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**Conference Paper**

## New Technology, Innovation and Space

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46<sup>th</sup> Congress of the European  
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“Enlargement, Southern Europe and  
the Mediterranean”  
August 30th-September 3<sup>rd</sup>, 2006

To the Local Organizing Committee  
Dear Colleagues,  
Please find attached herewith my  
revised paper on FOREIGN DIRECT  
INVESTMENT AND REGIONAL  
REDISTRIBUTION OF SKILLED  
LABOR.

Best wishes for the good  
organization of the Congress.

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FOREIGN DIRECT INVESTMENT  
AND REGIONAL REDISTRIBUTION  
OF SKILLED LABOR

Ross. Fakiolas

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### **Introduction**

New technologies in today's world are mainly the result of a long and endogenous to the economic system R&D process which includes diverse elements: Basic theoretical and applied research, repeated testing which ensures that the new techniques coming out of the previous processes are ready to be applied in production or to enrich the output-mix with new products, new ideas and techniques that contribute to the introduction of more efficient methods in the organization of production. Until about the end of the 1970s, R&D and the output of capital-intensive goods that incorporate advanced technology concentrated mainly to the more developed countries. Those hosted also the largest part of the world's skilled workers coming out of their educational institutions or immigrating from other countries.

Offering useful services to the host countries and integrating easily in

their societies, skilled persons have always exhibited high spatial mobility. Ever since the classical periods of ancient Greece and Rome their migration has contributed to the rise of the world output and, as a rule, it has also promoted cross-border transfers of technologies and new ideas (Baumol W. 1990). To meet the requirements for skilled workers necessary for R&D and the application of new technologies in the modern production conditions, specific clauses in the alien's laws of practically all the developed countries provide for their preferential treatment as immigrants. Often governments invite them to settle in and introduce fiscal incentives for their immigration (Beine M. and Docquit Fr. 2004:5-8).

What started as an effort to increase the "quality" of immigration in the new countries Australia, Canada and USA about two centuries ago has developed into a concentration of skilled immigrants to the developed countries and an international competition for attracting them in order to support both capital intensive production and R&D. Together with traditional self-selection effects on the supply-side, this explains the overall tendency for migration rates to be much higher for the skilled. While the export/GDP ratio has increased by 51% between 1990 and 2000, the total number of foreign-born individuals residing in OECD countries has increased in the same proportion (51%) over that period, but by 70% for the highly-

skilled migrants, against only about 28% for the low-skilled. The efforts of the developed countries to attract skilled labor explains also its agglomeration to them, where it is best rewarded. Nevertheless, the rapidly expanding diversity of skills makes some of them scarce even in the places in which they manifest a high concentration (Docquier Fr. and Rapoport H. 2005:3).

In the last 15-20 years that spatial distribution of high quality output, R&D and skill has been changing with an increasing momentum. Given that skilled workers in the social sciences, scientists and engineers, as well as persons with lower technical and professional skills in high demand exist in all countries, it is often more efficient to employ many of them in the countries where they live. To this effect but for other reasons as well large companies from most countries undertake Foreign Direct Investment (FDI), turning into Multinational Enterprises (MNEs, also called Transnational Corporations-TNCs). Based on capital-intensive production processes, all kinds of FDI employ many skilled workers (OECD 2000). As competition however becomes more innovation-based and spreads to the world markets, the MNEs relocate also to other countries some of their R&D, emerging both as principal economic actors and dominant players in the research activity. Having the appropriate organization and disposing of large material resources, the MNEs view

both the developed countries and the LCDs (less developed countries, including those with economies in transition) as markets of their products, and as sources of skills and even new technologies (UNWIR 2005:157). With those developments the MNEs have. In addition, most of the LDCs make systematic efforts to establish productive processes based on advanced technologies and to develop R&D on their soil.

