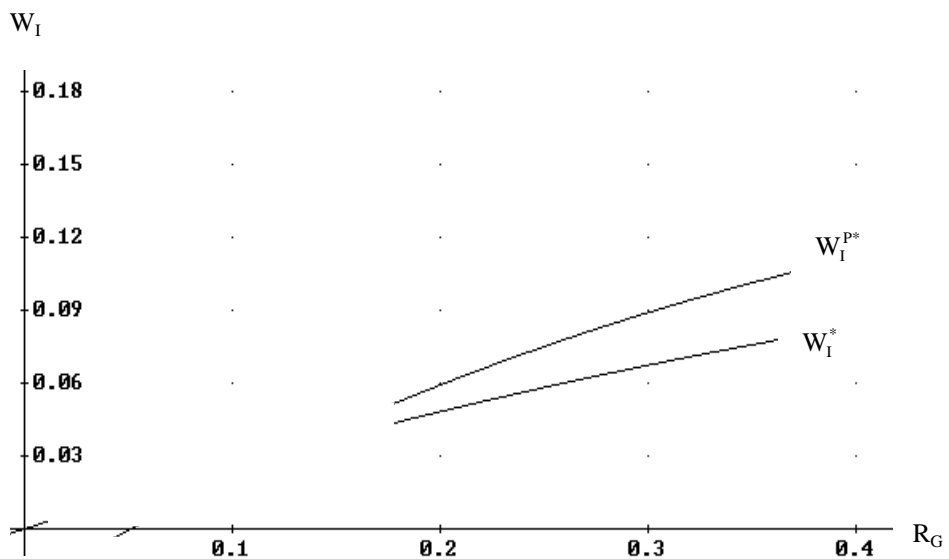
The domestic country is by trade policy in a better welfare situation than by free trade though the domesic firm makes less profit. The market area redistribution in favour of the foreign firm involves a redistribution from the firms to the consumers and the domestic state. For the foreign country the trade policy is disadvantageous, since the foreig W_A^{P*} loses part of the profit and the foreign government has subsidy expenditures.

Figure 13: Welfare of the foreign country by free trade and trade policy
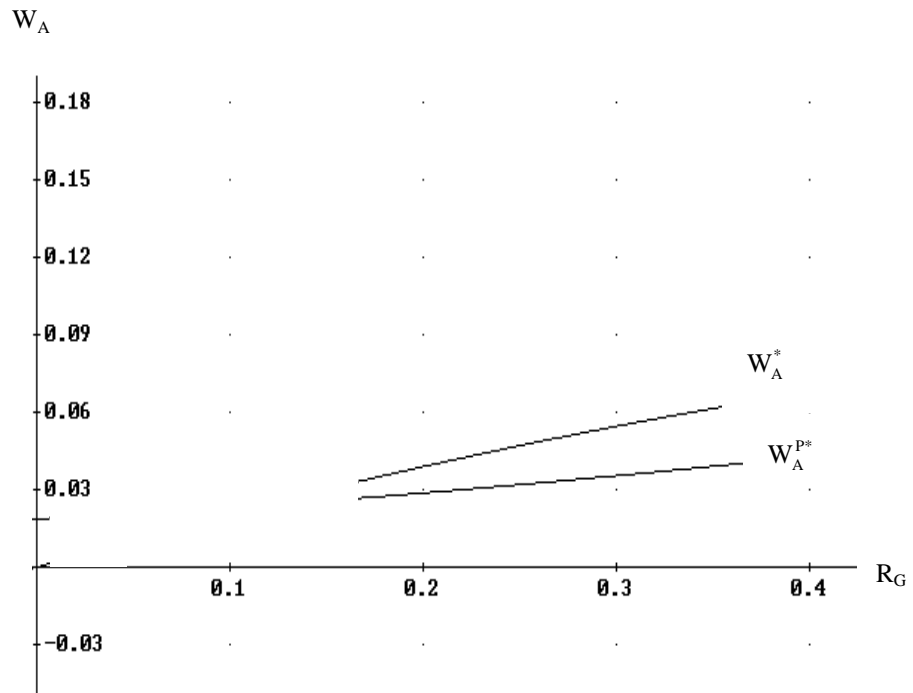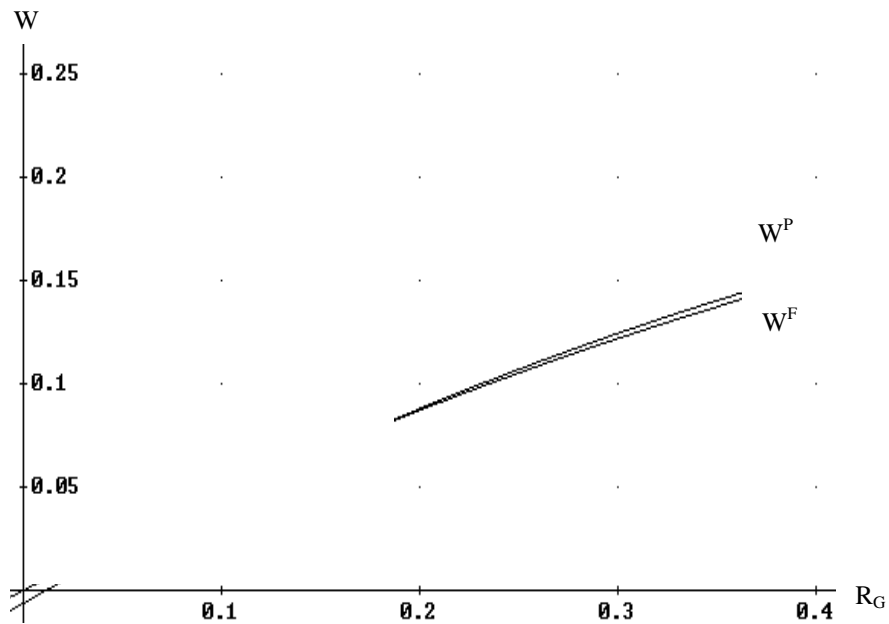
Figure 14: World welfare by free trade and trade policy

The surprising result is that the world welfare by trade policy is better than by free trade. That means, the welfare increase of the domestic country overcompensates the welfare loss of the foreign country (figure 14). This is made clear by some numerical data:

R_G	0.2	0.25	0.3	0.35
W^F	0.0872	0.1052	0.1219	0.1372
W^P	0.0879	0.1070	0.1244	0.1403

4 Conclusion

This model represents a combination between international trade and spatial economics. The surprising result, that trade policy causes better world welfare than free trade tells us, that we have to be careful with the subsidy cutback. The effects of the policy instruments depend on the geographical situation of the countries and the locations of the firms. All these factors have to be considered, when we choose the policy instruments.

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