

Strategic Trade Policy on Oligopolistic Markets

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Abstract

Trade policy has been a popular field of economists' interests since Brander and Spencer works were published in 1985. In the presence of strengthening competition on international markets, many governments are interested in supporting their chosen industries. The most profitable support is connected with oligopolistic markets. If a domestic firm is a part of an international oligopoly and receives any kind of support from its own government, it competes successfully on the market. Due to the public financing (or any other external funding), the firm may reduce its costs or any other expenditures and increase profits. Pivotal issue to emphasize is that concurrently with the improvement of the situation of a particular firm, there is no significant increase of the price of product, but there is a substantial improvement in terms of the national welfare. Many economists pointed out the role of government's subsidies regarding the strategic trade policy in case of the international oligopolies.

This paper presents some theoretical background for consideration of profitability of subsidies and their justification on the oligopolistic market. It concerns two models: Branders (1995) – third market model with export production subsidies and Bagwell and Staiger (1994), who refer to the R&D subsidies. Because of WTO restrictions concerning direct export subsidies, many of the theoretical models refer to the R&D subsidies, which are not banned.

The main purpose of this paper is to show theoretical assumptions of a motivation for implementing subsidies for domestic firm being a part of an international oligopoly. I will present figures showing the level of the R&D subsidisation in the EU-countries as well as in the countries joining the European Union in the next future. On the basis of some empirical data I will prove the thesis that government activity in the field of export support would help in achieving a dominant position on the international oligopoly and ameliorate the economic situation of the country because of the export trigger and national welfare improvement.

Keywords: *oligopolistic market, strategic trade policy, export subsidies, R&D subsidies.*

1. Introduction

Due to the susceptible of various interpretations of the term “strategic trade policy”, I quote the definition provided by Brander (1995): “strategic trade policy to be trade policy that conditions or alters a strategic relationship between firms”. It suggests that the vital condition for existence of the strategic trade policy is a mutually recognized dependency. Strategic trade policy does not exist under perfect competition, where firms' decisions are

independent. Strategic trade policy emphasizes its results in the presence of oligopoly. Trade policy on the oligopolistic market plays an important role, which is not present under other market structures. Any external intervention alters the strategic interaction between players on the market.

The most profitable support is connected with the international oligopolistic markets. If a domestic firm is a part of an international oligopoly and receives any kind of support from its own government, it competes successfully. Meanwhile, due to the public financing (or any other external funding), the firm may reduce its costs or any other expenditures and increase its profits. Pivotal issue to emphasize is that concurrently with the improvement of the situation of a particular firm, there is no significant increase of the price of product, but there is a substantial improvement in terms of the national welfare.

This paper presents some arguments for export support justification and points out the situations that ought to be considered with regard to the strategic trade policy effectiveness. I will concentrate on the Brander and Spencer (1985) third-market model (having the reciprocal market model in mind), because of the limits in considering subjects. A third-market model is one in which one or more firms from domestic country and one or more firms from foreign country compete on a third market. Moreover, those firms produce for export only. Such simplifications allow to observe the strategic effects of certain trade policies in pure form. In this model, a domestic government does not interfere with import and freely imposes an export subsidy, whose direct effect is to help a domestic firm to be faced against its foreign rival.

2. Export subsidy

An interesting game takes place between firms competing for the market position. That sort of game brings firms' productions and prices into line with competitors. This is possible to achieve the equilibrium – each market player chose the best strategy (i.e. pointed its production level) in the presence of the other players' strategies. Sometimes, the best strategy does not depend on choices of the competitors only. There is a situation when one firm dominates on the market and others are the followers. That is particularly

important on the international market – players are competing for the market share. World automotive market is dominated by few producers, which fight for the market outlet. Consequently, domestic government urges to impose trade policy supporting its automotive producer in order to improve financial situation in international oligopoly. When domestic firm accumulates its revenue as a result of the sales abroad only, firm's profits generate national welfare.

