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THE BASIS OF ECONOMIC GROWTH IN PERU

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THE BASIS OF ECONOMIC GROWTH IN PERU

Abstract. The foundations of Peru's economic growth are studied. Peru is an economy that has experienced considerable growth and we want to know if it is sustainable or not. The research is aided by the estimation of the Total Productivity of Factors (TFP) for Latin America in the light of the international context and with the purpose of obtaining, for Peru, the TFP and its components in a disaggregated manner. To do this, a non-parametric methodology is used to obtain the Malmquist Index, which makes it possible to decompose multifactor productivity into both technical efficiency and pure technological change. The estimation of the multifactorial productivity is made on the basis of the Peruvian economy and of 50 more economies worldwide for the period from 1993 to 2003. The results obtained are consistent with the empirical evidence for that period that suggests that the countries Latin American countries experienced a stagnation in their multifactor productivity and therefore have not been able to experience an extraordinary growth compared to the regional average, however, for Peru, there is an increase in the efficiency component with which this economy operates. It suggests that the key to long-term growth lies in the productivity of this economy and the institutional framework that surrounds technology and the innovation process, components that can offer sustainable and long-term growth.

Keywords: Total Productivity of the Factors, Technical Efficiency, Technological Change, Economic Growth, Peru.

LAS BASES DEL CRECIMIENTO ECONÓMICO DE PERÚ

Resumen. Se estudian las bases del crecimiento económico del Perú. Perú es una economía que ha experimentado un crecimiento considerable y se desea saber si éste es sustentable o no. La investigación se auxilia de la estimación de la Productividad Total de los Factores (PTF) para América Latina a la luz

del contexto internacional y con el propósito de obtener, para Perú, la PTF y sus componentes de forma desagregada. Para ello, se emplea una metodología no paramétrica que permite obtener el Índice de Malmquist y que hace posible descomponer la productividad multifactorial tanto en eficiencia técnica como en cambio tecnológico puro. La estimación de la productividad multifactorial se realiza sobre la base de la economía peruana y de 50 economías más a nivel mundial para el periodo de 1993 a 2003. Los resultados que se obtienen son consistentes con la evidencia empírica para ese periodo que sugiere que los países latinoamericanos experimentaron un estancamiento en su productividad multifactorial y por ello no han podido, hasta el momento, experimentar un crecimiento extraordinario respecto del promedio de la región, sin embargo, para Perú, se aprecia un incremento del componente de eficiencia con que opera esta economía que sugiere que la pieza clave del crecimiento de largo plazo se encuentra en la productividad de esta economía y el marco institucional que envuelve a la tecnología y al proceso de innovación, componentes que le puede ofrecer un crecimiento sustentable y de largo plazo.

Palabras clave: Productividad Total de los Factores, Eficiencia Técnica, Cambio Tecnológico, Crecimiento Económico, Perú.

Introduction

Until a few decades ago, Peru was not included in the issue concerning the world economic growth. At the regional level, its performance was among the lagging economies in Latin America. This poor performance would have had repercussions on its population, affecting the standard of living and quality of life of its inhabitants. In the early 1960s, economies such as the Republic of Congo and Pakistan showed a higher Gross Domestic Product (GDP) than Peru, however, it only needed a few decades to recover.

Peru's GDP in 2016, according to World Bank (WB) data, was multiplied by a factor of seventy-four times more than it was in 1960s. Today Peru holds the 49th position of 195 economies in the World Bank ranking with a GDP of 192.94 billion US dollars, significantly higher than most countries in the Latin American region (e.g. Ecuador, Guatemala, Dominican Republic, etc.) and very close to the performance, for example, of economies such as: Portugal, Finland, Chile and Colombia. Concerning Latin America, Peru ranks as the sixth most important economy. Compared to the World GDP, in 1960 Peru represented 0.19%, by 2016, this same economy was already 0.25%.

