IOSR Journal Of Humanities And Social Science (IOSR-JHSS)
Volume 29, Issue 10, Series 1 (October, 2024) 07-17
e-ISSN: 2279-0837, p-ISSN: 2279-0845.
www.iosrjournals.org

Technical Progress And Technological Dependence In Developing Economies

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Abstract:
This study aims to analyse the concept of endogenous technical progress and its implications for the development of emerging markets. The discussion focuses on the ability of developing countries to assimilate and adapt external technologies and the importance of building internal research and development capacities. The analysis examines the challenges these countries face in achieving sustainable technological autonomy and the impact of multinational companies on the technological evolution of local industries. The role of state intervention is explored as a crucial factor in overcoming the limitations imposed by international competition and fostering an environment conducive to technological innovation. The study highlights the need for integrated strategies, combining the adoption of external innovations with efforts to strengthen domestic technological capabilities, aiming for independent and sustainable economic growth.

Keyword*: Endogenous technical progress; Emerging markets; Multinational companies; Research and development; State intervention.*

Date of Submission: 20-09-2024 Date of Acceptance: 30-09-2024

I. Introduction

Technical progress is part of a sequence of transformations initiated by the Industrial Revolution. The current global situation features various countries with differing levels of technological advancement. In developed nations, technology is created and adapted for diverse industries. In contrast, developing countries often import technology, incurring high costs.

Recent technical advances have transformed sectors, including tax auditing. Modernisation and digitalisation in areas such as tax audits and electronic declarations have enabled automation, replacing tasks traditionally performed by workers. Advances in AI and data processing technologies help authorities collect information effectively, simplifying auditing and inspection processes. This trend is part of the broader movement towards intellectual automation, taking over roles that previously required human intervention and extending now to complex intellectual work.

The division of labour historically set the stage for innovations in the production process. This process, which started in the 18th century, led to the emergence of machinery that utilised new forms of mechanical energy and gradually replaced human effort, Smith (1776). The worker's role shifted from manual tasks to issuing commands to machines, which now perform most tasks. The evolution of technology suggests that this transformation is ongoing, with new innovations poised to reshape the production landscape further.

Technical progress in a global context reflects different industrial structures, marked by varying rates of technological change. While developed countries create a significant portion of their technology, developing countries often import it at high costs. This importation has long-term implications for technological dependence and economic development, which will be explored later in this study.

It is important to consider the market conditions under which these interactions occur to understand the dynamics between technology-creating and technology-importing nations. This study introduces the concepts of Contestable Markets and Schumpeterian Competition to frame the discussion. It then focuses on developing countries' technological policies, examining Brazil's specific case and the role of Multinational Enterprises (MNEs) in these contexts. Following this, the study addresses technology transfer and the strategies employed by firms, alongside the socioeconomic aspects of technology importation and dependence.

This study aims to explore the impact of technological dependence on developing nations and propose strategies for building indigenous technological infrastructure. By addressing the difficulties posed by a lack of

[1] The opinions and conclusions expressed in this study are solely those of the authors and do not necessarily reflect the official position of the institution.

technical and scientific foundation and the influence of multinational corporations, the study seeks to outline a balanced approach that combines protectionist strategies with openness to technological progress.

The study is divided into sections to achieve these aims. The first section provides a theoretical framework, introducing key concepts such as contestable markets and Schumpeterian competition. The second section discusses the characteristics of technical progress, differentiating between endogenous innovation and imported technologies. The third section examines the role of multinational enterprises in the technological development of host countries, focusing on both their positive contributions and the challenges they pose. The fourth section addresses the socioeconomic aspects of technology importation, highlighting how developing countries can adopt a technical base suited to their specific conditions. Finally, the fifth section presents the conclusion, summarising the findings and outlining strategies for developing countries to overcome technological dependence and foster sustainable economic growth.

II. Technical Progress: Definition, Types, And Impact

Technical Progress of Schumpeter

In the economic context, 'technical progress' is a broad concept encompassing both 'technical change' and 'innovation.' Technical progress refers to improvements in production processes, machinery advancements, and overall economic productivity growth. Within this framework, 'technical change' includes any alteration in the production function, such as technological upgrades, enhancements in human capital, and efficiency improvements. Meanwhile, 'innovation' involves practically applying new ideas, products, or processes that drive technical progress by introducing tangible economic improvements.

Schumpeter is a central figure in the debate on technical progress, addressing its nuances and economic impacts. Schumpeter's analysis emphasises the role of innovation and entrepreneurship in driving economic growth and disrupting existing market structures. His concept of 'creative destruction' highlights how technological advancements can lead to both the decline of outdated industries and the rise of new economic opportunities.

