

Appendix 1

Economic integration theory (outline)

It will probably not be exaggeration to say that the economic theory explaining the benefits resulting from economic integration has never managed to keep pace with practice so far. Whereas 16 customs unions were established in the world between 1818 and 1924 (Robson, 1990), the pioneer work of Viner analyzing the theoretical foundations of their creation was not published until 1950. The decision about establishing the first common market also caught economists unawares - the Spaak report (a blueprint for the Treaty of Rome) was, simultaneously, the work that introduced the concept of a "common market" to economy.¹ The theory of monetary integration was a little more fortunate in the race with practice: the discussion on this subject has already been under way for about 30 years, while the first practical steps aimed at establishing the monetary union in the European Union were not taken until the 1990s (certain actions, including the formation of the EMS, were already started in the 1970s).²

The main problem analyzed by the theory of economic integration are short- and long-term benefits flowing from the removal of obstacles to economic cooperation between countries. Some of these barriers are commonly known - these are deliberately introduced barriers to the movement of goods, services and production factors such as customs tariffs, licences required for undertaking economic activity, etc.. The other type of obstacles are not so much the existing barriers but rather impediments resulting from differences in institutions and differences in the economic policy instruments among countries (e.g. differences in taxation principles). The elimination of obstacles of the first type is frequently called *the negative integration*, while the modification of existing institutions and instruments of the economic policy aimed at removing the differences hampering cooperation is called *the positive integration* (terms introduced by Tinbergen, 1965).

Another distinction is the division of integration effects into static and dynamic. *The static effects* result from a more effective allocation of resources by consumers and producers leading to higher welfare of the society. The most important role is played by the elimination of distortions in the relative prices structure that influence allocation of resources in the market economies. The relative prices existing in the economy provide, on the one hand, information for consumers about the

¹ It is interesting to note that the idea of the common market did not arouse a great deal of enthusiasm initially - among the founding members of the EU-6 it was initially supported only by the Netherlands (Milward, 1992).

social costs of producing particular goods and services and, on the other hand, information for producers about the structure of output preferred by consumers. Economic decisions in a market economy are shaped as a result of a big number of overlapping individual decisions. If producers and consumers who take these decisions have false information about the costs of production, their decisions concerning production and consumption will be erroneous (not optimal). Customs tariffs and other instruments raising the prices of imports play just such disturbing role. Consumers, erroneously informed about a high price of imports will decide to increase demand for domestic products, in fact more expensive. The increased demand, not meeting any competition on the part of imports, will induce the domestic producers to increase not only production but also prices. The increased relative price of a product on which an import tariff was levied will reduce its consumption in favour of the consumption of other products (exempt from import tariffs or being subject to lower tariffs), which means a departure from the optimal basket of consumed goods in favour of a basket giving less satisfaction to consumers. It leads to obvious welfare losses³ (a similar analysis can be found in Baldwin's book, 1994). Ultimately, the removal of barriers raising artificially the cost of imports and distorting the structure of relative prices leads, thus, to a better allocation of resources in the economy allowing to achieve a higher welfare level.

The dynamic effects of integration can be explained, to a large extent, in an analogous way making reference to the optimal decisions made by the investors. Investors, while taking location decisions, are guided, on the one hand, by the relative prices of production factors and, on the other hand, by the future trading costs (that is, the costs of transporting goods from the production place to the place of selling - when production is located in another country these costs must include customs duties, which will have to be paid). If barriers to the movement of production factors and goods between two countries exist, the investor's calculation is disturbed, to a large extent, while decisions taken are not optimal. The factors of production are allocated in an ineffective way lowering the welfare growth in both countries below the potentiall attainable level.

Thus, an obvious question which could be asked is: why do barriers to economic cooperation, restricting so much the welfare of societies, continue to exist (and despite the efforts made on the

² Actually, the monetary unions (without a single currency) have already existed for years (Belgium-Luxembourg, USA-Panama), see: Gros, Thygesen, 1992. These were, however, always unions between two unequal partners: a smaller country subordinated its currency to the policy pursued by a larger country.

³ It might seem that a neutral customs tariff (that is, a tariff imposing uniform customs duties on all goods) would cause much smaller welfare losses, and represent - in categories of the welfare economy - the second best solution (the best solution would be, of course, to remove tariffs). However, it does not have to be true. Ultimately, the scale of deviation from the optimal basket will be determined by the change of relative prices in the importing country caused by a reduced demand for imports and an increased demand for the domestic production of particular goods. In the case of uniform tariffs for all goods, the elasticity of substitution between imports and the domestic production will decide about the change in demand structure on particular markets (the lower the elasticity of the substitution the smaller the change in the demand structure and, consequently, the change of relative prices - the result derived on the basis of the Armington's assumption about the imperfect substitution of domestic production and imports, see: Armington, 1969). Thus, the neutral customs tariff would not change the structure of prices only in the case of the uniform elasticity of substitution for all products, which

GATT/WTO forum they will certainly exist for a long time in the future as well)? The first explanation is that the above reasoning does not take into account the existence of the costs of adjustment to free trade. Secondly, the answer is provided by the political economy attributing the protectionism to pressures exerted by groups of interest (Schnuknecht, 1992). Even if a free trade increases the welfare of entire society, it can lower simultaneously, especially in the short term, the welfare of certain groups (e.g. employees of declining industries unable to withstand the competition after the scale of protection is diminished). The political strength of such groups and the homogeneity of their group interest may prove to be much greater than the pressure exerted by large groups, but heterogenous and loosely organized (such as, for example, consumers, Munk, 1993). Ultimately, the optimal strategy of politicians seeking to win the biggest number of votes in the elections frequently proves to be extending their support to the demands remaining in a conflict with the maximization of the whole society's welfare (Baldwin, 1994). Thirdly, a postulate of the optimal tariff is sometimes formulated, that is a tariff ensuring a higher level of welfare than the zero tariff (however, it concerns only such situation, in which the import demand of a given country is big enough to influence the world prices of imported goods). Finally, other numerous arguments in favour of customs tariffs could be quoted here. Although they admit that tariffs lead to welfare losses they justify their use by: strategic factors (e.g. national security), life style protection (e.g. protection of ineffective agriculture in order to preserve the traditional social structure in villages), or protection and incentives for infant industries (Herrick, Kindleberger, 1983). An argument is also sometimes advanced that the tariff protection of industry in the developing countries is justified by imperfections of the labour market, and it can be treated as a substitute for the institutional reform of this market (it concerns the situation when this market is segmented - the difference between incomes from work in industry and in agriculture is so big, that it is worthwhile to encourage the shift of employment to industry, even if it would be irrational under normal market conditions, without the tariff protection; see: *Policy-making in the Open Economy, 1993*).

A.1.1 Barriers in international cooperation and degrees of economic integration

The list of barriers disturbing the free movement of goods, services and production factors between countries is quite long and still open for the ingeniousness of those supporting the protectionist trade policy. The range of protectionist instruments used during the last few decades has expanded considerably, and the most noticeable and most ardently criticized instruments have been supplemented by more sophisticated ones.⁴ It does not signify any progress at all - new instruments can be even more effective impediments to the movement of goods, services and production factors than the old ones. Moreover, in comparison with tariffs, other instruments usually produce even

is an obvious absurd (domestic apples can be a good substitute of imported apples, but the domestic ersatz coffee is a very bad substitute of natural coffee).

⁴ A comprehensive review of the history of protectionism in selected Western countries can be found in the book: *Protectionism in the World Economy, (1992)*.

stronger disturbances in the operation of the market through the intensified administrative intervention, licensing or monopolization (McKinnon, 1991).

Barriers restricting the free movement of goods include primarily import tariffs and tariffs-like instruments such as, for instance, variable levies widely used in relation to agricultural products, or non-discriminatory border taxes permitted by the GATT in exceptional situations (such as the border tax presently imposed in the three countries of Central Europe). In each case it is a special ad valorem or fixed amount tax paid by importers. Another instrument of the traditional protectionism are *import quotas* limiting the quantity of goods of a given type which can be imported within a definite time (the system is usually based on licensing the right to import certain quantities of given products).

The tariffs and import quotas, which used to be the main protection instruments, have lost, to a big extent, their leading role in recent years. Favourite instruments of the so-called New Protectionism observed in the 1980s became antidumping procedures and the so-called voluntary limitations of exports (Irwin, 1994). *Antidumping procedures* usually imply a temporary suspension of imports followed by levying special additional tariffs in the case of goods imported to a given country at the price lower than the costs of production in the exporting country increased by the profit margin due to the producer (or simply at the price lower than charged domestically in the exporting country).⁵ *Voluntary limitations of exports* are usually "voluntary" only by their name. The exporting country is simply forced in one way or another (in most cases, under the threat of more stringent sanctions) to impose quotas on the goods exported to the importer's country (hence, it is an almost exact replica of import quotas, with this difference that it is now the exporting country, and not the importing country, which administers and licenses restrictions). Another instrument of the trade policy similar to antidumping tariffs as the *tariffs counteracting subsidies*, used in case it has been proved that the production of an imported product is subsidized in the exporting country.

Finally, the third type of obstacles to the movement of goods are *non-tariff barriers* impeding the access of imported goods to the domestic market or raising significantly the trading costs of imports. The list of such obstacles is very long starting with technical, health, safety or environment protection standards,⁶ and ending with sluggish customs and administrative procedures, additional charges, and additional costs of trade transactions. A special role is played by the restricted right of foreign suppliers to take part in public procurement bidding. Non-tariff instruments are perhaps the

⁵ This seemingly simple and honest definition permits, in fact, a huge freedom of interpretation. Estimating the real costs of production is neither simple nor explicit - one could cynically say that in order to prove dumping it is only necessary to hire good lawyers and accountants. As Baldwin says, "... most economists feel that most cases of "dumping" (...) are simply firms engaged in normal business practices"(Baldwin, 1994, p.21). Such opinion of economists does not seem to disturb the broad application of antidumping procedures as instruments of the trade policy, especially in the EU and in the United States.

⁶ From the technical point of view, using such standards for the protection against imports consists not so much in fixing stringent norms, which could be difficult to achieve for foreign producers (the norms can also create a problem for domestic producers!), but rather in not recognizing the standards and certificates from the exporting country and demanding that the imported products should obtain relevant certificates from the importing

most dangerous weapon of the New Protectionism: on the one hand, they are simple and effective in application, and, on the other hand, they are often difficult to appeal against by a country, whose exports are exposed to such annoyances.⁷

Of course, the ultimate effect of all these barriers is raising the costs of imports in comparison with the domestic production. Hence, in the case of all these barriers it is possible to estimate the tariff that would have an equivalent effect to imposing a given barrier⁸ (although, as we have already said, the market disturbances can prove to be stronger in the case of these barriers than in the situation when a customs tariff was levied).

Barriers to the free movement of services are usually of administrative character and they tend to differ according to the type of services they concern. The most stringent form of barriers are the *state monopolies* for performing certain services (it frequently refers, for example, to telecommunication services). A somewhat milder form is the *limited licensing of activity* in these fields, in which a given country does not want to permit free competition on the part of foreign companies (it usually refers to banking and insurance). Finally, a direct *administrative intervention* restricting the supply of offered services is also possible (it concerns, for instance, foreign airlines, whose possibilities of providing services are limited by the number of landing permits allocated to them by the transport authorities).⁹

Due to the fact that a big part of services can be offered only on the spot in the importing country (this feature represents a major distinction between the import of services and the import of goods produced at one place and transported to another), the key role is assumed by *the right of firms to establish their branches and offices* in the importing country (right of establishment). The restricting of this right blocks effectively the movement of services between countries. A similar role is also played by restricting the right to conduct professional activity in the importing country by the key personnel necessary for provision of these services (medical doctors, lawyers, finance specialists, etc.).

