

TECHNOLOGY-INTENSIVE FDI AND ECONOMIC DEVELOPMENT IN A SMALL COUNTRY – THE CASE OF ESTONIA

Marek Tiits

University of Tartu and the Institute of Baltic Studies

Abstract. This article reviews the role of foreign direct investment in industrialisation of various catching-up economies and draws based on this lessons for policy-making in small countries. The author states that the introduction of proactive foreign investment strategy is one of the most effective means in a small country to rapidly increase the knowledge intensity of the economy. However, the Estonian innovation policy, similarly to most of the EU new member states, has underestimated the power and role of such proactive strategies. The author calls for much better focusing of the activities of foreign investment agencies and closer co-ordination of FDI strategies with education, research, employment and other policies.

Keywords: foreign direct investment, R&D and innovation policy, economic development strategy, small countries, Estonia

1. Introduction

After WW II, most developing countries were if not directly hostile then at least very cautious of foreign direct investments.¹ With the emergence of dependency theory in the 1950s, a large share of investments of multinational corporations (MNC) in the economy was seen as a threat to the host economy. The concerns were foremost related to the excessive influence of multinational corporations in the politics and economy of the country of location. Foreign investments were therefore often considered a modern form of economic colonialism and exploitation (Singer 1950, Prebisch 1959).

¹ Foreign direct investments are usually defined as acquisition of a shareholding of a company by foreign investors that unlike portfolio investments, is accompanied by the right to participate in the management of the company or control over the management of the company. See also: IMF 1977:136 and Graham and Krugman 1993:13–33.

With the strengthening of globalisation trends from the mid-1980s, the attitude towards foreign investments became almost all over the world considerably milder. Most analysts are now quite optimistic about foreign direct investments and believe that in addition to the financial resources necessary for economic development, foreign investments bring about a number of additional benefits, for example, transfer of modern management skills, knowledge and technologies, knowledge of international markets, modern accounting and auditing standards, etc., thus supporting the economic development of the host economy (Porter 1990).

The success stories of Ireland and Singapore in attracting foreign investments and the economic growth arising from it are often quoted as examples, which prove the positive effects of the inflow of export-oriented foreign investments on the development of the target country (Barry 2002, Lall 2000, Finegold et al 2004). Malaysia, where the multinational corporations' share in export amounts to approx. 75%, is at the same time a modern example of a country where the question of a possibility of an independent economic policy in the globalised world has recently proved extremely relevant (ADO 2004:224–227, Malairaja and Zawdie 2004).

Historically, the fear of foreign investments is not only typical of the developing countries. For example, the United States were really afraid of the fate of their national industry during the invasion of Japanese companies in car manufacturing and microelectronics at the end of the 1980s. Modern expressions of similar developments include Chinese investments in Germany and elsewhere in the Western Europe and takeover of their low-tech and mid-tech companies (Ewing and Roberts 2005).

Thus historic experience demonstrates that foreign investments may play either a negative or a very positive role in economic development, and the ability of the host country to benefit from the presence of multinational corporations through an increase in productivity is often a great challenge. The impact of direct investments on the host country depends largely on the public policy implemented by the country under discussion. After all, it is public policy that makes political borders important in global economy (Nurkse 1953).

The aim of this article is to review the role of foreign direct investment in industrialisation of various catching-up economies and to draw based on this lessons for policy-making in small countries.

2. Technological development and global relocation of economic activities

David Ricardo's theory of comparative advantage, which attributes the differences in productivity to the economic environment, i.e. differences in the availability of land, labour force, natural resources, capital, etc., is nowadays one of the most widespread ways of describing international trade. According to this theory, it is the different productivity in producing certain goods that forms a basis for different specialisation of various economies and thus, for international trade (Ricardo 1817).

In the middle of the 20th century economists became increasingly interested in cross-country comparative research, which attempted to understand the most important factors that influence economic development. When studying the sources of economic growth experienced in the U.S., Robert Solow noticed that more than half of the actual growth had arisen from 'other reasons,' outside the standard explanations offered by classical economic theory, i.e. outside the contributions of the growth of labour force and capital investment. The component remaining outside the explanatory strength of the classical economic theory was *technological development* (Solow 1957, Abramovitz 1956).

