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Óscar Afonso



FACULDADE DE ECONOMIA

UNIVERSIDADE DO PORTO

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ÓSCAR AFONSO

CEMPRE**, Faculdade de Economia do Porto
Rua Dr. Roberto Frias
4200-464 Porto, Portugal
email: oafonso@fep.up.pt

ABSTRACT

In this paper, we examine the studies, since Adam Smith, on the impact of commercial and technological aspects, resulting from international trade, on the physical accumulation and quality of productive factors. We remark that the theory of economic growth and the theory of international trade, during the 'classic period', constituted two inseparable branches of economics. In this epoch, it was believed that international trade has a positive effect on the economic growth. Later, during the 'neoclassic period', these two theories of the economic thought became autonomous relatively to each other. Consequently, the importance of international trade was neglected in the context of economic growth, especially until the 1960's. Recently, with the introduction of models of endogenous growth, both theories have merged again. The modelling frameworks advanced by the new models, as well as the recent developments inside the international trade theory, has allowed us to obtain a better understanding of the relation between economic growth and international trade.

Keywords: *economic growth, international trade, endogenous growth, comparative advantages, developed countries, less developed countries.*

RESUMO

No presente artigo analisamos estudos, desde Adam Smith, sobre o impacto dos aspectos comerciais e tecnológicos, decorrentes da abertura de um país ao comércio internacional, na acumulação física e melhoria qualitativa dos factores produtivos. Observamos que no 'período clássico' as teorias do crescimento económico e do comércio internacional caminhavam juntas e eram evidenciados os efeitos positivos do comércio no crescimento. Por sua vez, no 'período neoclássico' deu-se uma separação entre as duas áreas do pensamento económico. Consequentemente, os efeitos positivos do comércio no crescimento foram negligenciados, sobretudo até aos anos 60. Recentemente com os modelos de crescimento endógeno, crescimento e comércio voltaram a considerar-se conjuntamente. Além disso, a modelização proporcionada pelos novos modelos, assim como os recentes desenvolvimentos ocorridos na teoria do comércio internacional, possibilitou uma abordagem mais rigorosa da relação existente entre aquelas duas áreas de pensamento.

Palavras chave: *crescimento económico, comércio internacional, crescimento endógeno, vantagens comparativas, países desenvolvidos, países menos desenvolvidos.*

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1. INTRODUCTION

A brief historical sketch

It can be said that the positive effects of International Trade (IT) on Economic Growth¹ (EG) were first pointed out by Smith (1776). This idea prevailed until World War II (WWII), although with relative hibernation during the ‘marginalist revolution’. After WWII, the introverted and protectionist EG experiments had some significance, especially in Latin America. From the 60’s on, owing to the failure of those experiments and to the association of quick EG with the opening of IT and the consequent international specialization in several countries, as well as to the results of many studies based on the neoclassical theories of EG and IT, a new decisive role was given to IT as EG’s driving force.

However, although the dominant theoretical position tended, from the beginning (with the Classics), to indicate a positive relation between IT and EG, many studies linked the gains of IT only with static effects. But Baldwin (1984), for example, concluded, in a survey of empirical studies, that the static effects were of little significance. The debate has widened in the last decades, precisely in the direction of pointing out and stressing the dynamic effects of IT. The theoretical development afforded by the models of endogenous EG [especially after the works of Romer (1986) and Lucas (1988)], which stimulated the creation of empirical studies, moved toward an integrated analysis of the EG and IT theories. So, the classical tradition, apparently interrupted by the neoclassical separation of those two areas of the theory, seems to have been recovered, assigning, as a result, a decisive role to IT on the countries’ rate of EG.

The recognition of this importance has even led to the ceaseless appearance of proposals from international organisations, such as the World Bank (WB) and the United Nations (UN). As a result, many countries began to reduce commercial barriers and other controls of economic activity and obtained a significant (and lasting) increase in the rate

¹ We use the word ‘growth’ although it would sometimes be more correct to use the word ‘development’. The decision to use the word ‘growth’ has to do, above all, with the treatment given to both words in the literature consulted. In fact, the dominant literature assumes, in general, that growth is a necessary condition for development and that growth is easier to measure. Thus, “Prior to the 1940s, economists, with few exceptions, did not share this perspective [development], being concerned with material progress rather than the more complicated issue of development.”, and “During the 1960s, however, the emphasis began to change, this approach to economic development being criticized from a variety of point of view, the result being that by 1970s the emphasis of the subject had changed significantly.” [Backhouse (1985, p. 362 and p. 368)].

of EG, which suggests that extroversion has a dynamic effect on the economy, helping to speed up the rate of EG. Moreover, the processes of economic integration intensified.

Aims and structuring of the work

The EG theory analyzes, at an aggregate level, the evolution of the real product and its distribution (intra and inter countries). In general, the models regard that product as created with a limited and aggregate number of factors. Models which are initially designed to explain the EG of the Developed Countries (DCs) are, in general, ‘supply side’ models because it’s admitted that, in the long-term, the product of equilibrium is located in the proximity of the potential product, and because the latter depends on the availability of the factors and technological level. The main objectives of those models are to explain the variations of the factors and of the production function itself (i.e., of the way on which the product depends on the factors) and account the effects that these variations have on the evolution and distribution of production.

Our aim is to analyze the impact of commercial and technological effects (ignoring the financial component), resulting from IT, on the physical accumulation of productive factors and on its improvement (efficiency gains). In other words, in the rate of EG, during the evolution of economic growth theory. We then underscore studies that manifestly convey the ‘effect of EG’ (changes that modify, in a durable way, the rates of EG and its tendency in the long-term), instead of simple ‘level effects’ (changes that influence the EG only in the short-term).

The structure which is followed in this paper observes the temporal evolution and the status that we think commercial and technological aspects have in what concerns the EG models. In effect, it seems to us that in the ‘classical period’ the EG and IT theories were linked (section 2), that in the ‘neoclassical period’ there was a tendency toward their separation (section 3), and that recently, with the new endogenous EG approaches, they were again considered jointly (section 4). Finally, in section 5 we present the main conclusions.

2. CLASSICAL PERIOD: INTERNATIONAL TRADE AND GROWTH

Since the classics don't distinguish the questions of EG from the questions of IT, the examination of this problem leads us to the classics' main models of IT.² However, given the aim of this work, we attempt to advance on those models which basically discuss the 'static gains of the IT'.

As far as the interaction between IT and EG is concerned, we found two main ideas to point out in Smith (1776). On the one hand, IT made it possible to overcome the reduced dimension of the internal market and, on the other hand, by increasing the extension of the market, the labour division improved and the productivity increased. The IT would therefore constitute a dynamic force capable of intensifying the ability and skills of workers, of encouraging technical innovations and the accumulation of capital, of making it possible to overcome technical indivisibilities and, generally speaking, of giving participating countries the possibility of enjoying EG.