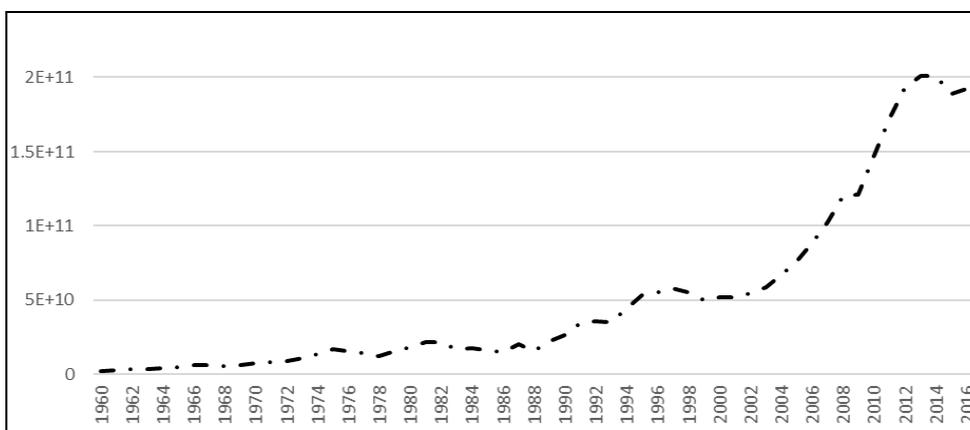


Figure 1. Gross Domestic Product of Peru 1960-2016 (Current U.S. Dollars).

Note: Source. Authors' own creation based on data from the World Bank economic indicators.

This growth has not been sustained over time if we consider the entire period from 1960 to 2016 for which we have available data. At the end of the 1970s and beginning of the 1980s, Peru recorded negative growth rates, an experience that was not unusual for countries in the region that incurred fiscal deficits or what in those years in Mexico was known as the "debt crisis" (Moreno-Brid and Ros, 2004). At the end of the 1980s, prior to the Fujimori era, Peru recorded negative growth rates of -12.3% like the one it experienced in 1989. Five years later, in 1994, in the middle of President Fujimori's administration, Peru would reach the highest figure of economic growth of the second half of the 20th century with a rate of 12.3%.

This evidence shows that Peru is currently experiencing exceptional economic growth, not only for the region but for a large part of the countries of the world; it is like the Latin American experience of the "economic miracle" experienced by the Asian tigers. It is incredible to see how, within a generation, we may go from a lagging to a better performer, with those people born in 1960 having been able to see these changes from a more productive nation today than they were five decades ago. Economic growth is the prelude to development, that is, it is presented as a condition, although not enough, but necessary to be able to carry forward the levels of development and well-being of its population. One of the indicators that best reflects this level of well-being of life of the Peruvian population is GDP per capita, which results from dividing GDP by the number of inhabitants. As this indicator improves, so too would their living conditions be expected to.

Peru's GDP per capita is considerably high; by 2016, an average individual had an annual income of just over US\$6,000 or the equivalent of US\$16.5 per day. These figures would place the income of an average Peruvian much higher than that recorded for that same year of inhabitants from such economies such as: Ecuador, Colombia, Jamaica, Belize, Guyana, El Salvador, Guatemala and Paraguay. These statistics show that Peru has changed in terms of its economic performance. In theory, significant advances have been made in order to have a practical accounting of economic growth and thus obtain an estimate of the contribution that each production factor makes to the product. In the economic growth theory, the residue, in other word, the part that is explained by determinants related to the accumulation of production factors, particularly, is understood as Total Factor Productivity (TFP) or Multifactorial Productivity (Rogers, 2003; Kong, 2007).

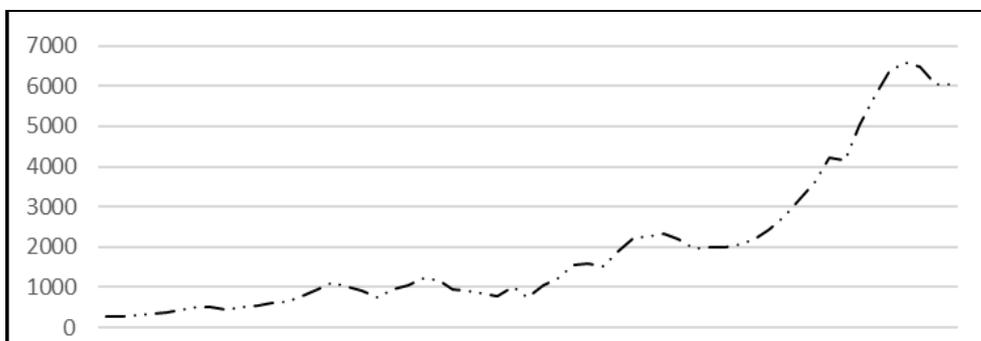


Figure 2. Peru. GDP per capita 1960-2016 (US Dollars).