Cournot duopoly – two firms (A domestic, B foreign) “play the game” on the third market competing through their output. Brander considers two stages of the game: “in the first stage the domestic government sets a subsidy level of subsidy per unit; in stage two – the domestic and foreign firms simultaneously choose output (export levels) for the third market”¹. Assuming: firms generate the same average costs and there is a single factor of production in each country.

x – domestic output (export on third market)

y – foreign output (export on third market)

* - variables associated with the foreign country

Π – profit functions

s – subsidy per output unit

TC – total cost

FC – fixed cost

VC – variable cost

c – labour per unit of output

w – unit labour cost

MP – marginal product

$$\frac{x}{c} = 1$$

¹ Brander, J.A. (1995), *Strategic trade policy*, National Bureau of Economic Research, Working Paper, No. 5020, p. 5.

$$w = 1$$

$$MP = \frac{\delta x}{\delta c} = \text{const}$$

$$TC = FC + VC - sx \quad TC^* = FC^* + VC^*$$

$$VC = cx \quad VC^* = c^*y$$

$$TR = x p(x,y)$$

$$\Pi(x,y,s) = TR - TC = x p(x,y) - (cx + FC - sx) = x p(x,y) - cx - FC + sx$$

$$\Pi^*(x,y,s) = TR - TC^* = y p(x,y) - (c^*y + FC^*) = y p(x,y) - c^*y - FC^*$$

$\Pi_{xs}=1$ growing subsidy increases marginal profit (profit boost due to the output increase)

1) First order condition (maximum profit as domestic as well as foreign producer):

$$\Pi_x = \frac{d\Pi}{dx} = 0$$

$$\Pi_x = p + xp_x - c + s = 0$$

$$\Pi^*_y = 0$$

$$\Pi_y = p + yp_y - c^* = 0$$

2) Second order condition:

$$\Pi_{xx} = \frac{d^2\Pi_x}{dx^2} < 0$$

$$\Pi_{xy} = \frac{d^2\Pi_x}{dy^2} < 0$$

If decrease in y sales results in increase of marginal profit for domestic company, than $\Pi_{xy} < 0$. Consequently, if s level was predetermined in stage 1 and is treated as exogenous, the solution to the first order conditions will yield x and y as functions of subsidy s .

Brander made the comparative static effects. Any particular changes in output due to the s are pointed as follows:

$$\Pi_{xx}dx + \Pi_{xy}dy + \Pi_{xs}ds = 0$$

$$\Pi^*_{yx}dx + \Pi^*_{yy}dy + \Pi^*_{ys}ds = 0$$

$$\begin{vmatrix} \Pi_{xx} & \Pi_{xy} \\ \Pi^*_{yx} & \Pi^*_{yy} \end{vmatrix} \begin{vmatrix} dx/ds \\ dy/ds \end{vmatrix} = \begin{vmatrix} -\Pi_{xs} \\ -\Pi^*_{ys} \end{vmatrix}$$

Using Cramer's rules:

$$\frac{dx}{ds} = \frac{\begin{matrix} \nearrow 1 & \nearrow 0 \\ -\Pi_{xs}\Pi^*_{yy} + \Pi^*_{ys}\Pi_{xy} \end{matrix}}{\Pi_{xx}\Pi^*_{yy} - \Pi^*_{yx}\Pi_{xy}}$$

$$\frac{dy}{ds} = \frac{\begin{matrix} \nearrow 0 & \nearrow 1 \\ -\Pi_{xx}\Pi^*_{ys} + \Pi^*_{yx}\Pi_{xs} \end{matrix}}{\Pi_{xx}\Pi^*_{yy} - \Pi^*_{yx}\Pi_{xy}}$$

$$\Pi_{xx}\Pi^*_{yy} - \Pi^*_{yx}\Pi_{xy} = D$$

$$D > 0$$

$$\frac{dx}{ds} = \frac{-\Pi^*_{yy}}{D} > 0$$

$$\frac{dy}{ds} = \frac{\Pi^*_{yx}}{D} < 0$$

Optimal subsidy level s , stated by the domestic government for the national producer makes its profits higher and than induces the improvement of the national welfare W .²

$$x=f(s)$$

$$\Pi=f(x(s),y(s),s)$$

$$W = \Pi (x,y,s) - sx(s)$$

$$\begin{aligned} \frac{dW}{ds} &= \frac{d\Pi}{ds} - (x+s \frac{dx}{ds}) = \Pi_x \frac{dx}{ds} + \Pi_y \frac{dy}{ds} + \Pi_s \frac{ds}{ds} - x - s \frac{dx}{ds} = \\ &= \Pi_x \frac{dx}{ds} + \Pi_y \frac{dy}{ds} - s \frac{dx}{ds} \end{aligned}$$