In turn, Ricardo (1817) presented a 'dynamic model of EG' with three forces and two restrictions.³ He characterized the progressive states as having high savings, capital accumulation, production, productivity, benefits and labour demand forcing the increase of wages and demographic growth. However, in view of the limitations of land, both in quantity and in quality, the additional alimentary resources were obtained in conditions of decreasing returns, in which the production is absorbed by wages in an increasing proportion, reducing the stimulation of new investments and, sooner or later, reaching the 'stationary state'.⁴ IT could delay the fall in the rate of profit.⁵ Apart from the contribution of IT, underestimating the importance of technology, he underestimated the positive effects of IT on technology.

Finally, among the Classics, Mill (1848) also explicitly reported the Classic point of view according to which the production resulted from labour, capital, land and their productivities. And just like Ricardo, he recognized that underlying the 'progressive

² More specifically, to the theory of absolute advantages developed by Smith and to the theory of comparative or relative advantages developed by Ricardo.

³ Forces: savings, IT and institutional element. Restrictions: law of decreasing incomes and Malthusian principle of population.

⁴ Characterized by: stagnated production, constant population and profit equal to risk premium and real wage equal to natural wage.

⁵ Maybe its interest to reject the corn laws [Ricardo (1815)] has been motivated by the consideration of the EG gains derived from that rejection, which by increasing the profit rate through reducing the land rent would benefit the capitalists and the industry through the accumulation of capital.

state' there was the 'stationary state', and that ultimately the force capable of delaying this state was technical progress. Accordingly, the emphasis that Smith had placed on the extension of the market decreases, even though he also defended free trade among countries. We think that this situation was the result of the expectation created by the Industrial Revolution (IR) in regards to technical progress.

3. POST CLASSICAL PERIOD: INTERNATIONAL TRADE AND GROWTH

Classical thought gave way to 'marginalism' from the 1870s onwards. This fact led to a 'new theory' (neoclassical) which, for some time, kept the main lines of the evolution of the economy in the long-term away from the studies.⁶ The structure of this section takes into account the separation that occurred between IT and EG theories, and takes also into consideration some reactions to the classical and neoclassical theories. We begin with the neoclassical IT theory (subsection 3.1), proceed to the post-classical EG, before Solow (subsection 3.2.), and then go on to the reactions (subsection 3.3.). Afterwards comes the modern neoclassical theory of EG (subsection 3.4.), and we conclude with the disclosure of extensions or works of synthesis, applications, and studies of commercial policies that discuss the theme under analysis (subsection 3.5.).

3.1. Neoclassical international trade

The followers of Ricardo ignored the question of the foundations of comparative advantages and didn't identify factors, resulting from IT, that could raise, in a lasting form, the rate of EG and its tendency in the long-term.⁷ In general, the changes introduced in the ricardian theory⁸ demonstrated the increase of welfare caused by IT, but ignored eventual gains in the rate of EG. It was in the context of neoclassical general equilibrium that the model of Heckscher (1919) and Ohlin (1933) appeared,⁹ whose

⁶ The huge potential contained in the contributions of the marginalists was so fascinating that it absorbed almost two generations of authors. In general, the preoccupation was mainly centered on the conditions of optimum allocation of rare resources that, to facilitate the analysis, were considered invariable.

⁷ Authors like Whitin (1953) and Mckenzie (1954) proposed models with variable production functions between countries, via a representative coefficient of productivity factors. But, even if some studies about trade between DCs [for example, MacDougall (1951), Stern (1962) and Balassa (1963)], find strong grades of correlation between exports and compared productivities, the fact that they are explained by exogenous causes isn't too reassuring about those models.

⁸ That basically entails considering the increasing opportunity costs instead of constant costs and the consumer indifference curves in the case of collectivities.

⁹ According to which, in free trade, each country tends to specialize in the good(s) relatively intensive on the factor in which the country is relatively more abundant.

contributions Samuelson (1948 and 1949) completed in the late 40's. In a rigid analysis of the model, we observe that it permits to advocate the opening of the countries to IT, showing that it is efficient, mutually beneficial and positive for the entire world. However, it limits the analysis to the static gains of welfare.¹⁰

3.2. Post-classical growth, before Solow

Generically, the classical economists gave us an idea of the race between the increase of the population and EG, with an uncertain winner. This version gradually disappeared with the IR, because the product increased from decade to decade in increasingly larger areas. That might be the reason why EG was no longer seen as a problem and why it wasn't amply pursued in the studies and writings of the following economists.

Nevertheless, Marshall (1890, p. 225) pointed out that "The causes which determine the economic progress of nations belong to the study of international trade". In effect, the expansion of the market that it represented led to the increase of global production and originated the increase of internal and external economies, which resulted in increasing income for the economy. But, although he understood the importance of those externalities, he also recognized the difficulties of his analytic treatment.¹¹ Among his successors, only Young (1928) was concerned with EG when he considered, like Smith, that the dimension of the market limited the labour division (and therefore, the productivity). He also examined the inter-relation between industries in the process of EG, the creation of new industries due to the specialization resulting from the extension of the market, the importance of specialization and standardization in a vast market and the influence of this market on technological progress.

Another exception of this period's remarkable was Schumpeter (1912, 1942 and 1954), who repeated old points of view concerning the tendency of the profit to reach a minimum and the dependency of the rate of EG on capital accumulation. But he went further, distinguishing 'invention' (advancement of useful knowledge to production) from 'innovation' (economic activity of exploring that knowledge). Considering the

¹⁰ It was also noted that the empirical tests done on its conclusions don't always lead to satisfying results [see, for example, Leontief (1953)].

¹¹ Regarding this, Marshall (1980, p.382) said: "The static theory of equilibrium is only an introduction (...) to the study of the progress and development of industries which show a tendency to increasing return".

latter as the central element of EG, he described the exigencies for a successful innovation, which included the need for markets opened to the exterior.

We conclude this subsection by mentioning some authors who made the restart of studies of dynamic themes – and, consequently, of the EG theory – easier, thus laying a good foundation for future investigations. Ramsey (1928) introduced the description of EG and the principle of research of an optimum EG. Cobb and Douglas (1928) presented production functions that became known as *Cobb-Douglas* production functions and which constituted an essential element of numerous models of EG. Harrod (1938 and 1948) and Domar (1937 and 1946) independently developed a model inspired in Keynes, which gave the research of EG an important momentum and a specific direction. Finally, Rosenstein-Rodan (1943) retrieved some of Young's ideas, when the problems of the Less Developed Countries (LDCs) attracted the economists' attention.