As a consequence of those developments, the concentration in the developed countries of the global capital-intensive production, the research and the skilled labor tends to diminish and, hopefully, income inequalities among countries will also be reduced. The traditional view of more complex production activities being undertaken in the North which accounts for the largest part of the world research expenditure, and simpler ones in the South is less and less a true reflection of reality (UNWIR 2005, Preface by the UN General Secretary Cofi A. Annan; see also Philip Martin 2003:7 quoting Straubaar and Wolburge 1997)

The first section of this paper examines the evolution of large companies into MNEs through FDI, increasing the proportion of technologically advanced production and the employment of skilled labor in the host countries. The second analyses the interests of the MNEs to expand their research to other countries, developed and developing and the systematic efforts by many

of them to attract any kind of FDI and to promote R&D. The third section looks into the effects of the internationalization of R&D and the spread of high technology industries on the regional distribution of output, the migration of skilled labor and the concentration of skill in a few developed countries. In the text below a key feature of the skilled workers is that they have education and training that takes time to acquire. Their number cannot usually increase quickly, unless: a) trained workers or those who are not employed are induced to rejoin the workforce, or b) workers are imported from abroad (see Martin Ph. L. 2003). The highly skilled are those who possess specialized knowledge that takes more than a four-year post-secondary education or equivalent experience.

### **1. Company expansion through FDI**

In order to realize economies of scale, restructure and consolidate or increase their profitability companies try to expand, employing various forms (see Schumpeter J. A. 1966):

- a) Greenfield investment that creates new productive capacity, usually through subsidiaries established in various regions.
- b) Close cooperation with independent firms through franchising, strategic partnerships, licensing and other agreements on technology transfers. These may lack the flexibility of the parent company beyond the terms of the original agreements but they are a

much looser and as a rule an easier form of expansion.

- c) Mergers and Acquisitions (M&As). They have been the predominant form, accounting for about 90% of business expansion (see *The Economist* 4/3/2006:31). A busy market of enterprises has emerged since the mid of last century, leading to the creation of large corporations.

Initially, the expansion occurred mainly within the national borders without much reaction by the governments, the trade unions and the losers (mostly small firms squeezed out of the market). Although the forms of the recent expansion through FDI are largely similar, their effects are different because they involve companies and countries into complex socio-economic and political processes. Greenfield FDI necessitates new contacts with the local suppliers and customers, while some of the experts employed come from the parent companies. The MNEs must establish close links with foreign firms operating under different legal systems and business ethics. Finally, unlike their past favorable attitudes, certain governments (and trade unions in their hostility to the current style of globalization) raise now objections to M&As. The main issue is the control of important companies (the so called 'champions') that is threatened to pass on to others, based in different countries. The question therefore is raised whether the forces of nationalism and economic protectionism are stronger

than economic rationality (see The Economist 4<sup>th</sup> and 18<sup>th</sup> March 2006). Despite those problems, the improved profitability of MNEs is likely to trigger further the expansion of the M&As through FDI (UNWIR 2005 and Financial Times 16/3/2006).

### **Size and growth of FDI**

The stock of FDI is large (put at \$9 trillion in 2004, and attributed to some 70,000 MNEs and their 690,000 affiliates abroad), with total sales by foreign affiliates amounting to almost \$19 trillion. Nearly half originates from the US, the UK and Luxembourg but among the top 100 MNEs investing abroad four companies are based in LDCs. About two thirds of the inward FDI go to the developed countries, showing its importance to countries at all stages of growth. The US and China account for nearly half of the total inward FDI and Germany for about 18%, with India coming fourth in the row.

In 2004 FDI accounted for more than half of all resource flows to developing countries and was considerably larger than the Official Development Assistance (ODA). It is concentrated however in a handful of developing countries, while ODA remains the main source of finance in most of the others. The recent high growth rates in South East Asia, India, China, Ireland and Finland, among other countries, is partly at least attributed to the large amounts

of FDI in them. The reverse is the case with the sub-Saharan Africa.

Despite temporary ups and downs, FDI is expected to rise further if the pursuit for new markets and skills continues and corporate restructuring persists. The main reasons are the positive, in most cases, effects of all kinds of FDI for both the receiving and the sending countries, and the need for specialization in research through FDI in R&D (UNCTAD 2004 and UNWIR 2005).

### **The pull factors**

The need of all countries to improve their competitiveness by capital investment incorporating new technology constitutes a strong pull factor. As a rule, FDI contributes to the output growth of the host country without heavy pressures for price inflation. The higher spending on real and human capital necessary for growth can be faced by imports through FDI, without foreign borrowing, public deficits or restrictions in the disposable income.