Schumpeter (1942) defines technical progress as changes involving the use of new machinery and the modification of equipment in the production process. In line with this, Solow (1957, p.312) states: "The variable t for time appears in F to allow for technical change. It will be seen that I am using the phrase 'technical change' as a shorthand expression for any shift in the production function. Thus slowdowns, speedups, improvements in the education of the labour force, and all sorts of things will appear as “technical change.” In this way, technical progress encompasses any shift in the production function, including productivity variations and improvements in workforce qualifications.

Moreover, in the capitalist system, technical progress involves introducing new products and production processes. Even minor changes consumers perceive, often driven by advertising, can be considered innovations. Although marketing can influence the perception of innovation, true technical innovation generally refers to tangible changes in technologies or production processes. Schumpeter (1942, p.83) observes: "The fundamental impulse that sets and keeps the capitalist engine in motion comes from the new consumers’ goods, the new methods of production or transportation, the new markets, the new forms of industrial organisation that capitalist enterprise creates." This view highlights technical progress as a central factor in capitalism's dynamics, driven by the creation of new consumer goods, production methods, markets, and forms of industrial organisation.

Human Capital and Innovation

Beyond Schumpeter's emphasis on innovation, the role of human capital in fostering technical progress is equally significant. Human capital forms the backbone of innovative activities through education and skill development, driving economic growth and enhancing productivity.

Technical progress involves a continuous process of innovation, which can be divided into 'primary' and 'secondary' innovations. Primary innovations represent breakthroughs that fundamentally transform existing technical foundations, such as the invention of new machinery, processes, or products. By replacing outdated technologies, they exemplify the concept of 'creative destruction,' opening up new possibilities for economic development.

Secondary innovations, on the other hand, follow the introduction of primary innovations. They focus on refining, enhancing, and adapting the initial breakthroughs to improve efficiency, optimise production routines, and consolidate the technical base. Secondary innovations thus contribute to the ongoing evolution of the technical framework by building on the foundation established by primary innovations. This cycle of innovation—where primary innovations pave the way for secondary ones—drives economic growth and productivity, reshaping market structures and competitive dynamics.

Together, primary and secondary innovations fuel technical progress, driving changes in production processes and enabling the emergence of new industries. The continuous interplay between these forms of

innovation ensures economic systems' sustained evolution, fostering competition and development. Technical progress can occur endogenously when innovation is generated internally within industries which benefit directly from their innovations, creating a continuous development cycle. On the other hand, exogenous technical progress occurs when industries adopt innovations developed in other sectors of the economy, such as textile industries using equipment produced by the chemical industry. In such cases, the industries incorporating external technologies do not directly influence the development of technical progress; they merely access these innovations, which can also benefit competitors. Adopting these external technologies is beneficial and relevant for companies to maintain their competitiveness, as Jorgenson (1973) observed. For the author, maintaining competitiveness in the market is important for survival.

Human capital is a factor of production that drives technical progress in all economies. However, this role is limited in emerging countries, where there is a lack of resources to train skilled researchers and invest in research to promote innovation and technological development. Therefore, it is important to examine how technical progress manifests and impacts these economies

Technical Progress in Emerging Markets

Technical progress is essential in shaping the development of emerging markets. In these markets, adopting new technologies can redefine competitive patterns, influence the operations of multinational companies, and significantly impact local economies. Understanding how technical progress interacts with the unique conditions of emerging markets is vital for grasping the broader dynamics of global economic development.

Multinational companies can drive technical progress in emerging markets. They introduce advanced technologies and processes, contributing to the development of local economies. However, they also present challenges for domestic firms, which may lack the resources to invest in research and development on a similar scale. Multinationals often dominate markets, shaping local consumption patterns and setting competitive standards. This influence highlights the complex relationship between local firms and multinationals, where technical progress can either promote growth or deepen economic disparities.

Emerging markets' ability to internalise technical progress is limited by various factors, such as insufficient resources to train skilled researchers and invest in local research and development. Many of these countries rely on external technologies, leading to a dependency that hinders their capacity to drive innovation independently. Furthermore, the lack of infrastructure and capital to support homegrown technological advancement exacerbates these challenges. To overcome these barriers, it is necessary to implement policies that support the development of a skilled workforce and promote domestic innovation.

Developing cutting-edge technology requires investment in research and development, alongside protective measures to nurture domestic industries. Countries like Japan and Germany have successfully employed this approach during their late industrial revolutions, where state-led initiatives fostered technological innovation and industrial modernisation.

