

Shaping Foreign Trade Policy under Conditions of Environmental Economic Development*

BY L.A.UKRAYINETS**

ABSTRACT. The interrelationship between global economic integration and environmental protection is anything but clear. An enormous number of models exist to explore such interrelations. Primarily, these models are based on the normative approach and trace the impact of trade liberalization on the environment along four categories: effect on products, effect on technology, effect on income, and effect on structure.

KEY WORDS. Liberalization of trade, eco-efficiency, economic integration, Pigou tax, product effect, technology effect, income effect, and structural effect.

In considering the relationship between economic development and the environment, two issues stand out. First, how does global economic integration affect environmental policies and the environment? In other words, does trade liberalization place greater stress on the environment? Do the processes involved depend on a country's size and per capita income, as well as on its trade regime with other countries? In this connection, is it possible to alleviate the negative repercussions of liberalization processes?

Second, how do environmental policies influence economic integration, specifically, trade regimes, profits and the allocation of capital? The issue assumes special significance in the context of global economic integration, since in the process of such integration, governments more often have had to abandon the customary tools of trade policies, such as tariffs and quotas, and instead turn to other means of market protection, including environmental policies. In this respect, the principal complication faced in the process of liberalizing trade is that the dilution of powers of national states can provoke the so-called ecological «downward race» (eco-dumping). Countries are prone to downgrade environmental standards in order to attain a comparative advantage over their competitors and to attract foreign capital.

* This article was translated from its original in Ukrainian.

** *Liliya Anatoliiivna Ukrayinets* was a student at Ivan Franko National University of Lviv from 1998—2003. In November 2003, she began her post-graduate studies at the university, specializing in the Global Economy and International Economic Relations field. She has published several articles.

To address these issues, one can apply either the traditional normative approach which assumes that a government strives to maximize its national welfare or the political economic approach. This paper applies the normative approach which analyzes the actions of a government not affected by political processes and is driven exclusively by interests of public well-being. Under such circumstances, the government would attempt to maximize the social welfare function (SWF). Obviously, to undertake SWF analysis, we must make an assumption that the country's population is sufficiently homogeneous, or that losses inherent in carrying out certain policies are always off-set by profits, i.e. only the net effect should be taken into consideration. Such an approach serves as a starting-point for a more realistic political-economic analysis. It allows an assessment of the impact of specific (trade or environmental) policies on the environment, on the allocation of resources, and on the trade regime. Such a thorough analysis also determines the gains and losses yielded by a particular policy. In other words, we must explore the economic consequences arising from various tools in order to identify relevant political interests and to determine how such interests are realized by different political institutions. Different environmental and trade tools for distribution and (in a smaller degree) productivity affect the political preferences of the electorate and, accordingly, government policies. Thus, the models explored in this article provide the basis not just for the normative analysis of environmental and trade tools, but also for a constructive, political-economic study that justifies the adoption of particular policies. In this respect, most existing studies on foreign trade and the environment are based upon SWF analysis. The political-economic approach has only a recent history and has not yet been sufficiently developed.

At this point, there is an enormous amount of research on the interrelationship between environmentalism and economic integration. It would be impossible to provide a comprehensive review of all such works in this paper, so only the most significant works are considered.

The models used may be classified according to the following criteria:

- channels via which the policies of one country affect other countries;
- country size;
- market features of the economy in question;
- the type of balance.

Furthermore, the models differ according to available instruments, that is, according to the type of policy applied (trade, envi-

ronmental). Finally, the models explore either production or consumption.

Prior to proceeding with a review of the models, let us analyze the existing differences between them. First of all, we will look into the means by which national policies are influenced by international factors. Linkages between countries may be limited to trade in commodities, but also may comprise trade in production factors. In the former, trade policy would affect the pattern of production and consumption and, indirectly, the level of pollution, as pollution intensity differs across economic sectors. Environmental policies directly affect the level of pollution and, in addition, modify the pattern of production and consumption by influencing relative prices. When production factors are internationally mobile, environmental and trade policies affect not just the distribution of resources between sectors and prices for such resources (Stolper-Samuelson effect), but the international distribution of factors as well. Finally, when there is cross-border pollution, environmental and trade policies have an impact on the level of pollution inside the country not just by affecting domestic production but also by influencing its foreign production.

Another criterion is the size of the country. Small, open economies are forced to accept world prices on factors and commodities while large countries themselves determine world prices with the help of their trade and environmental policies.

As a rule, trade models consider a general balance and interplay between factor and commodity markets. In addition, a partial balance is used to analyze trade and environmentalism. Partial balance models that disregard the effects of inter-market shifts may be used in analyzing a small market. This type of analysis obtains more precise results than the preceding one.