In other words, the difference in the productivity of the labour force and economy of rich and poor countries and thus in the living standards arises from the different knowledge and technology intensities of various economies. Economic development does not only depend on static comparative advantages described by Ricardo. Systematic investments into dynamic, knowledge and technology-based competitive advantages are of equal importance. Modern economic thought therefore sees the need for coordinated public and private sector investments in shaping such an economic environment, which would encourage industry to obtain in a certain area as large a global market share as possible, relying on the high knowledge-intensity and quality of its products (or services) (Porter 1990, OECD 1999, Lundvall et al. 2002, Freeman 2002, Cooke 1992, Malerba 2002).

The factors contributing to long-term economic development highlighted by various modern economic theories, such as a stable economic environment, well-functioning public service, social capital, investments in education, private sector's technological efforts, etc., are quite similar. Yet, catching up with rich countries in living standards is still quite complicated and, historically speaking, an exception rather than the rule (Gerschenkron 1962 and Abramovitz 1986).

From the 15th to 18th century the Netherlands were the most rapidly developing country in Europe, largely thanks to the trade developed in Northern Europe and successful introduction of hydraulics in agriculture. During the 17th and 18th centuries the Netherlands became the wealthiest country in the world. The Dutch economy was extremely specialised: while most of the food reserves were imported and wars were fought with the help of mercenaries, the population in cities concentrated on highly productive economic sectors.

The industrial revolution arriving at the end of the 18th century allowed England to overtake the Netherlands in terms of GDP per capital, but did not bring about a simultaneous economic development leap throughout Europe. When many countries tried to create their 'own Manchester' by copying foreign success, Western Europe industrialised gradually and unevenly. New technology and new ways of organising work spread first at the beginning of the 19th century to neighbouring countries (the Netherlands, Belgium, etc.) and from there to Prussia, Austria, etc. In modernising the infrastructure, banks established by foreign investors in *catching-up* countries played a crucial role by starting to invest in the development of railways, etc.

Among others also Sweden, where in 1870 the living standard was less than a half of that of England and $\frac{3}{4}$ of the population subsisted on agriculture, witnessed

rapid economic growth based on the growth of exports and technological development in the last decades of the century (de Vylder 1996).

In spite of rapid globalisation, which occurred in the 19th century owing to rapid development of the shipping trade and railway network, Switzerland as well as most Central and Eastern European countries and Russia remained primarily agricultural countries, which were relatively little touched by industrialisation (Maddison 2001, Pollard 1973, Berend 1998, Owen 1985, Mandelbaum 1945).

However, the United States, relying on its enormous internal market and being the first true consumer society, managed to catch up by the end of the 19th century in technological capability with Europe and even take over the global leadership (Nelson and Wright 1992).

In the second half of the 20th century, the flying geese metaphor was taken into use to explain the rapid development observed in Japan and thereafter in a number of countries in Southeast Asia. According to the metaphor, dynamic economic development in a developed country and gradual transfer of economic activities to the neighbouring countries promotes the economic development of the latter as well (Akamatsu 1935, Kojima 2000, Damijan and Rojec 2004).

Thus, long-term economic development takes place in waves, whereas the transfer of economic activities largely depends on the global spread of knowledge and technologies. Over time, market competition relying on dynamic knowledge-based comparative advantages in developed industries will be replaced by static, cost-based and resource-based comparative advantages described by Ricardo. Hence, upon the disappearance of relative cost advantages economic activities which require lower knowledge and technological intensity must be abandoned for preserving and increasing the living standard (Vernon 1966 and Wells 1972, Pérez 2002). (Figure 1)

Knowledge and skills that are important for the emergence of new industries are usually available in several places around the world. The fact that during the industrial revolution England was not the world's leading country in terms of research indicates that a country's socio-economic development does not depend only on technological development and the supply side of the economy, but just as much on the development of the demand side of the economy.

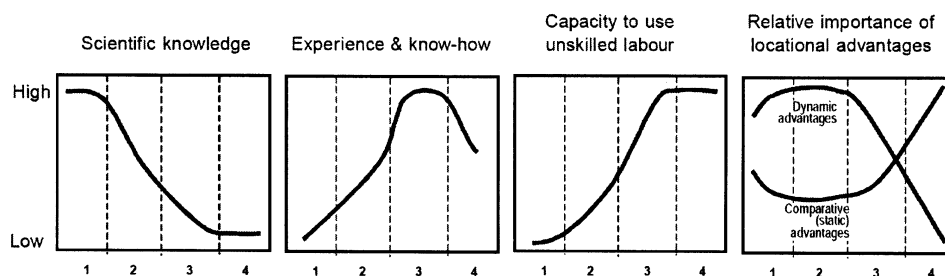


Figure 1. Changing entry requirements as technologies evolve to maturity.

