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Jerzy Rymarczyk

THE ECONOMIC EFFECT
OF INTRODUCING IMPORT TARIFFS.
A MODEL
OF GENERAL EQUILIBRIUM¹

General analysis is conducted usually when the introduction of tariffs for a certain type of good influences the market of other goods². A strict quantitative determination of the effects of tariffs duties in the macro scale is extremely difficult – therefore so far there have not been any empirical general analyses. To indicate the direction in which they do have an effect, it is enough to introduce another type of goods to the analysis. Theoretical analysis on the general level is almost entirely based on the two-good model. Also in such an analysis one has to distinguish between the cases of large and small countries. The influence of tariffs can be determined using the tools from the theory of foreign trade: transformation curves, indifference curves and exchange curves³.

¹ This paper was published firstly in: Prace Naukowe AE [RW of WAE] 1993, No 665.

² See: article by J. Rymarczyk, W. Szczepanik: *Ekonomiczne efekty zastosowania cel - model równowagi cząstkowej* [*Economic Effects of the Introduction of Customs - Model of the Partial Equilibrium*]. Prace Naukowe AE [RW of WAE] 1993, No 665.

³ In the theory of foreign trade the transformation curve is used to illustrate local production conditions. Its growth rate, described as the 'marginal rate of transformation' allows in the two-good model to establish each time valid exchange relation. This relation can be described as the relative price of goods. The exchange curve indicates what amounts of goods are offered by a given country onto the world market and wanted for the exchange into import goods in the possible kinds of terms of trade. The shape of the national curve of exchange depends on the structure of production and the structure of internal demand.

1. THE RESULTS OF INTRODUCING TARIFFS BY A SMALL COUNTRY

The domestic market of both types of goods is shown in Fig. 1: X denotes a good which is exported by a country (imported by a foreign country), M denotes a good which is imported by a country (exported by a foreign country). Because in the case of a small country, terms of trade T_F (in a free trade situation) stay unchanged and there is no return influence on the foreign market, therefore the analysis can be restricted to the internal market.

In the free-trade equilibrium, the point of production P_0 coincides with the point of consumption C_0 . Both countries and producers adjust their respective decisions connected with the goods X and M to identical price relations T_F . The amounts of export and import are given by a triangle marked by points P_0 and C_0 . The introduction of import tariffs causes the following effects:

- pricing effect; external terms of trade remaining by definition unchanged while the internal terms of trade worsen because of the increase in prices (the result of tariffs).

- production effect; with the new internal terms of trade T_1 , there is a new equilibrium of production at point P_1 because the producers adjust their decisions (concerning production levels) to the new internal price structure. The production of exported goods decreases and the production of imported goods increases.

- consumption effect; the consumers also adjust to the new internal price relations T_1 . The new point of consumption, on one hand, arises from the osculation of the domestic indifference curve with straight line T_1 , and on the other hand it lies on the straight line passing through the point of production P_1 . The consumption of imported goods at the point C_1 is smaller than that at C_0 .

- the balance of payments effect; in the general model there are changes both in the value of imports and exports to a degree where there is a new general equilibrium at which bilateral trade is balanced. External terms of trade which correspond with equilibrium T_A (here equal to T_F) are defined here in the following way – the relation between export and import prices ($P_X: P_M$) is inversely proportional to the amount of goods subject to trade in the situation of equilibrium.

$$T_A = \frac{P_X}{P_M} = \frac{M}{X}.$$

From here follows the equalization of trade balance

$$P_X \cdot X = P_M \cdot M.$$

If in the case of a small country with the given external terms of trade, the

size of imports is reduced because of the introduction of tariffs, so the size of exports (proportionally) has to be decreased to the same degree.

– effects for the state revenue; the difference between the internal terms of trade means that private economic subjects engaged in trade receive for one sold unit of export goods fewer import goods (than being actually sent from abroad). The difference is the tariffs equivalent seized by the state (C_1Z , Fig. 1).