\downarrow \searrow
 x 1

and

$$\Pi_x=0$$

$$\frac{dW}{ds} = \Pi_y \frac{dy}{ds} - s \frac{dx}{ds}$$

and max W means:

$$W'(s) = \frac{dW}{ds} = 0$$

$$\Pi_y \frac{dy}{ds} - s \frac{dx}{ds} = 0$$

$$\Pi_y \frac{dy}{ds} = s \frac{dx}{ds}$$

$$s = \frac{\Pi_y \frac{dy}{ds}}{\frac{dx}{ds}} = \frac{\Pi_y \frac{\Pi_{yx}^*}{D}}{-\frac{\Pi_{yy}^*}{D}} = -\frac{\Pi_y \Pi_{yx}^*}{\Pi_{yy}^*} \quad (1)$$

² Brander, J.A. (1995), *op.cit.*

Assuming: (i) $\Pi_y < 0$ – growing foreign firm sale always results in pressings domestic firm's profits down, and (ii) $\Pi^*_{yy} < 0$ – second order condition.

The sense of the subsidies depends on the change in the foreign firm's profits due to increase its supply y which is resulted in the supply of the domestic output x .

When $\Pi^*_{yx} < 0$ the implementation of the export subsidies is economically justified. The subsidy level is reckoned by the formula (1). It also gives the grounds that domestic exporter would receive the subsidies even from the budget. Its profit determines the national welfare and it grows faster than the subsidy transfer's cost. The company reached more aggressive response function (from A_1 to A_2) and it forces the foreign competitor limit output (from y_1 to y_2). The domestic firm becomes a leader – set the output level. On the other hand, the foreign firm becomes a follower on the market – it is obliged to follow its rival's decisions, which determine the sequential action. The new equilibrium point is marked (R_2).

Summarizing, the domestic government by setting the export subsidies allow the firm to achieve a dominant position everywhere it competes with firms without any external support.