Models are also distinguished by market characteristics: where competition is perfect, the analytical results will differ from those obtained from a market with imperfect competition. For example, under conditions of monopolistic competition, general balance models are suitable for exploring the influence of scale and product diversification. In the formulation of a strategic trade policy, the duopoly model of partial balance is usually applied according to which governments making use of various tools try to achieve the transfer of income to local firms. In analyzing environmental policies, duopoly models are also used from time to time. However, most models are based on the assumption of perfect competition.

First, the impact of trade policies must be analyzed, in particular that of trade liberalization on national welfare with due considera-

tion of environmental factors. Here, we must begin by recalling R. Pethig's studies¹. He analyzed the negative impacts from production on the environment that did not cause cross-border pollution. This is a standard assumption made in most of the studies described below. In his simple and fairly detailed model of general balance, R. Pethig shows that traditional principles of international trade theory, namely the theory of comparative advantage and of production factor price leveling, preserve their validity even when environmental factors are taken into account. The impact of the environmental factor depends on environmental regulation; therefore, the terms of trade depend on environmental policies. However, in cases of free trade there is no way to determine what advantages would be gained by each country. Following the abolition of trade restrictions, countries that export pollutant goods will suffer from an increased level of pollution, thereby reducing the gains from liberalization. On the other hand, the gains of a country exporting «clean» goods, will grow considerably. However, these results depend on the assumption that no environmental regulation exists at all inside the country. Even so, given optimal environmental policies, both countries generally would gain from trade liberalization. K. Asako's² research arrives at a similar result: upon transition from autarky to free trade, the position of a country exporting pollutant goods would worsen.

K. Anderson³ confirms such results using traditional graphical analysis of partial balance. A small, open economy that does not carry out its own environmental policies gains from trade liberalization where such liberalization brings about the growth of imports of commodities in production of which pollutant technology is employed. When the influence of external factors on the condition of the environment is taken into account, such a country gains more than the traditional advantages from trade liberalization (for example, where the world price is below the domestic price, the growth of consumer profits attributable to trade liberalization would offset the reduction of producers' profits): the overall gain, including growth in the national welfare, proves substantially greater. The reason for this is that, in the absence of internal environmental policies, the maximum social losses from pollution exceed maximum individual losses; thus, the reduction of internal production and the growth of imports yield an additional gain equal to the difference

¹ Pethig, R. Pollution, Welfare and Environmental Policy in the Theory of Comparative Advantage. // *Journal of Environmental Economics and Management* — 1976 — № 2 — C. 160—169.

² Asako, K. Environmental Pollution in an Open Economy // *Economic Record*. — 1979. — № 55. — C. 359—367.

³ Anderson, K. The Standard Welfare Economics of Policies Affecting Trade and the Environment // *The Greeting of World Trade Issues/ Ed. by Anderson, K., Blackhurst, R.* — N. Y etc.: Harvester-Wheatsheaf, 1992. — C. 25—48.

between expenditures integrated over the reduction value of production volume. The opposite is also true: where the world price for pollutant commodities is higher than the domestic price, increased production of commodities for export causes an increased level of pollution; therefore, the net effect of trade liberalization may become negative. Let us prove it in a formal fashion. Let us assume that a country manufactures two commodities of which one — X — negatively affects the environment. The «shadow price» of pollution: q_x . Let us compare a free trade regime (upper index f) with autarky (upper index a). Lower index p indicates production, and lower index c, consumption.

The production cost is maximized at world price:

$$p_X^f X_p^f + p_Y^f Y_p^f > p_X^f X_p^a + p_Y^f Y_p^a. \quad (1)$$

On condition of the existence of balance in trade, we obtain:

$$p_X^f X_c^f + p_Y^f Y_c^f > p_X^f X_c^a + p_Y^f Y_c^a. \quad (2)$$

Counting in the cost of pollution under conditions of free trade and autarky:

$$p_X^f X_c^f + p_Y^f Y_c^f + q_x X_p^f - q_x Y_p^f > p_X^f X_c^a + p_Y^f Y_c^a + q_x X_p^a - q_x Y_p^a. \quad (3)$$

Inequation (3) yields

$$p_X^f X_c^f + p_Y^f Y_c^f - q_x X_p^f > p_X^f X_c^a + p_Y^f Y_c^a - q_x X_p^a + q_x (X_p^a - X_p^f). \quad (4)$$

With RI indicating the actual profit, we obtain:

$$RI^f > RI^a + (q_x (X_p^a - X_p^f)). \quad (5)$$

To obtain this gain from trade liberalization, the production of pollutant goods must be reduced. This condition may be attained if X is an imported commodity.