Barriers restricting the free movement of production factors are usually of administrative character as well. In the case of capital movement they can assume the form of *capital flows control*

country. Once again it is only the question of ingenuity of bureaucrats how to make the procedure of obtaining such certificate possibly the most time consuming and expensive.

⁷ An example of such instrument could be the regulation concerning livestock transport, demanded by the EU producers who felt threatened by the import of calves from Central-Eastern Europe. The regulation restricting the maximum time during which animals could be transported in trucks would have nothing to do, formally speaking, with import restrictions (those proposing it referred to appropriate animal treatment principles). At the same time, the proposed maximum time was chosen in a way to make impossible non-stop delivery of animals from Central Europe to the main customer (Italy). The adoption of such regulation would imply a tremendous increase of transport costs and it could eliminate much cheaper imports from the market.

⁸ A review of the methodology of estimating the level of protection can be found in: Scandizzo, 1989.

⁹ We could quote here an example of the "air war" between the Polish Airline LOT and the British Airways about two years ago. The Polish authorities did not agree to a considerable increase of the number of BA flights between London and Warsaw being afraid of too strong competition for the domestic carrier.

including a required approval of the government (or the central bank) to conduct transactions of various types.¹⁰ An extreme case of the restricted free movement of capital is the regime of unconvertible currency (in this case an administrative permission is required for any transaction of exchanging foreign currency). Thus, generally speaking, barriers to the movement of capital are created by an excessive degree of administrative intervention, with their vexatiousness being the greater the less stable is the legal system and the more discretionary the decisions are.

Another example of restrictions on the free movement of capital are *restrictions concerning purchases of certain assets* (such as, for instance, the lack of or strictly restricted right to purchase land), securities (e.g. treasury bonds), or a restricted right to purchase freely the shares of domestic companies (in some sectors of the economy such purchases can be completely banned, in others partly, e.g. allowing for the minority ownership only). Finally, an important barrier to the free movement of capital are restrictions forbidding or taxing heavily the *repatriation of profits* (Baldwin, 1994).

The barriers restricting the movement of labour between countries are usually strictly limited *work permits*. This barrier can also mean, in the most extreme form, restrictive principles of granting visas and entry permits (such is usually the case when illegal employment is widespread). An extremely vexatious barrier, although concerning only the best qualified part of labour, is created by *not recognizing the diplomas issued in another country* and certificates confirming the right to perform a profession, as well as the already mentioned (in the context of restricted freedom of the movement of services) restricted right to perform professional activity in the importing country by the key personnel of firms.

The above mentioned barriers to economic cooperation, which are usually introduced deliberately, are intensified by *unintentional barriers* resulting from legal differences, differences in the tax regimes, or differences in the administrative practice among countries. Another type of an unintentional barrier is the risk connected with the instability of exchange rates. Taken together, they represent a powerful impediment to economic cooperation, which is difficult to eliminate even in the countries attempting to liberalize the movement of goods, services and production factors.¹¹

The removal of intentional and unintentional obstacles to economic cooperation undertaken for the sake of enhanced common welfare and accelerated economic growth is called economic

¹⁰ Such restrictions were in force in Western Europe, with different intensity, until the end of the 1980s (Baldwin, 1994). It could be added, moreover, that a full convertibility of the domestic currency, as interpreted by Art.VIII of the IFM Statute *does not imply* that all the restrictions on the free movement of capital are removed (although it calls for a full freedom of the current account operations).

¹¹ The questionnaire survey carried out on 20,000 EU firms (ordered by the Commission of European Communities) showed that in the mid-1980s, which is almost after 30 years of intensive integration within the common market, the firms still encountered powerful trade obstacles. The traditional instruments of the trade policy (tariffs, quotas) had obviously not existed for long decades. However, the firms pointed at the following obstacles: various technical standards and administrative barriers, border formalities and transport regulations,

integration. The theory of economic integration describes the successive levels of economic integration, which differ from one another as regards the degree to which obstacles are reduced (see: El-Agraa et al., 1994, Robson, 1990, Gros and Thygesen, 1992):

- **free trade area** - the participating countries eliminate tariffs and other restrictions on the movement of goods in mutual trade;¹²
- **customs union** - the participating countries remove tariffs and other restrictions on the free movement of goods in mutual trade and establish the common external tariff against third countries (thus, they create a single customs area);¹³
- **single market** - the participating countries remove all - direct and indirect - restrictions on the movement of goods, services, labour and capital;¹⁴ simultaneously with abolishing the control of movements, the countries accept uniform principles of the market regulation (e.g. uniform competition rules);
- **economic union** - apart from establishing the single market the participating countries introduce the monetary union and coordinate, to a large extent, their fiscal policies.¹⁵

As we are going to show below the successive stages in the removal of barriers to economic cooperation are connected with different types of cumulating benefits. A practical evidence confirming that such benefits are really noticeable is a marked world trend towards the expansion and consolidation of integration groupings.

A.1.2 Static effects of integration: theory of customs unions

The classical analysis of economic integration was mainly based on the examination of static, allocation effects of establishing the free trade area and the customs union. The point of departure for its deliberations was the Ricardian theory of international trade based on the principle of comparative advantage.¹⁶ The comparative advantage, and the accompanying possibility of specialization of

differences in VAT, capital market control, restricted participation in public procurements, and varying degree of the community's laws application (Emerson, 1991).

¹² The examples of free trade areas are EFTA and CEFTA; a partial free trade area (for industrial goods only) will be also established between Poland and the EU on the basis of the Europe Agreement.

¹³ An example could be the customs union between Turkey and the EU established recently.

¹⁴ The European Union has constituted a single market since 1992.

¹⁵ The Maastricht Treaty transforms the European Union from the single market into the economic union. Due to the fact that the Treaty contains also provisions concerning the harmonization of foreign policy, security, and internal policy, it represents a step forward towards the **full economic and political union**, which is sometimes described as the fifth and the highest integration level (Gros and Thygesen, 1992).

¹⁶ The analysis performed by Ricardo was based on the example of the Methuen Treaty signed between England and Portugal at the beginning of the 18th century. Under this treaty, the Portuguese wines obtained a preferential

different countries in the production of different goods, results from differences in technologies used in both countries and differences in relative abundance (and, thus, also price) of production factors in both countries. Briefly speaking it can be easily demonstrated that if the relative prices of labour and capital in two countries are different, and if both countries consume goods differing in production technology (and, thus, also in the relative consumption of production factors in the manufacturing process), the welfare will increase in both countries if each of them concentrates on the production (for its own market and for the export to the other country) of these goods whose manufacturing involves a greater consumption of the production factor which is relatively cheaper in a given country. The necessary condition of exchange, which is the difference in abundance of production factors implies also that the trade should be developing the faster the bigger the difference in the development (this is where the biggest differences in relative prices of production factors should be expected). Hence, the international trade based on the principles of specialization and comparative advantage was considered traditionally to be the driving force of growth on the world scale (Lal, 1993).

The comparative advantage theory is unable, however, to explain a gradually intensifying phenomenon of the domination of international exchange by the trade among developed countries with similar price relations of production factors. Moreover, particular countries *simultaneously* import and export similar goods produced according to similar technologies (e.g. cars). This phenomenon, known under the name of intra-industry trade, plays today a dominant role in shaping the structure of foreign trade in the developed countries.¹⁷ Its sources can by no means be explained by the classical theory of comparative advantage and specialization. They are identified rather in the growing role played by consumers' differentiated tastes (international trade increases the range of options) and in the efforts of firms to obtain the economies of scale (Balassa, 1966).

Figure A1.1 illustrates the classical static analysis of benefits flowing from the creation of customs union between two countries (A and B) based on the theory of comparative advantage (the underlying model is often called the *Ricardo-Viner model*). The analysis is performed with several simplifying, rigid assumptions concerning the organization of markets, mobility of factors, and level

access to the English market in exchange for the access of English woolen goods to the Portuguese market. The example was chosen quite unfortunately, as this treaty can be hardly considered a voluntary and mutually advantageous agreement reached by two equal partners: it was England which dictated prices and, in practice, subordinated the Portuguese economy (Braudel, 1992). The model of trade based on the principle of comparative advantage is frequently called the Heckscher-Ohlin model.

¹⁷ The method of measuring this phenomenon was first proposed by Balassa (1966). A developed form of the measure is the Grubel-Lloyd coefficient defined as $B=1-(\sum_k |X_k^i - M_k^i| / \sum_k (X_k^i + M_k^i))$, where X_k^i and M_k^i denote the export and import of goods of the k branch produced by the i country. If the intra-industry trade does not exist at all, for each branch either X_k^i or M_k^i is zero (a country either imports or exports exclusively a given product depending on the comparative advantage) and, thus, coefficient B equals 0. With the pure intra-industry trade, the exports and imports are equal to each other and, thus, the coefficient amounts to 1. According to Buigues, Ilzkovitz and Lebrun (1990), the coefficient of intra-industry trade measured in such way and estimated for the whole economy ranges in the EU countries from 57% in Italy to 83% in France (only Greece and Portugal, weakly integrated with the EU, have lower coefficients reaching 30-40%). Thus, the international trade between the EU countries is dominated by the intra-industry trade.

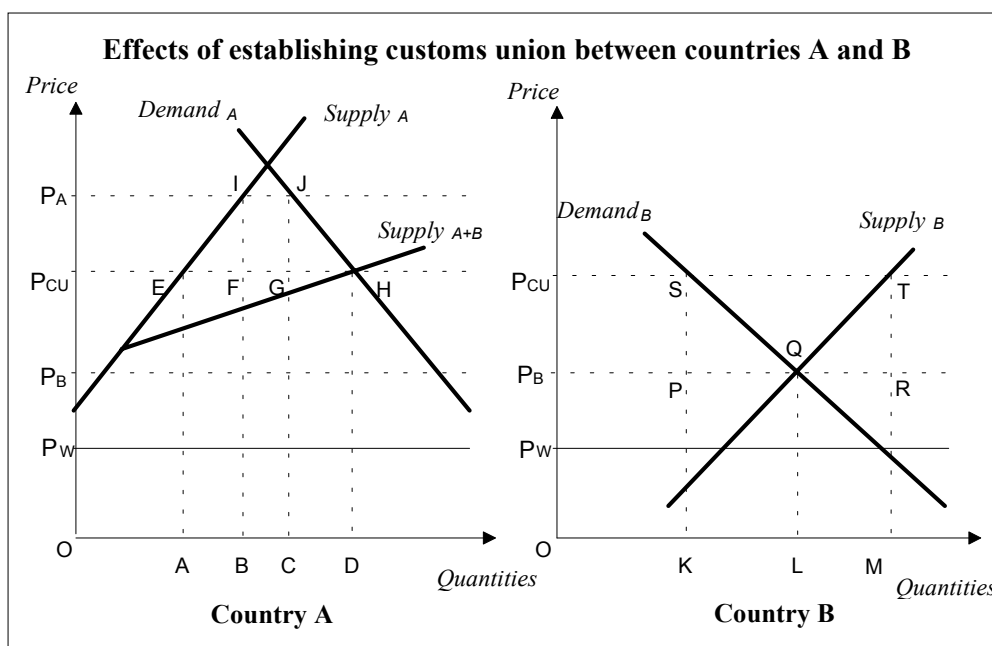


Figure A1.1

of prices (for more detailed discussion see: Robson, 1990). Moreover, the analysis is carried out in the categories of the partial equilibrium and it concerns one market.