Note: Source. Authors' own creation based on data from the World Bank economic indicators.

Internationally, estimations have been made of the productivity with which economies operate (Islam, 2003), while other more disaggregated studies try to explain the behavior of the TFP in relation to its components, i.e. technical efficiency and pure technological change (Han, Kalirajan and Singh, 2004). In this research, the TFP is estimated in a disaggregated manner using the Data Envelopment Analysis (DEA) methodology, particularly using the Malmquist Index regarding the case of Peru for the study period (1993-2003). This period is chosen because it precedes the exponential growth experienced by the economy in the last decade of the twentieth century and the beginning of the twenty-first century and is already documented in authors such as Loayza, Fajnzylber and Calderón (2004) and Loayza (2008, 2016).

It is aimed at explaining the basis of Peru's economic growth and providing evidence that more than the increase in the accumulation of production factors, the Peruvian economy has experienced improvements in the efficient use of its resources and in this sense its growth could be characterized as sustainable in the long term. This research joins the literature that attributes long-term growth to institutions and the role they play as regulators of productive activities in a country (Weil 2006). Institutions can be those that encourage the efficient use of Peru's resources and motivate both its business class and its political class to think not only about economic growth but also about long-term social welfare.

More efficient institutions also allow to respond to the technological change experienced in the frontier of knowledge at the world-wide level and offers certainty and certitude to entrepreneurs and investors that wish to encourage activities based on innovation. It is undoubtedly essential to review the literature that studies the institutional framework surrounding the innovation process, in particular, reference is made to the National Innovation System (NIS), however, concern is left as part of a future research agenda. In the following sections, the DEA methodology and the Malmquist Index are explained in greater detail, where the results of Latin America are analyzed in a general way, with particular concern in Peru. Lastly, the main aspects of the research are concluded.

Method

The TFP is estimated using the Data Envelopment Analysis (DEA). The DEA makes it possible to evaluate the relative efficiency of a set of decision units that are considered homogeneous (UDH, because of its Spanish acronym) i.e., that produce similar outputs from a common set of inputs. The constructions of its indicators establish a series of very flexible assumptions that make it possible to construct a frontier of efficiency as an approximate measure of effectiveness. In this way, it integrates units into its decision that maintain a better relationship between the use of their inputs and the generation of their output, qualifying the units far from the frontier as inefficient (Cooper et al., 2009).

Within the extensions of the DEA models, the Malmquist Method allows to obtain an index to calculate the TFP and to decompose this indicator in what corresponds to pure technological change and technical efficiency. According to Coelli (1996), the Malmquist Index uses distance functions compared to the technology of a given period, i.e., it measures the changes in PFT between two periods of time by calculating the distance quotient of each data and regarding a common technology. In

this way, the calculation can be made input or output orientations without specifying the units of measurement. Thus, TFP indexes and their components can be obtained, on the one hand, due to changes in efficiency (the position of homogeneous decision-making units towards the frontier) and, on the other hand, due to pure technological change (modifications in the frontier itself).

To calculate Latin America's TFP as a whole and, particularly Peru, the data were taken from Extended Penn World Tables (EPWT) version 3.0. The database originally contained a sample of 102 economies, however, our calculations are carried out on a sample of 51 countries due to the availability of information for the 1993-2003 study period. Inputs are taken from the number of workers employed for each economy and the standardized capital stock at 2,000 prices calculated with the Purchasing Power Parity (PPP). Concerning output, the real Gross Domestic Product (GDP) for the year 2,000 is used, calculated in the same way by means of PPP. The sample of countries is composed of: 1 country from Southeast Asia, 17 countries from Western Europe, 2 countries from North America, 2 countries from Oceania, 6 countries from Asia, 1 country from the Middle East, 7 countries from Africa and 15 countries from Latin America, among which Peru is the economy that deserves our particular interest.