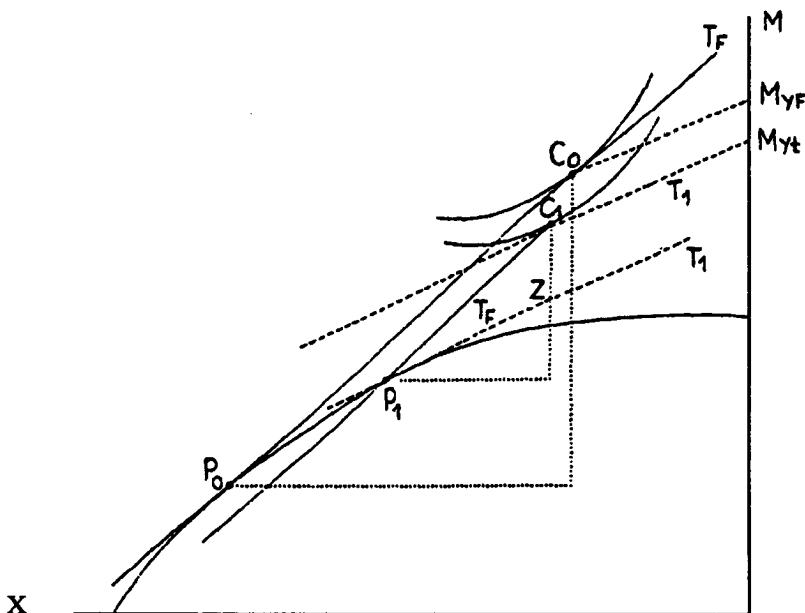


Fig. 1. The effects of import tariffs on the domestic market – case of a small country (general analysis)

– redistribution effect; macroanalysis is unable to state if there is a general improvement in the situation of producers because the increase in production of imported goods and obtainable increase in rents for producers are simultaneously accompanied by limited production of export goods. The consumers lose out to the same scale as they move into the lower social indifference curve. To a lower indifference curve than that of free trade, there leads every external line of 'terms of trade' which passes through the production point, on the right from P_0 .

– prosperity effect; because it is not possible to establish whether the situation of producers improved or deteriorated, therefore the prosperity effects are defined only on the basis of the achieved social indifference curve. In a case of a small country after the introduction of tariffs it stays on the level lower than in a free trade situation, therefore the effects for prosperity are decidedly negative. The probable ascertainment of effects for prosperity, especially useful for

empirical purposes, can be established with the knowledge of real income. Nominal income Y can be defined as a sum of value of goods consumed in the conditions of balance of export ($X \cdot P_x$) and import ($M \cdot P_M$) goods:

$$Y = X \cdot P_x + M \cdot P_M$$

Real income can be expressed in units of any of the two types of goods when the nominal income is divided by the price of the given good. Therefore, the real income in units of imported goods is:

$$M_Y = \frac{Y}{P_M} = X \cdot \frac{P_x}{P_M} + M$$

Real income corresponds, in conditions of equilibrium, to the amount of consumed import goods and the amount of consumed export goods multiplied by terms of trade ($P_x : P_M$). The level of real income depends primarily on the choice of terms of trade indicator, i.e. on the fact whether the goods are evaluated according to the internal prices (internal terms of trade). Using internal prices, real income in the situation of free trade is shown by M_{YF} in Fig. 1, and after the introduction of tariffs – the curve M_{YT} . It is obvious that real income decreases after the introduction of tariffs.

2. EFFECTS OF INTRODUCING TARIFFS BY A LARGE COUNTRY

Similarly as in the case of partial analysis it is necessary in general analysis in a case of a large country to distinguish between the domestic market, the world market and the foreign market (Fig. 2). The internal market is shown here in such a way that in a free trade situation the size of production, consumption and foreign trade are identical to that of a small country. In the world market the balance is established at the point of intersection of the exchange curves. The exchange curves mark the size of export and import planned by both partners with the possible kinds of terms of trade. In conditions of equilibrium (free trade) H_0 and terms of trade T_F , the amounts of goods subject to trade have to relate strictly to the amount of foreign goods brought into the internal market. The same applies to the foreign market where amounts of export and import goods are marked by the triangle between the point of consumption K_0 and point of production Q_0 . When tariffs are introduced to this situation, it results (from a foreign point of view) in a move to the left of the exchange curve of the country. This arises from the following calculation. The price relations existing in the country with the internal terms of trade T_1 , not only underlie production