The late industrialisation in many emerging markets demonstrates the importance of government policies in promoting technological advancement and industrial growth. For instance, while Argentina and Australia shared similar economic development trajectories at the beginning of the 20th century, Australia experienced more significant industrial progress due to the government's intentional industrialisation policy, as highlighted by Dieguez (1985). This comparison underscores the critical role of state intervention in steering economic development.

Technical progress in emerging markets is closely linked to the level of available human capital. Skilled labour and robust research institutions are vital for transforming knowledge into innovation. As Nelson and Phelps (1966) and Lucas (1988) highlight, higher education levels within the population increase workforce productivity and drive economic growth. Therefore, investing in human capital enables emerging markets to leverage technical progress for sustainable development.

Industrial Structures

Industrial structures are key in shaping the pace and direction of technical progress. The characteristics of different market structures, such as oligopolies, monopolies, or competitive markets, directly influence corporate strategies and their investment in research and development. For instance, sectors with high-profit margins, like oligopolistic industries, often have more resources to fund technological advancements, impacting how firms innovate and compete in the marketplace.

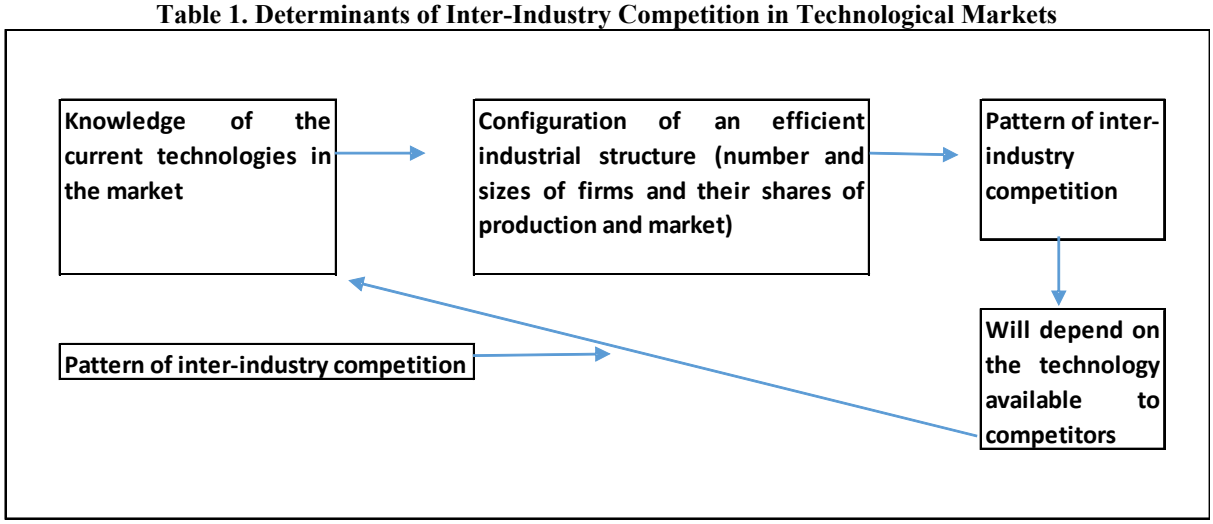
Introducing new techniques shapes the behaviour of companies and the market in which they operate. This outcome occurs because businesses that excel in technological innovations are the most prosperous overall. However, it's important to note that the market structure, in turn, significantly influences corporate strategies. In oligopolistic sectors with high profit margins, companies have more resources to fund research and development

expenses and attain technological advancements. The pharmaceutical industry serves as an example. Thus, it can be said that there is a reciprocal relationship between technical progress and industrial structure.

The concept of contestable markets is relevant in studying the interactions between technical progress and industrial structures. These markets are characterised by the ease of entry and exit for firms, which means that the threat of potential competition more influences the industrial structure than the production and pricing of established firms (Baumol et al., 1982).

Applying the most efficient industrial structure in these markets depends on the available technologies and the capacity to produce goods in volumes compatible with the market size. The competition cycle is completed as the competition pattern depends on assessing the strength of potential competitors, which influences the strategies adopted, as described in the following Table 1.