Results

Economic history shows that Latin America (LA) has experienced unstable economic performance characterized, among other things, by chronic crises and low growth. According to economist Sebastian Edwards, the region's average per capita GDP growth between 1979-2004 was 1.01% and 0.52% between 1982-2004. On the other hand, the growth experienced for those same periods by the Asian region yield values of 2.95 and 2.99 percent, respectively. These results suggest to the author, among other things, that, on average, the Latin American region has not only experienced a deterioration in its economic (low growth) and social (unemployment, inequality and poverty) conditions. The union of these with the vulnerability that characterizes it towards external shocks, also places the region in a dilemma between recovery or economic stability. (Edwards, 2007).

The economic performance experienced at the regional level does not differ from what is experienced within the economies that make up the region. According to Loayza, Fajnzylber and Calderón (2004), the average per capita GDP growth between 1961-2000 for Argentina, Brazil, Mexico, Colombia and Chile was 1.04, 2.49, 2.06, 1.92 and 2.53 percent, respectively. This explains why, for this same period, the region has presented an average growth of 1.75 percent compared to 5.19% recorded by the Asian region. Chumacero and Fuentes (2006) present data for 1961-2004, showing regional differences in terms of GDP per capita, which would be expressed as follows: LA (1.59), Asia (5.16), OECD (2.51), world growth (2.33) and for the United States (2.39).

Productivity in Latin America has particularly gone through stages of growth and decline. It is known that this represents about 80% of that experienced by the United States between 1960-1980. However, in the 1970s it would represent a drop of just over 20%. Regarding the particular case of Mexico, where these figures would go from 1.09% in 1960 to 0.77% in 2,000, while Argentina and Venezuela would obtain values of 0.69 and 0.61 percent, respectively. Productivity is, therefore, placed as one of

the main factors that make it possible to achieve the most industrialized economies (Loayza et al., 2004).

An interesting controversy occurs in the behavior of productivity in Latin America, particularly in the period of Latin American industrialization that would have been characterized by greater state interventionism. Recently, there is a clear trend towards the decrease of international trade barriers and financial deepening in the region at the beginning of the globalization stage in the twenty-first century. Originally, after the restrictive measure that was implemented due to the neoliberal model, it was considered that it would be a good mechanism to stimulate the advance of productivity and that it would allow a greater adoption and use of technologies coming from abroad and ultimately, an approach to the economic success experienced by western countries. However, this did not happen so literally, as documented by Lederman, Maloney and Servén (2005).

Lastly, Solimano and Soto (2005) argue that LA's unfavorable performance in the productivity area is due to the macroeconomic volatility that has recently been experienced in the global context and that has had an enormous impact on the region. According to the figures presented by the authors in Table 3, the Latin American region records close to 30% of the total for the 1960-2002 period, crisis scenarios with negative figures in GDP growth rates. This is a fundamental difference if these data are contrasted with the 12.3 percent experienced by the reference group composed of Asian and European countries.

The contribution of the TFP to the growth of Latin American economies regarding productive factors is minimal, and these differences intensify when compared to what is reported by Asian economies. For example, in Argentina, only 0.7 of the 2.4 percent of output growth between 1960-2002 is explained by the TFP contribution, with the remaining by contributions from physical capital (1.2) and labor (0.5); while for Korea, of the 7.9 percent increase in output, 3.7 percent is explained by contributions from TFP, 2.5 to capital and 1.7 to labor. In this sense, the low growth of the region is based on the low participation of productivity. This is a crucial factor if we bear in mind that productivity expresses the use and generation of technology. There is no doubt that productivity is prevailing in a volatile external environment with high demands for competitiveness.

Calculations using the DEA methodology allow us to obtain the Malmquist Index, which presents the productivity broken down between technology and technical efficiency for the 51 economies as a whole. The results are presented for the (1993-2003) period for which each of the indicators is averaged as presented in the following table.