Source: Pérez 2001:112.

Although technology and capital play an important role in socio-economic development, it is the entire institutional environment of the country that makes the difference. New industries emerge in countries where the technological capacity, market demand, market rules, social attitudes, etc., are the most favourable.

3. Small countries in global production networks²

The production networks of the global economy are not only international, but also rather concentrated. 30–40% of the global trade takes place within multinational corporations, i.e. either between headquarters and affiliates or between different affiliates of MNCs. Such internalised trade accounts for the most knowledge-intensive and dynamic part of international production where international firms place their R&D activities and various phases of production in different countries according to the advantages of specific locations (Lall 2002:49).

Multinational corporations gain their economic power largely from their ability to control resources which are of crucial importance in terms of further development of products and production processes, the ability to coordinate business operations and the transfer of knowledge and technologies between different parts of the network. While higher tier suppliers are in such a network responsible for co-ordination of smaller sub-networks, the low-end sub-contractors compete predominantly with the (low) cost, delivery speed and flexibility. The suppliers who rely solely on the cost advantage are typically used for pushing down the market price or are used as a reserve required for achieving a sufficient production capacity, which may be abandoned upon the change of economic environment very rapidly.

In developing the knowledge-based economy, most small countries are, in comparison with larger countries under dual pressure. On the one hand, limited resources and the increasing complexity of new technologies prevent small countries from developing an R&D infrastructure of sufficient strength. At the same time, due to smaller-scale production and relatively higher concurrent transaction costs smaller countries have difficulties in competing in low-tech and mid-tech segments of the world market which are increasingly dominated by Asian tigers' with their scale and cost advantages, and relative technological strength. In small countries, this forces industries of an otherwise similar level of development to find export opportunities and/or establish production bases abroad relatively earlier in comparison with larger countries. Relatively low share of global R&D and pressure for rapid internationalisation of domestic companies should not therefore be considered a weakness of the national innovation system, but a logical result of being small (van Beers 2003, Walsh 1987).

² There is no common definition of a small country. In different approaches the size of countries is compared based on the population, territory, GDP and other indicators. See also: Briguglio 1998.

Approx. 90% of all R&D investments in the world is made in OECD countries. However, R&D investments are rather concentrated even within OECD countries. 90% of global private sector R&D takes place in seven countries, incl. 40% in the United States. The R&D investments are also extremely concentrated by companies: the investments of 700 larger multinational corporations constitute the bulk of all private sector R&D investments worldwide (Lall 2002:49). (Table 1)

Table 1. Private sector investments in R&D, 2004

	700 large corporations	US	Europe	Rest of the world
No. of corporations	700	306 (USA = 294)	215	179 (Japan = 154)
R&D investments (bln £)	204.6	80.8	73.4	50.3

	Europe	Germany	France	United Kingdom	Switzerland
No. of corporations	215	54	36	41	20
R&D investments (bln £)	73.4	25.8	13.3	10.6	6.8

Source: DTI 2004.

Next to Germany, France and the United Kingdom smaller European countries such as the Netherlands and Switzerland are the location of headquarters of various multinational corporations. However, the highest number of headquarters of multinational corporations per capita is in Sweden. Likewise, the Finnish quick recovery from the economic crisis at the beginning of the 1990s and its success in the field of information and communications technologies is largely attributable to the success of a single company – Nokia – in international markets. At that, Nokia's investments in R&D have amounted over recent years to approx. 1% of the Finnish GDP.

For smaller European countries such as the Netherlands, Sweden or Finland it is thus one of the main economic policy choices whether to continue supporting the strategy of their multinational corporations, etc., or risk seeing them move elsewhere.