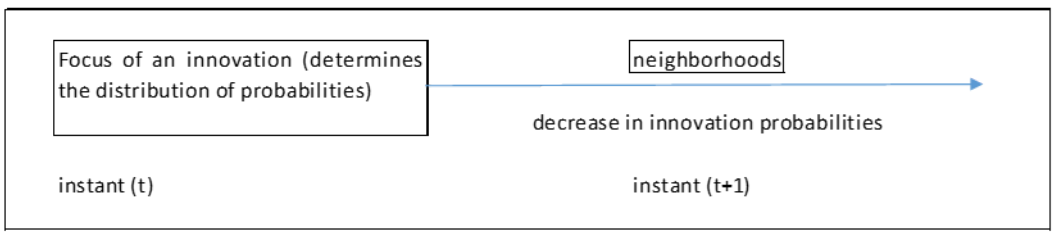
Table 1. Determinants of Inter-Industry Competition in Technological Markets



The Importance of Technology in Contestable Markets

Technology influences contestable markets by enabling potential entrants to challenge the practices of established firms. For this to happen, these competitors must have access to the technologies used in the industry and be capable of recovering their entry costs upon exiting the market. This is the ideal situation of perfectly contestable markets, characterised by absolute freedom of entry and exit; however, such markets are rare under current conditions. As shown in Table 2 below, technology and access to economies of scale and scope directly influence the dynamics of contestable markets.

Table 2. Stages of Industrial Market Evolution



The prevailing production techniques influence the size of firms and their production volume through two main mechanisms that promote cost reduction: economies of scale, where an increase in the use of inputs results in a more than proportional increase in the final output; and economies of scope, where the combination of two or more production lines within a single company reduces the costs of the production process. Depending on these economies, the industrial structure can range from a natural monopoly, characterised by the presence of a single company, to a natural oligopoly, with a few companies or a competitive market, with many companies.

Choosing the most suitable industrial structure leads to forming industrial complexes, which are groups of industries interconnected through significant relationships of buying and selling goods in the production process. The theory of contestable markets explains the relationship between technical progress and industrial structure. In contrast, Schumpeterian competition theory highlights that industrial structure results from the interactions between technical progress and the competition process (Tavares Jr, 1984, p.6).

In this context, Schumpeter argues that innovations are more likely to arise in markets with a certain degree of monopoly or oligopoly. In his view, large firms with market power and access to significant financial resources have a greater capacity to invest in research and development, driving innovation. This idea is associated with Schumpeter's concept of "creative destruction," where innovations promoted by dominant firms can destabilise and transform existing markets, leading to new industries and market structures. Therefore, for Schumpeter, a certain level of market power is often necessary to sustain innovative efforts.

The Schumpeterian theory concerns the irregular pace of innovations and their impact on the production chain. Competition arises when a technological innovation revolutionises the product transformation chain, forcing other links to become more efficient in utilising the introduced innovation. Technological discoveries give rise to natural paths of exploiting their potential, leading to a series of complementary innovations and cycles of prosperity and decline. The closer the innovation is to the initial focus, the higher the probability of innovations emerging.

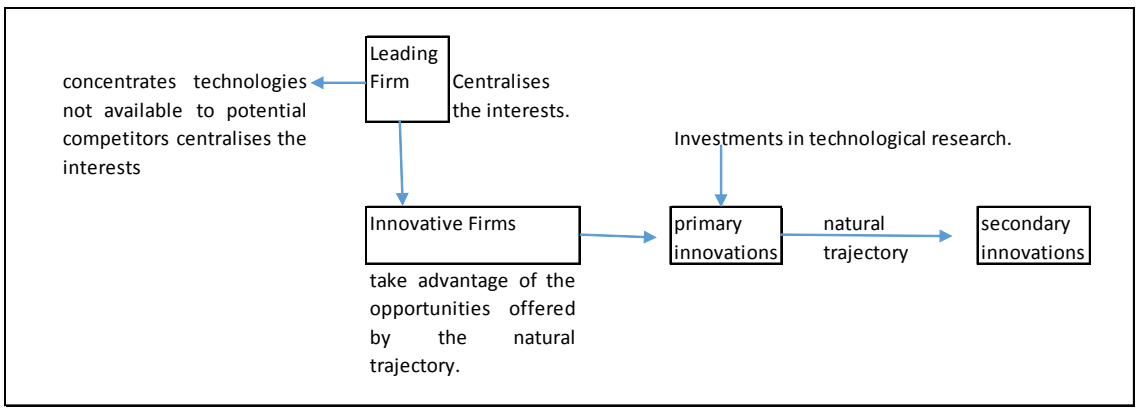
For traditional microeconomics, as Mankiw (2020) states, the definition of competition is related to the number of firms and their ability to set prices. In the Schumpeterian perspective, however, competition is seen as a dynamic process from which winners and losers emerge. Although the influence of technical progress on the determination of industrial structures has already been analysed, it is also important to discuss how this progress impacts competition between firms.