Let us assume that the world price of a certain product equals P_W . Before establishing the customs union, the country A imposes the tariff equal to $(P_A - P_W)$, while the country B a lower tariff equal to $(P_B - P_W)$. Consequently, the market prices in both countries are at levels P_A and P_B respectively (and, thus, above the world prices). At such prices, the consumer demand in the country A equals OC , the production in the country A amounts to OB , and imports to BC . Let us assume for the sake of simplification that the customs tariff is fixed in the country B at such level that this country does not import the analyzed product at all (of course, it does not export it either, because the domestic price is higher than the world price). In this way, the initial production in the country B is equal to demand and it amounts to OL .

Let us assume now that the countries A and B establish the customs union introducing a common tariff at the level $(P_{CU} - P_W)$ lower than that previously used by the country A, but higher than the tariff used by the country B. At the same time, these countries remove tariffs in their mutual trade. It causes that the market price in both countries amounts now to P_{CU} . The demand curve in the country A ($Demand_A$) does not change - instead of OC the consumers wish to buy now, at the lower price, a bigger quantity OD . Due to the absence of tariffs, this demand cannot be satisfied by the producers from both countries now (they offer a commodity at the same price). The supply curve of the country A ($Supply_A$) becomes, thus, replaced by the total supply curve of the countries A and B ($Supply_{A+B}$). The supply curve is now flatter than the previous supply curve (at the same price the producers from both countries offer a bigger supply than the producers from country A only). Let us assume, again for the sake of simplification, that the tariff accepted within the customs union ensures

that the total demand in the country A is satisfied by the producers from the union's area (A and B) and, consequently, the country A does not import the commodity in question from outside the union's area.¹⁸ As a result, the production in the country A amounts to OA and the import from the country B to AD.

In the new situation, the welfare in the country A improves. The main advantage is derived by the consumers who, on the one hand, pay a lower price P_{CU} for the commodity and, on the other hand, increase its consumption from OC to OD. The total increment of the consumers' welfare is equal to the area of quadrangle $P_{CU}P_AJH$. Simultaneously, however, the producers in the country A lose - the output shrinks to OA at the lower price P_{CU} . The loss in the producers' welfare is equal to the area $P_{CU}P_AIE$, which represents a part of the welfare growth area of the consumers. In this way benefits are transferred from the domestic producers to the consumers. The government suffers losses at the same time. Hitherto the government collected the import tariff reaching $BC \times (P_A - P_W)$. At the present time the duty is no longer collected (all imports come from the country B). A part of this loss is compensated by the consumers' increased welfare (quadrangle IJGF) and, thus, it represents the transfer of benefits from the government to the consumers; the remaining part (quadrangle $BC \times (P_{CU} - P_W)$) represents the welfare loss.

Hence, the area of welfare growth in the country A consists of the sum of triangles EFI (reduction of production costs) and JGH (growth of the consumers' welfare due to increased consumption). Together the areas of both triangles represent the *trade creation effect*, which is a favourable effect of replacing the less effective domestic production by the more effective imports from the country B. The area of welfare losses (quadrangle $BC \times (P_{CU} - P_W)$) represents the *trade diversion effect* being unfavourable for the country A and resulting from replacing the more effective imports from the rest of the world by the less effective, but treated preferentially, imports from the country B.¹⁹

Simultaneously, the country B derives benefits from establishing the customs union. Although the higher price P_{CU} causes that the consumers reduce consumption from OL to OK (thus, the welfare loss is equal to the area of quadrangle $P_{CU}P_BQS$), the producers' welfare grows along with the growth of prices and production (although production for the domestic market drops to the level OK, additional exports to the country A equal to KM). All in all, the producers from the country B gain more than the consumers lose (the welfare increment is equal to the area $P_{CU}P_BQT$). Hence, the welfare increment in the country B is equal to the area of the triangle QST.

¹⁸ These simplifications do not change the outcome of analysis, but they make the picture clearer.

¹⁹ See: Balassa, 1967.

The establishment of the customs union leads, thus, to the appearance of both positive effects of trade creation and negative effects of trade diversion.²⁰ The losses suffered by the country A as a result of the trade diversion are compensated, to some extent, by profits of the producers from the country B (El-Agraa et al., 1994; obviously certain efficiency losses are inevitable). All in all, it cannot be fully guaranteed that the effect of trade creation will be bigger in each case than the effect of trade diversion for the union as a whole and, all the more so, for the country A. The most often quoted list of the conditions that make the surplus of trade creation over trade diversion plausible includes (Robson, 1990): (a) area of the customs union (the bigger it is the greater the trade creation effect), (b) scale of tariff reduction as a result of establishing the union (the bigger it is the greater the trade creation effect), (c) scale of mutual competitiveness of the economies creating the union (the more competitive the economies are in relation to one another as regards the production of similar goods the more possibilities of production specialization and, thus, the bigger the trade creation effect), (d) scale of differences in production costs of the industries protected by tariffs before establishing the union (again, the bigger these differences are the greater the chances for specialization).

The benefits ensuing from the formation of customs union are higher if we take into account the economies of scale, that is the lower average per unit cost along with the growth of the scale of production.²¹ The effects of allowances made for the economies of scale in the customs union analysis are shown in Figure A1.2.

Let us assume that the prices of the analyzed commodity in the countries A and B before establishing the customs union amount to P_A and P_B respectively. They are equal (in the case of competitive markets we are speaking about) to the average costs of production. The producers from the country B are more effective than those from the country A (price P_B is lower than P_A). Despite this fact the production is continued in both countries. When the customs union is established, the whole production will be taken over by the more effective producers from the country B, which will lead to the trade creation effect as discussed above.

The dotted line on the right graph represents the curve of average costs incurred by the producers in the country B. Due to the effects of scale, the average cost drops along with the growth of production. Due to the fact that the producers in the country B satisfy now the total demand of the consumers from the countries A and B (curve $Demand_{A+B}$), the scale of production rises, which brings about a drop in the average costs and prices to the level P_{CU} . Thus, the benefits flowing from the trade creation are supplemented by an additional benefit connected with the fact that the efficiency

²⁰ The effects of trade diversion appear to be weaker in the case of free trade area, which does not require that the country B should raise its customs tariffs to the level of the common tariff (Robson, 1990). It is a simple consequence of the classical analysis of international trade - using the same graph A1.1 one can show that the country A would derive the greatest benefits in the case of complete elimination of tariffs (even unilateral) and not through reducing the tariffs to the level P_{CU} . Thus the lower the tariffs the bigger the benefits (they could be achieved by the country A only indirectly - through lower tariffs in the country B).

²¹ Economies of scale are frequently classified among the dynamic effects of integration, see: El-Agraa et al., 1994. However, we prefer to consider them only as some extension of the static analysis.

of producers from the country B increases as a result of economies of scale: the consumers from the countries A and B pay a lower price and, moreover, they increase consumption (overall growth of the consumers' welfare is equal to the area of quadrangle $P_{CU}P_BMK$). Moreover, this gain is not accompanied by the producers' losses - the reduction of prices from the level P_B to P_{CU} is a result of the reduction of costs and not the producers' loss.

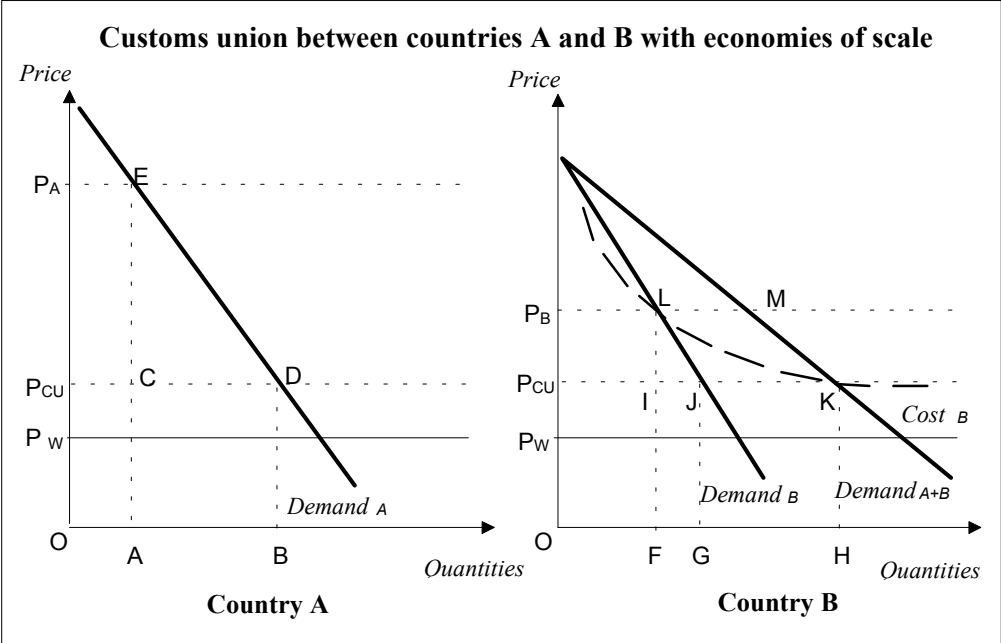


Figure A1.2

The static benefits resulting from the customs union are further increased if we take into account the benefits due to the improved international bargaining position and the ensuing improvement in the terms of trade in trade exchange with the rest of the world (see: El-Agraa et al., 1994), as well as the benefits produced by a greater scale of the market competition. It is connected with the existence of the so-called X-inefficiency in the industries protected by tariffs.²² Although this inefficiency cannot be shown as an additional social cost of protection in the simple Ricardo-Vinera model presented above, it becomes an important, additional factor in the more complex models of the effects of protectionism (Vousden, 1993).

A serious critical remark, which could be made about the customs union analysis based on the Ricardo-Viner model is that the analysis is restricted to the partial equilibrium (on a single, separated market). Attempts to widen the analysis to cover a bigger number of markets lead to very complicated

²² The term X-inefficiency was introduced by Liebenstein in a somewhat broader sense. It describes a difference between the potential output, which can be achieved from the used factors, and the output produced below the potential efficiency (which is a lower). Such difference may appear, as producers are interested in maximizing their utility rather than output (Liebenstein, 1978). The existence of protectionist tariffs causes that the domestic

models, which do not give an explicit answer to the question about benefits resulting from the customs union (Robson, 1990). In turn, the attempts to generalize the results of the partial equilibrium model onto the level of general equilibrium (El-Agraa et al., 1994) are based on breakneck assumptions about the absence of price impacts between markets (Robson, 1990).

Enriching the analysis by further markets of goods does not remove, however, the most significant reservation, which could be made with regard to the analysis of static effects of the customs union from the general equilibrium point of view. In the case of the customs union as shown in Figure A1.1., the consumers from the country A derive major benefits (the drop in prices from P_A to P_{CU}), but it takes place partly at the expense of losses suffered by the producers from the country A. The reduction of production scale in the country A can lead to the growth of unemployment and, consequently, to the lower consumers' real income. The demand curve ($Demand_A$) can, thus, shift downwards (with the same price, the impoverished consumers will be purchasing a smaller quantity of the analyzed commodity), which can reduce considerably the benefits of consumers in the country A flowing from the customs union.²³

A.1.3 Integration of markets for production factors and dynamic effects of integration

Many reservations concerning the benefits of the customs union are softened, or they disappear, the moment the economic integration reaches its higher level of the single market. It is due to the fact that the removal of barriers to the free movement of production factors creates prerequisites for a gradual elimination of differences in the efficiency in using production factors, which should pave the way for a higher pace of economic growth and welfare growth in the countries participating in the single market. The trade can be considered, to some extent, as a substitute for a free movement of production factors. The potential long-term benefits resulting from a full integration of the market are much higher than the short-term static allocation effects of trade liberalization (Wysokinska, 1995).