Where pollution is generated in the process of the commodity's consumption, the situation is different. Trade liberalization brings about reduced costs for imports and, as a rule, consumption increases. Therefore, when imported goods cause pollution, the quality of the environment deteriorates. When the consumption of exported goods generates pollution, the condition of the environment deteriorates only where, in the process of liberalization, domestic consumption of such goods grows. In a formalized way, this could be demonstrated in the following manner:

$$p_X^f X_c^f + p_Y^f Y_c^f + q_x X_c^f - q_x Y_c^f > p_X^f X_c^a + p_Y^f Y_c^a + q_x X_c^f - q_x Y_c^a. \quad (6)$$

As distinct from inequation (3), we take into account here the consumed amount of the commodity and not the produced amount. From inequation (6) we obtain:

$$p_X^f X_c^f + p_Y^f Y_c^f - q_x X_c^f > p_X^f X_c^a + p_Y^f Y_c^a - q_x X_c^a + q_x (X_c^a - X_c^f). \quad (7)$$

As in the case of inequation (5), this inequation may be set forth in the following form:

$$RI^f > RI^a + (q_x (X_c^a - X_c^f)). \quad (8)$$

The sufficient condition for gaining from trade liberalization will be the reduced consumption of pollutant goods. This condition can be met where X is an exported commodity, but this is not always so, since trade liberalization leads to income growth, i.e. the consumption of both commodities may go up as a result of trade liberalization. Inequation (8) does not apply if X is an imported commodity. The described phenomena are summed up in Table 1.

Table 1. Impact of Trade Liberalization

	Pollution in production	Pollution in consumption
Pollutant commodity is exported	In the process of trade liberalization, pollution is increased	In the process of trade liberalization, pollution may increase if the effect of income is substantial
Pollutant commodity is imported	In the process of trade liberalization, pollution is reduced	In the process of trade liberalization, pollution is increased

Now, let us presume that optimal environmental policies have been adopted in a country. In this case, trade liberalization would be conducive to the improvement of public welfare even when pollutant goods are exported whereby a tax on production would limit its negative impact and would restrict production growth, even with trade liberalization. Society's gains and expenditures would even out. K. Anderson⁴ further demonstrated that taxes on trade could be used to impede environmental degradation, although this tool is far from being very effective. The best solution appears to be to impose a tax on activities that cause pollution.

⁴ Anderson, K. The Standard Welfare Economics of Policies Affecting Trade and the Environment // The Greeting of World Trade Issues/ Ed. by Anderson, K., Blackhurst, R. — N. Y etc.: Harvester-Wheatsheaf, 1992. — C. 25—48.

In reviewing the foreign trade policies of a large country, one should account also for the effect that relates to terms of trade. When a large country proceeds to liberalize trade and its imports grow, national welfare also increases as in the case of a small country. However, such increases are less pronounced than those in a small country as world prices will tend to rise because of the increased demand for imported goods. As a result, such price increases reduce consumers' gain. With a growth in exports of pollutant products, trade liberalization yields positive results solely on the condition that optimal environmental policies are adopted. However, increased supply in the global market causes prices to fall; therefore, increases in national welfare occurs slower than in a small country. Anderson⁵ pointed out that, where there is cross-border pollution, social welfare increases in a large country may turn out more pronounced because production beyond the border declines, and pollution transfer declines accordingly. Such complementary gains may offset the negative changes to trade. Domestic production and pollution tend to rise but, given an optimal environmental taxation, the negative effects of increased pollution are overridden by the increased potential in consumption. In a large country, the introduction of a well-balanced tax on exports of pollutant goods would not just help alleviate the negative impact on the environment but would also lead to better terms of trade since it would restrict production growth.

In their fairly detailed model of partial balance, R. D. Ludema and I. Wooton⁶ went a step further in exploring strategic cooperation between countries. According to their assumptions, pollutant commodities are only consumed inside one country, while production occurs in both countries. Pollution takes place only during the consumption of an imported commodity. Perfect competition is at play. Inside the country, an import duty is levied, and across the border, an export tax. National welfare is determined in the following way⁷:

$$WF = S_c^d + S_p^d + R_t^d - E^d - (S_t^f + R_t^f), \quad (9)$$

where WF : welfare

S_c^d : gain of domestic consumers

S_p^d : gain of domestic producers

⁵ Anderson, K. The Standard Welfare Economics of Policies Affecting Trade and the Environment // The Greeting of World Trade Issues/ Ed. by Anderson, K., Blackhurst, R. — N. Y etc.: Harvester-Wheatsheaf, 1992. — C. 25—48.

⁶ Ludema, R.D, Wooton, I. Cross-Border Externalities and Trade Liberalization: the Strategic Control of Pollution // Canadian Journal of Economics. — 1994. — № 27. — C. 950—966.

⁷ Ludema, R.D, Wooton, I. Cross-Border Externalities and Trade Liberalization: the Strategic Control of Pollution // Canadian Journal of Economics. — 1994. — № 27. — C. 950—966.