The rapid internationalisation of production and R&D, which has taken place over the last decades, has been primarily driven by the desire of MNCs to gain access to new markets and/or technologies. Usually, small countries find it quite difficult to attract technologically oriented foreign investments, because it requires the existence of a high-level research and technological infrastructure (i.e. science, higher education, science parks, etc.) in the country. From the point of view of integration of the innovation and foreign investment strategy, small countries should take more interest in companies whose expansion decisions are led by the desire to gain access to new markets as well as companies with a global strategy (von Zedtwitz and Gassmann 2002:576). (Figure 2)

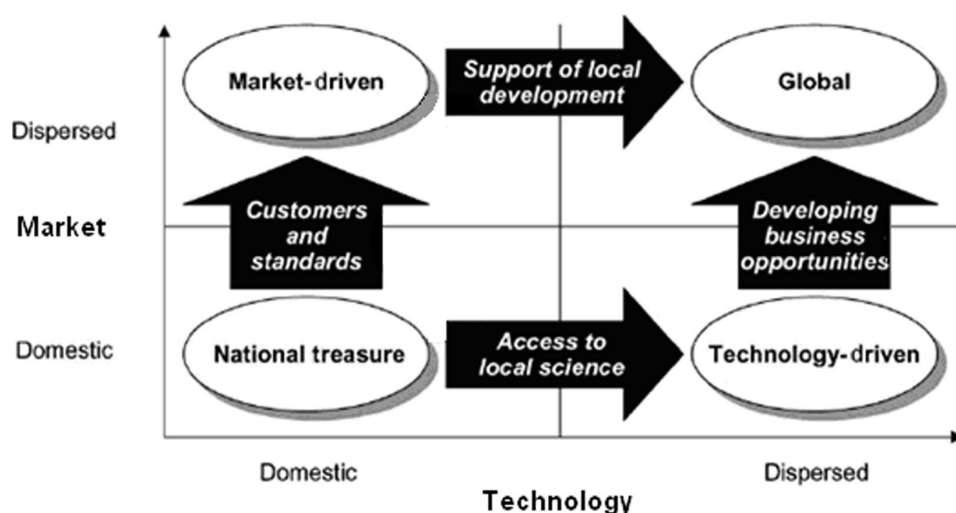


Figure 2. Main factors in internationalisation of technology-intensive businesses.
Source: Adopted from von Zedtwitz and Gassmann 2002.

Small countries are inevitably forced to acquire most of the new technologies from larger and technologically more advanced countries. It is therefore not that important for a small country to be in the absolute forefront of emerging radically new industries. It is far more important to ensure that they are able to host certain parts of the global production and that the respective international businesses are surrounded by a broad cluster of domestic supporting activities of the highest possible knowledge and technology intensity. Nonetheless, constant upgrading should take place not only in high-tech activities, but also in traditional industries.

Thus, for a small country one of the main issues of the economic development strategy is how to identify potentially rapidly growing new markets and companies taking positions there, providing thereafter the respective fast growing companies with an environment which is suitable for expansion, incl. access to new or bigger market, qualified labour, strong domestic suppliers and service providers, etc.

4. Estonia's attractiveness as a foreign investment destination

In spite of the rapid growth of the volume of foreign direct investments attracted by developing countries (on average USD 37 bln 1989–1991 versus USD 223 bln 1999–2001) these flows are extremely concentrated. In recent years, the 10 countries that have attracted most investments have received 80%, and 25 countries that have attracted most investments have received 90% of the entire foreign investment flows through 1999–2001 (Lall 2002:70–71). More recently, in 2004 and 2005, we have witnessed after the decline in 2002–2003 once again

strong increase of global FDI flows fuelled by an upsurge of cross-border mergers and acquisitions between developed countries, and emerging markets boom driven by relatively low interest rates in developed countries (UNCTAD 2006).

Deep integration into global production networks, which reaches beyond trade relations, still covers a relatively limited number of countries in spite of the liberalisation of financial markets and considerable reduction of trade barriers. In addition to many rapidly developing Asian countries (e.g. South Korea, Taiwan, Singapore, China, Malaysia, Thailand, India) this applies first and foremost to the border regions of Europe (e.g. Ireland, EU new member states, Russia), Brazil, Mexico and Argentina in Latin America and a few other places around the globe (Ernst and Kim 2002).

Previous direct investments in the 10 new member states who joined the European Union in May 2004 have been concentrated as well. As of 2005 in absolute terms nearly 80% of the direct investments made in the region had been made in the Czech Republic, Hungary and Poland. The foreign direct investments attracted by the Baltic states are in *per capita* terms rather high, but in absolute terms relatively modest, amounting to approx. 9% of the foreign direct investments made in the region (FDI 2007).