The first argument pointing at the benefits resulting from the removal of barriers to the movement of production factors is an improved efficiency of production factors allocation generated by a pressure to equalize their marginal productivities in the countries creating the single market. This process supplements, to some extent, the theory of comparative advantages. This time, however, a

producers, not threatened by competition, achieve a higher level of utility producing goods in a less efficient way than it would be possible.

²³ Of course, it would happen only if the customs union led to the appearance of a structural trade deficit in the country A in its relations with the country B (that is, if the drop in production of the analyzed commodity in the country A was not compensated by the growth of export and the production of another commodity). Such situation is ruled out in the simple model of Ricardo-Vinera based on the theory of comparative advantages, but

reaction to differences in the abundant equipment of the countries with factors of production (and, consequently, their prices and marginal productivities) is not the movement of goods (whose prices reflect these differences) but the movement of production factors themselves.

This phenomenon is analyzed in Figure A.1.3. (the graph deals only with the movement of capital²⁴). The analysis is conducted using a simple neo-classical partial equilibrium model, under the assumptions that the supply of both production factors is given, while the capital is perfectly mobile.

Let us assume that there were no capital movements between the countries A and B before forming the single market. Hence, the mechanism balancing the marginal productivities of capital in both countries did not exist either: the capital productivity in the country B was higher than in the country A. In both countries the capital productivity amounted to Pr_A and Pr_B respectively, and the installed capital to OB and OF .

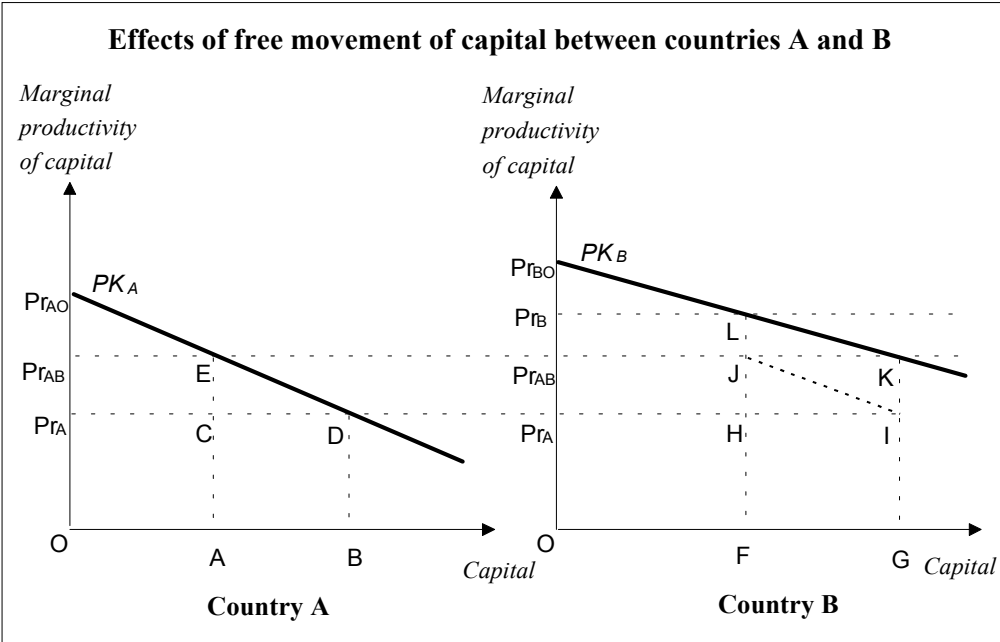


Fig.A1. 3

The curves PK_A and PK_B show the relationship between the marginal productivity of capital and the capital installed in both countries (the more capital the lower the marginal productivity). The value added in the country A is equal to the capital multiplied by its productivity and it is, therefore, shown in the figure by the quadrangle $Pr_{AO}OBD$. The whole value added is divided, according to the neo-classical assumptions, among the production factors (for the sake of simplicity, we are omitting

it can occur in reality forcing out the adjustment of nominal and real currency exchange rates in the countries A and B (and, thus, again changing the profit and loss account of both countries).

²⁴ The analysis concerning the movement of labour between countries forming a single market would look very similar. Although formally all factors receive an equal treatment, a greater role is usually attributed to the movement of capital - it is definitely a more mobile factor and, hence, potentially a factor benefiting more from free factors' movement than labour (it is confirmed by a relatively small mobility of labour observed during over thirty years of the EU integration, see: Molle, 1990).

here indirect taxes, which also take part of value added). Simultaneously, the unit price of capital is equal to its marginal productivity, which means that the remuneration of capital (profits) is represented by the rectangle $Pr_A OBD$ in the figure. Thus, the remuneration of labour is the rectangle $Pr_{AO} Pr_{AD}$. In the country B the value added before establishing the single market is represented by the quadrangle $Pr_{BO} OFL$, the remuneration of capital by the rectangle $Pr_B OFL$, and the remuneration of labour by the triangle $Pr_{BO} Pr_{BL}$. Let us note, that the ratio of labour remuneration to capital remuneration is much higher in the country A.²⁵

Following the removal of obstacles to the movement of production factors the capital, seeking higher profits, starts flowing to the country B. It happens so, until the marginal productivities in both countries are balanced at the level Pr_{AB} . The capital installed in the country A goes down to the level OA , which means that with a given supply of labour in the country A, its value added decreases and it is now equal to the area of quadrangle $Pr_{AO} OAE$. The remuneration of capital is equal to the quadrangle $Pr_{AB} OAE$, while the remuneration of labour to the triangle $Pr_{AO} Pr_{ABE}$ (thus, both are lower than before the single market was established). Simultaneously, however, the capital FG belonging to the country A and installed in the country B yields profits for the country A equal to the area of rectangle $FGKJ$ (capital FG multiplied by productivity OPr_{AB}). This area is bigger than the losses in the value added in the country A by the area of the triangle IJK .²⁶ This is how much the income of the country A increases in relation to the situation before establishing the single market. Due to it, the country A, although it produces less, obtains a higher income and welfare level.

The increment of the value added in the country B is equal to the quadrangle $FGKL$. At the same time, the entire additional remuneration of the capital FG (that is, the rectangle $FGKJ$) is transferred abroad to the country A (owner of the capital). It means that the income of the country B increases only by the remuneration of labour, that is by the area of triangle JKL . Consequently, the country B witnesses a major growth of production and, to a smaller extent, of the level of incomes. Ultimately, a more effective use of capital results in the growth of income and welfare in both countries.

In the light of the neo-classical model, free movements of production factors (especially of capital being more mobile than labour) should lead to the relocation of capital to the regions ensuring a higher marginal productivity (which is relatively poor regions in capital; Wysokinska, 1995), to the acceleration of economic growth in the countries importing capital, and to the general growth of welfare on the area of the single market. However, a few reservations with regard to this conclusion exist. Firstly, the factors of production (even capital) are not perfectly mobile in reality (the mobility

²⁵ We may assume, that the country A is a country of high wages and big abundance of capital, while the country B is a country of low wages, which suffers from a relative (in relation to its labour pool) shortage of capital. In the case of the customs union, the country A would specialize in the production of capital-intensive products and the country B in the production of labour-intensive products.

²⁶ Due to the fact that the outflow of capital from the country A, i.e. AB is equal to the inflow of capital to the country B, i.e. FG .

of, first of all, labour but also capital can be restricted, for instance, by the trade unions activity²⁷). Secondly, the countries suffering from the deficit of capital have, as a rule, an insufficiently developed infrastructure, and frequently also less developed human resources, which can lead to the additional adjustment costs for the investor. Thirdly and finally, low trading costs and (more or less rational) tendency observed among the investors to locate their investments in the regions, where the competitors and other investors already operate, may produce the polarization effect, that means the attracting of new investments by the most developed regions (and not necessarily by the regions with the highest marginal productivity of capital, Kundera, 1995).

A positive impact of integration on economic growth is confirmed also by Baldwin.. The analysis performed using the *exogenous growth model*²⁸ shows that the economic integration yields medium-term growth benefits. The static integration effects lead to higher incomes and savings, and ultimately to the higher "optimal" capital intensity (i.e. ensuring a balanced economic growth). This, in turn, means that the economy shifts onto a higher growth path (or, more simply, the productivity of capital increased by integration effects stimulates a temporary growth of investments, Baldwin, 1994).

In turn, the analysis performed with the *endogenous growth model*²⁹ indicates long-term growth benefits. They are connected with a wider access to the cumulated knowledge, a higher profitability of innovations (through operation on a larger market), a stronger competitive pressure, an improved efficiency of the financial sector and the capital market (reducing the risk of economic activity), and with tapping the economies of scale and comparative advantages in the field of R&D (Baldwin, 1994). All these elements should pave the way for an accelerated economic growth in the countries of an integrating bloc.

²⁷ An example could be the strikes of employees in the Italian factories of FIAT, opposing the transfer of the company's production to Poland.

²⁸ The *models of exogenous growth*, which dominated in the theory of economic growth till the 1970s, assume that the achievable long-term balanced economic growth rate is determined by the growth of labour supply and exogenously given technical and organizational progress. The models estimate an optimal (in the sense of ensuring a balanced growth) rate of capital intensity and labour productivity growth (dependent, among others, on the rate of savings). Due to the diminishing marginal return from production factors (resulting from the models' assumptions), the economic growth may be checked at some point in the future. Among widely known examples of the exogenous growth models are the Solow model (Solow, 1956; this model was also used by Baldwin in his book, Baldwin, 1994) and the Kalecki model (Kalecki, 1963).

²⁹ The *models of endogenous growth*, introduced to the theory of economy in the 1980s, assume that economic growth is dependent both upon the growth of physical and human capital, and on the endogenous (which is depending on the decisions of economic units and governments) technical progress. In these models, growth can continue infinitely (marginal revenue from production factors does not diminish). A special role in the models of endogenous growth is played by the cumulation of knowledge allowing to use production factors more and more effectively (through learning by doing). A review of the theories of endogenous growth can be found in: Barro and Sala-I-Martin, 1995; Gruber, 1994; Wojtyna, 1995.

A.1.4 Monetary and fiscal integration

The highest level of economic integration is the economic union. To complete the economic union, apart from establishing a single market, it is also necessary to achieve the monetary integration and a high degree of the fiscal integration.

The two key elements of the monetary integration are (Robson, 1990): (a) an irreversible stabilization of exchange rates among the countries belonging to the union (the safest way of achieving such stabilization is to replace the national currencies by the common currency), and (b) a full integration of the capital market (and thus, as a minimum, an unrestrained convertibility of the national currencies in the field of capital transactions and the removal of all controls of capital movements within the union). As a result of the monetary integration, the countries participating in the union must resign from using traditional monetary policy instruments including their right to finance the budget deficits with profits from seignorage. The sovereign rights concerning seignorage must be passed over to the common emitting institution (which is a kind of the central bank of the economic union).³⁰ Moreover, this institution has to take over the rights and obligations of shaping the common currency exchange rate and, consequently, also the control over the union's joint foreign exchange reserves. Thus, the establishment of the common emitting institution is sometimes treated as the third indispensable element of the monetary integration (El-Agraa et al., 1994).

The monetary integration changes significantly the situation of the countries which have embarked upon it. The analysis of costs and benefits of the monetary integration is an object of discussions on the optimal currency area. On the side of costs, it is necessary to include the loss of the national currency exchange rate as a tool for controlling the economy's external equilibrium. If a strong external shock appears, there are no possibilities of counteracting it by changing the nominal exchange rate. Hence, the economy has to adapt itself to the new situation through the changes of real exchange rate, which is by, for example, lowering wages and labour costs (Gros and Thygesen, 1992).