R_t^d : revenue from duty

E^d : negative impact on the environment

S_p^f : gain of foreign producers

R_t^f : revenue from export tax

In the Nash point of equilibrium, the amount of industrial taxes exceeds the optimal level. The negative impact on the environment provides the country with the grounds for fixing a duty rate above the optimal level. As a consequence, the foreign country is forced to reduce its export tax. Losses from the tax reduction would be borne by the citizens of the foreign country who suffer no pollution; but, at the same time, this reduction eases the tax burden, thus fostering an improvement in the national welfare. A different scenario is also possible. Should taxes on trade be abolished, for example, according to the terms of a free trade agreement, the foreign country will introduce a production tax to improve its terms of trade. Similar results could be achieved on the basis of J. Markusen's⁸ and K. Kutilla's⁹ findings. However, the application of this model is limited by virtue of the assumptions made. It is difficult to determine precisely the negative impact on the environment caused by domestic consumption of imported goods.

M. McGuire¹⁰ studied the effect of ecological regulation in the two-sector model of Heckscher-Olin. His assumption was that two commodities are produced by applying labor and capital. One of the sectors generates pollution, and the environment is exploited as the third production factor. One of the ways to model environmental control is to impose a tax on the exploitation of the environment. Another alternative is to introduce licenses on pollution, to be sold at auctions. To attain an optimal result, the limiting cost of the environmental product must be equal to its price. McGuire shows that, for a linear homogenous productive function with equal flexibility of substitution \square_{KE} , \square_{LE} , the effect of environmental regulation is the inverse of the effect of technological advance. Tightening up environmental control would alter prices and the location of factors. In a small open economy, the price of one factor that is intensively utilized in a pollutant sector would go down, while the price of the other factor would rise sharply. For example, let us assume that the pollutant sector is relatively labor-intensive. Reduced exploitation of environmental resources caused by tightened environ-

⁸ Markusen, J. International Externalities and Optimal Tax Structures // *Journal of International Economics*. — 1975. — № 5. — С. 15—29.

⁹ Kutilla, K. Environmental Regulation in an Open Economy // — 1991. — № 20 — С. 127—142.

¹⁰ McGuire, M. Regulation, Factor Rewards, and International Trade // *Journal of Public Economics*. — 1982. — № 17. — С. 335—354.

mental regulation, would reduce the marginal productivity of labor and capital in the sector. This would entail the outflow of labor and capital to other sectors until the marginal productivity indicators are equalized. At that point, output in the pollutant sector would go down and go up in the other sectors, and the production process would become more labor-intensive. The marginal material product of labor would diminish, and increase of capital. A similar process would be observed in factor prices as the small open economy would adopt world commodity prices. If different countries apply different types of environmental regulation, the rule of equalizing production factor prices would no longer apply, and different combinations of factors would be used by different countries in the production of a given commodity. For a large open economy, tightening up environmental regulation would lead to a growth in world prices for the pollutant commodity, and, accordingly, those factors that are intensively used in the production of the commodity would yield extra gain in other countries (the Stopper-Samuelson effect). M. Rauscher¹¹ analyzes optimal environmental policy by making use of a simple Heckscher-Olin model where only capital is utilized in one sector and both capital and the environment in another. The welfare function is additively separable in respect of consumption and quality of the environment. Rauscher argues that, to export a non-pollutant commodity, the optimal policy for a small open economy would be to reduce emission standards in combination with trade liberalization because domestic demand for pollutant goods may be satisfied by imports. Where the country exports a pollutant commodity, the policy must be directly the opposite. Rauscher also demonstrates how in the case of a large open economy, environmental policy affects the terms of trade. He corroborates the results obtained by K. Anderson and K. Kutilla for the conditions of overall equilibrium. When country A exports a «clean» commodity, the pollutant emissions are likely to increase because the country strives to reduce imports and to increase the relative price of the exported commodity, and vice versa: an exporter of pollutant products, to improve its terms of trade, would restrict emissions and introduce stricter environmental standards. Such assertions prove to be correct on condition that in foreign country B, restrictions exist on emissions of pollutant substances and which remain in force. However, should foreign country B introduce a tax on emissions, the situation changes. When country A exports pollutant goods and reduces production to improve its terms of trade, there will be a flow of capital

¹¹ Rauscher, M. *Foreign Trade and the Environment // Environmental Scarcity: the International Dimension* / Ed. by Siebert, H. — Tübingen: Mohr, 1991.

in foreign country B from the «clean» sector into the pollutant one since such production becomes more profitable. As a result, marginal productivity of the utilization of the environment rises; therefore, notwithstanding the existing tax on emissions, pollution levels rise in the foreign country B. Where such pollution crosses borders, the possibility emerges of an opposite result: in spite of one's own emissions reduced own emissions, the level of pollution in country A goes up. That is why when cross-border pollution occurs, the introduced tax on production of export goods should be lower than where there is only local pollution. It must be noted, however, that this model does not consider the possibility of strategic cooperation between the two countries.