Each firm's competitive strategies are formulated based on its technological capabilities. Firms that master specific technical knowledge can use this technology as a competitive tool. This aspect is particularly evident in product differentiation strategies, where new technologies enhance product qualities, as seen in the automotive industry with new models. Technology also impacts markets for homogeneous products by making production more efficient and reducing costs. There is, however, a divergence between certain governments of developing countries, which prefer technological specialisation, and entrepreneurs, who prefer to diversify their production to cope with market volatility.

Firms incorporate technical progress through the knowledge available in society, but only a portion of this knowledge is effectively transformed into production techniques. Furthermore, the innovation creation and appropriation system is not equitable, as production always involves activities that require advanced knowledge of the technical base. Within an industrial complex, a "leading industry" drives the innovation process, introducing radical innovations that significantly alter production processes.

Innovative firms within this complex adjust their operational routines according to the natural pathways that emerge from major innovations, which are the foreseeable paths of technological development. Incremental innovations arise to address the shortcomings of major innovations, maximising their potential and creating new market opportunities. As shown in Table 3 below, the interactions between primary and incremental innovations and technical progress are central to the development of industrial complexes.

Table 3. The Role of Leading and Innovative Firms in Technological Trajectory



In this context, investments within an industrial complex are directed towards projects that may result in incremental innovations aligned with the technological trajectory defined by radical innovation. The strategy focuses on improving and expanding what has already been innovated rather than seeking radical innovations, as incremental innovations are seen as more predictable and aligned with the industry's development. This aspect strengthens the position of innovative firms and maximises the return on investment in research and development.

This approach is particularly relevant for emerging markets with a strong presence of foreign capital in innovative industries. In these markets, primary innovations are often imported from foreign technologies, while

secondary innovations are developed locally, adapting these technologies to the specific conditions of the market. Thus, emerging markets internalise the benefits of primary innovations and develop their own technological advancements, promoting sustainable industrial development.

In the case of Brazil, modernisation would occur by strengthening the competitiveness of manufactured goods, expanding research institutions, and enhancing sectors of the capital goods industry. This process is driven by investments in innovation and technology, which increase the productive efficiency of companies and the quality of products. However, technological development in Brazil also depends on government incentives, which have historically been prioritised during economic expansion. In contrast, the ideal would be to intensify these incentives during crises to redefine the economy's course. Budget constraints and uncertainty in research outcomes limit the transformation of knowledge into production techniques.

Since the 1950s, with the support of foreign capital and specific industrial policies, many developing countries, such as Brazil, have started to establish industrial sectors that have driven economic growth. Subsidiaries of multinational companies have helped diversify the industrial sector and modernise local firms, a process known as the extension of technological trajectories.

However, according to Cardoso and Faletto (1979) from the Dependency School, peripheral countries have a difficult barrier to overcome to become developed due to their technological dependence on developed countries and the restrictive clauses in technology licensing agreements. In general, this technological dependence has several important implications for developing countries: subsidiaries of multinational companies utilise local labour for production but not for research and development; access to technology and the international financial market is limited; and the importation of technology often hinders local efforts in research and development.

In this context, the dominance of multinational companies in the Brazilian industrial market, especially in high-tech sectors such as electrical equipment, communications, transport, pharmaceuticals, and durable consumer goods, further intensifies this dependence. This dominance affects not only national consumption patterns, favouring foreign products but also the national political process. The power of multinationals reflects the global oligopolistic structure, where industrial concentration increases the market power of these large companies, which seek to maximise their profits through production and export, especially in markets with cheap labour.

Access to technical progress and innovation is essential for developing countries to overcome underdevelopment. These countries, however, do not possess an industrial structure characterised by high levels of concentration and monopoly, which would be capable of financing technological innovations and generating significant revenue in domestic and foreign markets. An industrial structure is required to drive industrial modernisation, increase productive efficiency, and allow for production expansion. The lack of an industrial structure with a high degree of monopoly ultimately becomes a barrier to the development of these countries, as it makes it difficult to obtain the resources needed to invest in innovation. Thus, a barrier emerges that, if not overcome, may prevent these countries from reaching a stage of sustainable development, as occurred in the United States, where the vast domestic market allowed for the formation of large companies and the continuous financing of innovations.

III. Advantages Of Multinational Corporations

Multinational corporations possess significant advantages that allow them to achieve higher profitability and market dominance. These advantages include superior access to financial and human resources, which enable continuous investment in research and development and keep these companies at the forefront of innovation. Operational efficiency, resulting from economies of scale and scope, also contributes to greater profitability and a dominant market position.