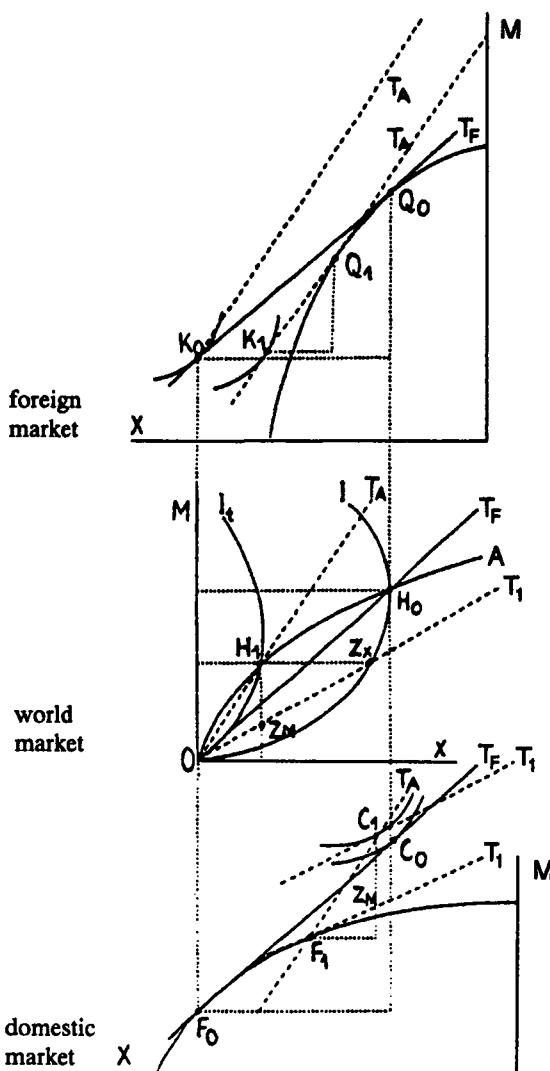


Fig. 2. The effects of import tariffs on the domestic, foreign and world markets
— case of a large country (general analysis)

and consumption expectations, but also expectations towards foreign trade. 'Natives' would like to trade with the amounts of export and import goods marked by the point Z_X . Imposing tariffs by the state means that a part of export goods is not sold abroad but 'sold' to the state. The equivalent of this is segment $Z_X - H_1$, where the remainder to be sent abroad is left as an amount of export described by the segment between the ordinate and H_1 . The abroad is *de facto*

offered the amount described by H_1 with the simultaneous demand for imports defined by the same point. If the exchange curve of a foreign country A passes (as in Fig. 2) through the point H_1 , it is then also a new point of equilibrium after the introduction of tariffs. Terms of trade passing through that point H_1, T_1 become the new external terms of trade which in the case of a large country differ from the free-trade terms of trade.

It is not relevant for the conditions of equilibrium if the amounts of tariffs correspond with the units of export or import goods. The equivalent of tariffs in export units $Z_X - H_1$ can be, using the external terms of trade T_1 , easily transformed into the equivalent of tariffs in import units $H_1 - Z_M$. Equivalency of fees in units of export or import is easily explained by the fact that in a general equilibrium the export tariffs cause the same results as their respective import tariffs; the reason being that in a general equilibrium the effects of tariffs depend largely on price relations which in turn can be affected by both import and export tariffs.