3.3. Reactions of classical and neoclassical theories

Immediately after the end of WWII, the dominant position was questioned, namely in the case of the LDCs. Those reactions abandoned the classical and neoclassical orientation in considering hypotheses that were strange to them.¹² The introverted and protectionist EG experiments of Latin America (industrialization for import substitution) also stood out, with rationalization and justification owing, first of all, to some structuralist economists [Prebisch (1949) – executive secretary of UN – and Singer (1950)] and to the UN Economic Commission for Latin America (ECLA). Essentially, they defended that the IT brought on negative consequences in the long-term for the LDCs because their specialization occurred in products with low demand income elasticity and, therefore, with a weak perspective of exports growth, and noticed a tendency for the constant deterioration of trade terms. Furthermore, this specialization entailed significant economic and social costs of adaptation to the evolution of the chain of IT.

Myrdal (1956 and 1957) sustained that IT didn't equal the remuneration of factors (in contradiction with the proposal of the neoclassical model) and that, unlike the industries of the DCs, the traditional industries of the LDCs remained weak. In short, the IT had some positive effects of diffusion on the LDCs, but in the long-term the negative effects remained because it stimulated a production of primary goods (plantations and mining

enclaves) subject to irregular prices and demand. Lewis (1954 and 1969) and the marxist author Emmanuel (1969) decided, respectively, on the deterioration of the trade terms of the LDCs and on the existence of unequal trade biased against the LDCs. Nurkse (1959) also questioned the relevance of commercial trade between the DCs and the LDCs for the latter. Perroux (1978) considered that the LDCs were controlled. Consequently, the EG and the structural transformation were induced by the DCs, which will cause the loss of potential positive effects to the external world, in the long term.

Another group of (radical) authors observed the economic relations as a whole (chain of goods, services and capitals): radical marxist visions [among others, Destanne de Bernis (1977) and Andreff (1981)] and the dependency theory [among others, Santos (1970), Frank (1970) and Amin (1970 and 1973)]. Basically, they defended that the underdevelopment was the consequence of the changes and deformations in the economic and social structures caused by the economic and social relation that existed with DCs.

3.4. Modern neoclassical theory of growth

In the late 50's and early 60's the interest for the EG reawakened with the recovery of the classical approach, according to which the production was a function of labour, capital, land and their productivities. The question of the 'accounting of EG' was also raised.

We can be pointed out 1956 as the year of birth of the 'modern neoclassical theory of EG' with Solow [and Swan (1956)]. The proposed model¹³ describes the relation between savings, accumulation of capital and EG based on a function of aggregate production (crucial supply), and there was a point of sustainable equilibrium (steady-state), which would be reached regardless of initial conditions. By increasing the productivity of the factors, the exogenous technical progress created positive effects on the process of accumulation and made the model compatible with a balanced growth path. In economic terms, this means that it took into account the convergence between economies. Moreover, along with the diffusion of technical progress there would be a

¹² For example, underemployment of resources, differences between industries according to their more or less dynamic effects, monopolies and factor mobility.

¹³ Whose basic characteristics are: closed economy, competitive markets, rational men, production function with constant returns to scale, productivity of the inputs (capital and labour) positive but decreasing, exogenous growth of labour and of technical progress.

convergence of the rate of EG per capita for a common steady-state. Consequently, it can be said that, by facilitating the diffusion of technical progress, the IT would be important for the LDCs.

As far as the ‘accounting of EG’ is concerned, Solow (1957) used the function of aggregate production as a starting point to measure the sources of EG in the United States. The rate of EG springs from labour and capital growth rates (which we call traditional sources), weighed by the respective participation in production and technical progress or total productivity of factors (TPF).¹⁴ The TPF resulted from the difference between the observed rate of EG and the part of that EG explained by the traditional sources (thus the designation ‘residual of Solow’). Clearly he distinguished ‘EG effects’ (the three sources mentioned above) from ‘level effects’. As a result, IT would, eventually, be a ‘level effect’ that would create positive effects in a transitory period of time.

From Solow on, many economists considered the advance of knowledge to be a source of the ‘residual’. However, the ‘accountants of EG’ (post Solow) included as sources the contributions of many elements such as the accumulation of ‘human capital’, economies of scale, the improved allocation of resources and the new generations of more productive machines [among others, Kendrick (1961), Denison (1962, 1974 and 1985) and Griliches and Jorgenson (1967)]. However, they didn’t quantify the advancement in knowledge, leaving a residual factor unexplained. Furthermore, they didn’t include IT, at least not explicitly, as a source of EG. We think that this situation is due to two factors that have already been mentioned. On the one hand, the separation that occurred between the theories of IT and EG, and on the other, the effects of IT on the level and not on the long-term rate of EG.

3.5. Theoretical synthesis, empirical applications and commercial policies

As we have said, the works of the ‘accounting of EG’ widened the scope of studies of the sources and began studying different structural situations, abandoning therefore some neoclassical assumptions. Thus, studies done since the late 1960s considered, besides the traditional factors, other explanatory variables, maintaining the functional scheme

¹⁴ Abramowitz (1956) observes that this item is usually designated in different ways, as TPF, residual factor, technical progress, growth of the efficiency factor, or as the factor that marks out our ignorance in ascribing increments of production to some specific factor.

proposed by Solow. In this context, in view of the need to determine the totality of growth sources and in view of the failure of introverted growth experiments, along with EG's association with the opening of IT, there was an increase in the research on trade and growth.

We present some theoretical studies and empirical applications which ensued, as well as studies/recommendations on the external commercial policy, whose defining characteristic resides in the fact that IT (above all the exporting component) is considered an explanatory variable of EG. They generally associate this situation with an improved allocation of resources (according to the comparative advantages), with a greater utilisation of productive capacity (which makes it possible to obtain economies of scale), with a greater propensity to implement technological improvement (in answering to the greater competition that they are subjected to), and with the higher level of employment created when compared to introverted strategies.

Theoretical synthesis

We begin with the structuralist synthesis of EG of Kuznets (1972), Chenery and Syrquin (1975 and 1989) and Chenery *et al.* (1986). In brief, we noticed that what is most relevant is the fact that the observation of the process of EG of the country depends on the changes of factorial provision but also, and especially, on changes in demand, leading to the increase of the internal market, the substitution of imports and the variations of exports. In this sense, they defend that the TPF included, among other factors, the ones associated with the weight and countenance of IT.