Table 1
TFP and its Breakdown (1993-2003)

	Efficiency	Technology	TFP
Argentina	0.975	1.184	1.148
Australia	1.017	1.335	1.360
Austria	1.114	1.283	1.429
Belgium	1.177	1.322	1.556
Bolivia	1.269	0.948	1.185
Brazil	1.210	1.160	1.406
Canada	0.885	1.141	1.004
Colombia	1.239	0.938	1.162
Korea	0.932	0.960	0.895
Costa Rica	0.946	0.842	0.796
Denmark	1.022	1.290	1.315
El Salvador	0.987	0.868	0.852
Spain	1.048	1.087	1.131
United States	0.955	1.173	1.120
Ethiopia	1.070	0.948	1.019
Philippines	1.102	0.783	0.861
Finland	1.275	1.420	1.811
France	1.066	1.255	1.333
Guatemala	1.194	0.914	1.089
Honduras	0.778	0.906	0.697
Iceland	1.067	1.342	1.434
India	1.201	0.986	1.176
Ireland	1.464	1.108	1.628
Israel	1.277	1.195	1.518
Italy	1.332	1.355	1.803
Japan	1.005	1.260	1.263
Kenya	1.024	0.959	0.971
Luxembourg	1.063	2.034	2.160
Mauritania	1.555	1.127	1.750
Mexico	0.906	1.163	1.052
Morocco	0.939	0.790	0.740
Nicaragua	0.631	1.066	0.667
Nigeria	1.003	0.997	0.998
Norway	1.136	1.738	1.978
New Zealand	0.793	1.283	1.013
Low Countries	0.944	1.493	1.409
Panama	1.215	1.096	1.332
Pakistan	1.342	0.926	1.242
Peru	1.082	1.074	1.170
Portugal	1.197	1.143	1.362

United Kingdom	1.078	1.092	1.179
South Africa	1.161	1.125	1.306
Sri Lanka	1.664	0.867	1.436
Sweden	1.012	1.298	1.312
Switzerland	0.673	1.773	1.196
Thailand	1.128	0.789	0.885
Trinidad and Tobago	0.961	1.156	1.119
Turkey	0.807	0.775	0.623
Uganda	1.000	0.882	0.882
Uruguay	1.180	1.127	1.327
Venezuela	1.023	1.139	1.162
Average	1.081	1.136	1.221

Note: Authors' creation.

Latin American economies show an unfavorable TFP performance. The period between 1993-2003 covers both the period of economic openness, and the period of greater degree of globalization. Only the economies of Brazil (1,406), Panama (1,332) and Uruguay (1,327) recorded a TFP above average (1,221) of the 51 total economies included in our study sample, including Peru. Since 1980, efficiency declines paradoxically in the face of a recovery of the technological factor, but it does ultimately keep TFP with no significant variations. There has been a neglect of the factors in the region that provide efficiency in the conduct of economic activities both in the private sector (perhaps due to privatization), and in the public sector (perhaps due to the lesser intervention that the State has had in these economies), and the effort that has been emphasized to leave productive activities in the hands of market forces.

The region has benefited from the availability of technology as a result of the economic openness gradually experienced by each of the region's economies, but without the efficiency mechanisms, or rather, the institutional mechanisms, to make the best possible use of the available technology. A review of some statistics on the innovation process is enough to evidence a lack of interest in this sector. For example, they spend less than the minimum required expenditure (1%) on R&D. According to Melo (2001), data from the Ibero-American and Inter-American Network of Science and Technology Indicators (RICYT) for 1999, suggests that spending on Science and Technology (S&T) as a percentage of GDP was 0.54, 0.63 and 0.41 for Argentina, Chile and Mexico respectively; while Spain, Canada and the United States recorded values of 1.61, 0.89 and 2.59.

In Latin America, there is a clear lack of interest on the part of the private sector in directing its resources to technological activities, which is not the case for industrialized and newly industrialized countries. In 1998, about 67% and 74% of total R&D expenditures were financed by industry, while the government accounts for slightly more than a third in the United States and Japan. Conversely, in the case of Latin America almost three quarters of the total expenditure on S&T is financed by the government sector, while the rest is distributed among companies, higher education, nonprofit organizations, and the external sector. In Mexico, for example, total expenditures on S&T are financed 71.1% by the government, 16.9% by businesses, 8.6% by higher education, 0.9% by the nonprofit organization, and 2.5% of the total through foreign channels, with all these data for the year 1997.