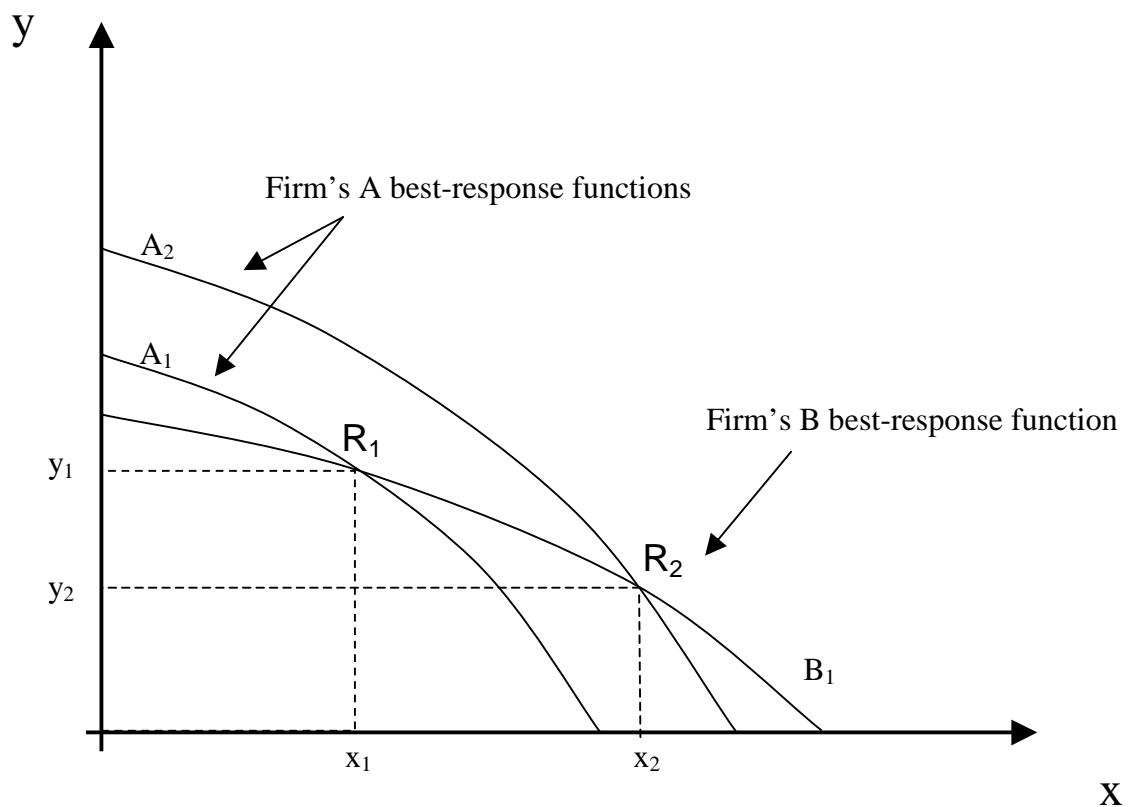


Figure 1: Export subsidies and reaction functions in Cournot model

Source: According to Brander, J.A. (1995), op. cit. s. 12

3. Special circumstances in third market model

3.1. Timing – governments' game

At the situation when two governments impose a support funding, policy makers try to foresee each others' plans and decisions in terms of the subsidy level. The game is played on the governments' level.

Domestic firm profit function:

$$\Pi(x,y,s) = x p(x,y) - (cx+FC-sx) = x p(x,y) - cx - FC + sx$$

Foreign firm new profit function:

$$\Pi^*(x,y,s) = y p(x,y) - (c^*y+FC^*-s^*y) = y p(x,y) - c^*y - FC^* + s^*y$$

Third-market model ought to take into consideration foreign welfare function:

$$W^* = \Pi(x(s^*), y(s^*), s^*) - s^*x(s^*)$$

Prisoner's dilemma appears – domestic government as well as foreign one urge to support its firm in order to compete with its rival successfully. Unfortunately, both companies are in worse situation than they could be under perfect competition. But each government has justified reasons for supporting. That incentive is the intervention of the foreign rival.

3.2. Opportunity cost of public funds

There is a need to stress that the cost of public funds for producers is not the same on different markets and under different social conditions. The alternative cost of public funds could be so high that it cuts above the profits gained due to the subsidies. It obviously changes the assumption that $\Pi_{xs}=1$.

We should take into account alternative public cost of the subsidies (δ), which would effect on net national welfare.

$$W = \Pi(x,y,s) - \delta sx(s) \quad \text{and} \quad \delta > 1,$$

The value of the δ depends on the alternative cost of the funds spent on subsidies. If δ is significantly large, and if you need to gain $W > 0$, so that $s < 0$ – than the government should impose the export tax rather than the export subsidy.³

3.3. Legitimate ownerships of the exporters

With regard to the strategic trade policy, Dick (1992) emphasized the meaning of the legitimate ownership of the domestic firm. If it was a joint-venture company owned by the foreign investors, the extra profit (with export subsidies) would not interfere with national (domestic) welfare, and be transferred onto the foreign investor account.⁴ There

³ Neary J.P. (1994), *Cost asymmetries in international subsidy games*, Journal of International Economics, Vol. 36, p. 343.

⁴ Dick R. (1992), *Strategic trade policy and welfare: The empirical consequences of cross-ownership*, Journal of International Economics, Vol. 35, p. 227.

would not be any domestic welfare improvement. The profit-shifting will be constituted in two stages. At the first stage, domestic company gains the profits, and de facto, this is the foreign investor's profit. Therefore, the profit is transferred abroad in the second stage.

4. Support for exporters in R&D expenditures

Many of the researchers pointed out the role of export subsidies in terms of the strategic trade policy. Unfortunately, the export subsidies allocated directly for the production processes are not allowed. The Subsidies Code of General Agreement on Tariffs and Trade forbids the developed countries to implement direct payments to the export production. That ban does not refer to R&D subsidies. There are large possibilities for the continued support to the producers through the measures intensively applied by developed countries such as producer subsidies and for the research and development programmes. Subsidies relate to all advantages to the benefit of producers, which would not be available on the perfectly competitive market. There is also a range of supporting instruments imposed by governments to keep their producers competitive on the foreign markets.

This subject is touched on in the model of Bagwell and Staiger (1994), which refers to the R&D subsidies. This kind of subsidies means the financial help for industries as well as for institutions, which provide scientific and technological basis of the industries' development. It seems to be the reason why the R&D subsidies are used by the governments. Nowadays, they have an obvious effect on industries' modernization – specially these industries which form the international oligopolies. The most popular international oligopolies are set up by the producers of computers, semiconductors, aircrafts, engines, telecom equipment and many others.

