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Higher education and integral development in Mexico

La educación superior y el desarrollo integral en México

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Abstract

Mexico's school enrolment in the 2021-2022 school year corresponds to 5.07 million students (5.5 % in higher technical and normal levels; 86.2 % in bachelor's degrees; 7.2 % in specialties and master's degrees; 1.1 % in doctorates), representing 4 % of the total national population. The article is structured based on the deductive method and with a quantitative archetype; its objective is to determine the correlation between the higher education student population and economic growth and human development. It is hypothesized that higher education will contribute significantly to the achievement of these objectives, in the first instance to try to achieve economic growth, and then to gain access to economic, social, sustainable and human development. The hypothesis was confirmed that in Mexico during the period from 2010 to 2022, the highest number of higher education students can explain 82.6 % of the variations experienced in the increase of the Gross Domestic Product (GDP) or economic growth. It was considered that the highest levels of education in the country (doctorate and master's degrees) would have a decisive influence on the increase in GDP (economic growth) and a better position in the Human Development Index (HDI), but it turned out that the most influential variable in the estimated linear regressions is enrolment at the bachelor's degree.

Keywords

Economic growth, education, higher education, human development, regression analysis, postgraduate.

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Resumen

La matrícula escolar de México en el ciclo escolar 2021-2022 corresponde a 5,07 millones de alumnos (5,5 % en nivel técnico superior y normal, 86,2 % en licenciatura, 7,2 % en especialidad y maestría, y 1,1 % en doctorado), representando el 4 % de la población total nacional. El artículo se estructura con base en el método deductivo y con un arquetipo cuantitativo, teniendo como objetivo conocer el estado de correlación existente entre el universo estudiantil de educación superior con el crecimiento económico y el desarrollo humano. Se parte de la hipótesis que la educación superior contribuirá significativamente al logro de estos objetivos, en primera instancia, para tratar de alcanzar el crecimiento económico, y después, para lograr tener acceso al desarrollo económico, social, sustentable y humano. Se confirmó la hipótesis de que, en México, durante el período de 2010 a 2022, el mayor número de alumnado de nivel superior puede explicar el 82,6 % de las variaciones experimentadas en el aumento del Producto Interno Bruto (PIB) o crecimiento económico. Se consideraba que los más altos niveles de estudios en el país (doctorado y maestría) influirían de forma determinante en el incremento del PIB (crecimiento económico) y en una mejor posición del Índice de Desarrollo Humano (IDH), pero resultó que la variable más influyente en las regresiones lineales estimadas es la matrícula de nivel licenciatura.

Palabras clave

Análisis de regresión, crecimiento económico, educación, desarrollo humano, enseñanza superior, posgrado.

Introduction

With the new paradigms of sustainable and human development, education presents as one of the three blocks required to measure the Human Development Index (HDI). Education is not only a right that should encompass the entire population, but is considered a human right in recent approaches. In this regard, Rodríguez Acosta (2018) expresses: "Education helps human beings to be autonomous, to have a better quality of life, to make decisions, to be supportive. Not only does one have the right to access education, but to access quality education" (p. 161).

The objective of the article is to make the theoretical-conceptual approach that allows to know the correlation level of higher education with economic growth and with the stage of integral development (economic, social, sustainable and human). The idea is to answer the research question: Is the higher enrollment of higher education in correspondence with the level of economic growth and development achieved in Mexico?

It is assumed that education contributes to achieve a higher level of economic growth and achieve a substantial improvement in stages of comprehensive development, particularly education at the higher level. The importance of higher education in the country is evidenced by the fact that more than five million students are enrolled in the last school year, representing at least 4 % of the total national population.

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For some years, efforts have been made to deepen the issues of economic growth and development, and over time, efforts have been made to analyze development in a more comprehensive way, addressing it from the social, sustainable and human spheres. Likewise, it has been thought that education (especially the higher level) can contribute significantly to achieve better stages of economic growth and integral development, so this time the correlation between higher education and economic growth and the level of integral development in Mexico is addressed. The concept of education is analyzed in relation to economic and integral growth and development, as well as the most recent aggregated information of higher education in the nation.

This article is based on the use of the deductive method, understood as the reasoning process that recognizes the emission of judgments from arguments that clarify or explain certain aspects of reality. A paradigm is used that allows the disaggregated treatment of complex phenomena, which become indicators that can be analyzed, based on observation, measurement and estimation (Dolores *et al.*, 2022, p. 160). In quantitative terms, a simple linear regression exercise is performed, with 13 annual data on the educational enrollment of higher education in Mexico (2010-2022) as an independent variable, extracting information from the General Directorate of Planning, Programming and Educational Statistics (DGPPyEE), attached to the Ministry of Public Education (SEP), so that no experimental study is carried out (none of the variables has been manipulated).

The work basically consists of three parts: the first discusses the concepts of economic growth and development (economic, social, sustainable and human), related to the importance of higher education for its achievement; the second part presents information of the last thirteen years regarding enrollment and levels of higher education in Mexico (bachelor's, specialty-master's and doctorate); the third part presents the simple regression and some econometric indicators between higher education and economic growth (measured through GDP).