In turn, in a brief reference to the analyses that underscore economic integration (more or less institutional), we mention, for instance, Young (1928), Florence (1948), Stigler (1951), Meade (1953), Svernilson (1954) and Scitovsky (1958).¹⁵ This group of authors took dynamic effects into account,¹⁶ namely those resulting from the increase in competition, from the gain of economies of scale, from changes in the level and nature of investments, from the increase of research expenses, from technical progress and from the elimination of the risk and uncertainty in trade.

¹⁵ Also, for example, Nurkse (1953), Scitovsky (1954) and Lewis (1958) deserve citation. However, they consider the relation between the dimension of the market and the productivity in the case of LDCs.

¹⁶ We therefore left out works that, in relation to this, analyze static effects (basically resultant from trade creation and diversion) like, for example, Viner (1950), Meade (1955) and Johnson (1957 and 1958).

Another example is Findlay's model (1980 and 1984) for the commercial relations between the (developed) North and the (underdeveloped) South. While integrating the neoclassical theories of IT and EG and at the same time recognizing the specificities of the LDCs, he assumes that the economy of the North is dynamically described by Solow's (1956) model of EG, except for the fact that it consumes an importable good in addition to its own product, while the economy of the South works according to Lewis' (1954) model of unlimited supply of labour. The terms of trade [based on Johnson (1967)] related EG in the two economies. So, the South had the IT as the principal driving force of EG. However, the rhythm of EG was determined by the (exogenous) EG rate of the North.

We conclude with the work of Feder (1982),¹⁷ where EG proceeded from the effects of the traditional sources and from the exporter sector performance. In brief, he considers that economies have two distinct productive sectors (exporter and non-exporter), differing in the final destination of productions and in the superiority of the productivity of the traditional factors in the exporter sector. He concluded that the rate of EG was explained by the rates of investment, labour growth and exports growth. He also presents a way of comparing the relative benefits of the allocation of resources to both sectors.

Empirical applications

In what concerns empirical applications, we immediately point out the structuralist inclination present in Hagen and Hawrylyshyn (1969), Chenery *et al.* (1970), Chenery *et al.* (1986) and Chenery and Syrquin (1989). These authors tested the significance of 'structuralist' variables,¹⁸ and decided on its relevance in explaining EG, particularly in samples of LDCs and in the years that followed the 60's. They demonstrate, with empirical studies, the evidence that the exports promote EG. Moreover, they claim that the existence of imports limits may reduce EG.

Feder (1982) proceeded with the empirical application of the developed framework, in semi-industrialized and marginally semi-industrialized countries,¹⁹ between 1964-1973.

¹⁷ The model of Feder (1982) isn't exactly a theoretical synthesis, but a development of a framework to mark the influence of IT on EG. Its inclusion in the theoretical synthesis is justified by the influence that it has had on the empirical analyses of several authors.

¹⁸ For example, the inter-sector transfers of resources, Balance of Payments and export growth.

¹⁹ More precisely, he considered two cross-section samples, an extensive sample with 31 countries ('semi-industrialized' and 'marginally semi-industrialized') and a reduced sample (with 19 'semi-industrialized' countries), according to Chenery (1980).

He concludes that, statistically, its formulation was superior to the traditional neoclassical formulation. He also decided on the superiority of the marginal production of the factors in the exporter sector and on the externality of this sector over the other. Finally, he concluded that the allocation of one unit of capital to the exporter sector would create one marginal value for the economy superior to what would be obtained if it were affected by a non-exporter sector. Ram (1987) extended the analysis of Feder to the estimation of time-series for each country from a sample of 88 LDCs, in the years 1960-1985. The obtained regressions (being globally statistically significant) confirm the positive effect of the exporter sector, in about 70% of the countries.

We conclude by saying that even more sceptic empirical applications like those of Michaely (1977), Tyler (1981) and Dodaro (1991) do not challenge the positive effect of IT on EG, provided the countries have reached a certain minimum threshold of development.

The question of the international trade policies

In view of the failure of introverted EG experiments, of the success of extroverted EG experiences (case of countries of Southeast Asia) and of the dominant theoretical thought, the UN started to recommend the opening to IT. They started the process with resolution 1707 of 1961 and continued, for example, in 1964 with the UN conference on trade and development (UNCTAD I). Both the General Agreement on Tariffs and Trade (GATT/WTO), through successive rounds of negotiations and the recommendation of the Organisation for Economic Cooperation and Development (OECD) worked also in favour of the liberalization of trade [see, for example, Arndt (1987, pp. 72-77)].

Little *et al.* (1970) considered the strategy of substitution of imports to be responsible for the existence of firms with high costs, charging consequently high prices for their products, which can only be purchased by high income consumers. Thereupon this situation would lead to the dependence of the enterprises on governmental decisions. Therefore they defended the promotion of exports.

Balassa (1978) compared the strategies of promotion of exports with those of substitution of imports. His work is based on Michalopoulos and Jay (1973). He considers a sample of 10 LDCs with different grades of use of those strategies (in 1960-1966 and 1966-1973). Taking neoclassical production function, he uses different

versions functional forms, resulting from different exporting performances. From the results, he stressed, on the one hand, the significance of the export growth and, on the other hand, that the countries with rates of export growth higher than the average also registered the best performances. More recently, Balassa (1986 and 1987) analyzed the EG, between 1963-1984, of a group of LDCs that he divided in those turned toward the exterior and turned toward the interior, concluding that the former exceeded the performance of the latter, especially from the middle of the 70's on.

In 1985, Krueger observed that especially from the early 60's on, some LDCs reduced commercial barriers and other controls of economic activity and obtained a significant (and lasting) increase in the rate of EG. Namely, technological factors, of economic behaviour and political and economic consideration that involved dynamic effects (besides the static effects), helped explain the differences of performance among economies. Rajapatirana (1987),²⁰ co-responsible for the *World Development Report* 1987, claimed again Krueger' arguments, considering that the IT allowed for dynamic gains when subjecting the internal production to international competition and also made it possible for countries to specialize in different branches of industry and production stages. Moreover, by allowing access to the DCs' technology, along with the expansion of exports, it stimulated internal technological development.

Finally, an obligatory reference concerning the divulgation at an academic, institutional and political level is the *World Development Report* 1987 of the WB. With data concerning 41 LDCs, considering two periods of time (1963-1973) and (1973-1985), it grouped the countries in four groups according to the commercial strategy adopted (strongly extroverted, moderately extroverted, moderately introverted and strongly introverted). As a result, it came to the conclusion that the extroverted strategy was superior and decided that the fastest, most sustainable and even most balanced (in terms of personal distribution of income) EG was obtained with this commercial orientation.