The benefits resulting from the monetary integration include primarily a reduced risk of changes in the exchange rate (it should be an incentive for long-term economic ventures), stability of prices, increased predictability, and elongated horizon of economic activity (Nielsen, Heirich, Hansen, 1992). At the moment the irreversible stabilization of exchange rates leads to the common currency, additional benefits are (Gros and Thygesen, 1992): lower costs of transactions between different

³⁰ The term "emitting institution", which is clearly linked with the introduction and emission of the common currency, was used here for the sake of simplification. In reality, as long as the member countries do not resign from their national currencies (although the exchange rates stabilize irreversibly), a common monetary institution may not be necessary. It is sufficient to subordinate the monetary policy of the countries participating in the union to one central bank - the leader, emitting the union's strongest currency. The bank-leader defines priorities of its monetary policy (as a rule, the stabilization of prices) and the remaining banks have to adapt themselves to the policy, with their only goal being the stabilization of the exchange rates in relation to the leader's currency (Gros and Thygesen, 1992). In such way a high degree of monetary integration was already achieved within the EMS by Germany, Belgium, Denmark, Holland and Austria (the bank-leader is, of course, the Bundesbank, see: European Monetary Institute, 1994).

countries of the union, elimination of unjustified price differences between markets, a lower indispensable level of foreign exchange reserves,³¹ and dynamic growth effects due to the improved microeconomic efficiency (see: chapter A.1.3).³² Last but not least, the psychological effects of introducing the common currency for the social perception of the fact that the union is a homogeneous economic organism should also be taken into account.

The critics of monetary integration claim that depriving the government of traditionally used economic policy instruments (exchange rates) and eliminating, or at least restricting considerably the freedom of using other instruments (monetary policy instruments) may carry a risk of substantial macroeconomic costs for the participating countries. Under the single currency, and a single inflation rate, the country can not reach its internal equilibrium (a combination of inflation and unemployment rates considered to be optimal). This problem was raised by Fleming and next by Corden in the early 1970s (El-Agraa et al., 1994). The Fleming-Corden argument concerning the costs of the monetary integration is shown in Figure A1.4.

³¹ The level of foreign exchange reserves, which should be possessed by the union's emitting institution (following the introduction of the common currency) is lower than the sum of reserves, which would have to be kept in the central banks of the countries participating in the system of stabilized exchange rates (before introduction of the common currency). The reason is that in the case of the common currency only interventions aimed at controlling the value of this currency in relation to third currencies are needed, while before it was also necessary to stabilize, through interventions, exchange rates within the union.

³² The importance of some of the above mentioned benefits resulting from the introduction of the common currency is sometimes questioned. A reliable system of stable exchange rates reduces considerably the exchange rate risk even without a full monetary integration, while transaction costs in the case of using national currencies are not all that high, especially since the time the accounting of firms was computerized.

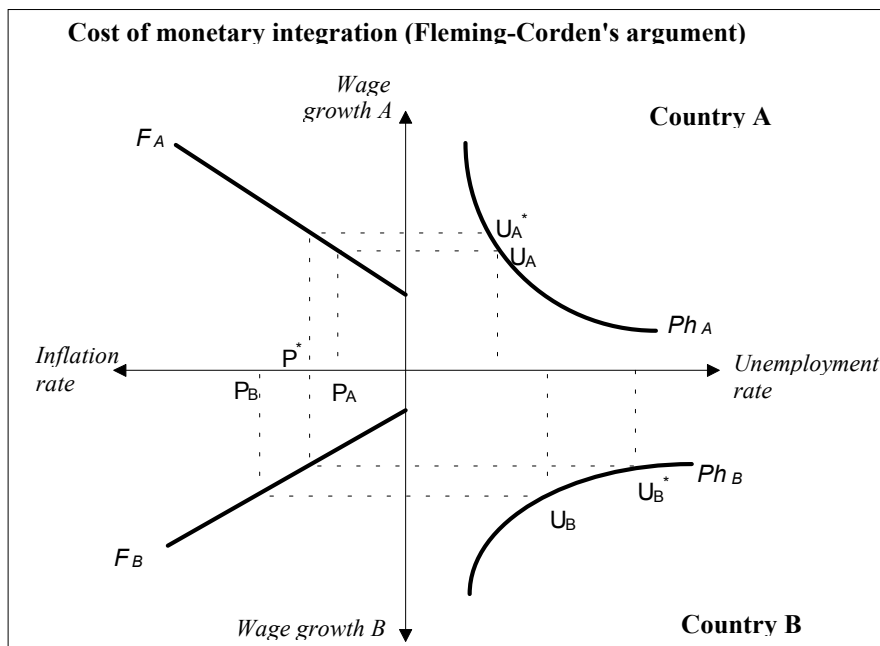


Figure A1.3

Let us assume that before the monetary integration the country A had a lower inflation and unemployment rate than the country B. The lines F_A and F_B describe, for both countries, the correlation between the rate of inflation and the growth of nominal wages (a certain growth of wages, compensated by the labour productivity growth, does not generate inflation). The lines Ph_A and Ph_B are the Philips curves for both countries.³³

At the time when both countries are free to control their exchange rates, they can also freely shape their macroeconomic policy in the search for an optimal (from their point of view) combination of inflation and unemployment. The unemployment in the country A is at the level U_A , and the inflation at the level P_A (in the country B - U_B and P_B respectively). If both countries carry out a full monetary integration, their inflation rates become similar reaching the level P^* . This leads, however, to the appearance of new unemployment rates - U_A^* and U_B^* . It is particularly penalizing for the country B paying the price for reducing inflation in the form of a marked growth of unemployment (an unwanted price, as the country prefers to have much lower unemployment at the cost of higher inflation).

The situation may look even worse in a country, which (for one reason or another) is forced to cope with the corrective inflation (that is, inflation not resulting from the growth of wages but from the necessity of changing the structure of relative prices, e.g. raising artificially low prices of certain services). Such situation can be seen in Figure A1.5.

³³ The Philips curve makes the growth of wages and, consequently, inflation dependent on the rate of unemployment. The Philips curve concept, extremely popular in the 1960s and at the beginning of the 1970s (thus, at the time Fleming and Corden performed their analysis), became an object of criticism in the later years (see: the following footnote).

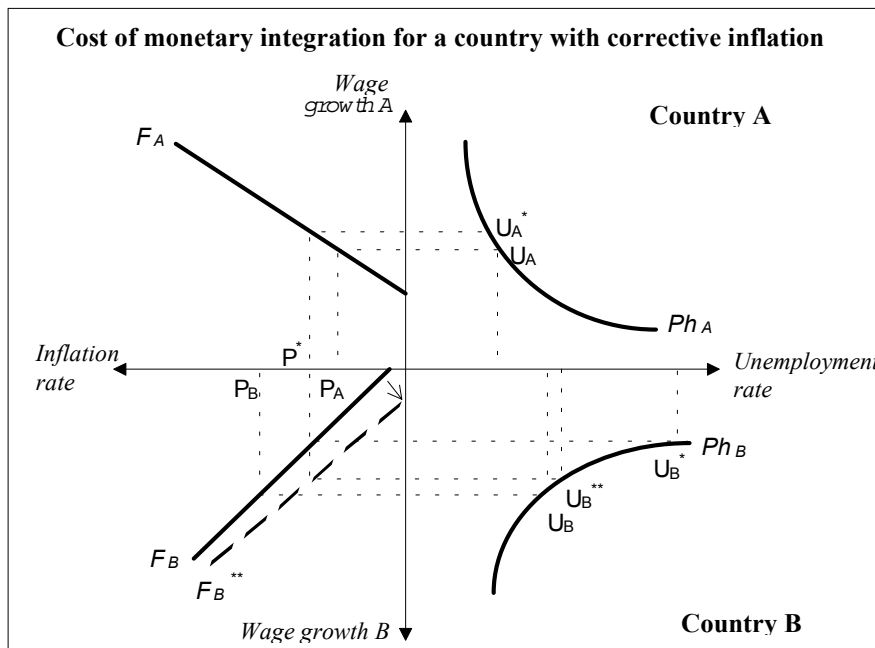


Figure A1.4

The line F_B showing the correlation between the rate of inflation and the growth of nominal wages in the country B differs from that in Figure A.1.4, as it envisages a positive inflation rate even in the case of zero growth of wages. In the case of monetary integration of the countries A and B, the unemployment rate in the country B would rise dramatically to U_B^* . Moreover, the farther to the left is the intersection point of the line F_B and the inflation axis, the greater the probability that the wage growth obtained at the new equilibrium point will be minimal or even negative (this effect cannot be shown in Figure A.1.5), while the unemployment rate will be extremely high. The situation of the country B would not improve until the corrective inflation process is finished. The line depicting the correlation between the wage growth and inflation would shift then from the position F_B to F_B^{**} , while unemployment would decline - with the same rate of inflation P^* - from U_B^* to U_B^{**} .

We should note, however, that (as it is shown by El-Agraa et al., 1994) replacing the traditional short-term Phillips curve by the long-term curve,³⁴ leads to the conclusions incompatible with the findings of Fleming-Corden analysis (the country B achieves the reduction of inflation and, simultaneously, does not pay the price in the form of unemployment growth in the long term).

³⁴ The concept of long-term Phillips curve, proposed by Friedman (1968) and next developed by the new classical economy (as the expectations-augmented Phillips curve, see: Lucas, 1972), shows it as a simple, vertical line (one unemployment rate is connected with different inflation levels). It happens so, because along with the stabilization of inflation at a higher level, employers and employees change their expectations concerning price increases (a starting point for wage negotiations) and, thus, the short-term curve shifts upwards (such phenomenon was observed during the inflation in the 1970s).

A natural supplement of the monetary integration is the fiscal integration, which is the removal of barriers to economic cooperation ensuing from differences in the functioning of public finance in the integrating countries. The three successive and more advanced levels of the fiscal integration are (Robson, 1990): (a) fiscal harmonization, that is establishing the common principles of using the fiscal policy instruments by the integrating countries, (b) fiscal coordination, that is a voluntary convergence of the fiscal policies, and (c) full fiscal integration, that is standardization of the fiscal policy used on the entire area of the economic union (which is, the implementation of identical taxation principles and rates, as well as a convergent policy in the field of fiscal deficits and public debt). The final effect of integration can be the adoption of a common tax system (Wilmott, 1993).³⁵

The fiscal integration in the field of the budgetary policy and the public debt is considered to be an indispensable supplement to the monetary integration. The differences in the implemented policy and, in particular, the excessively high level of fiscal deficits and public debt in relation to GDP persisting in some of the integrating countries would pose a threat for the economic equilibrium in these countries and, consequently, for the exchange rate stability.³⁶

In the field of indirect taxes, the main argument in favour of integration is the creation of identical conditions for all producers, which is a basis for free competition on the single market. The existence of major differences in indirect taxes may disturb the postulated neutrality of the tax system and, consequently, the structure of prices, imposing additional barriers to the free movement of goods (Cnossen, 1993). In the single market conditions, the persistence of differences in indirect taxes leads also to the emergence of numerous technical and organizational problems connected with collecting taxes (Wilmott, 1993). In the case of direct taxes, the main argument in favour of integration is a desire to avoid disturbances in the price relations for production factors, which leads to the non-optimal structure of production and non-optimal investment decisions. The persistence of major tax differences between the integrating countries, accompanied by the free movement of capital, is also an incentive to evade taxes (e.g. through fictitious operations of transferring profits to the countries with the lowest tax levels, see: Lacan, 1993).

³⁵ The Neumark report compiled in 1962 recommended that the EU countries should adopt a common tax system as their final goal (Wilmott, 1993).

³⁶ That was the reason why coordination of the fiscal policy (deficits and public debt) was included among the criteria of membership in the monetary union formulated in the Maastricht Treaty. Moreover, the Treaty envisages penalties (fines) for the participating countries which fail to improve their public finance to the required degree (see: European Monetary Institute, 1995).