Foreign investment in developing countries tends to increase when monopolistic advantages, such as patents and know-how, are more pronounced. These advantages enable multinationals to safeguard their innovations, maintain market leadership, and make market entry more difficult for new competitors, thereby ensuring higher returns. According to Vernon (1966), companies with exclusive technological advantages are more likely to invest in foreign markets to maximise the value of their innovations and explore new growth opportunities. Additionally, these companies can leverage their market power and competitive advantages to charge prices significantly above the marginal cost of local firms, using their advanced technology and established brands to limit competition. Consequently, subsidiaries of multinationals can maximise their profits by maintaining high prices, as local competitors often struggle to match their efficiency and innovation.

During times of crisis, the competitive advantages of multinationals become even more pronounced. Local companies face credit constraints due to high interest rates in the financial market, while multinationals, with access to global resources, are less affected. This resilience in the face of adversity is a testament to the stability and reliability of multinationals. Even in periods of economic growth, local firms find it challenging to

access the necessary capital for investing in innovation and expansion, further consolidating the dominance of multinationals in the market.

Multinational corporations also benefit from internationalising their operations, which allows them to conduct initial tests in domestic markets and distribute component production among subsidiaries in different countries. This global operational model enables them to capitalise on economies of scale and swiftly adapt to the demands of diverse markets, thereby reinforcing their dominant position.

Another advantage of multinationals is aggressive tax planning. Profit increases are achieved by shifting profits from countries with higher tax rates to those with lower ones, using strategies such as transfer pricing manipulation and royalties. This approach allows companies to significantly reduce their overall tax burden by allocating profits to lower-tax jurisdictions. According to the theory of international tax arbitration, multinationals exploit differences in tax laws between countries to minimise taxes and maximise net profits, thus enhancing their competitiveness in the global market.

Additionally, by operating across various jurisdictions, multinationals minimise the influence of monetary policies specific to a single country. According to the theory of international diversification, by spreading their operations and assets globally, these companies reduce their exposure to local economic and monetary risks, such as exchange rate fluctuations and changes in interest rates, thereby maintaining greater financial stability and competitiveness in the global market.

Another significant advantage for multinationals is the ease of transferring funds between subsidiaries in different countries. This capability optimises financial resource management, ensuring efficient capital allocation and mitigating the risks associated with monetary and exchange restrictions, strengthening operational and strategic flexibility.

Finally, the internationalisation of production can lead some local companies to depend on the technical information and patents held by multinationals. This dependency arises because multinationals often possess advanced, protected technologies essential for developing and producing certain products. Consequently, local companies may need to license these patents or collaborate with multinationals to access the necessary knowledge, limiting their autonomy and capacity for independent innovation.

IV. Measures Adopted by Developing Countries to Mitigate the Impact of Multinational Monopolies

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However, multinational companies' activities are not necessarily detrimental to developing countries' technological autonomy. To understand this issue, it is essential to examine both the benefits and challenges that the presence of these companies can bring to local technological progress. Moreover, assessing the scope and limitations of the restriction and industrial protection policies implemented by governments is important. This will be the focus of the discussion that follows, considering the potential positive and negative impacts of multinationals on the local economy.

Technology transfer refers to transmitting or selling technical knowledge, even when it forms part of a capital, managerial services, and technology package. Over time, the purchasing firm, having assimilated foreign technology, may develop internal capabilities to improve this technology.

Technological autonomy involves selecting appropriate techniques, improving import conditions, building research and development capacity, and sourcing components from more affordable suppliers. This strategy aims to encourage research and the development of new products and processes tailored to local needs and resources.

Ricardo's Comparative Advantage Theory suggests that each country should focus on producing goods with a cost advantage. In other words, each country should produce goods with the best raw materials, labour, and technology conditions. Through international trade, each country would have access to goods produced at the lowest costs. This process is known as the international division of labour. This theory contrasts with the autonomy strategy of developing countries, which require substantial support in investment and government protection against foreign competition to assimilate and adapt imported technology.

Underdevelopment in developing countries is caused by their position in the international division of labour, favouring manufactured goods over those producing primary goods. This situation worsens concerning foreign technology.

Foreign companies use their advantages abroad, including licensing, which reduces investment costs and risks by acquiring already-tested technology. Moreover, licensing allows for purchasing foreign product designs when importing finished products is restricted. However, the disadvantage of licensing for developing countries lies in the clauses imposed on the licensee country for using the know-how.

Another common form is foreign investment, which involves capital, administrative methods, and technical knowledge, usually carried out alongside licensing. Foreign investment can increase the local industry's competitiveness by introducing new techniques, focusing on high-tech industries, and lowering consumer prices. On the other hand, foreign investment may reduce this competitiveness by introducing barriers to entry through product differentiation and economies of scale.