The concept and definition of economic growth and comprehensive development

In many social environments and circles, education is associated with a document or degree, ignoring that the universal purpose of the educational process is in the first instance the transformation and social training

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achieved by students. The acquisition of knowledge leads to the personal improvement of people, and to an important degree it can generate wealth for the family, the community and for society in general (Muñoz and Salas, 2011 in Medina, 2019, p. 5).

The 2030 Agenda (UN, 2015) sets out the objectives that it seeks to achieve in order to obtain sustainable development. Among them, objective no. 4 aims to achieve quality education, mentioning the importance of education to access new stages of development, including:

- To leave poverty aside requires moving up, through social and economic mobility.
- It promotes the reduction of social inequalities and gender equality.
- It empowers people, through the strengthening of a healthy and sustainable life.
- It fosters tolerance among individuals and promotes the creation of social and peaceful life.

After the Second World War, the discussion of the concept of economic development was emphasized and, with it, different doctrines of economic thought have debated about its definitions and concepts, where it has been shown that the term development contains a heterogeneous meaning in certain historical moments (Villalobos, 2022b, p. 198). To the extent that different political and social nuclei come to power, the economic policies provide notions about their conception of development, which is intimately linked to their ideological considerations.

For Brunet and Böcker (2007 in Martínez and Amador, 2010, p. 86), with the ideas of the English economist John M. Keynes, the foundations of the theory of economic development are established at the end of the Second World War, and since then five schools of economic thought that proposed theories for its explanation are presented:

- Development economics
- Accelerated accumulation systems
- Socialist (Soviet) structure of industrialization
- Structuralist approach of ECLAC (Economic Commission for Latin America and the Caribbean)
- Dependency theories (Latin American)

It is important to note that, for some decades, especially in the early twentieth century, the terms "economic growth" and "development" were

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often used as synonyms, even though conceptually they differ (Villalobos, 1986, p. 172). Even since the mid-nineteenth century, economic growth and development are closely related, especially in the case of industrialization, which entails economic growth derived from increased production (Martínez and Amador, 2010, pp. 84-85).

To talk about development, at present, it is necessary to define five fundamental concepts that, in my opinion, are taking place successively: economic growth, economic development, social development, sustainable development and human development (Villalobos, 2022a, pp. 78-98).

A brief definition of economic growth indicates a sustained rise in output per person, which is higher than the proportion that increases population mass, which is generally based on achieving higher productivity through technology. Benjamín Retchkiman (in Villalobos, 2020, p. 67) assumes efficiency, technological progress and proper management of productive factors to achieve economic growth. Technological progress, which is undoubtedly linked to the educational aspect.

Within the traditional theories of economic growth, the three variables that determine it (natural capital, human capital and organization) have been highlighted, where human capital is inextricably linked to the process or degree of education achieved. So the fundamental human capital is investment in education, which in turn should lead to improved labor productivity.

Another factor was added to the three-factor neoclassical theory that determine economic growth (land, labor, and capital). Theodore Schultz and Gary Becker would call it "human capital", understood according to Martínez and Amador (2010) as "the productive capacity of an individual that is favored by a number of aspects among which education stands out" (p. 88). The first works of human capital were based mainly on the study of the years of schooling attained by the workers and their work experience.

It is worth mentioning that Schultz established that human capital, determined by its qualitative components (skills, knowledge, attributes and skills for work), together with the expense to optimize those skills, increases worker productivity. Later, Becker added education and investment to training as contributions to human capital theory (Pérez and Castillo, 2016, p. 654). Becker mentions two types of skills acquired by workers: specific and general, the first suitable for the production processes of a company, while the second are viewed transversely, since they can be transferred to other companies or organizations.

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Meanwhile, Giménez (2003 in Sandoval and Hernández, 2018, p. 140-141) distinguishes two kinds of human capital: innate human capital, which includes the possibility of change based on modifying nutritional and health aspects; acquired human capital, which is built with the preparation and formal and informal education of the worker, as well as with his accumulated experience through years of work. Formal education comprises all levels of schooling completed, where an official certificate of studies is obtained; while informal instruction covers knowledge acquired outside schools, corresponding to subsequent training and self-learning.

Economic development is achieved when it is preceded by economic growth, which leads to better living standards and conditions for the population, with a better distribution of national income standing out, as well as when there is access to better food and housing. Sandoval and Hernández (2018) state: "The traditional approach identifies economic development with economic growth or increase in gross domestic product (GDP), it is argued that a necessary condition for development is the growth of the economy" (p. 145).

Regardless of the political status of countries, achieving national economic development has been the priority objective for all countries. As pointed out, several approaches and theories have been proposed to explain how to achieve economic development, among the most important in economic matters are: classics, Keynesians, Marxists, neoliberals (neoclassics) or monetarists, structuralists and ecologists.

Sharing what some authors point out, it is undeniable that economic development has a strong relationship with technological innovation in the industrial production apparatus, which is limited to the educational process of a region or country, as maintained by institutions such as the World Bank and authors such as Ávila and Domínguez (2019, p. 120).