The new member states do not differ only in terms of the current FDI stock, but also in the sectoral division of investments, technology-intensity, geographical location, ownership relations and investment management. In Central European countries which have attracted the largest investment in absolute figures, one of the main target sectors has been industry. Until recently, the service sector has dominated in FDI flows to the Baltic states and Cyprus (Eurostat 2005, Galego et al. 2004:76, Hunya 2004a).

At the end of 2006 real estate, rental and commercial activities held the most important position among foreign direct investments made to Estonia with 30%, followed by financial intermediation with 28%, manufacturing industry with 18% and wholesale and retail trade with 10%. Similarly, Estonia's outward foreign direct investments were dominated by financial intermediation with 38%, real estate, rental and business operations with 32%, transportation, warehousing and communications with 10%, whereas the share of the manufacturing industry was only 4%. (BOE 2007)

In the manufacturing industry in Estonia the following fields have received the most foreign direct investments: wood and food processing (22%); food and beverages (19%); non-metallic mineral products (11%); pulp, paper and paper products; publishing and printing (10%), electrical and optical equipment (9%) (Tiits 2007:15).

Investments originating from other countries of the Baltic Sea region account for 77% of Estonia's inward FDI position. Both in Estonia as well as in Finland one of the main investors is Sweden. The Swedish investments account for approximately ½ of Estonia's inward FDI position. (Table 2)

Table 2. FDI positions between countries of the Baltic Sea region, 2004 or the most recent year available

	FDI destination								
	EE	LV	LT	PL	SE	DE	FI	DK	RU
Estonia	***	8%	8%						
Latvia	1%	***	2%						
Lithuania		1%	***						
Poland			1%	***					
Sweden	46%	11%	15%	5%	***	2%	54%	20%	
Germany	2%	15%	11%	13%	6%	***	5%	4%	11%
Finland	24%	8%	8%	1%	16%	2%	***	2%	
Denmark	2%	8%	15%	3%	3%	1%	4%	***	
Russia	2%	7%	8%	1%			1%		***
Total	77%	59%	68%	21%	26%	5%	64%	27%	11%

Source: BRE 2005.

In the early 1990s privatisation was in Estonia one of the primary drivers of the inflow of FDIs and one of the most important sources of foreign exchange income, but over time market-seeking and Estonia's relatively less expensive production inputs (labour, energy, etc.) have become some of the main investment arguments (Varblane et al. 2003, Varblane 2001, Johansen 2000).

Between 1997 and 2001 approx 2/3 of the foreign companies which invested in Estonia were primarily interested in access to Estonian and other Baltic markets, another 1/5 of foreign investment companies were interested in optimisation of costs. More recently, takeovers of foreign takeovers of domestic banks and indigenous industry, and relocation of production from Nordic countries have dominated the foreign domestic investment to Estonia and other Baltic states (Tiits 2007, Tiits 2006).

It is typically expected by the economists and policy-makers that the initial current account deficit which appears after liberalisation of markets due to the influx of foreign capital is covered with the increase of exports. In Central and Eastern Europe inward FDI has definitely played a significant role in balancing the trade and current account deficits, which remain nonetheless dangerously high. The economic standstill and low interest rates in developed countries have, however, produced a stock exchange and real estate boom, which together with exorbitant domestic consumption have become one of the main destabilising factors in the region (Economist 2005, Tiits 2005).

5. International dimension of Estonian innovation policy

Domestic and foreign investors active in Estonia both agree that one of the major problems of the Estonian economic environment is the lack of qualified labour and weak vocational education, in-service training and retaining system

(Tiits 2007). This is by no means a uniquely Estonian problem. According to multinational companies, Central and Eastern European countries have been in general relatively incapable of providing local input suitable for international production networks. In the short-term perspective this is reflected mainly in the difference of productivity, export, wages and other indicators between foreign and domestic capital-based companies, in the inability of entrepreneurs to move to new fields of endeavour that would render a higher value added as well as in the high unemployment (of young people), etc. However, the less foreign investment enterprises depend on local inputs (besides cheap labour, etc.), the more mobile and ready to leave the country they will be if the economic climate would worsen (Dyker 2004).