It can be concluded that the current technological policy of developing countries advocates support for research and development activities. This approach aims to strengthen local firms that operate under the recent impact of primary innovations generated abroad. The objective is to form sustainable industrial structures aligned with the characteristics of the local market.

Many governments adopt measures for local protection to support this development and reduce excessive dependence on foreign technology. These measures include tariff policies, joint ventures, and restrictions on foreign companies entering certain sectors to secure a market reserve.

Such measures are necessary to strengthen the local base and promote a competitive environment. This action is particularly important when local companies, using licensed technology, may become overly dependent on the equipment and technical knowledge of the original foreign suppliers.

However, protectionism should not be imposed on local firms in industries where technology is widely disseminated and companies are already internationally competitive. In such cases, this measure harms the public interest, as protecting these local firms grants them competitive advantages that may distort the market.

The best solution would be to adapt foreign capital to the local technical base. Industrial growth, although also driven by innovations from abroad, is only possible with endogenous technical progress. The problem, however, lies in the barriers to this endogenous process, with the most prominent being the insertion of developing countries into the international division of labour.

The State of Information Technology in Developing Countries

The more a country advances in producing cutting-edge sectors, the greater its potential for economic growth. Conversely, developing countries specialising in producing and exporting primary products and manufactured goods remain importers of services, technology, and information from developed countries.

Take Brazil, for example, where substantial public and private investments significantly transformed its industrial base, resulting in diverse industries. By 1970, this technological leap had made Brazilian industries more globally competitive. However, external debt servicing largely absorbed the trade surplus, illustrating the complex relationship between financial constraints and technological advancement in economic growth (Erber, Araujo Jr., & Tauile (1985).

All these transformations characterised changes in the international division of labour. Such transformations are further complicated when there is a shift from a predominantly electromechanical technology, based on machinery and equipment, to an information-based economy. This result is due to several key factors:

- Shift in Resources: Products incorporating microelectronic components use more information and less material and energy. In these cases, the international market for metals experiences price drops, reducing export revenue for countries with raw materials.

- Loss of Competitive Advantage: Developing countries, with fewer technical and financial resources to incorporate new technologies, lose competitive advantages and cease to export manufactured goods.
- Technical Support Issues: These countries also have less local technical support and sometimes face inadequacies regarding the available production factors.
- Economic growth, driven by a technical base, has various consequences. A technical base, understood as a degree of automation, enables the automation of productive activities, resulting in increased profits due to reduced labour costs.

However, the reduced demand for labour in modern sectors can lead to unemployment. This decline in employment levels reduces the market for various goods and lowers the profit rate associated with the equipment volume. It necessitates an increased expansion of profit mass to facilitate new investments. Such unemployment can only be offset by a marked expansion of growth resulting from a significant investment increase.

The growing use of automation reduces the possibility of generating new jobs and leads to the loss of bargaining power for the working class. It also results in job destruction through the substitution of workers by machines. Artificial Intelligence (AI) is expected to both destroy jobs and create new ones, similar to automation in the past but more intensively and broadly than the introduction of previous technologies. As with past technological innovations, there is public apprehension about these changes.

Despite the challenges posed by automation, new opportunities are also emerging in sectors closely linked to information generation, manipulation, and distribution. It is important to note that both manual and intellectual work are being automated, with machines now capable of carrying out tasks that were once the sole domain of human intellect and skill.

Importation of Technology and Technological Dependence

Numerous theories attempt to explain the slower growth of developing countries compared to wealthier nations. Rostow (1960) argues that this disparity is both quantitative and temporal, suggesting that developing countries are in a stage of development through which developed nations have already passed. Moreover, until the mid-20th century, investment in scientific and technical capacity did not receive the same priority it does today.

However, these countries' current development is not merely a delayed repetition of what the more advanced nations have experienced. The current form of the international division of labour does not lead to the advancement of developing countries. This division tends to perpetuate itself unless peripheral nations adopt measures to foster their own scientific and technological progress.

Indicators used to analyse technological development policies include research and development (R&D) expenditures and patent registrations (84% of patents in peripheral countries are foreign-owned). Developed countries spend six times more on R&D than developing nations, further exacerbating technological gaps and dependence.

Peripheral countries import technological and scientific resources from developed nations to bridge this technological divide and integrate into the global context. However, this transfer of foreign technology, which historically accelerated peripheral technological and economic progress, has limitations. The primary issue is that developed countries typically transfer only parts of their technology, often focusing on production engineering while withholding specific R&D activities.