Technological innovation or knowledge society plays a strategic role in global economic competition, which is why high investments are given in the educational system (research, technology and innovation), to enable access to better stages of economic development. Márquez Jiménez (2017) states: "As long as countries, organizations or individuals fail to meet these requirements, they risk being excluded from the knowledge society and, with it, from globalized economic competition" (p. 5).

Economic development becomes social development when better indicators of education, health, public security and social security are available. For Midgley (1995 in Juarez *et al*., 2019, p. 63), social development is understood as a process that promotes the well-being of individu-

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als and communities, which is achieved with an efficient combination of economic development, leading to improvements in social order contexts.

After achieving economic growth and economic and social development, the next stage is considered as sustainable development, which comes when it is possible to satisfy inadequacies or requirements that affect the present of societies, without endangering or depleting the resources of the future. Sustainable development is intimately related to the care and protection of the environment, so it is a proposal that integrates economic, social and ecological dimensions, in search of the construction of a comprehensive vision of development.

So important is education in achieving development that goal no. 4 for sustainable development of the 2030 Agenda aims to "ensure inclusive, equitable and quality education and promote lifelong learning opportunities for all" (UN, 2015). Some revealing data on the lack of education worldwide are released by the UN (2015), where it is noted that:

- In 2018, an estimated 260 million children were out of school, equivalent to one-fifth of children of that age.
- Enrollment at the primary level is covered by 91 % in developing countries, but the remaining 9 % means that 57 million children do not attend primary schools.
- Globally, half of children and adolescents have failed to achieve basic standards of literacy and math skills. Also 617 million young people do not have minimum learning in arithmetic and literacy.

Goal no. 4 includes ten goals to be able to fulfill its main purpose. Goal 4.7 sets out an expectation that "all students acquire the knowledge and skills necessary to promote sustainable development" (UN, 2015).

Another concept that has recently been put forward is sustainable social development (SDD), which includes both tangible and intangible aspects. Among the former is drinking water in homes, healthy food, medicines and decent housing; within the latter is education, employment, social equity and application of justice (Vallance *et al.*, 2011 in Juarez *et al.*, 2019, p. 65).

Finally, after achieving economic growth and development in the economic, social and sustainable spheres, the next step is human development, which consists in the transformation of placing the individual as the central axis of public policies, thus allowing to meet their primary needs individually. The main driver of the concept of human development is Amartya Sen, who goes beyond ideas of achieving economic growth and development, placing personal freedoms as goals of human

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development. This would mean improving conditions and capabilities seeking to achieve a full and dignified life, in coexistence with a democratic and equitable society (Márquez Jiménez, 2017, p. 13).

The skills approach, first addressed by Sen and subsequently by Nussbaum, is the accumulation of real opportunities enjoyed by an individual to secure and promote his or her fundamental rights, seeking to empower individuals to achieve a life of dignity and fulfillment. Here it should be considered that education (especially civics) tends to achieve digital capacities focused on achieving an integral, democratic coexistence and above all that promotes human development (Gozalvez and Cortijo, 2023, pp. 44 and 54).

Amartya Sen's contributions served as a basis for the UN in 1990 to begin the elaboration of the HDI in different countries and regions of the world. In addition, was awarded the Nobel Prize in Economics in 1998. According to Pérez and Castillo (2016, p. 658), Sen redefines the concept of development, contrasting it with its traditional or strict approaches, and presents it as the improvement in the quality of life of people, based on the enjoyment of real freedoms, emphasizing that these depend on socioeconomic institutions (education and health care) and policies (participation in debates and public scrutiny).

Education will become important in comprehensive development, when it is delivered with quality and relevance. Farro (2001, p. 49 en Blancas, 2018, p. 116) indicates that when talking about educational quality, implicitly, we talk about competitiveness, since it along with social responsibility, can contribute to generate or stimulate economic growth, which can allow to achieve greater stages of integral and human development.

Human development is concretized and synthesized with the HDI, whose function is to measure the advances of the standard of living of a locality (municipality or province) or country. The HDI has three components: a long healthy life, knowledge, and a decent standard of living. On the contrary, the Multidimensional Poverty Index (MPI) measures the occurrence of deprivation and the degree of poverty intensity. While the HDI measures average achievement, the HPI captures people's unmet needs through three components: education, health, and standard of living.

A concept intimately linked to poverty and marginalization is that of social inclusion, which, for Cecchini (2020), is complex and multidimensional and can be addressed from different visions (economic, social, educational, labor and productive). The author adds: "ECLAC considers that inclusion, in general, means an improvement process of living condi-

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tions, economic, social, political conditions and the full participation of the population in society and development" (p. 112).

In the current times and more since 2020, with the arrival of the COVID-19 pandemic, the lack of access to social networks and online applications implies social exclusion. For this reason, families in situations of poverty have to make an extra economic effort to have Internet services that allow them to have a connection to the network, to communicate with their schools or to live with their friends, having to sacrifice other essential satisfiers (clothing, food, travel), to have equipment and access to commercial or educational networks of the Internet.

The absence or ineffectiveness of public education policies may have the effect that not all social sectors have equal opportunities for accessing education. There may be inadequate infrastructure or lack of academic quality, presenting implications for not reaching the stages of development that the country requires.