4. MODELS OF ENDOGENOUS GROWTH AND INTERNATIONAL TRADE

In the field of the IT theory, the 'paradox of Leontief' originated debates and controversies leading to the appearance of new developments,²¹ which tried to explain

²⁰ Other works of authors of the WB could be mentioned [example: Michaely *et al.* (1989)].

²¹ To find some developments see, for example, Helpman and Krugman (1985) and Krugman (1989).

the advantages not from the standpoint of a static natural situation but circumscribed to an evolutionary process, associated with the EG, where the structural characteristic from which they proceed is continuously under change.²² The EG theory also suffered significant developments with the models of endogenous EG.²³ These models identify the moving force of growth, its respective dynamics and the forces that influence its accumulation (case of the IT). Thus, these placed the accumulation of human capital and the production and the diffusion of technological innovations in the forefront. The parallelism of these elements with the evolution of the theory of IT isn't accidental. In fact, the models of endogenous EG evolved towards an integrated analysis of the EG and of the IT,²⁴ recovering in this sense the classical tradition that had been interrupted with the neoclassical separation.

The models of endogenous EG did not come about by accident. Being concerned with the exact microeconomic foundations, they are consequence of the general development of economic theory. We should mention the developments and dissatisfaction with Solow's work, the earlier studies of themes such as learning by doing [Arrow (1962)], the role of human capital [Uzawa (1965)], increasing returns to scale [Kaldor (1961)] and even the idea of per capita growth sustained by increasing income from the investment in capital goods, which include human capital, dating back to Knight (1944); as well as the inspiration provided by countless authors which have already been mentioned, since Adam Smith.

In accordance with this recent developments, we open the section with a brief and special reference to Lucas' second model (1988) and to the models of endogenous Research and Development (R&D) devised by Romer (1990 and 1993), Grossman and Helpman (1990, 1991a and 1991b) and Aghion and Howitt (1992). We conclude with the mention of several applications.

²² The following should be noted: the recognition of non-homogenized production factors (specially labour), the innovation capacity, the dimension and structure of internal trade, product differentiation, the distortion of commercial nature, transport costs and economies of scale.

²³ Those developments were decisively impelled by Romer (1986) and Lucas (1988) and are analyzed, along with other subsequent contributions, for example, in Barro and Sala-i-Martin (1995).

²⁴ Autume (1994) noticed that the new theory of IT (which was also inspired by modern industrial economy) represented a similar development, because of its methods of analysis as well its themes, for the international dimension, as an important aspect of the EG analyses.

4.1. The model of Lucas and the models of endogenous R&D

In the model of *learning by doing and comparative advantage*, of 1988, Lucas deals with the relation between IT and EG. Essentially, he considered the function of aggregate production with two consumption goods and only one production function, human capital, whose rate of accumulation depended on the quantity of labour connected with production (thus expressing the learning effects). He concluded that with IT each country would specialize in the good for which the autarky donation of human capital presented a comparative advantage. And this specialization tended to be reinforced because the learning took place in the specialized sector. Accordingly, if the rate of learning differed from sector to sector, the rates of EG would be different from country to country.

In the endogenous EG models devised by Romer (1986) and Lucas (1988), the production function of the economy resulted from the aggregation of the firms. Consequently, they turned out to be extremely aggregate and incapable of correctly explaining the microeconomic foundations capable of justifying the functioning of externalities and the agents' investment decisions. A second generation of models [Romer (1990 and 1993), Grossman and Helpman (1990, 1991a and 1991b) and Aghion and Howitt (1992)] considered innovations to be the foundation of the EG process. The innovations were the result of an explicit activity of R&D that occurred in the firms, with the result of R&D being the main determinant of the EG rate.

Technological knowledge is by nature a good without rivalry of use (public good).²⁵ The market system can't correctly guarantee its production without some public intervention in implementing a system of patents. This system endows technology with the economic nature of a private good, in which the exclusion of use is possible, and which therefore can be sold. An economic problem immediately arises. By definition, the patent places the holder in a monopoly position, and by exploring that position he gains a monopoly rent. On the other hand, the patent entails a fixed cost for the user because its price is generally independent of use. A dilemma of economic policy also subsists in these models, in relation to the diffusion of innovations. The patent system is positive because

²⁵ The microeconomics theory designated it thus, because once they have been produced they can be distributed to all with no additional cost.

it allows the existence of private incentives of R&D activities but, on the other hand, it limits the diffusion of the externalities associated with innovation.

The producer finds himself in a situation of increasing returns (incompatible with the behaviour of perfect competition). Therefore, innovation leads to an imperfect competition of a profoundly dynamic nature that makes the rents of monopoly temporary, since the law endows the patents with a temporary validation, and because the innovations gradually become obsolete with new innovations. So, underlying innovation there is a continuous struggle to re(conquer) temporary positions of monopoly and of EG which are the result of that effort.²⁶ Of course, when enlarging the market, the IT allows holders to receive larger incomes and, therefore, greater incentives for new R&D.

Modelling the innovation process can be accomplished in different ways. Traditionally, we can have innovations of products or of processes. One of the most interesting paths views the improvement of products as a driving force of EG. The improvements can be made at the level of consumption goods – like in Grossman and Helpman (1991a and 1991b), in which the EG assumes a qualitative character, expressed in the increase of the variety or quantity of goods offered to consumers – or intermediary goods – like in Romer (1990) and Grossman and Helpman (1990) and a particular production function described the form that the innovations of a period depended on the effort of R&D –.²⁷ Aghion and Howitt (1992) developed a slightly different model, drawing attention to the particularly interesting aspect of Schumpeter's 'creative destruction'. They observed that the time for carrying out the innovation was random and, furthermore, that the innovations were conceived from the standpoint of the previous ones, which means that these could become obsolete and unprofitable.

The link between IT and EG was explicitly referred by Romer (1990) [as well as Romer (1993)] and Grossman and Helpman (1990, 1991a, 1991b and 1991c). Romer (1990)

²⁶ This is an argument contrary to the traditional neoclassical analyses, whose proposal is based on the fight against monopoly situations because they lead to price distortions, prejudicial to the efficiency of the world economy. However, it's a return to Schumpeter, since this author, though he recognizes the validity of the traditional neoclassical argument, defends a stronger contrary argument because the monopoly rents offer enterprises the possibility to innovate.

²⁷ Romer (1990), for example, suspects that the global stock of knowledge, shown at a certain moment by the number of the past innovations, has an externality effect on the current R&D. In effect, the register of the patent prohibits the use of innovation in production but doesn't exclude its free use as a source of inspiration for subsequent R&D.

sustained that even populous countries (with a large number of both consumers and workers) can still benefit from IT. His model suggests that what is essential in what concerns growth is integration, not in an economy with a large population, but in one with a high donation (provision) of human capital. The IT, in those integrated economies with different aggregate levels of human capital, was a factor of EG.