In his subsequent works, Rauscher¹² deepens the results by means of inserting a third, non-commercial commodity. He assumes that each country was completely specialized in the production of either commercial good and, in addition, produces the non-commercial commodity. In both sectors, two factors are employed: capital and the environment. Welfare function is additively separable in respect of each of the three commodities and the quality of the environment. This model resembles the Heckscher-Olin model. Rauscher argues that a small country would apply the same environmental policy in both sectors. At the same time, a large country, to improve its terms of trade, would increase the price of the factor that it possesses in relatively good supply. In the environmental policy context, that would mean that, for example, the exporter of pollutant goods must toughen its environmental standards to the level that exceeds the Pigou level. In this model, lesser utilization of the environment entails the reduction of the marginal product of capital in both sectors. However, it is impossible to determine in what sector this reduction would be more prominent. Where the yield of capital in the non-commercial sector is more pronounced, capital would flow to the sector of commercial goods, and this, in turn (albeit not necessarily), would foster the production of export goods and thus worsen the terms of trade. Therefore, individual environmental standards should be applied to each sector. Upon making additional, well-justified assumptions, Rauscher demonstrates that reduced emissions in the commercial goods sector lead to a reduced output of goods in the sector, thus improving the terms of trade. The effects that are attributable to increased emissions in the non-commercial sector are ambiguous: on the one hand, increased emission standards in the sector increase the marginal product of capital, attracting extra capital from the commercial goods sector and thereby improving

¹² Rauscher, M. On Ecological Dumping // Oxford Economic Papers. — 1994. — №46. — C. 822—840.

the terms of trade. On the other hand, this process would entail the growth of this commodity production, with the respective reduction of price. As a consequence, the price of capital in this sector would go down, and it would flow to the commercial goods sector, worsening the terms of trade. That is why recommendations regarding policies in this sector would depend on specific indicators. However, such assertions only prove true based on the assumption that complete specialization exists as does the employment of the environment as production factor in both industrial sectors.

B. R. Copeland's analysis¹³ covers many industrial sectors and takes into account the existence of multiple disproportions in trade, as well as looks into the impact of progressive trade-related and environmental reforms on a country's welfare. The presence of multiple disproportions makes it impossible to work out general recommendations regarding the introduction of reforms aimed at enhancing welfare. Copeland emphasizes the importance of defining the interdependence between environmental and trade policies and the need for coordinating reforms in these domains. He derives schematic models for the introduction of welfare-oriented reforms: where protectionist measures are adopted for a pollutant industry, the proportional lowering of barriers to trade and the restriction of pollutant substances emissions would, as a rule, promote the improvement of welfare standards. Of importance to the analysis is the identification of the collateral consequences of reform: the alleviation of one disproportion may sharpen the negative impact of another. From this perspective, quota is a more effective tool than tax because when it is imposed, as a rule, there occur no undesirable collateral effects. We may acknowledge that Copeland's work represents a generalization of all models previously proposed and of their adoption to real-life situations.

In the Heckscher-Olin model, the terms of trade are defined by the relative employment of production factors that are assumed to be exogenous. However, the inclusion of the «environment» as a production factor cannot be considered exogenous. That is, the possible significance of the environment's contribution to a production process (for example, the allowed scope of emissions) is determined in advance by environmental regulations. Such regulations result from a political process which must be explored from the perspective of political economics. If we recognize the maximization of the public's welfare to be the principal function of the government, then such political processes reflect the population's preferences.

¹³ Copeland, B.R. International Trade and the Environment: Policy Reform in a Pollutant Small Economy // *Journal of Environmental Economics and Management*. — 1994. — № 26. — C. 44–65.

This assertion forms the basis of B. R. Copeland and M. S. Taylor's¹⁴ models. In their paper, the scholars group the countries of the world into two regions, North and South, where everything is presumed identical except human capital. In both regions, lines of commodities are produced with labor being measured according to productivity, while pollution is assumed to have local characterizations. This model rests upon inequalities in per capita income levels. Since a high-quality environment belongs to the top category of commodities (a luxury item), the richer Northern region imposes higher taxes on pollution than the Southern one, with the purpose of compensating for the higher level of marginal damage.

The effects of trade liberalization may be divided into three categories: effect of scale (where economic growth entails increases in pollution levels); technological effect (at higher levels of income, transition to cleaner production processes occurs); structural effect (changes that take place in the framework of international specialization). As relative prices for pollutant goods are higher in the North, the countries of the South begin to specialize in their production. When the above-described assumptions hold, the level of pollution in the North decreases and increases in the South; under conditions of trade liberalization, the global level of pollution rises. However, if environmental taxes are set at an optimal level, both regions gain from liberalization.