In this work we understand the importance of continuous and constant education throughout the existence of people, especially that corresponding to technical and higher levels. Lifelong learning presents as a fundamental tool to transform the quality of life in a personal way, but it also involves changes that lead to improvements in society in general, and should ultimately lead to higher levels of economic growth and comprehensive development in all its areas.

The whole world and our country require trained and educated individuals to interact in local or global markets, where they highlight critical and constructive thoughts that are able to influence the contribution of the stages of economic and cultural development, in a sustainable way for the regions where they participate. Even so, in Latin America and especially in our country, there are accumulated lags for decades in the educational system, highlighting features such as elitism and lack of public budget to support it, in addition to the inadequate use of resources that have been allocated to the school sector.

Just as the concept of development is considered to be polysemic and its definition is based on who holds economic and political power, educational systems are being transformed from these areas. Hence, our role is to create the conditions for school processes to become inclusive and allow the active intervention of vulnerable groups in society. It seeks to regularize and standardize educational contexts, creating common elements for most of students to achieve an equitable enjoyment of knowledge, technology, and science (Martínez Díaz, 2020, p. 53).

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The educational investment made with public resources results in the beneficiary students to improve their economic conditions and, in addition, would benefit the local economy of the region or country where they are located, by increasing the productivity of work and the speed of application of technological innovations, highlighting those processes in peripheral or dependent regions. According to the neoclassical view of economics, the educational service generates social benefits and positive externalities for the society.

In a direct observation, Barro and Lee (2010 in Sandoval and Hernández, 2018, p. 153) worked with adult education indicators from 146 countries, spanning 1950 to 2010, and with five-year intervals. They point out that inhabitants in developed nations had an average of eleven years of schooling, compared to seven years in the least developed or poor countries, which indicates about at least four years of difference between rich and poor countries, when it comes to adult education.

Education, according to the philosopher Immanuel Kant, should not respond to particular interests, but to their own interests of individual improvement and conversion into better people, in such a way that better stages of development for society and humanity in general are achieved, marking that self-interest is limited and human interest is infinite (Obando Ibarra, 2018, p. 38). Within Kantian philosophy, the educational process is immersed in moral actions, but it is emerging as an essential point to achieve the development of humanity. In this sense, Ortiz Soriano (2023) states that "in the field of education that is the basis of the development of people in particular, and of humanity in general" (p. 160).

Education, in its relation to development, should not only focus on instruction and acquisition of competences, but ultimately focus on achieving human development as a space of freedoms of the individual. Critically, Obando Ibarra (2018) points out that an insane environment has been created, where some segment of the student population only wants to achieve high educational levels, not to be optimal professionals, "but to compete, to earn more, to ascend socially" (p. 37).

The new paradigm of education must foster a movement that has consequences on people's lives. In this sense, the role of higher education institutions is indispensable for the training of people who have to assume social leadership, so the Agenda 2030 (UN, 2015) to achieve sustainable development reaffirms the role of the university to create a culture of social responsibility and a determining role for achieving development (De la Rosa *et al*., 2019, p. 181).

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As for Pegalajar *et al*. (2022, p. 423), programs for obtaining university degrees should incorporate programs based on sustainability subjects and active learning methodologies, which stimulate the educational system based on values and the development of critical thinking attitudes observed by students. Likewise, Juárez *et al*. (2019, p. 61) indicate that education implicit in sustainable development (ESD) requires the application of active or participatory methodologies of learning and teaching that motivate students, providing autonomy. Such behaviors can achieve sustainable development benefits by promoting future scenarios and social acceptance of decisions, as highlighted by the world's leading educational institution, UNESCO.

Education in a current vision must correspond to a key element in generating economic, social, sustainable and human development. In this sense, education and development are linked, inferring that education is the engine of change and the driver that will allow generating an increase in the quality of life of individuals and society in general.

Only with an articulated and continuous education between the different educational levels, where quality prevails, will be able to prepare the human resources that must face the productive processes and the permanent advancement of technologies; therefore, university preparation and training is considered as an act that leads to educational justice that must implement development in the countries (Ovalle, 2019, p. 30).

Rather than education serving to benefit the privileged and presenting an exclusively instrumental value, it must become an engine for achieving human development, being able to promote equality and social justice, which ultimately result in improving the distribution of wealth (Martínez and Amador, 2010, p. 84). In this regard, Blancas Torres (2018, p. 120) notes that education has a significant influence on social change, which entails the transformation of the population and a better living standard for all people.

As mentioned above, education allows individuals and society to be closer to improving their quality of life, for that reason education is a link that generates highly positive impact in the chain of achieving integral and human development. On the contrary, the lack or absence of education results in opposing poles between development and marginalization (poverty).

The quality of education implies becoming suitable for economic growth and integral development, when the members of the school community are linked to this process and can understand the multiple areas that determine them; so that the challenge is to be able to build a compre-

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hensive educational system that favors the progress of the human being, at the same time that an integral human development is achieved (Joaqui and Ortiz, 2020, p. 158).