One promising avenue for developing countries is to innovate new products and processes based on imported production engineering. These could be either replicas or secondary innovations, adapting foreign products and processes to the local context. This approach offers a beacon of hope, suggesting that even with limited resources, developing countries can make significant strides in technological development.

When paired with robust local research and development efforts, the importation of technology can become a powerful instrument for learning and emancipation. This underscores the importance of local initiatives in shaping the technological landscape of developing countries, empowering them to take charge of their own progress.

Finally, the reasons for the prevalence of technology importation in peripheral countries include the lag of their technical-scientific systems relative to the increasing demand for technical knowledge, which encourages imports. Additionally, these countries' adoption of consumption patterns from central nations leads to importing technology geared towards consumption. This outcome includes the demand for products like those abroad and reliance on externally developed production techniques and designs. Other factors include state incentives for foreign technology entry and competition from foreign capital, which pressures firms in developing countries to stand out, making it almost inevitable for national companies to resort to importing foreign technology to compete with international products.

V. Conclusion

The analysis presented in this work highlights that technical progress is relevant for economic development and international competitiveness, particularly for developing countries. While the importation of technology has significantly contributed to the initial economic momentum in these nations, it has also created a technological dependence that restricts their ability to innovate autonomously and compete on an equal footing in the global market. Challenges developing countries face, such as the lack of a robust technical-scientific base and the dominance of multinationals, underline the need for strategic policies to build their own technological infrastructure and strengthen research and development capacities.

Measures such as joint ventures, partial nationalisation of foreign-owned subsidiaries, and import regulations were identified as key strategies to mitigate the negative impacts of multinational monopolies. However, these strategies alone are insufficient. An integrated approach involves government efforts to strengthen the domestic technological base, foster research and development (R&D), and build human capital. State intervention plays a relevant role in this process, not only by creating policies that support local industries but also by investing in education, infrastructure, and technological innovation.

Developing countries must create an environment conducive to endogenous technical progress through investments in cutting-edge industries capable of generating technological innovations. Building internal innovation capacities involves establishing robust research institutions, promoting collaborations between the public and private sectors, and encouraging the development of technologies that meet local needs. This focus on endogenous progress will allow developing economies to adapt technologies more effectively to their unique contexts, increasing productivity and reducing dependence on imported technologies. In this way, these nations can pursue a path of sustainable economic growth less reliant on external technological inputs.

Furthermore, the study suggests that governments should be careful when dealing with external technologies. While some level of technology importation is inevitable and often necessary for rapid industrial growth, adapting these technologies to the local socio-economic environment is relevant. The goal should be to use imported technology as a learning tool, gradually building the capacity for internal innovation. This will require targeted policies that protect nascent industries, encourage knowledge transfer, and promote the development of national solutions to local problems.

Ultimately, the future of economic development in these countries will depend on a balanced strategy that combines openness to external technological advances with efforts to build domestic capacities. Only through such an integrated approach can developing countries overcome the barriers imposed by the international division of labour, achieve technological autonomy, and secure a more equitable and independent position in the global economy.

The conclusions of this study highlight the existence of a barrier to entry for developing countries into the group of developed nations. In the 1980s, Brazil, Thailand, the Philippines, and South Korea were considered the next countries with the potential to become developed nations. Brazil's prospects were seen as promising, as the country possessed high-technology industries, such as military, aerospace, chemical, and others. Furthermore, the size of the internal market allowed economic growth to be driven by domestic demand without relying exclusively on exports. However, what was subsequently observed were several political and economic crises and, more recently, deindustrialisation. Although Brazil increased investments in education, much like the Asian Tigers, only South Korea achieved the expected economic development.

Brazil's large internal market suggested an advantage over the 'Asian Tigers', as the country had major companies capable of meeting domestic demand and, in turn, financing investments in research and development (R&D). A nation with a vast territory and a significant internal market appeared to possess the necessary conditions to achieve developed nation status. However, Brazil ultimately failed to realise this potential.

The sections of this study examined how these nations can leverage technical progress to promote sustainable development, offering insights into possible paths for reducing technological dependence. Future research could explore specific policy measures and industrial cases that illustrate successful strategies for promoting technological autonomy. Moreover, a comparative analysis of how tailored industrial policies, such as sectoral subsidies and export incentives, impact technological progress and economic growth in developing countries could provide valuable insights. Investigating the role of regional economic integration in facilitating knowledge and technology transfer among developing nations may also offer new strategies to overcome technological dependence and enhance competitiveness in the global market. Through concerted efforts that align with their development goals, developing countries can aspire to free themselves from the constraints of technological dependence and chart their course towards a more prosperous future.

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