In their other work, Copeland and Taylor¹⁵ explore cross-border pollution. In this case, uncoordinated national environmental policies cannot compensate for market weaknesses; therefore, gains from trade liberalization fail to materialize. As in the previous case, free trade and a relatively substantial difference in the levels of human capital cause the concentration of pollutant production in the South where environmental standards are less strict. Nonetheless, in the presence of cross-border pollution populations of the North also suffer from increased levels of pollution but are unable to influence this level by means of Pigou taxes. As a result, upon attaining a Nash equilibrium, in the absence of cooperation the North would suffer losses from trade liberalization while the South would gain. The reason for this is that countries of the South may resort to lower environmental taxes (because of their lower per capita incomes), so countries of the North face a choice: resign themselves to pollution increases or reduce pollution caused by their own produc-

¹⁴ Copeland, B.R., Taylor, M.S. North-South Trade and the Environment // *Quarterly Journal of Economics*. — 1994. — № 109. — С. 755—787.

¹⁵ Copeland, B.R., Taylor, M.S. Trade and Transboundary Pollution // *American Economic Review*. — 1995. — Vol. 85. — С. 716—737.

tion. In the model by Copeland and Taylor¹⁶ the North compensates for the higher pollution levels in the South by leveling prices for production factors in such a way that the global level of pollution remains constant: reduced emissions equal reduced contributions of the production factor. As a result of this and specific features of the model, the North incurs substantial losses from international trade; however, this model serves as basis for a whole series of other models. In general, given the existence of local pollution and environmental taxes, the situation of a country who exports pollutant goods is most likely to worsen (since emissions grow). Where pollution crosses borders, and different countries harbor differing public preferences regarding development, the inverse result obtains: exporters of clean goods suffer from elevated levels of pollution. If this effect is pronounced and surpasses benefits gained from consumption increases brought about by trade liberalization, the country's welfare dwindles. The rationale behind such a result is that an individual region is incapable on its own of improving the state of the environment on the global scale, and that an economy with a high level of pollution enjoys a comparative advantage inasmuch as its primary objective is not improving the quality of the environment.

Under such conditions, cooperation efforts run into obstacles. Copeland and Taylor argue that the improvement of the quality of the environment on global scale would be promoted by international trade in pollution permits as it would level out the costs of exploiting the environment. Of course, the issue may be resolved most effectively by the introduction in each country of an environmental tax on par with the global marginal losses caused by the country's emissions. To meet this requirement, as a rule, collateral payments must be included.¹⁷

While in their early works, Copeland and Taylor¹⁸ emphasize that the only stimulus for international trade is the difference in income levels (and therefore also differences in environmental regulation), in their subsequent works¹⁹ they also pointed out that the terms of trade and pollution depend on the relative contribution of production factors. The North is wealthier, therefore it is more likely to adopt stricter environmental regulations; at the same time, countries

¹⁶ Copeland, B.R., Taylor, M.S. Trade and Transboundary Pollution // *American Economic Review*. — 1995. — Vol. 85. — C. 716—737.

¹⁷ Markusen, J. Cooperative Control of International Pollution and Common Property Resources // *Quarterly Journal of Economics*. — 1975. — № 89. — C. 618—632.

¹⁸ Copeland, B.R., Taylor, M.S. North-South Trade and the Environment // *Quarterly Journal of Economics*. — 1994. — № 109. — C. 755—787; Copeland, B.R., Taylor, M.S. Trade and Transboundary Pollution // *American Economic Review*. — 1995. — Vol. 85. — C. 716—737.

¹⁹ Copeland, B.R., Taylor, M.S. A Simple Model of Trade, Capital Mobility and the Environment // *NBER Working Paper Series*. — 1997. — № 5898.

of this region are saturated with more capital. If pollution growth is directly connected with increases in the capital intensity of production, this results in conditions for trade that depend on the relative significance of the two opposite effects. Where the difference in incomes is small and utility functions similar, corresponding environmental taxes are equal in both regions, the terms of trade will be determined by the relative contributions of production factors. In such a case, countries of the North would export capital-intensive pollutant goods. Inversely, if the difference in relative contributions of production factors is insignificant while the difference in incomes is substantial between the two regions, the North would specialize in the production of «clean» goods.

Copeland and Taylor demonstrated the interaction of these two effects in a special factorial model where the environment was the variable factor, and labor and capital the constant factors. According to their assumptions, pollution did not cross borders. As in their previous work, the level of pollution was determined exogenously by way of maximizing utility. The researchers demonstrated that where the influence of factor composition was stronger than the influence of income, global levels of pollution would decrease during the movement toward free trade. The North may specialize in the production of pollutant goods, but it applies stricter regulations than the South. If income effect prevails, global levels of pollution would increase.