These times require students to have full knowledge of the use of new communication technologies (ICT) and to be immersed in active learning methodologies. Therefore, education systems have the challenge of preparing them and reducing intergenerational gaps, for which Echeverría Samanes and Martínez Clares (2018, p. 4 in Martínez Díaz, 2020) state: "Education is the most powerful weapon which can be used to respond to the inescapable need to update and improve the skills of increasing numbers of people and also throughout their lives" (p. 58).

Joaqui and Ortiz (2020) make it clear that the main interest of education and learning should not be to maximize economic output, so their main function is to try to contribute to social and human development, adding: "the aim is to carry out a more balanced process, an economic growth for the benefit of society, but better yet, to increase social capital for the good of all humanity" (p. 160)

In this sense, Rodríguez *et al.* (2019, p. 89) state that commercial activity is sustained based on the principle of instrumental, sordid and speculative rationality, so that, in philosophical terms, business and education must be intertwined with social approval and economic growth. The authors says that collective organization must prevail in the educational system, rather than the advancement of individual competencies.

Finally, it is important to emphasize that the next sections will address the part corresponding to the Mexican nation, where reference will be made to the normative part and some data will be made explicit that allow us to locate the importance of higher education level in Mexico.

Enrollment at the higher educational level in Mexico

It should be recalled that in 1948 the Universal Declaration of Human Rights (UDHR) was pronounced and in article 26.1 (UN, 2022, pp. 5-6) indicates that everyone enjoys the right to education, which should be provided free of charge in elementary and primary settings. In addition, efforts should be made to ensure that technical and vocational education is widely available to the population, with equal access, depending on the merits or qualifications obtained. Article 26.2 (UN, 2022, p. 6) states that education shall aim at the full development of the individual and the

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strengthening of strict compliance with human rights, which shall allow always enjoy freedom.

As Mexico is a signatory to the UDHR, the human rights aspect is linked to education. About it, no. 3 of the Political Constitution of the United Mexican States (CPEUM) refers: "The State shall provide and guarantee initial, preschool, primary, secondary, and higher education [...] The State shall be responsible for the management of education, which, in addition to being compulsory, shall be universal, inclusive, public, free and secular" (paras. 1-2).

The General Law of Education (LGE, 2021) has this numeral of the CPEUM. In the last paragraph of Article 7, the LGE (2021) states that education provided by individuals will require authorization by the State, granting recognition of official validity of studies (RVOE), according to what CPEUM states (No. 3, fraction VI). According to fraction I of the number. 35 (LGE, 2021), the education provided in Mexico, through the national education system, will be of three types: basic (initial-preschool, primary and secondary), upper secondary (baccalaureate and professional baccalaureate) and higher.

Higher education is the latest outline of the educational services envisaged by the CPEUM (art. 3), stating: "It is the service that is provided at its various levels, after the upper average rate. It is composed of the bachelor's, specialty, master's and doctorate" (LGE, 2021, art. 47). It also mentions that it is composed of normal and higher technical education at all levels.

Mexican higher education faces many challenges, among which, Sánchez Mendiola (Pelletier *et al*., 2022, p. 45) points out: diverse national coverage; versatile quality; regulatory problems; limited financial support; recognition of teachers; large digital gap increased by the COVID-19 contingency. Additionally, it mentions that Mexico, being an emergency economy, presents problems for the use of non-school modalities (online), highlighting the following:

- Unfortunate categorization of online learning, which is seen as of lower quality in parallel to face-to-*face* education.
- Preeminence of face-to-face instruction in universities.
- Diverse reach in online or mixed learning capabilities.
- Insufficient technology and educational infrastructure.

Mendiola said that Mexico had a large and complex educational system at the higher level. It states that there are about 6,000 higher education institutions (40.5 % public and 59.5 % private), with 5 million stu-

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dents enrolled (52.5 % women and 47.5 % men), with more than 400,000 instructors, most of them attached to public universities, finding that out of every 100 students who enter basic education, 36 students enroll in higher education and only 26 obtain a degree (Pelletier *et al*., 2022, p. 45).

Some data for Mexico for the upper level in the 2022-2023 school year are highlighted, based on the data provided by the DGPPyEE, dependent on the SEP (2022):

- There were 5,192,618 pupils enrolled, of which 53.7 % were women and 46.3 % men. The Statista Research Department estimated the Mexican population as of July 29, 2022 at 128.9 million (4 % of the national population pursuing higher education). Attended in 8789 schools and counting with 490 309 teachers.
- Mexico City has 17.1 % of the students at the higher level, the State of Mexico has 10.9 %, Puebla has 6.8 %, Nuevo León has 5.9 % and Jalisco has 5.8 %. These five states account for 46.5 % of national high school students.
- 63.2 % of higher education students are enrolled in a public university and 36.8 % in private universities. This means that slightly more than one student in three studies in private higher education institutions.
- 70.4 % of the students at the higher level are enrolled in formal education and 29.6 % in non-formal education (*online*).
- From the higher level: 5.7% of the upper and normal technical course; 85.9 % of the bachelor's degree; and 8.4% of the postgraduate degree, of this, 73 726 students are enrolled in a specialty (16.8% of the postgraduate course and 1.4 % of the total of the higher level), 304 153 study a master's degree (69.4 % of the postgraduate course and 5.9 % of the total) and 60086 students are in doctorate (13.7% of the postgraduate course and 1.2% of the total).