Grossman and Helpman (1990) considered that the rate of the world EG depended on the allocation of the human capital among sectors and on the existing level of the countries. In effect, the allocation of human capital to R&D has positive influences on the rate of EG. Therefore, the R&D activities should be mainly undertaken in the countries with a comparative advantage in R&D. Grossman and Helpman (1991a) take into consideration a model with 2 countries (with certain provisions of factors), 2 goods (homogenous and differentiated) and 2 factors (human capital and non-qualified labour). Integrated equilibrium can be reached in a certain interval for the initial provisions of factors. Each country specializes itself in a certain differentiated good – investing an adequate amount in R&D –, using the rest of its resources to produce the homogenous consumer good.

Like Rivera-Batiz and Romer (1991a), Grossman and Helpman (1991b and 1991c) went on to compare the meanings of EG of a closed and of an open economy. They stressed that, because IT was favourable to diffusion, open economies had access to a wider base of technological knowledge, which would lower their costs of product development and speed up the introduction of new varieties of goods. Furthermore, it allowed for the elimination of redundancies (for instance, countries could perform different kinds of research). Finally, stronger competition would foster creativity, innovation and the exploration of economies of scale.

Romer (1993) advises the LDCs to open to the foreign investment with more advanced technology so that they could register increases in the rate of innovation and in the rate of growth of the economy. The argument is that technology is the driving force of growth, and so, having access to better technologies or lower research costs increases both the rate of innovation and the rate of growth. Opening to foreign investors who know more advanced technologies would be a fast and costless way of increasing the rate of growth.

More recently, Barro e Sala-i-Martin (1997) [as well as Connolly (1997)] constructed a model of endogenous growth in which, in the long run, the world growth rate is driven by discoveries in the technologically leading economies (DCs). The imitator countries (LDCs) converge at least partially towards the leaders, as copying is cheaper than innovating in the presence of trade in ideas, i. e., international knowledge spillover.

4.2. Applications

We now propose to reveal applications that,²⁸ in light of the new EG theories, conferred a decisive importance to IT as a driving force of EG. We'll start with general studies and proceed with others which, in a more specific and explicit way, reinterpreted the empirical evidence of the role of IT in EG. We'll consider analyses that stress the dynamic effects of Economic Integration, the catch-up of convergence, the importation of capital goods and the capacity for adapting and imitating innovations, although sometimes it has been difficult for us to accomplish this separation, due to the interrelation between emphases. We conclude with the matter of causality between EG and IT.

Studies of general character

There are studies in the field of endogenous EG which, without intending to, have shown the special significance of IT. This is precisely the case with Levine and Renelt (1992), when they pointed out the existence of a positive relation between investment rates and EG rates and a similar relation between growth of export rates and investment rates. The increase in the rate of saving, which both allows and is 'materialized' in the increase of the rate of investment, also indirectly contributes to the impact of the growth of exports.

Another of those studies is the one by Englander and Gurney (1994), which evaluated the contributions of new approaches to the theory of EG striving toward the understanding of the productivity evolution in the OECD. Essentially, they noticed that the accumulation of human and physical capital (including infra-structures), R&D, technical knowledge and trade are presented as main sources of growth in the productivity in the long-term. As far as the significance of trade is concerned they defend that these factors speed up the diffusion of new products, processes and results of R&D among economies. They also quote Maddison (1991) to justify the positive correlation

²⁸ Both in terms of statistic/econometric treatment and in terms of the analysis of used factors.

between labour productivity and the increase of exports, as well as between labour productivity and the difference between the rates of growth of the exports and of EG. Finally, they defend that the most performing firms are the ones that successfully participate in world markets.

Reviewing the experience of the 'Asian tigers' in light of the new emphasis placed on human capital and on technological development, Mateus (1995) also pointed out the integration between productivity and export growth, stressing that, above all, they are dynamic factors that explain the maintenance of the process.

Economic integration

The enlargement of the market afforded by economic integration is viewed, as we have said, as a positive factor for the productive effectiveness of the integrated geographic group. Baldwin (1989) empirically analyzed the consequences of the big market of 1992 in the European Union (EU),²⁹ taking the endogenous mechanisms of EG into account. He noted that it led to an increase of the global rate of EG, in view of the mid-term effects it had on savings and investment and, in the long-term, on the rates of production and consumption growth and on the determinants of the innovation profitability.

Rivera-Bátiz and Romer (1991b) concluded that the intensification of world integration would lead to incentives and would avoid redundancies in industrial investigation. Moreover, they came to the conclusion that, compared to the residents in closed economies, the residents of the integrated economy had access to a wider base of technological knowledge.

Yet again in the analytic context of the endogenous models of EG, Bertola (1992) nevertheless proposed more modest results for the results of the European integration, taking into consideration the relation between the global economic efficiency of the 'union' and the phenomenon of EG location. According to the author, mobility would create an excessive concentration of production factors that could be prejudicial to the global EG, thus calling for a complex set of measures of economic policy.

²⁹ Dates from the institution of the Single European Market, following the Cecchini report and the Single European Act.

Catch-up of convergence effect

Several works focus on the convergence effect (catch-up bonus), which is potentially visible in any open economy that is not a leader in technology. The basic formulation considers that these economies, besides having the incentive to reach the leader(s), have at their disposal technologies that have proven their worth. This enables them to choose the best or most adequate to fit their needs and capacity, at a lower cost (imitation). He also states that the differential between a converging country's rates of EG tends to lower with the lag reduction, because the opportunities for innovation, diffusion or knowledge convergence become less abundant. Finally, he reveals that the effect depends on the intensity of international trades and on the ability of internal technological adaptation (and emphasizes the importance of human capital for this purpose).

Fecher's study (1992) can be taken as an example. Given that several empirical studies considered the countries' abilities to imitate technologies of leader country(ies) and the activity of innovation to be vital factors for productivity growth, he empirically analyzed this situation in (eight) industrial sectors of (eleven) OECD countries, in the period 1970-1986. In order to undertake this task, he divided the TPF into technical progress and increase of technical efficiency. He noted the explanatory power of the catch-up (with positive influence on technical efficiency) and of R&D (with positive influence on technical progress) in relation to the TPF, as well as the benefit deriving from the separation of its elements into technical progress and increase of technical efficiency.³⁰ He also considered additional hypotheses related to the international atmosphere. Stressing that R&D sectors can efficiently prevent other national and foreign sectors from taking advantage of their projects, he includes a measure of international and intra-sectoral externality that would have a positive and significant effect on technical progress. And he considered two additional variables that reflect changes in the terms of trade and in the growth of world demand, which had a positive and statistically significant impact on technical efficiency. Moreover, he noticed that the coefficients of the catch-up and R&D variables were robust in what concerns the inclusion of new explanatory variables.