Thus, a conclusion can be made that there is no simple interrelationship between trade, the environment and development. Depending on the particular sector, country, market, and adopted policy, trade and trade liberalization may have either a positive or negative influence on the environment and development. In fact, trade in most cases has both positive and negative impacts simultaneously.

The effects of physical and economic factors involved in trade and trade liberalization could be divided into at least four types: product effect, technology effect, income effect, and structural effect.

Product effect manifests itself when the traded product affects the environment in a certain way. *Positive influence*: Trade may foster the spread of environmentally-protective technologies (for example, microbiological processes for cleaning up oil patches). Or, trade may promote a wider proliferation of goods and technologies that are less harmful to the environment (for example, solar batteries or more economical cars) than those currently employed.

Negative influence: Trade may cause the circulation of goods internationally which, from an environmental point of view, would be

better not to be traded at all. In sales of noxious wastes and toxic substances, environmental risks grow with longer transportation distances since there is always the threat of spillage. In addition, such goods may find their way to a country where they will not be properly discarded because domestic legislation does not even provide for any penalties for such actions.

A sub-type of product effect is sometimes called the **technology effect**. It is related to changes in product manufacturing according to the most recent technology. The effect of technology is generated by the manner in which trade liberalization affects technological exchanges and processes employed in the manufacture of traded products. The *positive influence* of technology is manifested in the reduced volume of pollution per unit of product. Foreign producers can transfer «cleaner» technologies when there is a favorable climate for investments in the country. Growth generated by trade and pressures of a competitive market caused by the liberalization of trade compel firms to upgrade equipment and technology. New, open markets allow profits to increase profits, the turnover of capital to accelerate, and investment in new, cleaner technologies.

On the other hand, trade liberalization also may prove *detrimental* to more environmentally-acceptable production methods. Liberalization provokes the emergence and expansion of harmful pollutant technologies. The impact the technology effect will have depends on other conditions in the market that determine technological choices (for example, prices and national environmental regulations).

Effect of income relates to the promotion of greater and more effective economic activity because of trade and trade liberalization. Such growth may have a *positive effect*. First, greater efficiency may bring direct benefits to the environment as an efficient firm would consume less natural resources and generate less harmful waste. Second, such efficiency may indirectly benefit the environment by making people more affluent and therefore more inclined to care about environmental protection. That does not mean that poor people are not worried about the state of the environment. On the contrary, impoverished people are more dependent on the environment than wealthy people. Nonetheless, their first priorities are food, housing, adequate income, and permanent jobs. Where trade helps to overcome extreme poverty, it may save people from the vicious circle of poverty when people are forced to exhaust the environment to subsist.

Greater economic activity may also have a *negative impact*. Many types of economic activities stress out the environment by depleting natural resources and raw materials and generating waste and pollution. Greater economic activity means greater harm to the

environment if no appropriate regulation of such economic activities is established.

Another possible negative effect is related to the extra welfare created by trade: a certain portion of it may be utilized for improving the state of the environment, but in respect of some types of pollution, more welfare means more pollution. For example, in wealthier countries much higher levels of gasiform emissions is observed that cause the greenhouse effect than in developing countries.

Structural effect relates to changes in the national economic structure as a result of trade liberalization which compels a country to specialize in those goods in which it has a comparative advantage. For example, a non-trading country possessing sizable forests would harvest only as many trees as are needed for its own citizens. With trade liberalization, this country would fell trees also for export and augment the share of timber in its overall production structure. The effect of this on the environment may be both positive and negative.

Positive effect: If the structure of production evolves in the direction of less pollutant sectors accounting for a greater share of production, then trade is bound to bring about the improvement of the state of the environment (at least, at the national level: pollutant firms may move to other countries).

Trade with a country whose consumers demand «green» goods is also liable to alter production structure if exporters create new products or sectors. The possible environmental gains are obvious. Frequently, an impulse for the production of «green» commodities originates not with the ultimate consumer but with firms buying up manufactured goods. Thus, for example, Ford and GM, the US automobile giants, declared that they intended to buy only from suppliers with ISO 14001 EMS certifications. Assuming that ISO certification entails improvement in the environment, Ford and GM originated such an improvement.

Negative impact: When the goods in which a country has the lead require a great amount of natural resources or cause pollution, then trade liberalization would increase the share of such industries in the national economy. Without an appropriate environmental policy, this would mean increased levels of pollution or the accelerated exhaustion of natural resources. When liberalization creates favorable conditions for such trade and binds national natural resources to foreign demand, environmental degradation and the depletion of resources would proceed at an extremely rapid pace.