Bagwell and Staiger (1994) pointed out that the investment reaction curves are negatively sloped (see figure 2). Regarding this fact and assuming that there is one firm in each country only, a strategic domestic R&D subsidy lowers its cost of investment ($r_0 \rightarrow r_1$). It improves company's ability to invest. This response is in turn beneficial to the domestic country.

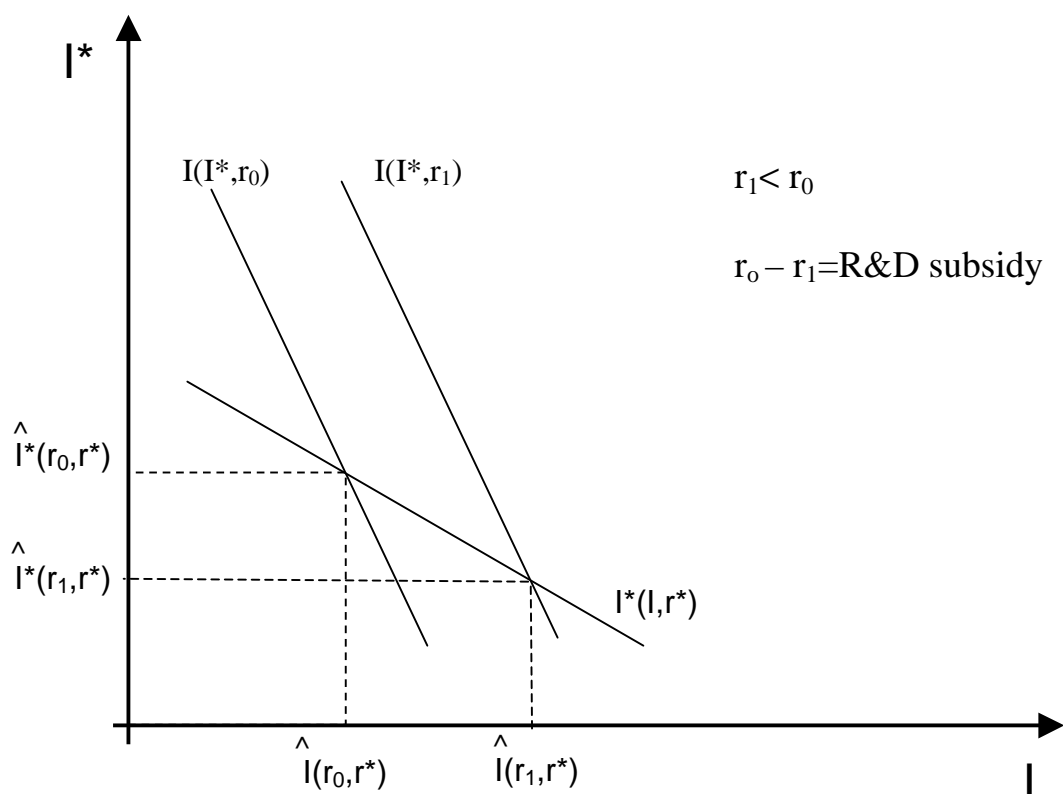


Figure 2: Investment reaction functions

(*) – denotes foreign country variable

(^) – denotes foreign country variable

I – investment level

r – costs of investment

Source: Bagwell, K., Staiger R.W. (1992), The sensitivity of strategic and corrective R&D policy in battles for monopoly, *International Economic Review*, Vol. 33, No. 4, p.799.

When there is more than one domestic firm engaged in R&D project curve $I(I^*, r_0)$ is also negatively sloped, but after first stage (investment r_1) the support for each firm is obviously lower than it could be if there is only one producer on the market. Because of this fact $I(I^*, r_1)$ is expected to be more vertical. The conclusion is that subsidy is relatively more attractive the smaller the number of domestic firms.

Important issue that should be now taken into consideration is the investment reaction curves and reduction of mean cost. Investment reaction curves are negatively sloped as long as R&D reduces mean cost. When mean cost reduction is associated with growing risk – “risk effect” may press down “the mean effect”. It means two opposite effects: the risk effect suggests positive externality from investment, but this effect must be balanced against the mean effect, which corresponds to a negatively sloped investment curve. The optimal R&D policy obviously depends on that balance. When mean effect dominates, strategic subsidy and corrective taxes are called for, but when the risk effect is stronger, that is a justification to impose strategic taxes.