FDI however may be followed by stagnation or slow growth and high unemployment if rising research output and production with capital intensive methods in some sectors is offset by a decline in others, employing labor intensive processes. Furthermore, the dualism existing in most countries may increase. Efficient company groups with well-developed cross-border links operate like a “vanguard” in the dynamic

global framework of market liberalization. They are able therefore to restructure and follow worldwide technological progress. But they leave behind the large number of the marginal and less efficient firms that account for a high proportion of the output and employment (Georgacopoulos A. 2003).

### **The push factors**

The principal push factor for all kinds of FDI is the need of many large companies to expand to other countries. Apart from the cheap raw materials and the new product markets, the MNEs search also for the large number of different skills that are necessary for most kinds of output at the present level of technology and are in short supply in many countries. Excluding foreign immigration, the only way to have them in the short run at competitive wages is through various forms of association with other companies abroad.

### **Policy and enabling factors**

The policy factors include the efforts of the host-countries to invest in education, the measures to strengthen their national innovation systems (NIS) and the care for the “losers”, all of which determine to a large extent the potential benefits from FDI. The implementation however of the appropriate policies is not always easy, especially for host countries with large budget deficits, balance of payments

problems and increasing difficulties to face competition in the product markets. Developments in migration, output and employment in the short run are certainly relevant to demographers and politicians respectively. But they may be misleading in other spheres of social science.

Advances in transport and communication reduce transfer costs and facilitate access to natural resources and strategic assets abroad. They are therefore strong enabling factors for both inward and outward FDI. Together with the advances in information technologies and the trends for more liberalization in the world trade, they make it easier for firms to restructure their operations internationally (UNWIR 2005; see also Section 3 below).

## **2. The internationalization of R&D**

### **Efforts of the LDCs to participate in international research**

In that part in which the non-marketable results are significant, R&D is primarily funded by the national governments and the international organizations and manifests a wide spatial distribution. It aims, as a rule, to improve public health and security conditions, raise agricultural efficiency, strengthen environmental protection and create positive externalities that promote the public interest. Observations, however, show that R&D takes place in more and more LDCs, increasing its overall size and the areas of the

research activity. In China, India, Pakistan and North Korea state funding for R&D is considerable serving, among others, military purposes and in some the exploration of space. India is included now in the “big” actors in computer software research and China is not far behind in various other research fields. The Russian Federation continues the Soviet Union tradition of allocating large sums on military and space research, with results in those areas and in some fields of engineering to compare favorably to those of the developed countries.

### **The FDI in R&D**

In the remaining part of the R&D, the MNEs play a leading role by spreading research activity worldwide through FDI. FDI in R&D can be seen as a logical next step in the increasing globalized production systems of MNEs. That process greatly resembles the kind of international restructuring that has taken place in export-oriented manufacturing and services, as analyzed in OECD et al. 2004 and UNCTAD 2004 respectively. Through it the MNEs seek to improve their competitiveness by exploiting the different advantages of other countries, developed and developing. As a rule, all countries welcome FDI in R&D more than any other kind of FDI because of the prestige attached to areas with research establishments and the increase in the employment among

the highly skilled (UNWIR 2005:172ff and elsewhere).

In addition to the reasons mentioned above, the LDCs are interested in promoting R&D in order to face problems related to their own physical and social environment. They are also interested in creating the necessary infrastructure in order to adjust to their local conditions the technologies developed in other countries. R&D has substantial spillover effects to countries with increasing flows of graduates and LDCs with expanding tertiary education manifest a particular interest, especially when many of their graduates remain unemployed or emigrate. Most LDCs apply now long term policies to revise the content of training and adjust the structure of their educational systems to the changing demand for skill (Martin Ph. L. 2003). They try also to improve their fiscal position because, among other benefits, the availability of a workforce with skills in high demand and a well functioning public sector are necessary and often a precondition to attract FDI in R&D and turn out competitive products.