Appendix 2

Short- and medium-term growth benefits of integration. Theoretical model

It is not difficult to show the relations between foreign transfers and investment, budget deficit and economic growth in the short and medium period using a simple theoretical model (similar to the model IS-LM used in the standard macroeconomic analysis). For the short period, it will be a demand determined model, and for the medium period the model of demand-supply character.

Short-term model (demand determined)

Let us write the short-term model as a number of behavioural equations and identities

- (1) $X^d = (I + FDI) + C + G - TDef$
- (2) $TDef = FDI + Tr_c + Tr_i + Tr_g - \Delta Res$
- (3) $C = \alpha(I - \tau)X^d + Tr_c$
- (4) $I = \beta_0 - \beta_1 ir + Tr_i$
- (5) $DefG = G - \tau X - Tr_g$
- (6) $M^d = M_{pr}^d + DefG$
- (7) $M_{pr}^d = \xi_0 - \xi_1 ir$
- (8) $M^s = M^d$

where: X^d - aggregated demand, I - domestic investment, C - personal consumption, G - government consumption, FDI - foreign investment, $TDef$ - foreign trade deficit, Tr_c - consumption-supporting transfers, Tr_i - investment-supporting transfers, Tr_g - transfers supporting government expenditures, ΔRes - increase of foreign exchange reserves, τ - tax rate, ir - interest rate, $GDef$ - budget deficit, M^s - money supply, M^d - demand for money, M_{pr}^d - demand of private sector for money, α , β_0 , β_1 , ξ_0 , ξ_1 - parameters (all positively defined).

Real sphere (equations (1)-(5)): equation (1) is the definition of aggregated demand (the sum of domestic and foreign investment, consumption, government demand, diminished by trade deficit). Equation (2) defines a simplified balance of payments equilibrium: the inflow of foreign exchange, as a result of foreign investment and transfers from the EU (earmarked for the financing consumption, investment, and government expenditures) diminished by the resources absorbed by the growth of

foreign exchange reserves, is equal to the trade deficit (we assume that the remaining items of the balance of payments are in equilibrium). Equation (3) defines the personal consumption as a constant share of income after taxes (for the sake of simplification, we accept a single, average tax rate τ covering both direct and indirect taxes) increased by transfers from the EU financing consumption. Equation (4) makes domestic investment dependent on the level of interest rate and on transfers from the EU financing investment. Equation (5) defines the budget deficit as the difference between the government expenditures and the revenues from taxes and transfers from the EU earmarked for the financing current government expenditures.

Monetary sphere (equations (6) - (8)): equation (6) defines the demand for money as the sum of the private sector demand and the government demand for credit for financing the budget deficit. Equation (7) shows the link between the private sector's demand for credit and the interest rate level. Finally, equation (8) defines the monetary market equilibrium (the supply of money is equal to the demand).

Together, equations (1) -(8) constitute a short-term demand model of the open economy, with the real exchange rate level (clearing the external account i.e. ensuring that identity (2)¹ is fulfilled) and the interest rate (clearing the money market as described by equation (8)) determined by the market.

Substituting equation (7) to (6), and next (6) to (8), we can calculate the solution of money market equations (the interest rate balancing the demand for and the supply of money; for the sake of simplicity, we shall write the solution using positive parameters γ_0 and γ_1):

$$(9) \quad ir = (\xi_0 - M^s) / \xi_1 + (1/\xi_1) GDef = \gamma_0 + \gamma_1 GDef$$

Substituting equation (9) to (4), and next equations (2), (3), (4) and (5) to identity (1) and making a number of simple transformations we obtain the solution to the set of equations (1) - (8), i.e. the level of aggregated demand. This level depends upon two economic policy variables, namely the level of budget deficit and the level of foreign exchange reserves:

$$(10) \quad X^d = [(\beta_0 - \beta_1 \gamma_0) / (1 - \alpha(1 - \tau) - \tau)] + [(1 - \beta_1 \gamma_1) / (1 - \alpha(1 - \tau) - \tau)] GDef + \\ + [1 / (1 - \alpha(1 - \tau) - \tau)] \Delta Res$$

Let us note first that *the scale of transfers from the EU does not influence the short-term economic growth* (the scale of foreign transfers and direct investment was netted out in the course of transformations²). The whole short-term growth benefit resulting from transfers is eliminated by the

¹ The exchange rate intervenes in the model implicitly (a direct introduction of the exchange rate to the model would require adding two equations linking the level of exports and imports, and, thus, also the trade deficit with the real exchange rate level).

² The netting out of foreign transfers and direct investment took place due to the fact that they appear with a positive sign in equations (3)-(5), but they are deducted when equation (2) (the balance of payments equilibrium) is substituted to equation (1). It reflects a simple fact that although transfers and investments raise the level of particular elements of the final domestic demand, they also force out an adjustment on the side of the balance of

growth of trade deficit accompanying them. The only variables, which can influence the rate of growth are, thus, foreign exchange reserves and the budget deficit.

It is not difficult to notice that the sign of parameter determining the impact of foreign reserves growth is always positive (the sum of share of consumption financed from domestic resources in the aggregated demand, $\alpha(1-\tau)$, and the share of taxes, τ , is always lower than 1). Thus, the whole parameter $[1/(1-\alpha(1-\tau)-\tau)]$ defines *the positive multiplier of aggregated demand with respect to the growth of reserves*. The higher the growth of reserves the lower the real appreciation, and the lower the trade deficit. The growth of foreign exchange reserves counteracts the syndrome of generalized "Dutch disease".

The sign of the parameter determining the impact of the budget deficit is not so clear. Whereas the expression in the denominator is always positive (see: above), the sign of the expression in the numerator depends on whether the product $\beta_I\gamma_I$ is bigger or smaller than 1. This product (as it can be easily noticed substituting (9) to (4)) determines the extent to which the investment demand falls when the budget deficit increases by unit. It is a well known problem of the crowding-out effect mentioned several times in chapter 4 (see: Dumas, 1985). If we believe that $\beta_I\gamma_I$ is equal to or bigger than 1 (which is that the budget deficit crowds the investors out of the market on a more than proportional scale), the impact of increased budget deficit on the short-term level of aggregated demand is zero or negative. On the contrary, if we believe that it is lower than 1 (that seems to be more likely in the short run), the increased deficit will accelerate the growth of aggregated demand in the short term. Irrespective of the doubts concerning the sign, the parameter $[(1-\beta_I\gamma_I)/(1-\alpha(1-\tau)-\tau)]$ defines *the multiplier of aggregated demand with respect to the budget deficit*

In the short term, when the economic growth is determined by the level of aggregated demand,³ increasing foreign exchange reserves (active policy of counteracting the real exchange rate appreciation) will be stimulating growth; the growth of budget deficit may have positive or negative effects (depending on the characteristics of domestic demand for credit and propensity to

payments (increased inflow of foreign exchange due to foreign transfers and direct investment results in such real appreciation of the currency which leads to the mirror trade deficit and current account deficit before official transfers). Hence, it appears that even if we wanted to accelerate economic growth in the short term through absorbing foreign transfers and direct investment it would be impossible. The obstacle here would be constraints created by the balance of payments finding expression in the effects of generalized "Dutch disease" (see: Box 3.1).

³ The assumption that the level of aggregated demand determines short-term economic growth is typical for Keynesian models. Neoclassical models, which assume a full capacity utilization, lead to the conclusion that the growth of aggregated demand will bring growth of prices rather than any growth of real output. A reasonable compromise is to accept that the increased aggregated demand will result in some mix of the output growth and price effects in the short term, with the mix structure being determined by characteristics of a given economy (extent to which capacities are not utilized, degree of imbalances in economic structures, behaviour of economic units, and so on). All in all, thus, the multiplier growth effects as shown by the short-term demand model should be treated as *the upper bound of the possible impact on the economic growth*: the real growth effects would be probably smaller.

invest); transfers from the EU and direct foreign investment will not have any influence on the rate of growth.

Medium term model (demand-supply)

In the longer term, it can no longer be assumed that GDP will be determined only by the aggregated demand. Hence, for the purposes of medium-term analysis it is necessary to expand the model to cover the supply side (economy's production capacities).⁴ We shall still use equations (1)-(8) to describe the demand side (in fact, we can replace these 8 equations by their solution given in equation (10)), and we will add equations defining production capacities and supply of production factors. Thus, the medium-term model is now constituted by equations (11) - (19):

- (11) $X_t^d = \mu_0 + \mu_1 GDef_t + \mu_2 \Delta Res_t$
- (12) $X_t^s = f_{prod}(K_{Pr,t}, K_{G,t}, L_t)$
- (13) $K_{Pr,t} = (1-\delta_{Pr}) K_{Pr,t-1} + I_{Pr,t-1}$
- (14) $K_{G,t} = (1-\delta_G) K_{G,t-1} + I_{G,t-1}$
- (15) $I_{G,t-1} = \lambda Tr_{i,t-1} + I_{G,t-1}^*$
- (16) $I_{Pr,t-1} = \beta_0 - \beta_1 (\gamma_0 + \gamma_1 GDef_{t-1}) + (1-\lambda) Tr_{i,t-1} - I_{G,t-1}^* + FDI_{t-1}$
- (17) $I_{G,t-1}^* = \sigma_0 + \sigma_1 \lambda Tr_{i,t-1}$
- (18) $L_t = g_{lab}(K_{Pr,t}, K_{G,t})$
- (19) $X_t^d = X_t^s$

where: X_t^d - aggregated demand in period t, $GDef_t$ - budget deficit in period t, ΔRes_t - growth of foreign exchange reserves in period t, X_t^s - production capacities in period t, $K_{Pr,t}$ - capital stock in the private sector in period t, $K_{G,t}$ - capital stock in the public sector in period t, L_t - labour in period t, δ_{Pr} , δ_G - depreciation rates in both sectors, $I_{Pr,t-1}$, $I_{G,t-1}$ - investment in both sectors in period t, $Tr_{i,t-1}$ - investment transfers from the EU in period t-1, $I_{G,t-1}^*$ - government investment financed from domestic sources in period t-1, FDI_{t-1} - direct foreign investment in period t-1, μ_0 , μ_1 , μ_2 , β_0 , β_1 , γ_0 , γ_1 , λ , σ_0 , σ_1 - positive parameters $0 < \lambda < 1$, f_{prod} - a monotonous, neoclassical production function, g_{lab} - a monotonous function of demand for labour.

Equation (11) is the solution to the set of equations (1)-(8) describing the demand side of the economy (the parameters of equation (10) were replaced, for the sake of simplicity, by positive parameters μ_0 , μ_1 , μ_2 ; please note, that we assume the sign of parameter μ_1 to be positive, i.e. the

⁴ Even if we believe in the existence of idle capacities in the short term (which entitles us to use the demand-determined model), we cannot afford it in the case of medium-term analysis. The growing demand may

growth of deficit increasing the aggregated demand in the short term, see: discussion above). Equation (12) is the production function that links the potential output (capacities) with the available production factors (capital stock in the private and the public sector, and labour). Equations (13) and (14) describe the process of building up the capital stock in both sectors: a part of assets from the previous period are depreciated, and investment made in both sectors in the previous period increases the capital stock (for the sake of simplicity we use one period lag only). Equation (15) defines the investment in the public sector in the previous period as a sum of investments financed out of transfers from the EU (parameter λ tells us what part of investment transfers is consumed by the public sector) and the accompanying investment financed from domestic sources (equation (17) relates the volume of accompanying investments to the scale of public investment financed from transfers⁵). Equation (16) defines the private sector investment in the previous period as the difference between the total domestic investment (estimated on the basis of equations (4) and (9)) and investment made by private foreign investors, and public investments (equation (15)). Equation (18) relates the demand for labour to the installed capital stock.⁶ Finally, equation (19) balances the economy's demand and supply sides (the realized aggregated demand cannot exceed production capacities), implicitly determining the level of prices (the level of prices increases if the initial demand exceeds supply).