Table 1 shows the enrollment of students from 2010 to 2022, together with GDP, noting that the years correspond to the previous immediate school year (for example, the year 2022 corresponds to the 2021-2022 cycle). School cycles for the SEP run from September to August.

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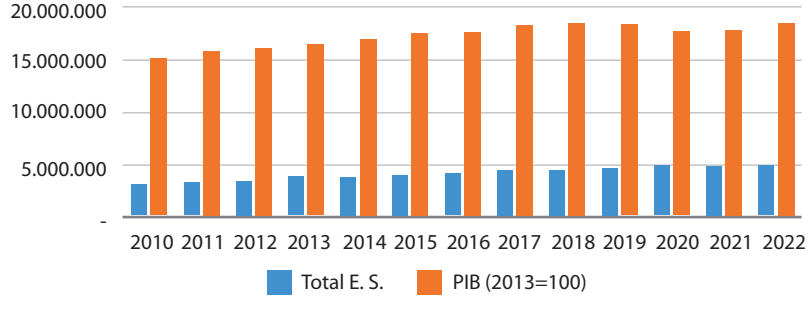
Table 1
GDP/enrollment in higher education in Mexico 2010-2022

Year	GDP* (2013 = 100)	Total E.S.	Bachelor	Graduate	U. government	Private U.S.	Schoolgirl	Not schooled
2010	15,147,830	3,107,713	2,878,417	229.296	2,060,189	1,047,524	2,847,376	260.337
2011	15,744,973	3,322,046	3.071.043	251.003	2,223,184	1.098,862	2,981,313	340.733
2012	16,212,911	3,550,920	3,274,653	276.267	2,368,463	1,182,457	3,161,195	389.725
2013	16,405,770	3,732,653	3,449,401	283.252	2,504,599	1,228,054	3,300,348	432.305
2014	16,964,883	3,882,625	3.588,041	294.584	2,486,980	1.395.645	3.419.391	463.234
2015	17,428,156	4,032,992	3,718,995	313.997	2,716,519	1.316.473	3.515.404	517.58
2016	17,595,775	4,244,401	3,915,971	328.430	2,843,429	1,400,972	3,648,945	595.456
2017	18,307,213	4,430,248	4,096,139	334.109	2,943,428	1,486,820	3,762,679	667.569
2018	18,545,018	4.561.792	4,209,860	351.932	2,954,468	1,607,324	3.864.995	696,797
2019	18,430,382	4,705,400	4,344,133	361.	3,039,167	1,666,233	3,943,544	761,856
2020	17,701,916	4,931,200	4,546,586	384.614	3,147,394	1.783.806	4,061,644	869.556
2021	17,904,768	4,983,206	4,579,894	403.312	3,231,266	1,751,940	4,030,616	952,590
2022	18,560,365	5,069,111	4,647,443	421.668	3,252,074	1.817.037	4,004,680	1.064.431

* Quarterly GDP in millions of pesos at 2013 prices.

Source: Own elaboration from SEP (2022) and INEGI (2022).

Figure 1
Students of higher education and GDP in Mexico
(millions of students and pesos)



Source: own elaboration.

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Before starting with the analysis, the GDP presented in Table 1 has discounted the inflationary indexes based on the year 2013. From 2010 to 2018, we can see real growth of 22.4% over eight years, which gives an average annual real growth of 2.8 %. In 2019, a slight fall in GDP of 0.6 % (less than 1 %) was observed, having a great collapse of 4 % in 2020 (in nominal terms the fall was greater than 8 %), which is explained by the economic contraction caused by the COVID-19 pandemic.

In 2022, it was possible to recover the GDP losses in Mexico, which occurred in the last three years (2019 to 2021), resuming the national production or demand recorded in 2018, although it should be noted that the national population increased in three years. In 2010, *per capita* GDP (GDP/Population) was estimated at 126 176 pesos per year at 2013 prices, growing until 2018 *per capita* GDP to 141 240 pesos, observing a real increase of 11.9% in eight years, giving an average of 1.5% per year in the period. GDP fell significantly in 2020 due to the COVID-19 contingency and despite the fact that in 2022 GDP managed to reach the monetary amount of 2018. The real *per capita* GDP is 140 833 pesos, having a fall in real terms of 0.3 % from 2018 to 2022.

According to Table 1, it went from 3.1 million high school students in 2010 to almost 5.1 million by 2022. This shows a 63.1 per cent growth in the country's higher enrollment, equivalent to an annual growth of 4.8 % from 2010 to 2022. Graduate enrollment grew by 83.9 % over the period.

The relative share of higher technical, normal and undergraduate studies in the total tertiary level was 92.6 % in 2010, rising to 91.7 % in 2022. In contrast, postgraduate studies in 2010 accounted for 7.4 % of the total higher education level, while in 2022 it accounted for 8.3 %. In the period 2010-2022 (thirteen years), it can be seen that undergraduate students grew by 61.5 %, specialty-master by 77.9 % and doctoral 136 %, observing a greater dynamism in the highest degree of studies recognized in Mexico: the doctorate.