³⁰ That situation impels Fecher (1992, p. 24) to say that he confirmed the results of other works which tried to prove the importance of those factors to the evolution of productivity after WWII, like those of "Fagerberg (1989) (...) Kormendi and Meguir (1985) (...) Dowrick and Nguyen (1989) (...) Dollar, Wolff and Baumol (1987) and Dollar and Wolff (1988) (...)".

In 1988, Englander and Mittelstadt ascribed the cut in productivity growth in the OECD (that, in average terms, went from about 3%/year in the 60's to 0.5%/year in the 80's) above all to the decrease of the catch-up possibilities (decrease of the technological trench in relation to the leader country, US) in the context of a decrease in international trade (increase of protectionism).

Larre and Torres (1991) also pointed out the catch-up effect as a raiser of productivity gains. As for the channels that make this possible, they mentioned the importation of technology by residential agents and the establishment of foreign firms that, in turn, imported or produced those investment goods. Referring to the Portuguese, Spanish and Greek experience of the 60's and 80's, they considered direct foreign investment and the opening to IT to be conditions that rendered the effect favourable.

Similarly, in the model developed in 1993, Ben-David conferred a central role to IT as a propagator of the catch-up effect. This work is, in fact, often quoted to justify the important role the IT plays in the income and the real convergence of the LDCs.

Recently, Cameron *et al.* (1997) also pointed out how important the technological diffusion that occurs with IT is for the LDCs. Cameron *et al.* concluded, for example, that the IT affects the rate of convergence of the productivity in three ways: it helps to speed up the domestic rates of innovation, affects the quantity of technological know-how that may be transferred from the frontier to the LDCs and, finally, affects the rate at which this technology transfer occurs.

Finally, general works of identification of the sources of EG also decided on the importance of the catch-up. These are Englander and Gurney (1994) – when associating the evolution of the TPF to the imitation of the technology used by the leader economy, Pack (1994) – who, when re-reading the importance of the IT, stressed that the LDCs could register improvements in the TPF because the initial delay offers an opportunity that can be exploited – and Mateus (1995) – when he considered that the 'Asian tigers' obtained technology from the DCs via the volumes of investment executed in the context of economies oriented toward exportation –.

Importation of capital goods

Just as the earlier ones, the works now quoted discuss the importance of IT to the composition of the investment and not only to the total accumulation of capital, because it allows access to imported production factors incorporating new and improved technologies. De Long and Summers (1991 and 1993) studied the relation between investment and physical capital and the TPF, noticing that the countries that confer a greater portion of their product to investments in machinery tend to register a higher level of TPF. And De Long and Summers (1994) showed that, excluding DCs from the sample, the investment in machines comes from imports, and this is how foreign technology is incorporated. In the same way, Rodrik (1994) and Lee (1995), for example, recommend the opening to IT, specially in what concerns the importing of capital goods.

Pereira (1996) studied the impact of imported capital on the performance of the Greek and Portuguese economies, in the period 1962-1990, with an econometric modelling that took into account the direct and indirect dynamic feedbacks of the changes in imported capital on internal behaviour. He concluded that the accumulation of imported capital affected the product as an additional factor of production and as a productivity fomenter (because it was technologically advanced). Besides this, the imported and internal capital showed to be complementary (an increment in the rate of accumulation of imported capital implicated an increment in the variation rate of internal capital) and the imported capital and the labour presented a relation of substitutability (advanced technology substitutes non-qualified labour). Finally, the marginal product of the imported capital was greater than the marginal product of the internal capital. This fact also suggests a relative shortage of imported capital. This shortage was lowered after the countries' adhesion to the EU. As a result, the facility of access to external markets granted by the process of economic integration positively affected the economies through the importation of capital goods.

R&D, capacity of innovation and *spillovers*

In 1993, Coe and Helpman associated the path of TPF to changes in the stock of R&D (proxy of the stock of knowledge/capacity of innovation), domestic and foreign (pondered by the importance of the imports on the Gross Domestic Product), in 21 industrialized economies of the OECD, in the period 1971-1990. The results confirmed the positive relation between a country's R&D stock and its TPF. However, in the

context of work, it is more relevant that a country's expenditures with R&D influence the TPF of other countries. In fact, in 1990, they noticed that the benefits of the investment in R&D of the more industrialized DCs reverted to the other countries. Besides this, the greater the effect of the stock of external R&D on the domestic TPF, the greater the opening of the economies to the exterior. Finally, they noticed that the LDCs were the ones that benefited most from the stocks of external R&D.

In a later work, Coe *et al.* (1995) developed this last point, applying the same type of model³¹ to a sample with a greater presence of LDCs, and concluded that, in the sequence of the IT, the LDCs obtained important spillovers derived from DCs' R&D, that the larger spillovers originated in the US, which hold the largest stock of R&D, and that a strong association exists between the intensity of IT and the provenance of the spillovers.³²

Growth, international trade causality

In 1996, Frankel *et al.* dealt with the possible causality between the EG and IT, resorting to the experience of the Southeast Asian countries. They began by referring the estimates of the several empirical studies which afford the IT a decisive role as a source of EG,³³ but the estimates were obtained with methodologies incapable of testing the direction of the causality between the variables. As a result, they noticed that these works were seen with reserve, since, according to others, the existent correlation made it possible to support contrary hypotheses.³⁴ So they considered it necessary to make IT endogenous, having decided on the importance of the catch-up effect (particularly in China, Indonesia and Thailand), investment and education (specially in Japan, Korea and Taiwan) and of the opening to the IT (specially in Hong Kong and Singapore) to EG. Furthermore, if there is a causality between EG and IT, this helps reinforce the effect of IT on EG, instead of questioning it.

In a recent work, Frankel and Romer (1999) enlarged the study to include 150 countries, in 1985, and concluded, for example, that the trade appears to raise income by spurring

³¹ With some adaptations, specially due to the inclusion of the rate of education as a proxy of human capital, to attend to the capacity of the gains of the spillovers derives from the DCs (due to the fact, according to some authors, in 1991, the G7 led 92% of the R&D executed on the world scale).

³² For example, it is noted that, in general, the countries of Latin America have more intense commercial trades with the US and are also more influenced by the R&D done by the US.

³³ Understood in its ample sense. And they quote Grossman and Helpman (1991b and 1991c) in order to stress that very important spillovers are obtained by imports as well as by exports.

the accumulation on physical and human capital and by increasing output for given levels of capital.