The review of PTD’s behavior in Latin America is needed to have a clear understanding of the economic context surrounding the region within the studied period. Peru, as a member country, has also had to overcome both, the wave of globalization, and certain neoliberal economic policies characterized, among other things, by severe corruption within this economy. However, the economic performance has been favorable, where several authors such as Loayza (2008), consider that between the end of the nineties and the beginning of the 21st century a watershed is marked for this economy and that is why the TFP estimation is justified during this period.

Between 1993 and 2003, Peru’s TFP had a favorable performance of 1,170. This positive behavior is also composed of favorable indicators, both of its performance in efficiency (1,082) and of its performance in the component of pure technological change (1,074). Authors such as Reyes-Mondragón (2019) make longer-term estimations for a period from 1966 to 2003. The results obtained show that the Peruvian economy improves its TFP, not only because it operates with positive efficiency indicators throughout the analyzed period, but also because improvements in technology are increasing, as can be observed in the following Table 2.

Table 2. Peru. TFP and its components for different periods.

Period	Efficiency	Technology	TFP
1966-1973	1.143	0.996	1.142
1973-1983	1.409	0.961	1.358
1983-1993	1.227	0.966	1.187
1993-2003	1.082	1.074	1.170

Note. Extracted from Reyes-Mondragón (2019).

In graphical terms, the bars in Figure 3 show the behavior of the TFP and its components during four time periods. We can see that, in all these periods, it is efficiency that contributes the most and improves the TFP. However, in the last period, the period that falls within our remit, improvements in technology provide a scope to the efficiency indicator, while both contribute in a similar amount to the increase in TFP.

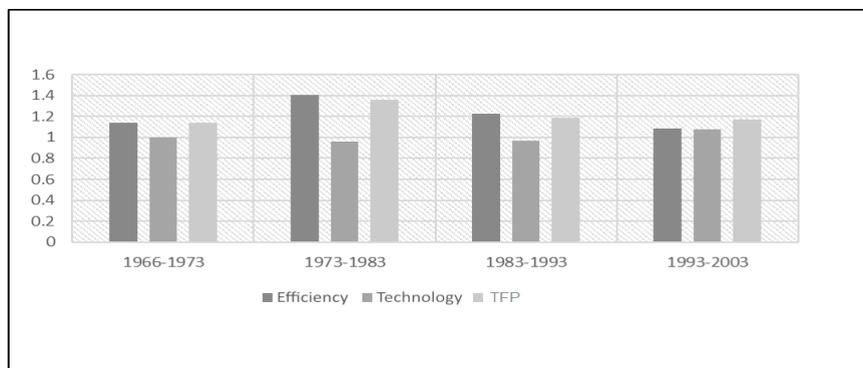


Figure 3. Peru. TFP and its components for different periods.

Note: Source. Extracted from Reyes-Mondragón (2019).

The above could indicate that in the Peruvian economy the institutional conditions have been established for its economy to operate efficiently, and to use its productive resources in the best possible way. While it is true that economic performance is not everything, in many cases it is presented as a prelude to better living conditions for the population. Peru still has issues that deserve attention, such as poverty, food security, inequality, social marginalization and discrimination, mineral exploitation, care for the environment, pollution, labor exploitation, etc., issues in which progress has been made without structurally addressing widespread social welfare.

Resources and their efficient use are not enough for an economy to be sustainable. Peru can still improve and strengthen its constitutional framework, particularly in key sectors such as science, technology and innovation. Some authors such as Díaz and Kuramoto (2010), review the main indicators of science and technology in Peru, as well as an institutional review. In their research, the authors use the SWOT methodology to point out the areas of opportunity to improve the main indicators that promote the generation, dissemination, and use of knowledge in Peru. The application of this methodology is useful and complementary to quantitative studies. Some authors have applied it to other areas, finding interesting insights, particularly for the design and implementation of science and technology policy that goes hand in hand with the expected economic growth. For example, Ghazinoory and Ghazinoori (2006), apply SWOT to Iran's innovation system, particularly focusing on strategies the government can implement to strengthen its innovation performance. Al-Mubarak and Busler (2012), apply SWOT to innovation systems in a sample of European countries, pointing out the areas of opportunity that would favor the competitiveness of each system.