Out of the total number of students at the national higher level, in 2010, public universities accounted for 66.3 %, while private universities accounted for 33.7 %. By 2022, public schools accounted for 64.2 % of students and private schools for 35.8 %, with a decrease of two percentage points for public institutions and the same for private institutions.

Regarding the type of education in 2010 (formal and non-formal), 91.6 % of them were in higher education (traditional), while 8.4 % were in non-formal education (online or mixed). By 2022, trends are changing significantly, with 79 % pursuing traditional studies (formal education) and

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21 p% non-formal education. In 2010, there were 260,337 students enrolled in non-formal education, while in 2022 there were 1,064,431 students, quadrupling the number in thirteen years, of which 63.8 % were students from private universities and 36.2 % from public schools. Most of these percentages can be explained by the contingency originated with COVID-19, due to the collapse recorded in the economic activity of the country.

Distance higher education (non-formal education), in the 2021-2022 school year, concentrated in the following states: Mexico City 28.5 % of students, Mexico State 10.5 %, Puebla 7.9 % and Veracruz 6 %, absorbing these four states 52.6 % of high school students in non-formal education.

To conclude this section, the 16 Mexican universities that have the highest number of students in the 2021-2022 school year will be presented, with their corresponding participation in the total number of high school students in the country and their public or private support:

- National Autonomous University of Mexico (UNAM): 257 747 (5.1 %). Public.
- National Polytechnic Institute (IPN): 140 806 (2.8 %). Public.
- University of Guadalajara (UDG): 140 348 (2.8 %). Public.
- Universidad Autónoma de Nuevo León (UANL): 136 423 (2.7%). Public.
- Open and Distant University of Mexico (UNADM): 110 650 (2.2 %). Public.
- Benemérita Universidad Autónoma de Puebla (BUAP): 95 224 (1.9 %). Public.
- Technological University of Mexico (UNITEC): 89 327 (1.8 %) Private.
- Universidad del Valle de México (UVM): 82 316 (1.6 %). Private.
- Autonomous University of Sinaloa (UAS): 71 556 (1.4 %). Public.
- Autonomous University of the State of Mexico (UAEMEX): 69 794 (1.4 %). Public.
- Autonomous University of Baja California (UABC): 67 944 (1.3%). Public.
- Universidad Veracruzana (UV): 66 679 (1.3 %). Public.
- Metropolitan Autonomous University (UAM): 57 249 (1.1 %). Public.
- Monterrey Institute of Technology and Higher Studies (ITESM): 57,216 (1.1 %). Private.

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- Universidad Michoacana de San Nicolás de Hidalgo (UMSNH): 40 635 (0.8 %) Public.
- Higher Education and Research (Millennium TEC): 39 474 (0.8%). Private.

The 16 universities listed consist of 1,523,388 students enrolled in the 2021-2022 school year, representing 30.1 % of the total number of students at the higher level in Mexico. This means that 3 out of every 10 students of the higher level of our country are enrolled in one of the 16 universities listed.

The following section will address the relationship between high school enrollment and economic growth and development in its different areas achieved in Mexico.

Higher Education and its Relationship with Economic Growth in Mexico

One of the attributes of knowledge is that it can be demonstrated and measured with statistical indicators. One of the most commonly used elements is correlation tests, which involve the association of variables that present a predictable behavior (Dolores *et al*., 2022, pp. 160-161), hence its importance to try to plan activities or to explain a particular phenomenon.

This section addresses the role of higher education in the process of economic growth in Mexico. It has been argued for some decades that education is a driving force for economic growth. To test this hypothesis, an econometric analysis of simple linear regression is performed, where GDP is the dependent variable and the enrollment of students of higher education (includes bachelor's and postgraduate) is the independent or explanatory variable.

In the econometric study, five fundamental tests were performed: correlation coefficient, F test (Fisher), Durbin-Watson coefficient (DW), Student's T test and P test (probability). The estimates presented are run in Excel, using its tool "Data Analysis", where the DW was calculated by the author, since the referred program does not present it.

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Table 2
Regression analysis between higher education and economic growth (GDP) in Mexico

Remarks	13		Coefficients	Statistical T	Probability
R^2 Coefficient	0.840	Interception	10 646.07	12.0362	0.00000
R^2 adjusted	0.826	Students E. S.	0.00159	7.6101	0.00001
F	57.91	Critical value F	0.00001	DW	0.834

Source: Own elaboration.

These data allow us to perform the following econometric analysis of the calculated regression from 2010 to 2022:

1. *Coefficient of R^2 determination*: the changes in the dependent variable (GDP) can be explained or move in the same direction as the movements observed in the independent variable (enrollment of students of higher studies), which can explain 82.6 % of the variation experienced, so that other variables not considered in the regression explain 17.4 %. In this way, the hypothesis is affirmed that, the greater the increase in higher education enrollment, a higher stage of economic growth reached.
2. *F-test*: the calculated value of F = 57.91, while in the tables for this statistic a minimum value of 3.14 is requested for 13 data, and with an independent variable the amount exceeds without any problem, then it can be affirmed that the estimated simple linear regression can be fully accepted with a high statistical significance degree, i.e., with a confidence level of 99 % (or 1 % of significance). Additionally, this indicator is reinforced with the critical value of F = 0.00001, when that parameter should not exceed 0.05, set in the statistical tables, and the closer to zero that parameter better for regression. This confirms the significance of the independent variable (higher education enrollment) in the amounts observed in the dependent variable (GDP).
3. *DW coefficient*: This is a determinant test to validate the linear regression model in general terms, since when presenting autocorrelation (positive or negative) it would annul all the statistical parameters obtained. In the data thrown with the DW coefficient = 0.83, values of tables are taken and mark as lower limit 0.74 and an upper limit of 1.04, for 13 data with an independent variable, so we appreciate that the parameter is within

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the allowed range and no autocorrelation, neither positive nor negative in the equation.