The strategic role of R&D subsidy remains attractive for variety forms of product market competition when it leads to reduction of the expected costs. Country’s strategic incentive is to subsidize R&D although corrective incentive is to tax R&D. On the other hand, if R&D greatly increases the risk of the distribution costs and only modestly lowers the mean of costs, R&D tax is strategically incentive and R&D subsidies are corrective. Therefore, the determinant of appropriate R&D policy is not the form of product market competition, but rather the nature of uncertainty in the R&D process.

Bagwell and Staiger concluded that optimal R&D policy would require a precise assessment of the role that uncertainty plays in the R&D process. Moreover, R&D subsidy can play a positive strategic role. It remains attractive under several specifications: (i) large economies of scale, (ii) not much R&D subsidy receivers, (iii) nature of uncertainty.

Both public and private funds finance the research and development subsidy. In the European Union average R&D expenditures⁵ as a percentage of GDP amounts to 1.65% (2000). Many firms may find it difficult to get external sources of finance for R&D projects because of a high level of risk attached to them. Usually a particular firm finances the main part of its R&D programmes.

According to the surveys of the Commission of the European Communities and Eurostat the highest share of R&D expenditures in total gross domestic product was in Sweden (3.72%), Finland (2.89%), and Germany (2.30%).

⁵ State aid as well as “self-financing” in company

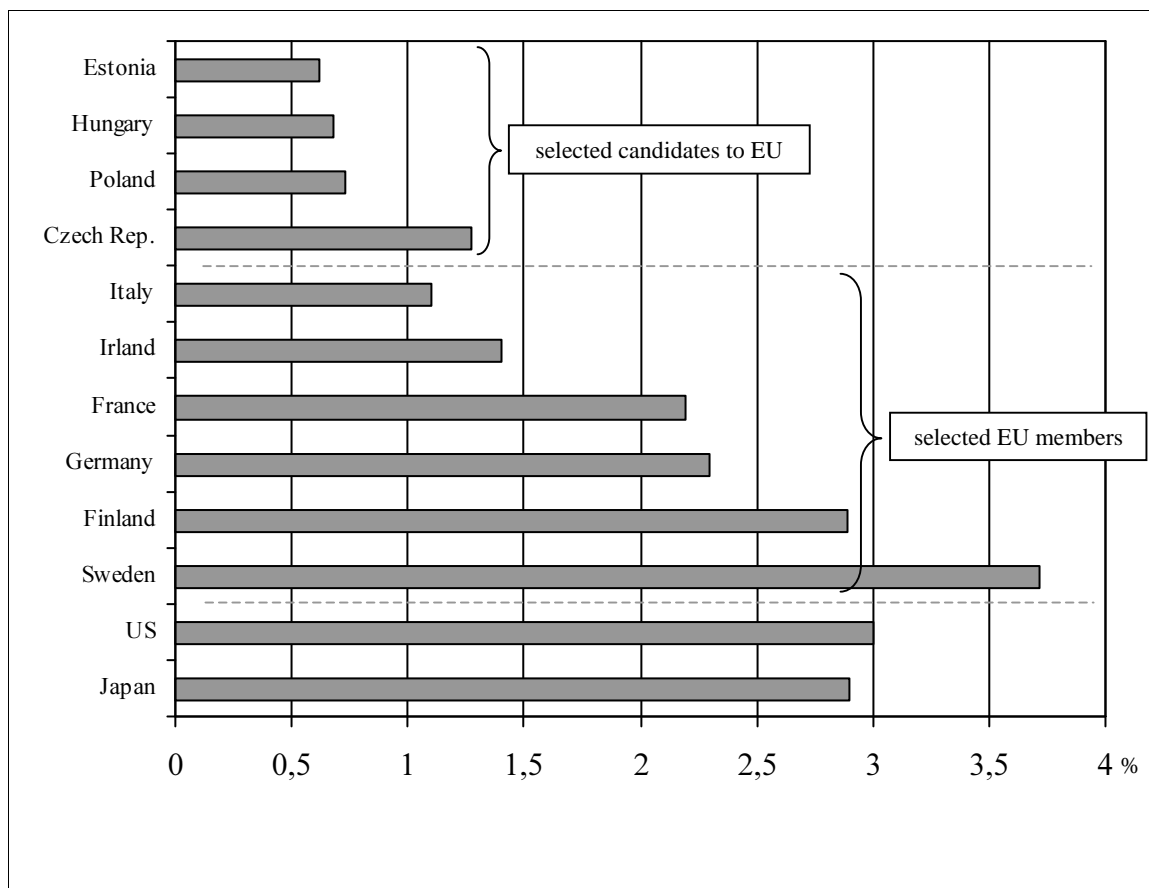


Figure 3: R&D expenditures as a percentage of GDP (2000)