The comparison of the recent experiences of Asian 'new tigers' such as Malaysia and the Philippines with slightly earlier developments both in East Asia as well as in Central and Eastern Europe, and Latin America shows that the inflow of foreign investments into (nominally) high-tech sectors may very well take place without any special strategy, simply as a result of good luck. Nevertheless, the rapid increase of the importance of local input has been in the Southeast Asian successful 'tiger economies' primarily the result of very strong and selective public policy (Lall 2000). This requires efficient coordination of the government policy as well as an active role of the state in developing the qualifications that are of importance for the future. The modern innovation policy is therefore primarily a horizontal policy, which should function as an interface between different sub-policies (education, research, competition, enterprise, employment, regional development, environmental and other policies) (OECD 2005 and EC 2002).

The development of the domestic supporting industries, which would be able to offer bigger foreign investment enterprises sufficiently high quality services, is always quite a challenge for small countries. Since not all international markets are alike and the development of domestic capacity is time-consuming, the activities of foreign investment agencies are increasingly characterised by greater focusing of their activities. Thereby, it is one of the main issues of the economic development strategy both in Estonia as well as elsewhere in catching-up economies to see which unique competitive advantages are available and how new ones could be created – in other words, what could be the future international specialisation of the given economy. There are no analytically neutral 'correct answers' to this type of questions.

The skills development decisions, and thereby decisions about possible future specialisation of an economy depend largely on the existence of a comprehensive shared vision of a country's future. Even though it is clear from economic theory that it is more beneficial to specialise in rapidly growing high productivity industries, making these choices assumes very high risks and is thus closely related to the value judgements and legitimacy of the public policy decisions in general.

6.1. Relocation of economic activities in Europe

Which are the fastest growing markets in today's world? Although the service sector accounts for approx. 75% of the GDP of developed countries, the share of services in international trade remains relatively modest. Manufactured goods account for approx. 80% of the world's import-export volumes. The exports of high-tech products have been most rapidly growing part of the trade of manufactures through 1985–2000. In 1985 modern high-tech products amounted to approx. 12% of the world's export volumes, but by 2000 the respective figure had risen to 23%. The share of information and communication technologies (ICT) grew at the same time from 5% to 14% (WTO 2004 and Lall 2002:56–57).

Now that North American and European markets have gone through the first the most rapid growth phase of introducing information technology, the emerging markets in Asia and elsewhere continue to witness a relatively rapid growth. The increasing capital-intensity and price competition forces the industry to consolidate and look for new lower cost production locations near Asian rapidly growing markets and elsewhere (Economist 2004, Kelly et al 2004, Hemerling et al 2003, Jin 2004).

The on-going global relocation of economic activities does not concern only ICTs, but is a much broader process. Various West European companies have relocated parts of their production to Central and Eastern Europe and are expanding rapidly their activities in developing Asian markets. Equally, the U.S. ICT and pharmaceutical companies are about to move a considerable portion of their operations from Ireland to China and elsewhere, etc (Forfas 2005).

Since the Western European economies are dominated by capital-intensive mid-tech industries such as chemical industry, machinery or car manufacturing where cost cutting and maximising the economies of scale has become increasingly important, relocation of these economic activities from Western Europe is likely to continue. Along these lines the recent UNCTAD expert survey and the analysis of the *Boston Consulting Group* highlight business and ICT services, education and medical services as the likely main FDI target sectors for Central and Eastern Europe in the coming years. In manufacturing, continued relocation of electronics manufacturing, metal processing, car manufacturing and machine engineering related activities is foreseen (GIPA 2004:37, Waddell 2005).

In this context specialisation in servicing Western Europe is clearly one of the most obvious strategic choices for Central and Eastern European countries. However, Central and Eastern Europe is by far not a homogenous region and the geographical locations of individual countries play quite an important role in the actual development of FDI flows. While German investors are relatively active throughout Europe, smaller European countries tend to turn their eyes mainly to investment opportunities in neighbouring countries. Austrian investors account for quite a large share of the FDI position of Slovakia and Slovenia, Sweden has been quite active in the Baltic Sea countries, Finland has been more active in Estonia and in North-western Russia, etc.

Over the last dozen years the Estonian economy has been integrated very closely with the Nordic countries and become a part of the cross-border economic clusters in the Baltic Sea region (banking and insurance, electronics and telecommunications, wood and wood products, metal, machinery and means of transport, etc.). Estonia has thereby become quite dependent on the developments in Scandinavia, including the respective location decisions affecting the Baltic states and Poland (Tiits 2007).