There are therefore substantial pull factors in countries at all stages of economic growth to attract FDI in R&D. As however R&D is among the most immobile activities of the MNEs, an analysis is necessary of the push factors fostering it. These are both commercial related mainly to issues of organization and the

required skill; and technical, reflecting the special characteristics of the necessary procedures for relocating R&D to other countries. Because of their effects on the migration of skill, some of their aspects are analyzed below; others are examined in more detail in the next section.

a) In-house creation of new knowledge and capabilities needs to be supplemented by external knowledge sourcing. For economic and technical reasons large companies find it more efficient to reduce their in-house basis and applied research in order to focus primarily on product development and the absorption of external knowledge. The increasing dependence on external sources of technology is among the most important changes in new technology industries. This makes outsourcing not only more attractive but often necessary. Companies increasingly need FDI in R&D in order to tap resources of knowledge overseas and specialize in their research activities, relocating some of them to other countries.

b) The MNEs benefit by utilizing their subsidiaries and other affiliations abroad to adapt their own products to the market and manufacturing processes of the host countries. They promote FDI in R&D because in some industries product development is becoming very complex and multi-disciplinary and specialized R&D is required on each particular case and stage of

research. In many of those industries no company, including global market leaders, can mobilize internally all the resources, capabilities and knowledge required. When appropriate, the MNEs perform also science and technology work in host countries to address local market needs.

c) The various forms of FDI examined above are employed to face those complex issues. Greenfield FDI in R&D generally focuses on the suitable for the local market development of products based on technologies applied in the mother company; some innovations can be new to the user but not to the world. The various forms of cooperation with foreign firms prove very useful for outsourcing of new knowledge and skills. Applied research and scanning of local technologies is usually performed by subsidiaries in other countries acquired through M&As. Foreign affiliates usually maintain close intra-firm technological linkages with sister companies. If different technologies developed by a firm are complementary to one another and can only be used jointly, a particular innovation in the host country may have little value on its own, as in various computer software products (UNWIR 2005:164 ff).

### **3. Migration and regional redistribution of skilled labor**

The current internationalization of R&D through FDI and the efforts of many LDCs to expand their R&D affect in many ways the location of

the research activities, and the composition, the magnitude and the direction of the migration flows. The first part of this section examines the effects of FDI on the global migration and the regional concentration of skilled labor; and the second its effects on the migration to and from the host countries.

### **3.1 Global migration and concentration of skilled labor**

All kinds of FDI increase the stock of “modern” skills, accelerating, at the same time, the depreciation of many “traditional” skills. But they affect in different ways the flows of skilled migration worldwide and the spatial concentration of skill. The aim of this subsection is to present the factors that increase the migration of skilled labor and those which have the opposite effects. A similar attempt is made for the factors that tend to increase or decrease the spatial concentration of skill. Given that the magnitudes involved do not lend themselves easily to exact statistical measurement and the relevant statistical information is not adequate, no attempt is made to quantify the results of this presentation.

#### **The migration of skilled labor**

A host of technological, economic and organizational developments offer now more opportunities to skilled persons to acquire and to utilize their skills in the countries where they live. They tend therefore to reduce both the migration and the pressures for the concentration of

skill to the more developed countries, as that used to be in the recent past. Among others, these developments include the production of capital and technology intensive material goods and services in an increasing number of countries, the close legal cooperation of the MNEs with independent firms in other countries, the trade liberalization, the continuing decline of the technological and cost barriers, the age structure convergence across countries and the tendency for factor price equalization among countries. They also include the establishment in many countries of well functioning universities and research centers. These are gradually becoming an integral part of the world research activity, diffusing in more countries the global concentration of skill and restricting its migration (see UNWIR 2005:100,218). To serve their commercial objectives, the MNEs develop ties with local units and public research institutions and participate in cooperative research projects with local industry or industry associations. Science parks are also used to create a more conducive environment for R&D and innovation in many countries, often in close proximity to the universities and technical institutes. The combined effect of those developments leads to a virtuous circle that eventually stops or reduces migration, according to the economic Neoclassical Theory of factor price convergence and the self-stopping migration (see Martin Ph. L. 2003).

In some cases there are mixed effects. With FDI, for example, the migration of skill increases because some of the skilled persons employed by the MNEs in their subsidiaries abroad come from their respective parent companies, as mentioned above. But many of the skilled workers of the host country who would emigrate are employed at home.