Since the functional forms of both the production and demand for labour functions have not been specified, we can not solve the model analytically. Instead, we shall bring it to the form in which it will be easy to determine the sign of output multipliers calculated with respect to three key variables: transfers from the EU, direct foreign investment, and budget deficit.

First of all, it should be noted that the combination of equations (12) and (18) links production capacities in the period t to the stock of fixed capital in the private and public sectors (the demand for labour in a given period t is determined by technology). We have to point also at an important characteristic of the production function f_{prod} : *the elasticity of output with respect to the capital stock in the private sector is higher than in the public sector.*⁷

Let us look now at equations (15)-(17). The growth of budget deficit by unit (in the previous period) does not change the value of public investment, but it lowers the private sector investment by $\beta_1\gamma_1$. Consequently, as a result of a higher budget deficit in the previous period the value of capital stock in the public sector in the period t does not change, but the value of capital stock in the private sector lowers (and, thus, also the demand for labour). The smaller capital stock in the private sector

encounter the barrier of existing capacities sooner or later. Hence, in the medium term it is necessary to analyze both the demand side and the supply side of the economy.

⁵ It complies with the EU principle of co-financing investments by the country-beneficiary of the structural assistance (see: Kwiecinski, 1995).

⁶ We assume that, at a given moment, with a given production technology, the factors of production are no longer substitutes (although they are substitutes in the longer term; the problem is discussed in: Czyzewski, Orłowski, Zienkowski, 1993a).

⁷ It results both from our conviction about a higher efficiency of the private sector and from the findings of empirical studies (see: World Bank, 1995; Barro, 1991).

leads to lower production capacities in the period t (equation (12)). An opposite impact is exerted by the growth of foreign direct investment, which increases the value of capital stock in the private sector and productive capacities in the period t .

In turn, if investment transfers from the EU were higher in the previous period, both public and private investment was higher as well. However, the combined effect is modified significantly by two factors. Firstly, the closer λ is to one (i.e. the more EU transfers are earmarked for the public sector investment, e.g. for the costly development of infrastructure) the higher is the share of poorly efficient capital stock of the public sector in the total capital stock and the lower increase of productive capacities can be achieved due to investment. As absorptive capacities of the private sector are limited,⁸ it can be presumed that the higher is the average annual value of transfers from the EU the higher is also the value of λ (the experience teaches that public investment is able to absorb practically all available funds). Hence, the higher the investment transfers from the EU the higher the ratio of capital stock in the private sector to the capital stock in the public sector, and in this way the lower the growth benefits.

Secondly, as it was said in chapter 4, a significant inflow of transfers from the EU may be an incentive to increasing the budget deficit. If transfers from the EU were really accompanied by a higher budget deficit, and if the value of λ was big enough, even major investment transfers from the EU directed to the public sector could not be sufficient to compensate a drop in the value of investment and in the capital stock in the more efficient private sector. In this way, the multiplier of productive capacities in relation to transfers could prove to be negative (with an sufficiently big scale of transfers).

Both observations made above could be easily formalized by making the parameter λ variable in the model and adding an equation linking the deficit (in the previous period) with the total value of transfers from the EU (and not only with investment transfers):

$$(20) \quad \lambda = h(\text{Tr}_{i,t-1})$$

$$(21) \quad \text{GDef}_{t-1} = v_0 + v_1 (\text{Tr}_{i,t-1} + \text{Tr}_{g,t-1} + \text{Tr}_{c,t-1}).$$

where: h is a monotonous function moving asymptotically to 1, $\text{Tr}_{i,t-1}, \text{Tr}_{g,t-1}, \text{Tr}_{c,t-1}$ - transfers from the EU (respectively: for investment, government, and personal consumption), v_0, v_1 - parameters (positively defined).

In the case of transfers financing the personal and government consumption, and even (with an appropriate combination of parameters λ and v_1) with a large investment transfer, we could obtain a negative multiplier of productive capacities with respect to the transfers. However, we hesitate to introduce equation (21) to the model. As it was shown in chapter 4, *a positive correlation between the scale of transfers and the level of budget deficit is only a risk appearing in the integration process* (a

risk, which can be avoided by the government being aware of threats and pursuing a proper macroeconomic policy). And thus, these are not so much **large** transfers, which inevitably lead to the reduced benefits from integration, but rather **large and improperly used** transfers. Unfortunately, the higher the level of transfers the greater the risk that they will be used improperly.

The comparison of equations (11) and (12) shows what happens if, as a result of the growth of budget deficit and the ineffective use of investment transfers by the public sector, the size of productive capacities appears to be smaller than the value of aggregated demand:

$$(22) \quad \mu_0 + \mu_1 \text{GDef}_t + \mu_2 \Delta \text{Res}_t > f_{\text{prod}}(K_{\text{Pr},t}, K_{\text{G},t}, g_{\text{lab}}(K_{\text{Pr},t}, K_{\text{G},t}))$$

As the equation (19) shows, in such situation the prices will grow to clear the market (by the inflationary depreciation of incomes and expenditures). There are, however, two other solutions. The first one is to launch a stabilization programme, i.e. to reduce the value of the left side by diminishing the current budget deficit. The other solution is to reduce foreign exchange reserves, which implies the growth of net foreign debt.⁹ Let us make an extremely important point, that according to the presented model asking the EU for more transfers is not a solution for this problem (although apparently they would allow to increase imports and, thus, close the gap between demand and supply).

In the medium term, the budget deficit exerts a strongly negative influence on economic growth in the conditions of integration with the EU. On the other hand, a positive effect is exerted by direct foreign investment. A large scale of investment transfers from the EU can lead, in turn, to a marked lowering of the investment efficiency and, consequently, to the lowering of benefits resulting from integration. Moreover, if a large inflow of transfers, even those of investment character, creates an incentive to increase the budget deficit, the overall impact of transfers on economic growth can prove to be negative.

⁸ Due to a limited number of appropriately profitable investment projects.

⁹ The level of reserves could just as well remain unchanged, and the gross foreign debt could be increased.

Appendix 3

Macroeconomic model for analysis of Polish agricultural policy

The POLAGR model was built in 1994 and used for the simulation analysis of different variants of the Polish agricultural policy. In this Appendix, we shall present in brief the model's structure and its main characteristics, as well as the results of simulations used in chapter 6.¹

A.3.1 Computable general equilibrium model POLAGR

The POLAGR model belongs to the class of Computable General Equilibrium Models - CGE. These models are commonly used for the long-term analysis of development of market economies.² They represent a practical development and application of the theoretical General Equilibrium model formulated by Walras in the 19th century (one of the foundations of the neoclassical economy).

Main characteristic of CGE models: the main characteristic of CGE models is an assumption that in the long period the economy develops as a result of constant adjustments of demand and supply (growth of supply is possible due to expanding productive capacities, as a result of the cumulated growth of production factors). The adjustments of demand and supply take place as a result of changes in the price structure informing consumers about production costs and forcing producers to allocate production factors in accordance with consumers' decisions. As it was shown by Walras, the list of factors sufficient to find the solution (the point of general equilibrium, in which the markets of all goods and factors are in equilibrium, budgetary constraints are fulfilled for all agents, and agents' utility is maximized) includes:

- free prices (both the prices of products and production factors) set by demand and supply (clearing the market);
- rational behaviour of consumers maximizing utility functions, and producers maximizing profits;
- mobility of production factors among sectors of the economy.

A characteristic (and unique) feature of the CGE models is that any change in such instruments of the government intervention in the economy as taxes, tariffs, interventionary purchases, etc. changes the profitability of production of goods and services, and in this way (through reactions of

¹ Description of the model can be found in: Orłowski, 1996a.

² A wide description of techniques and applied structures of CGE models can be found, among others, in: Pereira and Shoven (1988), Robinson and Roland-Holst (1988), and Shoven and Whalley (1984).

both producers and consumers) leads to a different equilibrium and a different path of economic growth.

Functioning of the CGE model, in a simplified version, can be presented as follows. With a given level of incomes and allocation of production factors, the demand for goods and services is divided into the demand for imports and the demand for domestic production (depending on the price relations between the domestic production and the imports). Next, the demand for domestic production is confronted on particular markets with the level of supply. If markets are not in equilibrium, prices and, consequently, the profitability of production change. It exerts an influence on the change in demand structure (consumers' reaction to price changes) and on the structure of production factors allocation among different branches of the economy (producers' reaction to changes in the profitability of production). The demand for production factors declared by producers is confronted on the labour market and the capital market with their supply, thus setting their prices.³ The demand for production factors and their prices determine the level and structure of primary incomes, which next, after making allowances for transfers appearing in the economy, are used to determine the final distribution of incomes (between households, the government, and firms). Incomes generate the consumer demand and the investment demand,⁴ while the foreign demand generates the demand for exports. Taken together it gives a new demand for goods and services (see: the beginning of the paragraph). The model is being solved until the vector of prices ensuring the equilibrium on all markets (both for products and production factors) is obtained.

Assumptions of the POLAGR model: a number of additional assumptions were introduced in the model to adapt better its structure to the specific characteristics of the Polish economy and its food sector. These additional assumptions are:

- limited mobility of certain production factors. It is assumed that employment in agriculture is not mobile in the short term, i.e. that even a deteriorated relation between agricultural incomes and wages in other branches of the economy will not cause an immediate movement of labour from agriculture to other branches (it is due to social factors checking the outflow of labour from agriculture). However, the labour in agriculture is mobile, to some extent, in the longer term (cumulated changes in income relations cause, with some lag, the outflow of a part of labour to other branches);
- the mobility of capital is also limited in the short term. Changes in the structure of capital installed in the economy take place only through new investment;
- the agricultural production does not respond to current changes in prices, but it is a function of price relations observed in the past. It means that in the present period the level of domestic

³ The price of labour is commonly known as the wage.

⁴ The investment demand is generated in the model as the sum of savings of firms (i.e. profits), households, the government (negative savings of the government are equal to the current budget deficit), and the foreign sector (equal to the current account deficit).

agricultural production is given and it does not depend on price fluctuations (demand can be adjusted to supply only through changes in the value of imports and the demand for food⁵);

- in the case of 8 main agricultural products, it was assumed that market prices are not shaped in an elastic way (depending on demand and supply), but they are fixed in a rigid way by the agricultural policy. If the agricultural policy does not support prices, their level is equal to world prices. Otherwise, if the level of prices is set above world prices, the model estimates the value of tariffs and variable levies, as well as export subsidies coherent with the supported level of prices (the demand surplus created by the rigid level of prices is satisfied by imports, while the supply surplus is exported - in both cases at world prices).

Dynamics of the model: the accepted additional assumptions, although they modify the original structure of the CGE model, still allow to find the general equilibrium solution. The model is being solved for successive years, and its dynamics is linked with: (a) path of the capital stock growth, determined by the investment made in particular periods, (b) path of the labour supply growth, dependent on demographic factors and on the labour movement from agriculture to the remaining sectors of the economy, and (c) lagged price relations influencing decisions concerning the structure of agricultural production, the outflow of labour from agriculture, and the structure of investment in the economy.

⁵ It is due to the inelasticity of production function in agriculture. Production decisions (e.g. decisions concerning the structure of crops) are taken well in advance on the basis of price relations observed in earlier periods. Once the decisions are taken, no changes in current market prices can modify them.