4. *Statistical T*: the tables for this test indicate that the value of the variable be greater than 2.65 (with 13 data or degrees of freedom and with significance of 0 01), when T = 7.61, surpassing without any problem the value of tables, confirming the hypothesis that the greater increase of the enrollment of higher education (independent variable) similar movements are observed and in the same sense of GDP (dependent variable).
5. *P-test*: with this coefficient we reinforce the explanation of the significance of the independent variable in the values found in the dependent variable, the closer to zero is better if it exceeds the amount of 0.05, it is said that it would not present explanation impact. In the regression P = 0.00001, much less than the advised, which confirms that increases in higher education enrollment in Mexico can produce increases in GDP.

Two more simple linear relations were experimented, putting the enrollment of higher level students in Mexico as an independent variable and as independent variables: the GDP *per capita* of Mexico and the HDI for Mexico. This last variable, trying to relate it with integral development. But these data yielded no expected explanation, presenting the estimated regression models with negligible values in both cases, both with amounts and with growth rates.

It was also intended to show that with greater postgraduate studies (specialty-master's and doctorate), as an independent variable, it could be specified the changes experienced in the amounts of GDP, which would serve as a dependent variable over the last twelve years, yielding the following results:

- *Postgraduate*: adjusted determination coefficient of 76.2 %, with significant parameters. A positive autocorrelation was found with DW = 0.63, when the table asks us to place the indicator between 0.74 and 1.04, thus losing the validity of the regression.
- *Specialty-mastery*: adjusted determination coefficient of 76.4 %, with relevant parameters, and positive autocorrelation with DW = 0.64.
- *Doctorate*: adjusted determination coefficient of 74.2 %, with significant parameters, but same as in previous years with positive autocorrelation: DW = 0.61.

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In the last year, changes in GDP (dependent variable) were related to those recorded in higher education enrollment only at the bachelor's degree level (independent variable), obtaining results very similar to the previous linear regression. Therefore, such data will no longer be reported.

Conclusions

The objective of this work was to analyze the relationship of higher education level with economic growth and with the stages reached of development in its different fields (economic, social, sustainable and human). The question raised was: is the higher enrollment of higher education in correspondence with the levels of economic growth and integral development achieved in Mexico?

Economic growth is the permanent increase of the national product or wealth, based on the increase of productivity, where the educational level plays a fundamental role to achieve its improvement. Once economic growth is achieved, economic development is accompanied by a better distribution of income, optimizing the population's food and housing levels. Social development is achieved when there is economic development, along with increases in the attributes of community existence, which are achieved with elevated public safety, education, health and social security. Sustainable development is obtained when there is social development, along with not compromising the resources of future generations and caring for the environment. Human development involves talking about the combination of economic, social and environmental aspects, which are reflected in achieving a life of dignity and fulfillment, based on human freedoms.

In the 2021-2022 academic year, Mexico enrolled 5.07 million students, representing 4.0 % of the total national population; at the technical level, 5.5 % of the total were enrolled; at the undergraduate level, 86.2 % were enrolled; in specialty and master's degree, 7.2 %; and in doctoral studies, 1.1 %. In another classification: 4 million are enrolled in public universities (64.2 %) and 1.82 million in private universities (35.8 %). Of the total number of students enrolled at the higher level, 79 % are enrolled in traditional mode (schooling) and 21 % in non-schooling mode, which correspond to 1.06 million students, falling in 63.8 % to private universities and 36.2 % to public universities.

This work started from the hypothesis that higher education contributes to achieve economic growth and better stages of integral devel-

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opment in the nation (economic, social, sustainable and human). It was possible to verify the hypothesis that the higher the enrollment or number of students of higher level in Mexico from 2010 to 2022, a higher stage of economic growth reached, explaining this correlation with 82.6 % variation between the independent variable (higher education) in relation to the dependent variable (GDP). Thus, other variables could explain 17.4 % of the changes experienced in economic growth (GDP).

It was intended to show that the horizon of human development, measured with the HDI, can likewise be explained by the higher coverage of higher education in the country *(independent variable) from 2010 to 2022, but with these data no expected explanation was obtained.* Similarly, the increase in GDP *per capita* could not be explained by the country's higher education students.

At a higher level of the degree of studies in Mexico, experiencing the levels of higher studies as independent variables (doctorate and master respectively), acceptable levels of explanation would be reached, but autocorrelation was presented in the estimated linear regressions, which caused loss of confidence of the resulting statistical parameters.

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