Other developments increase the migration of skill. They include those that tend to multiply the diversification of skills and to increase their circulation. Countries applying capital-intensive processes and disposing of developed research and innovation systems send, as a rule, skilled workers to others and receive from them workers with different specializations. With the increasing specialization in R&D, those exchanges expand to both the sending and the receiving countries, they become more frequent and increase the flows of skilled migration (OECD 2003 and OECD 2005). They occur also among the LDCs. India establishes affiliates in China and China does the same in India (Martin Ph. 2003). The same applies for neighboring trading partners, as those in Eastern and Southern Europe (see Labrianidis L. 2003 and Palankai Tib. 2003). On a broader spectrum, companies from countries all over the world maintain a continuous flow of experts to the large research centers in others for microchip, pharmaceutical,

geophysical, nuclear and other kinds of research (UNWIR 2005:158).

In addition, the establishment in a country of complex machinery produced in another increases the spatial mobility of many kinds of skilled workers: those necessary for its establishment, initial operation, maintenance and repairs, and those who travel to the country of origin in order to familiarize themselves with the technical characteristics of the new product, before they undertake (partly or fully) the responsibility of its operation. Naturally, the same applies when the export products consist of advanced organizational techniques.

### **The regional concentration of skill**

The heavy concentration of skilled labor in a few developed countries where R&D took place and advanced technologies were applied without delay appears to belong to the past. In an increasing number of countries in all continents there are now many active research centers and industries applying advanced technology. FDI and the efforts of many national governments are the main actors in these developments.

On the other hand the concentration of skill in certain areas persists and new agglomerations emerge for various reasons, as the following examples indicate. Supported by the respective governments, aerospace research is mainly concentrated in USA, the Russian Federation and China. The air transport research,

partly private and partly state funded, is also concentrated primarily in USA, the Russian Federation and the five larger EE countries. Two main research centers have been established with the cooperation of all countries in Switzerland (CERN for research in the substance of the matter) and in France (for nuclear fusion). They are both unique in their respective kind of research. Many other concentrations of skill have been developed and maintained on the basis of the critical mass of the researchers and the research facilities created in certain regions. That comparative advantage includes, among others, a networking of private companies and public corporations supplying necessary research materials and services to one another, and a good selection of job offers at high wages and with up-to-date research facilities. Both constitute a strong attraction for skill and the participation of firms and governments for further growth. The silicon valley in USA and similar agglomerations in Japan, France and many other countries are among the representative cases of those concentrations.

### **3.2 Effects on the host countries**

#### **The migration of unskilled labor**

As a rule, FDI contributes to the growth of output, the expansion of the educational system and the increase in the demand for labor in the host countries. Naturally, investment from other sources like

local savings, the ODA and foreign borrowing have similar but not the same effects. FDI is usually based on feasibility studies examining primarily its profitability for the MNE fostering it. Host countries, therefore, should be aware that its effects may be mixed and even negative, compared to the existing alternatives. The formulation of the appropriate policies to maximize the anticipated benefits and minimize the likely adverse effects is not an easy task, as mentioned above in the policy and enabling factors fostering FDI. More difficult, however, is their implementation because the MNEs are in a strong bargaining position, on account of their good organization and the apparent benefits from the FDI they offer.

Following output growth the overall employment conditions improve, provided growth does not result from more capital-intensive processes at the expense of production with traditional labor intensive techniques. Increased school attendance on the other hand results into a gradual decline in the supply of unskilled labor. Their combined effect would be the decline of any likely unskilled emigration. If growth continues, unskilled emigration will tend to stop completely and many unskilled jobs will be undertaken by legal and undocumented foreign immigrants. Spain, Portugal, Italy and Greece had been traditional emigration countries of unskilled labor until the end of the 1960s. Since then they have turned gradually into areas with

a large number of foreign immigrants working primarily in unskilled jobs.

### **The geographical movements of the skilled workers**

FDI tends to increase the demand for skill because the new capital and technology intensive processes established in the host countries employ many skilled workers. The higher the FDI in R&D, the higher is that demand that is satisfied by increased immigration, the decline of any likely emigration, the return home of skilled expatriates and, in the short-to-medium run, by the increase in the local supply of skill (see Cincera Mich. 2004).

a) The immigration of skilled workers increases because some of the skills required for FDI are not locally available. Besides, parent companies find it necessary to keep a minimum number of their employees on the staff of their respective subsidiaries. If however experts coming from abroad fill the new skilled jobs and the new production replaces part of the local output, the demand for existing (traditional) skills may decline. Unemployment and the emigration of the persons possessing those skills may continue and even grow, whereas the demand for other kinds of skill increases.