Introducing tariffs results in:

- pricing effect; if the curve of foreign price exchange is neither fully flexible (perfect flexibility would apply to the case of small countries) nor very inflexible, then the external terms of trade of the country in relation to a free trade situation get better and the internal terms of trade get worse. The improvement of the external terms of trade of a country corresponds with the worsening of external terms of trade of foreign countries while the internal ones are identical.
- production effect; varies depending on the levels of the new internal terms of trade. This differs from the similar effect in the case of a small country only in respect of quantity. Abroad however it is reversed. All this means that the production of export goods in a country grows while that of the imported ones falls.
- consumption effect; in a case of a normal indifference curve and not too high (not prohibitive) tariffs, the improvement of external terms of trade of a country usually enables a higher consumption of both kinds of goods. Foreign countries however, have to account at any time for losses in consumption of the country's export goods. In the case of import goods, foreign countries can increase their consumption (as in Fig. 2).
- balance of payments effect; identical as in the case of a small country, the trade is always balanced. Quantitative trade flows reduce themselves, percentage-wise naturally, in a varied way because of the changing external terms of trade.
- state revenue effect; as in the case of a small country, the tariffs equivalent in the terms of goods is defined by the difference between the external and internal terms of trade.
- redistribution effect; neither at home nor abroad it is possible to establish whether there has been a general improvement in the producers' situation or not. As for the consumers, their domestic situation improves while the foreign consumers are worse off.

— prosperity effect; the improvement of the consumers situation in the country means an increase in real income. It is the reverse abroad, where the worsening of the consumers position is connected with the decrease in real income. It could usually be larger than its increase in the exporting country.

The process of these effects and its intensity depends (apart from the usual assumptions made in a general analysis of equilibrium) to a large degree on tariff rates, the flexibility of the exchange curves and the way in which the state uses the revenue obtained from tariffs. If their extent exceeds the maximum tariffs, then prosperity and real income in the country decrease without them being increased abroad. If the foreign exchange curve is very inflexible (it is then convex towards an abscissa), then both the external and internal terms of trade of a country can improve (the Metzler paradox). This means that parts of the industry competing with imports are not protected by tariffs and as such incur unintentional losses. As a result, production of such goods decreases and there is an increase in production of export goods. In foreign trade, the inflexibility of the foreign exchange curve results in the fact that 'natives', with lower exports, receive — in absolute terms — more imports. The additional consumption of export goods is partly consumed and partly destined to cover tariffs. Both in a partial and general analysis, the final results of introducing tariffs depend on the use of the state revenue obtained from there. Presented here, the influence of tariffs is valid under the assumption that the state itself consumes the revenue from tariffs and the funds obtained do not influence the lowering of taxes or an increase in public goods which could be beneficial for private economic agents. If the state channels the revenue obtained from tariffs to transfer payment for businesses harmed by the introduction of tariffs, then the effects of redistribution and prosperity change.

The state could also enter the world market with such funds, influencing the changes in terms of trade in many ways and in effect modify the influence of tariffs. The separate and important issue for the general analysis is the influence of tariffs on the functional distribution of income. If the introduction of tariffs for a given product affects the markets of other goods, it cannot remain without influence on markets of production factors either. According to the theory by Heckscher, Ohlin and Samuelson, a rich country would export capital-intensive goods and import labour consuming goods because the wealth of capital allows for the lower production costs of the capital-intensive goods, while the costs of the labour-consuming goods is relatively high⁴. If tariffs are introduced, then local industry competing with imports widens the range of its products while

⁴ This theory is actually a neoclassical analysis of the reasons for foreign trade within the theory of comparative costs. Its forerunners are Eli Heckscher and Bertil Ohlin (1933). This theory explains the direction and structure of foreign trade as differences in being 'equipped' in capital and labour among the countries participating in world trade.

producers of capital-intensive export goods have to limit their production. The branches of importing industry where labour-intensive goods are produced, will require relatively more additional labour than capital. On the other hand, capital-intensive export branches of industry will release relatively more capital than labour. If there was an equilibrium on the market of the factors of production until then, now there will be a temporary surplus of demand on the capital market and some shortages on the labour market. The new equilibrium on the market of production factors will be established at the lower price of capital and higher price of labour (the Stolper-Samuelson theorem).

It can be analytically proven that the labour factor is being both relatively and absolutely privileged by tariffs. The result is not just the increase of earnings, i.e. the higher share of this factor in the national income, but also the increase in the absolute sum of earnings. It has particular significance when tariffs reduce real national income as happens in the case of a small country.

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