Source: *State Aid Scoreboard*, Commission of the European Communities, second edition, Brussels 20.12.2001, p. 19, and Zambon, S., *Study on the measurement of intangible assets and associated reporting practices*, European Commission, ENTR/01/054, April 2003.

Government's funding for R&D is extremely different in various countries and overall changes. Government can directly fund the business for carrying out the research, either under procurement programmes or as a grant. It can also support R&D through tax incentives, notably tax credits. Other way is to perform R&D in public laboratories and fund university research, which may have an impact on high-tech industries through technology spill-over effects.

Government support to R&D and technological development has been rapidly expanding during the 1990s, reaching almost one fifth of the total government support to the

industry. According to the OECD survey, a majority of such programmes support collective R&D efforts of firms and cooperative research between firms and public institutes. About one third of the support programmes directly promote selected technologies, mainly in the sectors of microelectronics, information technology, energy savings, aircraft and space industries, biotechnology and new materials. Some programmes provide funds for technology parks and R&D venture capital. There is a strong concentration of support on large-scale projects and existing production – only one sixth of technological support relates to the new capital investment. Support mainly takes the form of grants and often reaches a high share of total costs of a research project. Direct government funding of R&D performed by firms has a positive effect on business. One dollar given to the firm – results in 1.7 dollars in research activity.

Most of the expenditures in research and development programmes were incurred by the business enterprise sector (Irish government invested 7 percent of the total R&D funds spent in 2000, German – 14%, and Italian – 21%).

5. Conclusions

The rate of growth in the value of international trade is constantly increasing. This is obviously linked to the increasing integration of national economies into world trade. However, simultaneously the deepening of the international division forces some countries to the margin of international trade. Without financial support and cooperation in science, sophisticated technologies and modern competitive goods, they would not be “up-to-date”. On the export side, competitive goods and services give advantages on the foreign market. In order to concentrate export on the “dynamic” products the policy makers should exploit the potential for long-term productivity growth associated with an export-oriented industrialization strategy in high-tech sectors.

Table 1: Export value growth and share in total export of the 10 most market-dynamic products, 1980-2000 (percent)

Rank	Product group	Average annual export value growth 1980-2000 (%)	Share in total world export	
			1980	2000
1	transistors and semiconductors	17.4	1.0	4.1
2	optical instruments	16.1	0.1	0.3
3	computers	15.3	0.9	3.4
4	parts of computers and office machines	15.2	0.7	2.4
5	knitted undergarments	13.4	0.3	0.6
6	electric power machinery	13.4	0.3	0.6
7	perfumery and cosmetics	13.4	0.2	0.5
8	plastic articles	13.1	0.6	1.2
9	telecom equipment, and parts	12.8	1.5	3.0
10	electricity distributing equipment	12.3	0.4	0.7

Source: UNCTAD website:

<http://www.unctad.org/Templates/WebFlyer.asp?intItemID=2211&lang=1> (downloaded on 30 July 2003).

Seven on ten the most dynamic products in world non-fuel exports belong to the group of high-tech products (see table 1). Average annual rate of their export growth (1980-2000) reached 14.3% compared to overall export growth of 7%. Most of these high-tech products revolve around information and communication technologies.

Export of products of the high skill- and tech- intensive category and the science-based category has grown rapidly over the last 20 years. Countries that specialized in the export of dynamic products and gained market share were prominent in the group of countries that the most benefited from world trade over the last 20 years. A number of developing economies have achieved important gains in market share in technology-intensive industries of non-resource-based manufactures, which participate in the international oligopoly. The top of this sort of economies are China, the Republic of Korea, Mexico, Malaysia, Thailand, Taiwan, Hungary, Poland and Czech Republic.⁶ Perhaps the most important finding is that the higher the skill and technology content of production process, the faster is the growth rate of exports, which is the main aim of the strategic trade policy.

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