A.3.2 Model characteristics

Social accounting matrix SAM⁶ : the POLAGR model is built on the basis of the SAM for 1991. The matrix was constructed on the basis of: the SAM for 1990, the full National Accounts (by institutional sectors) for 1991 (in both cases data and estimates of the Research Center for Statistical and Economic Studies of the Central Statistical Office and the Polish Academy of Sciences were used), household survey 1991, the input-output tables 1990, and the data on agricultural production 1991 (data of the Central Statistical Office), the data on farms keeping accounting records (data of the Institute of Agricultural Economics and Food Economy).

Demographic projection: based on the demographic data and forecasts by the Central Statistical Office and the Polish Academy of Sciences.

Disaggregation level: 26 branches of the economy (12 agricultural products, 12 branches of food-processing industry, remaining branches of industry, services); 3 production factors: capital (mobile in the period longer than one year), labour outside agriculture (fully mobile), labour in agriculture (mobile in the period longer than one year).

Parametres of the model:

- *Production functions outside agriculture*: Cobb-Douglas functions estimated on the basis of the cross-section sample of Poland's administrative provinces, years 1992-1993 (co-author of the estimation - A.B.Czyzewski);
- *Functions of consumer demand*: the indirect addilog estimated on the time series 1970-1992 (estimations made by J.Plewa);
- *Armington functions (demand for imports)*: estimated on the quarterly data for the years 1990-1994 (co-author of the estimation - A.B.Czyzewski);
- *Functions of export demand*: assumed parametres based on the review of literature;
- *Functions of the structure of crops, allocation of labour by farmers, outflow of labour from agriculture⁷* : estimated with the time series for the years 1982-1994 (co-author of estimation - A.B.Czyzewski);

⁶ For more information about the structure of SAM matrix see: *Social Accounting Matrices*, 1995.

⁷ The model of labour outflow from agriculture consists of two parts. The first part describes the employment reduction process (concerning farmers below 35 years of age, see: OECD, 1994b) as the function of: lagged employment, job offers outside agriculture, lagged income relation:

$$\mathbf{L}^{\mathbf{R}, < 35} = \alpha (\mathbf{L}^{\mathbf{F}, < 35}_{t-1})^\beta (\mathbf{OP})^\gamma (\mathbf{YF}_{t-1, t-2, t-3})^\xi e^{\rho U91},$$

where: $\mathbf{L}^{\mathbf{R}, < 35}$ - number of farmers below 35 years, OP - job offers outside agriculture, YF - ratio of agricultural incomes to average wage, U91 - dummy variable (1 in 1991), subscripts t-1, t-2, t-3 - lags.

Estimated elasticities (value of t statistics in brackets): $\beta=0.747$ (4.54), $\gamma=-0.873$ (2.40), $\xi=0.234$ (3.44), $\rho=0.095$ (2.65). Determination coefficient: $R^2=0.955$.

- *Functions of the structure of investment outlays*: estimated on the cross-section and time series for the years 1991-1993;
- *Remaining parametres of the model*: calibrated on the basis of the SAM for 1991.

A.3.3 Structure of POLAGR model

*Equations of the model*⁷ :

- *Consumer demand* is described by the equations of indirect addilog system, relating the level of demand in particular groups with the level of disposable income and relative prices (the actual functional form is very complicated):

$$C_i = f_i(Y(1-\text{tax})/P, P_i/P)$$

C_i - demand for product i , Y - income, tax - tax rate, P_i/P - relation of price i to average prices.

- *Households' savings* (S_g) equal a difference between disposable income and expenditures:

$$S_g = Y(1-\text{tax}) - \sum C_i P_i$$

- *Investment demand* is equal to the sum of savings of firms (profit after taxation), households, the government (negative savings of the government are equal to the current budget deficit), and the foreign sector (foreign savings are equal to the current account deficit).

- *Foreign demand (exports)* depends on the total world demand and on the relation of prices of Polish exports to world prices:

$$E_i = \alpha(\text{WDem})^\beta [P_i \text{XR} (1+\text{tar}_{z,i})(1-\text{subs}_i)/P_W]^\gamma$$

The second part of the model describes the process of labour allocation by rural population working in agriculture between agricultural and non-agricultural activities (incomes from non-agricultural activities represent a significant supplement of farmers' incomes) depending on the trend and lagged income relation:

$$\text{LA}^{\text{A,NA}} = \mu (\text{YF}_{t-1,t-2,t-3})^\lambda \text{Trend}^\kappa,$$

where: $\text{LA}^{\text{A,NA}}$ - ratio: labour allocated by farmers to agricultural activity to labour allocated outside agriculture, YF - ratio of agricultural incomes to average wage, Trend - trend variable (time), subscripts $t-1$, $t-2$, $t-3$ - lags.

Estimated elasticities (value of t statistics in brackets): $\lambda=0.983$ (4.84), $\kappa=-0.027$ (1.61).

Determination coefficient: $R^2=0.923$.

⁷ The equations are presented in a simplified form omitting less significant parametres and variables.

E_i - exports of good i , W_{Dem} - world demand, XR - exchange rate, $tar_{z,i}$ - foreign tariff on Polish good i , $subs_i$ - export subsidy (estimated only for agricultural products as the difference between the levels of domestic and world prices), P_W - world price.

- *Total demand* is the sum of consumer demand (personal, and exogeneously assumed government demand), investment demand, foreign demand and intermediate demand:

$$Q_i^d = C_i + g_i + i_i + Inv + E_i + \sum_j a_{ij} X_j$$

Q_i^d - total demand for good i , G - government demand, Inv - investment demand, X_j - gross output of branch j , g_i , i_i , a_{ij} - coefficients from the input-output table.

- *Demand for imports* is estimated on the basis of Armington equations (derived upon the assumptions about the cost minimization by consumers and the imperfect substitution of imports and domestic production):

$$M_i / X_i = \alpha [P_i XR / (P_W (1 + tar_i) (1 + levy_i))]^\sigma$$

M_i - imports of good i , tar_i - Polish tariff on good i , $levy_i$ - variable levy (determined only for agricultural products as the difference between the levels of domestic and world price).

- *Production functions outside agriculture*: Cobb-Douglas functions, making production dependent on the use of production factors (labour and capital):

$$X_i = \alpha L_i^\beta K_i^{(1-\beta)}$$

L_i - employment in branch i , K_i - capital in branch i .

- *Functions of production in agriculture* make production dependent on the decisions taken in the previous period and concerning the structure of crops and livestock size (determined by the price relations), and on the efficiency level determined by the investment in agriculture (yields, average production of meat and milk per animal).
- *Demand for labour* (employment in non-agricultural sectors) is estimated by maximizing the profit function of producers, which leads to the formula:

$$L_i = \beta (X_i P_i (1 - vat_i) - \sum_j a_{ji} X_j P_j) / w_i$$

w_i - wage in branch i , remaining in a constant relation to the average wage in the economy, vat_i - VAT rate.

- *Employment in agricultural sector* is estimated on the basis of demographic trends and the model of labour outflow from agriculture (see: footnote 7 in this chapter).
- *Capital stock in branch i* depends upon the capital stock in the previous period, depreciation, and the investment made in branch i in the previous period (the investment

in branch i depends on the volume of production and the return on capital recorded in this branch):

$$K_i = K_{i,t-1} (1 - \delta_i) + \text{Inv}_{i,t-1}$$

δ_i - depreciation ratio in branch i .

- *Incomes of non-agricultural households* are the sum of incomes from work (wages multiplied by employment), capital (a constant share in gross profits transferred to households), and transfers from the government (including old age and disability pensions) and from abroad.
- *Farmers' incomes* are the sum of incomes from the sale of agricultural products (production volume multiplied by prices), transfers from the government, and the remaining incomes (including incomes from work outside agriculture estimated on the basis of labour allocation model, see: footnote 7).
- *Incomes of the government* are the sum of revenues from different taxes (indirect and direct) and tariffs; *expenditures of the government* are the sum of consumption, transfers, and costs of the agricultural policy (transfers to farmers, net export subsidies, investment subsidies connected with the agricultural policy).
- *Profits of enterprises* are calculated residually:

$$\Pi_i = (X_i P_i (1 - \text{vat}_i) - \sum_j a_{ji} X_j P_j - L_i w_i) (1 - \text{tax})$$

Π_i - profits in branch i , tax - corporate income tax.

- *Income relation* is the relation between the farmers' average income and the average wage..
- *Equations clearing the markets of products* (except for agricultural products) are used to determine the equilibrium prices P_i balancing demand with supply (the sum of production and imports):

$$Q_i^d = X_i + M_i$$

- *Equations clearing the markets of agricultural products* are used to estimate the production surplus (which has to be exported with subsidies):

$$\text{Surpl}_i = X_i - Q_i^d$$

Surpl_i - production surplus of product i .

- *Equation clearing the labour market* is used to estimate the equilibrium wage (with a given rate of unemployment of structural character):

$$L^s (1-UR) = \sum_i L_i$$

L^s - total labour supply (outside agriculture), determined by demographic factors, UR - assumed structural unemployment rate.

- *Balance of payments equation* is used to estimate the equilibrium exchange rate balancing the revenues (the sum of export earnings, transfers and capital inflow) with the expenditures (the sum of expenditures on imports, interest payments and transfers).

The structure of the model is presented in Figure A.3.1.⁹

A.3.4 Results of simulations

Selected results of simulation experiments discussed in chapter 6 are presented in Tables A.3.1 and A.3.2. The results are discussed in greater detail in: Orłowski, 1996a.

⁹ Unfortunately, although less important relationships have been removed, the structure of the model is still very complicated. All our efforts to make the graph more legible proved to be futile. However, as we believe that the interested Reader will be able, at the cost of a great effort, to determine the correlations occurring between the model's variables, we have decided to include the schemat.

Tab.A3.1 Costs and effects of agricultural policy (alternative scenarios)

	Price support policy		Price support policy with quantity controls		Efficiency growth scenario	
	<i>10 years</i>	<i>20 years</i>	<i>10 years</i>	<i>20 years</i>	<i>10 years</i>	<i>20 years</i>
Total economic policy cost <i>(billions of US\$, 1991 prices)</i>						
(1) for taxpayers	1.61	4.96	0.94	0.59	1.21	1.72
(2) for consumers	1.55	1.77	1.56	1.81	0.00	0.88
Total cost	3.16	6.73	2.50	2.40	1.21	2.60
Producer subsidy equivalent (PSE)	33.4	43.5	28.8	23.8	0.0	14.4
Income relation between farmers and employed in other sectors						
index, initial level=100	142.9	172.4	134.1	133.9	111.9	151.5
index, base solution=100	131.9	155.6	123.8	120.3	103.3	136.8
Number of farmers						
in millions	3.085	2.780	3.084	2.651	2.738	1.922
index, base solution=100	106.6	115.1	106.6	109.7	94.6	79.6

Source: Orłowski 1996a

Tab.A3.2 Macroeconomic effects of agricultural policy (alternative scenarios)

	Price support policy		Price support policy with quantity controls		Efficiency growth scenario	
	<i>Index after 20 years (base solution =100)</i>	<i>Yearly average growth rate</i>	<i>Index after 20 years (base solution =100)</i>	<i>Yearly average growth rate</i>	<i>Index after 20 years (base solution =100)</i>	<i>Yearly average growth rate</i>
GDP	98.6	4.2%	97.1	4.2%	103.1	4.5%
Gross investment	77.0	5.6%	89.1	6.4%	106.2	7.4%
Personal consumption	102.1	3.8%	98.8	3.7%	102.5	3.9%
<i>of which:</i>						
Food	97.3	1.5%	95.5	1.4%	89.9	1.6%
Other goods and services	103.5	4.7%	99.8	4.5%	103.6	4.8%

Source: Orłowski 1996a

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