Expansion of Estonia's export markets beyond the Nordic countries to Western Europe has so far not worked out very well, and the early 1990s vision of Estonia as the Hong Kong style 'gateway to Russia' has failed to materialise as well. The continuing dependence on the Nordic countries is likely to give Estonia in the short-term and mid-term perspective quite a straightforward opportunity for creating and sustaining high employment levels in the export sector. The main risks of such a development scenario for Estonia derive from possible excessive focussing on the Nordic countries as its main business partners and export markets.

5.2. Europe in global economic competition

The economic success of Ireland in the 1990s can be largely attributed to the investments of U.S. information and communication technology and pharmaceutical companies for establishing a production base oriented to the European single market. Ireland, which had suffered a long economic crisis, mainly hoped to create new jobs when it made the U-turn in the economic policy and offered a production base for foreign investors.

Similarly to the US companies' investments in Ireland, Russian investments in Europe have been largely motivated by the desire to increase the profit earned on goods sold in the European market. However, larger Russian internationalising companies are not high-tech, but export natural resources (oil, gas, metal, etc.). The large and increasing share of the export of natural resources in Russian export raises the issue of preventing the classical 'Dutch disease' in the event of a fall in the prices of oil and other commodities in the world market (AFP 2004).

The opportunities beyond Estonia's immediate neighbourhood look much more promising. According to UNCTAD, in the coming years the US will remain the largest foreign investor in the world, followed by the United Kingdom, Germany and China. It is quite remarkable that in addition to China, the top 15 investors include a number of developing countries such as the Republic of South Africa, India, Brazil, Malaysia and South Korea. Some of these countries are important predominantly due to their direct neighbours, but in general the international companies of the developing countries are becoming increasingly important global players (UNCTAD 2005, UNCTAD 2006).

The Asian companies, which started out in the global division of labour with simple assembly work and thereafter gradually assumed more product design related responsibilities, are now overtaking North American and West European

well-known trademarks and, whenever possible, acquire the latest technologies controlled by the companies which had formerly conquered the Asian markets. The Chinese 'technology for market' policy is in this context particularly noteworthy (BBC 2004, BBC 2005, EC 2005, Lei 2007).

Learning from Ireland's and Singapore's success, Estonia should be foremost interested in attracting direct investments related to new emerging industries. Yet, the main complexity of such an approach lies in the fact that radically new industries are not beforehand readily identifiable in the mainstream economic statistics, market surveys, etc.

The sectoral division of worldwide corporate R&D investments shows, however, the leading role of the pharmaceutical industry and biotechnology, information and communication technology and electronics in the knowledge-based economy. Similarly to the 1970s the high prices of fossil fuels in the world market have put alternative energy technologies strongly on the agenda. Also, several countries have increased their investments in nanotechnology in recent years (Tiits et al. 2005).

Although the priorities and volumes of R&D investments offer a certain advance indication of the possible future technological breakthroughs, one should not take the world in a technological and deterministic manner. The growth in research funding and the number of publications indicates, to a certain extent, possible future breakthroughs in one or another technological field. It is, nonetheless, often quite impossible to know in which branches of the economy the new technological solutions will have the strongest economic effect. The development of research and technology inevitably results in opportunities and threats and the future is born in the mutual effect of technology, society and economic development, where people's readiness for adoption of one or another technology plays the most crucial role.

Predicting the future dynamics of an industry is a very complicated task. The governments **must be** nonetheless aware of main development trends, challenges and the likely reactions of companies in their key industries. Not being informed about the industrial dynamics leads very easily to a significant waste of resources, e.g. in development of human resources and technological capabilities or in trying to attract FDI into industries where there is no chance of success.

Since a lot depends on the research activities of larger countries and multinational corporations, any strategy for attracting technology-intensive foreign investments will remain inevitably relatively eclectic, and eventually professional day-to-day work with potentially interesting foreign investors will end up being the most crucial success factor.

6. Summary and policy recommendations

In spite of the rapid globalisation observed over the last few decades the living standards have not risen in a number of countries around the world. Globalisation

exerts strong pressure for change, provides ample opportunities for more efficient specialisation and thus a rise of the living standards, but the realisation of new opportunities arising from the opening-up of markets depends nevertheless on the steps taken in a specific country to support the economic development.

Obviously, an economy that is losing its cost advantages can counter the increasing international competition pressure by reducing the cost of labour: for instance, through opening the market for low-paid immigrants, reducing taxes on labour force, reducing the cost of production inputs through devaluation of the currency, etc. Although such a policy may render a seemingly positive effect in the short-term perspective (e.g. through temporary preservation of employment, etc.), it does not help to increase the living standards in the country. To the contrary, it only favours continued specialisation to the low-income activities.