b) As more employment opportunities for skilled jobs are created, many of the likely unemployed skilled workers will be absorbed in production, to the extent that their skills match those in high

demand. Any likely emigration among the skilled workers will also tend to decline to the extent that: i) their skills match those in higher demand at home, as above; and ii) both the wages and the opportunities for professional advance at home are not substantially below those anticipated, in the perception of the would-be-emigrants, in the country of destination.

c) Increased employment opportunities for skilled jobs induce more qualified expatriates to repatriate. In the last twenty years, for example, many Chinese and Indian researchers in the universities, the science and technology parks and other responsible positions in industry and the services of the developed countries have repatriated, contributing substantially to the economic development of their respective countries. Expatriate employees of subsidiaries gain experience that is eventually used in their own countries when they repatriate. The repatriation of skilled expatriates occurs also in smaller LDCs. In some of them the majority of persons with responsible positions in the academia, the research centers and practically in all walks of life had, until very recently, acquired or improved their professional qualifications abroad. Many expatriates return also as investors, contributing to the FDI in their home countries (see Martin Ph 2003).

d) If the increased demand for skill continues, the wages of the skilled workers will tend to rise. Employers

will explain this as a developing scarcity of skill, necessitating increases in the immigration of skilled persons. An employers' need for skilled migrants, however, is neither simple nor straightforward. It raises also questions about how necessary is it to import skills, versus changing educational systems and wage structures to fill existing gaps (see extensive analysis in Cornelius et.al... 2001).

Rising wages for the skilled workers increase the returns to schooling, mainly in tertiary education and retraining courses for skills in short supply. That would induce more people to acquire skills, diverting resources to education and strengthening the demand for those educational services. To the extent that the educational system responds to that challenge, the local supply of skill will increase in the short-to-medium run. Therefore, any likely brain drain in the host country will tend to develop into a brain gain through the expansion of the educational system and the increase in the local supply of skill (see Sevilla Jaypee 2004). Far from causing a brain drain, the emigration of many skilled persons from a LDC develops, as a rule with some notable exceptions, into a brain gain, creating incentives for more and better training. Eventually, it develops also into a brain exchange among countries, with mutual benefits for all actors involved. However, the supply of the skills in high demand will increase moderately if a large proportion of

the additional graduates are mainly in the humanities (see Martin Ph 2003). Available experience indicates that local cultures in many developing societies attach high prestige to humanities and the non-technical subjects in the social faculties. Besides, it is less difficult and costly to study those subjects than the more technical ones, including the various subjects in business administration. It may therefore take some time before the local supply adjusts to the demand by kind of skill.

e) The process of on the job training and gaining experience by the locals is intensified. This experience is usually the scarce factor in LDCs because in most of them there are now adequate flows of graduates from their expanded educational systems. The biggest expatriate community is that originating from the former USSR with 4.2 million people, of whom 1.3 million with tertiary education, a ratio of 3.3 to 1; for India the ratio is under 2 to 1 (1.9 expatriates, 1 million with tertiary education), indicating that emigration from the developing countries does not necessarily consist mainly of low skilled persons (OECD SOPEMI 2004:127ff).

### **Conclusions**

Although the heavy concentration of R&D and skilled labor in the developed countries declines through FDI and the efforts of many LDCs to develop their own research, other factors, based on government decisions or originating from market

forces continue to attract those productive agents in various geographical regions.

The developments that tend to increase the migration of skilled labor through FDI and government initiatives do not seem to be of a temporary nature. Others, however, with the opposite effects are also very likely to continue. On balance, it appears that growing numbers of skilled persons will be employed in their respective countries of origin, while the flows of skilled migrants will also keep growing.

An increasing number of LDCs have now large flows of graduates from their extended educational systems, contributing substantially to the world research output in three main ways: By running their own public and private research centers; as partners and employees of the subsidiaries of the MNEs established in them through FDI; and through their nationals doing research work in foreign universities and research centers. Despite its alleged detrimental effects, globalization, whatever its definition, appears to be reducing at a quick pace the inequalities among countries in R&D and the production of high quality material goods and services.

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