This analysis leads to the following conclusions:

- in the absence of environmental policies in countries, trade liberalization benefits those countries that specialize in the production of clean goods but may have a negative impact on wealthy countries

who export pollutant goods. For smaller countries, the optimal policy is free trade and the introduction of standards that completely compensate any negative impact on the environment. Optimal environmental policies would make trade liberalization beneficial for all countries, albeit the global level of pollution would increase.

- A country's supply of «environmental resources» as a factor of production largely depends on its environmental policies. The introduction of free trade intensifies this. The best solution to this problem, however, would not be protectionism but an adequate protection of property rights.

- Given the existence of cross-border pollution and different priorities in different countries, trade liberalization may lead to declining prosperity in a country where a clean environment is considered a priority. To carry out optimal policies (from the global point of view), the policies of different countries must be coordinated since a policy that is considered optimal from a national point of view would not outright overcome environmental damage.

- Where capital is mobile and trade in commodities is conducted solely for the purpose of leveling the balance of payments (single-commodity model), the impact of environmental policy on trade in certain sectors is similar to the impact on trade in commodities. If an optimal environmental policy is adopted, and governments do not pursue a particular strategy, capital mobility favors the growth of welfare.

- In the Heckscher-Olin model, capital mobility causes the decline of pollutant sectors in a country with stricter environmental regulations. This is at variance with the results stated above, namely, that free trade is beneficial for all participants in the presence of an optimal environmental policy.

- Under conditions of imperfect competition, an environmental policy that aims at attracting capital to a country may cause sharp changes in the level of welfare: such a policy, on the one hand, is conducive to increases in pollution levels and tax revenues and, on the other hand, to reduced expenditures on transportation and lower domestic prices. Depending on the net effect of gain from production growth, under conditions of imperfect competition countries may resort to low or high environmental taxes. The impact of an environmental policy that entails a growth in carrying charges is less tangible than the impact of a policy affecting variable cost.

- Correlations between trade and the environment are complicated, diverse, and significant; trade liberalization as such is neither good nor bad as regards the environment. Its impact on the environment depends on how environmental and trade objectives correspond to each other. To achieve positive results, the appropriate environmental and economic policies must be pursued.

Literature

1. Anderson, K. Economic Growth, Environmental Issues and Trade // Pacific Dynamism and the International Economic System / Ed. by Bergsten, F., Noland, M. — Washington, D. C.: Institute for International Economics in Association with the Australian National University, Pacific Trade and Development Conference Secretariat. — C. 341–363.
2. Anderson, K. The Standard Welfare Economics of Policies Affecting Trade and the Environment // The Greeting of World Trade Issues / Ed. by Anderson, K., Blackhurst, R. — N. Y etc.: Harvester-Wheatsheaf, 1992. — C. 25–48.
3. Asako, K. Environmental Pollution in an Open Economy // Economic Record. — 1979. — №55 — C. 359–367.
4. Copeland, B. R. International Trade and the Environment: Policy Reform in a Pollutant Small Economy // Journal of Environmental Economics and Management. — 1994. — № 26. — C. 44–65.
5. Copeland, B. R., Taylor, M. S. A Simple Model of Trade, Capital Mobility and the Environment. // NBER Working Paper Series. — 1997. — № 5898.
6. Copeland, B. R., Taylor, M. S. North-South Trade and the Environment // Quarterly Journal of Economics. — 1994. — №109. — C. 755–787.
7. Copeland, B. R., Taylor, M. S. Trade and Transboundary Pollution // American Economic Review. — 1995. — Vol. 85. — C. 716–737.
8. Kutilla, K. Environmental Regulation in an Open Economy // — 1991. — № 20. — C. 127–142.
9. Ludema, R. D, Wooton, I. Cross-Border Externalities and Trade Liberalization: the Strategic Control of Pollution // Canadian Journal of Economics. — 1994. — № 27. — C. 950–966.
10. Markusen, J. Cooperative Control of International Pollution and Common Property Resources // Quarterly Journal of Economics. — 1975. — № 89. — C. 618–632.
11. Markusen, J. International Externalities and Optimal Tax Structures // Journal of International Economics. — 1975. — №5. — C. 15–29.
12. McGuire, M. Regulation, Factor Rewards, and International Trade // Journal of Public Economics. — 1982. — № 17. — C. 335–354.
13. Pethig, R. Pollution, Welfare and Environmental Policy in the Theory of Comparative Advantage. // Journal of Environmental Economics and Management — 1976 — № 2 — C. 160–169.
14. Rauscher, M. Foreign Trade and the Environment // Environmental Scarcity: the International Dimension / Ed. by Siebert, H. — Tübingen: Mohr, 1991.
15. Rauscher, M. On Ecological Dumping // Oxford Economic Papers. — 1994. — № 46. — C. 822–840.

This article was received by the editorial board on 03.01.2005.