The objective of the *Knowledge-based Estonia* strategy (KBE 2007) to increase Estonia's R&D investments by 2014 to 3% of the GDP cannot be achieved by simply increasing the public sector appropriations for R&D investments. The nature of market competition and corporate action strategies are very different in different industries, whereas the R&D intensity of traditional industries, which are dominant in the current structure of the Estonian economy, is everywhere the world fairly low (DTI 2004). The corporate R&D investments in Estonia can be increased by several-fold only if the corporate business models and the entire structure of the economy are considerably modernised.³

Characteristically to small countries, in developing the knowledge-based economy in comparison with larger countries, Estonia is under dual pressure. The increasing market share of China, India and other rapidly developing Asian countries in low-tech and mid-tech fields and limited domestic market makes it difficult to compete in these areas. Limited resources do not allow either to invest sufficiently in R&D or development of new high-tech solutions in order to compete with multinational corporations, which dominate the most rapidly growing high-tech markets.

While Denmark is an example of a successful small country whose economic success is based on very strong design and continuous updating of low-tech and mid-tech sectors, the experience of such small countries as Ireland, Singapore, etc. indicates that in a small country with an open economy the strongest and virtually the only possibility to considerably increase the knowledge-intensity of the economy is to implement a targeted foreign investment strategy (O'Connor 2001, Shin 2005, van Grunsven and van Egeraat 1999).

³ In the 1970s Finland, which had a relatively low-tech economy, established an analogous political goal to considerably increase the level of R&D investments. disappointingly, this goal was not achieved. However, Finland of the 1990s is an example of how the success in the rapidly growing telecommunications equipment market forces Nokia to sell virtually all its earlier operations for the purpose of accumulation of resources. But the local authorities and the Finnish state keep investing. See: Lemola 2003.

6.1. Proactive strategy for attracting technology-intensive foreign investments of strategic importance for Estonia

Although the technology transfer arising from the inflow of foreign investments, introduction of new technologies and work organisation have been the main driving forces behind the economic development in Estonia and other Baltic states over the last 10–15 years, the implementation of a targeted foreign investment strategy has, unlike in Ireland and Singapore or even the Czech Republic and Hungary, been considered relatively unimportant (Hunya 2004b:106).

Estonia should start implementing a more proactive foreign investment strategy, paying special attention to attracting ICT, biotechnology and nano-technology related investments. This should be done with regard to radically new industries (e.g. biotechnology-based pharmaceutical industry, bio- and nano-electronics, etc.) as well as through modernising the traditional areas dominant in the current Estonian economy (e.g. usage of IT or biotechnology in wood processing, food processing, textile or chemical industry, etc.).

6.2. Modernising the labour supply structure and life-long learning system

Although transportation, communications and other physical infrastructures as well as the general level of education of the population are all important from the point of view of the dynamics of the economic development and foreign investment strategy, the current analysis indicates that the most critical factor for Estonia has been its ability to provide both foreign investment enterprises and local companies with qualified labour.

Estonia has reached a development phase where the attraction of the economic environment is increasingly dependent on investments in modernising education and research, including in-service training and retraining employees and active labour market measures. But not all branches of the economy are alike and one of the main complications of this process is setting education and research financing priorities, which must take into account both local developments as well as the dynamics of global markets (Dunning 2000, Shin 2005, Tiits 2007).

In the broader context of the Baltic Sea region, establishing an international science and technology co-operation programme, which would help Estonian companies train their employees and update their technological base necessary for moving up along the global value chains, would be most welcome.

6.3. Efficient coordination of the public policy

The development of new technology-intensive markets or market competition in specific areas over the next 5–10 years cannot be predicted in great detail. Equally, structural change in an economy and development of knowledge-based economy is never the result of a single political decision, but should be rather seen as the result of continued longer term process which builds both on adequate public policy and a series of strategic choices made by various private sector actors.

The modern innovation policy should thus be seen as a horizontal policy, which must ensure stimuli and an ability of the private sector to grasp the possibilities of dynamic knowledge-based economy.

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Address:

Marek Tiits
Institute of Baltic Studies
Lai 30
51005 Tartu, Estonia
E-mail: marek@ibs.ee

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