5. CONCLUSION

In the present work we tried to explain the importance of commercial and technological (dynamic) aspects underlying the IT to EG.

We noted that the dynamic potential afforded by IT that was pointed out by the classics [Smith (1776)] was disregarded by the ‘marginalist revolution’. This was due to the fact that the ‘marginalist revolution’ studies temporarily left out the lines of the long-term evolution of the economy. As we know, after 1870 the EG was no longer viewed as a great issue for economists due, as it seems, to the perspectives opened by IR. Nevertheless, as exceptions to the rule, authors like Marshall, Young and Schumpeter still dealt with the importance of IT to EG. On the other hand, for instance, the main development in what concerns the scope of the IT theory (the Heckscher-Ohlin-Samuelson model) came to the conclusion that countries benefited from the opening to IT; however, it did no more than identify static gains. But existing studies – for example, Baldwin (1984) – conclude that the static effects (gains only for the increase in the level of per capita income) are very modest.

It was in this context that, namely after WWII, occurred some reactions to the classical and neoclassical theories which ended up being put to practice in the experiments with introverted and protectionist growth, specially in Latin America. In short, the defenders of these theses maintain that the relevant products as regards IT were produced in keeping with the appeals of the DCs markets and their technologies. Thus, the LDCs were in a disadvantageous situation due to their reduced dimension and sophistication of their markets, as well as to the weak capacity for technological innovation and to the commercial intervention in what concerns the DCs consumers.

The interest for the EG reawakened, however, with the works of Solow (1956 and 1957). From then on there was a real concern in analyzing the questions belonging to growth in a quantified and systematized way (with a clear distinction between questions belonging to growth and questions belonging to development).

³⁴ See, for example, the work of Jung and Marshall (1985).

It should be noted, however, that Solow's (and Swan's) neoclassical growth model assumed technological progress to be exogenous, not because this was a realistic assumption, but because it was the only tractable one. This suggests that interaction with other countries may have no effect on an economy's long term rate of growth. Nevertheless, there may be some interesting effects of openness in the long term level of welfare, and in the transition to the steady state. In the open economy version of the neoclassical model, international flows of capital raise the rate of convergence to the steady state.

In the late 1950s, the seminal paper by Solow (1957) attempted to account for economic growth in the US, finding it to be not fully explained by the increase in productive inputs such as labour and capital alone. The largest part of growth was thus attributed to a residual. In subsequent research, much effort was devoted to trying to better understand the origin of productivity increases by squeezing down the residual, by introducing other variables such as accumulation of human capital, economies of scale, a better allocation of resources and new generations of more productive machines. However, even with the introduction of new variables an unexplained residual remained.

Therefore, on the one hand, the attempt to determine sources of growth in their entirety and, on the other hand, the failure of introverted growth experiences and the association of fast EG to the opening of IT and to the resulting international specialisation in several countries led to the undertaking of research on trade and growth (which adopted the neoclassical framework). We mentioned some theoretical studies – structuralist syntheses, analyses that underscore economic integration, the models of Findlay (1980 and 1984) and Feder (1982) –, empirical applications – among others, structuralist studies, Feder (1982) and Ram (1987) – and studies and/or recommendations about the external commercial policy – among others, UN recommendations, Balassa (1978, 1986 and 1987), Krueger (1985) and WB (1987) – whose defining characteristic is to view IT (above all the exporting component) as an explanatory variable of EG.

Generally, they associate that situation with a better allocation of resources (according to the comparative advantages), with a greater utilisation of the productive capacity (which makes it possible to obtain economies of scale), with the greater propensity to implement technological improvement (in answering to the greater competition that they face) and with the higher level of employment created in comparison with introverted strategies.

Although this body of literature enlarged the original framework, technology was still treated as a public good.

However, on the one hand, in view of the neoclassical theory's limitations (mainly because the technological progress is exogenous but also because, in open economies, this suggests that, in practice, the increase of the convergence among countries is not verifiable) and, on the other hand, in view of the many developments and suggestions which are afforded by Smith, Schumpeter, Knight, Arrow, Kaldor and Uzawa, among others, economists have recently started to model the process of knowledge accumulation, and the resulting literature is known as endogenous growth theory. This allows us to develop tractable and flexible models that embody the vision of economics life as an endless succession of innovation and change wrought by competition.

These growth models allow for an economy to be able to reach a balanced growth path through endogenous forces and underscore the microeconomic foundations of the growth process, identifying in detail the driving force of growth (which is knowledge, generally under the form of technological innovation), its respective dynamics as well as the driving forces which influence its accumulation. Thus, in most new models the determining factor of economic growth is endogenous innovation, and this innovation is still influenced by IT. Consequently, the modelling which these new models afford brought with it a more exact approach to the relation between EG and IT. So we can say that the dynamic potential created by IT was decisively recovered more recently with the advent of the models of endogenous growth.

Furthermore, the endogenous approach, bringing increasing returns and non-competitive market structures into the core of growth analysis, made it so that perfect competition would no longer be a *sine qua non* condition for optimal trajectories of growth to exist. The growth path may not be optimal. So, the governmental intervention may be useful in order to move the growth path towards the optimal one.

Regarding the contribution of IT to EG, in light of the new approach, we alluded to Romer's work (1990), which viewed IT as a motivating factor of growth, when integrating economies with different levels of human capital. We also saw that the assumptions as to differences among countries condition trade patterns and their effect on growth. With respect to this, Lucas (1988) and Grossman and Helpman (1991a) assume that the only differences among countries have to do with initial provision of

factors, whereas Grossman and Helpman (1990) point to differences in respect to the countries' technological capacities.

The works of Grossman and Helpman (1991b and 1991c) and Rivera-Batiz and Romer (1991a) have also helped clarify why a country's participation in an integrated world economy can speed up its growth: among other reasons, it allows access to a wider base of technological knowledge, it makes technological diffusion easier, it motivates research and avoids redundancies in research. We also presented Romer's work (1993), which recommended that the LDCs open to the foreign investment with more advanced technology so that they could register increases in the rate of innovation and in the economy's rate of growth.

In this context, the abundant empirical evidence, specifically, suggests that trade openness tends to be beneficial for growth. Especially for the DCs, because they affect the domestic rates of innovation. And for the LDCs (which hardly invest in R&D) because of the dynamic effects of the economic integration with DCs, the catch-up of the convergence, the importation of capital goods and the capacity for adaptation and implementation of innovations. Finally, let us mention that the intensity of dynamic effects depends simultaneously on the geographic structure of international trade (i. e., on the level of development of trade partners), on the composition and intensity of IT and on the capacity for internal technological adaptation, which is made possible through higher levels of human capital, as suggested, for example, by Lucas (1988) and Romer (1990).

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