Discussion and Conclusions

The empirical bibliography evidencing the economic performance of different countries at the global level is extensive. The pattern of behavior is varied, with some showing a clear tendency towards convergence with leading economies and others towards divergence and economic lag. GDP turns out to be one of the main indicators for a nation's wealth, either through a comparison in terms of levels or growth rates. This comparison based on the PPP methodology is also approximate to the level of development of the countries when considering the GDP per person. Economically, it is interesting to analyze the factors that affect the performance of an economy, particularly as in the case of Peru, which go from an unfavorable performance to an "economic miracle" type as occurred in East Asian countries (Lau and Park, 2003). The emblematic case is that of South Korea, which presented accelerated and sustained growth and which today, in terms of economic growth, has surpassed countries such as the United States. García-Blanch (2002) documents, for the Korean case, that the stimulus with respect to the profitability of investments and the returns to capital, in a first stage, allowed South Korea the expansion of the physical and human capital stock (from 1963 to 1981) to later give way to an improvement in the efficient use of its productive resources, that is to say, to an increase in its productivity (from 1982 to 1991).

The growth and productivity background for the Latin American region and also for Peru was presented in the document. The literature review on the subject suggests

that the unfavorable growth of Latin America is due to economic instability and the gaps in TFP that it maintains against the more industrialized economies. The region's economic vulnerability to external shocks, and the crisis scenarios that have enveloped the region seem to be common characteristics. The results of our Malmquist Index calculations, on the other hand, provide a better picture of TFP behavior due to the components of TFP, namely technical efficiency and pure technological change. Between 1993 and 2003, the TFP for Latin America would have little significant improvements due, on the one hand, to the increase in technology and, on the other hand, to the decline in efficiency in almost all the economies of the Latin American region.

These results suggest that the stagnation of TFP in Latin America is characterized by an increase in technology, but due to a fall in technical efficiency, which is noticeable, especially because of the efficiency determinants. One of these important factors are institutions, in particular the institutional framework surrounding the innovation process which, if complemented by global technological progress, would open up the possibility of recovering the region's economic performance. It is suggested that special attention should be paid to the region's institutional framework, since it is here that there is a promise of improvement towards multifactorial productivity that would ultimately ensure long-term economic growth.

TFP estimations in Latin America were made in order to have a context of the performance of the components of multifactorial productivity as one of the long-term determinants of the Region. The DEA methodology and particularly the Malmquist Index requires a set of homogeneous units that allow us to make a comparison of our economy in question, in this case Peru's economy. Once we consider the 51 economies in our study, all of which belong to the Latin American region, we can appreciate the multifactorial productivity and its components in the case of Peru.

Peru's economic growth has not been even slightly without ups and downs. However, the analysis period for 1993-2003 is used since it is in this period that the Peruvian economy reflects a better upward behavior. The question discussed in the document's body is whether Peru's growth is sustainable or not, in this sense, whether its growth is based on multifactorial productivity or on the accumulation of production factors. Our research is added to the literature that supports that economic growth is based on improvements in the efficiency with which it manages its resources, that is, on improvements in productivity (Chirinos, 2008; Loayza, 2008, 2016).

The behavior of the TFP and its components are better appreciated in the long term, which is why it is helped by the research of Reyes-Mondragón (2019) who also applies the Malmquist methodology, but for a longer period 1966-2003. The results of this author show that in the last period 1993-2003, both efficiency (1,082) and pure technological change (1,074) have increased, and this situation has been reflected in the TFP estimations (1,170). In this sense, the research corroborates the idea that Peru's long-term growth can be sustainable if it continues to improve its efficiency indicators that go hand in hand with institutional change. It is argued that the institutional framework plays a fundamental role in the growth of the Latin American economy, particularly because it is in the institutions where incentives, regulation and legal support are found so that the economies carry out productive activities that contribute to the country's product.

Within the institutional framework, this research also supports the need for more in-depth studies that make up the different institutional approaches to scrutinize the

areas of opportunity that Peru has in the coming years. One of the most important institutions is the one involved in the innovation process, known within the literature as the National Innovation System (SNI, Sistema Nacional de Innovación). A study that analyzes in greater detail the functioning of the SIN, with a mixed type study methodology, may provide evidence of whether the Peruvian economy has developed technological capabilities for the use of technological progress or has lagged behind in this area. This topic is left as a research agenda for specialists to resume and complement public policies that lead Peru to economic growth and sustainable social development.

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