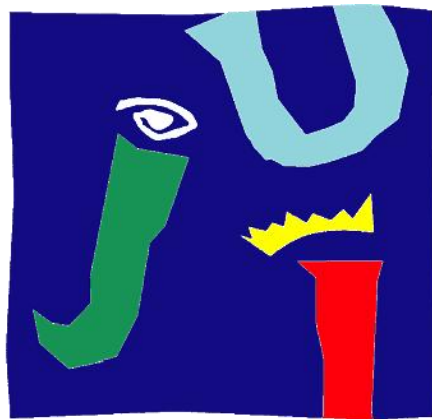# The Effect of the Informal Employment Rate on Productivity: Application to Developing Countries

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ABSTRACT

This paper measures the effect of the informal employment rate on labor productivity in developing country economies.

In addition, knowing that productivity is influenced by other factors such as unemployment, inflation, skilled labor and the rate of trade openness, an econometric model is used that considers all these variables and is capable of quantifying their effect both individually and jointly, considering productivity as an endogenous variable in this specification.

In this way, and by analyzing the individual effect of each factor considered on the endogenous variable after estimation, it is possible to contrast the contribution of the informal employment rate with that of the other regressors considered and, in general, to clarify which factor has the greatest influence on productivity in developing economies.

The model used for the calculations was estimated by a panel data on 26 non-developed countries over the period 2015-2018. Taking into account the results obtained, it has been determined that the informal employment rate negatively affects productivity, being also the most statistically significant variable according to the estimates, which were modeled from World Bank data and from the labor and wage statistics of the International Labor Organization (ILO) for the countries considered.

Finally, the final objective of this work is that its results and conclusions contribute to the dialogue for the elaboration of labor policies that strengthen and give greater coverage to the formal sector of the economy, being aware that this will better reward its workers and allow them to have knowledge and enjoyment of guarantees expressed in legal contracts which, in terms of aggregate welfare, will surely lead to an increase in productivity that will facilitate their progress and greater national development.

Key words: productivity, informal employment rate, labor market, economic development, labor welfare, job quality, decent jobs.

INTRODUCTION

The ultimate objective of this work is to show an alternative for the process of elaboration and design of public policies regarding the labor market of a national economy, mainly those that are in development.

Aware of the unfavorable conditions in which undeveloped countries find themselves most of the time in order to grow their economies and progress socially, the emphasis of this research lies in the search for alternatives that allow generating inclusive economic growth in a sustainable manner, which guarantees employment and decent work for their populations, in accordance with Goal 8 in the framework of the Sustainable Development Goals (SDGs) set forth by the New Agenda of the United Nations.

Specifically, the effort of this work focuses on the presentation of solid arguments that allow, firstly, the protection of jobs and support for workers in the informal sector by exposing the consequences that their non-consideration may cause on the development of a country (sub-goal 8.3 of the SDGs).

Secondly, the alternatives sought must, in turn, be geared towards social cohesion, where welfare extends to all or a large part of the population (sub-objective 8.5 of the SDGs).

For this reason, it is considered that satisfactory solutions can be found in the study of the labor market in accordance with these goals, so that nations can then develop policies that promote these measures and ensure social as well as economic progress.

However, there are many indicators that allow the labor aspect of a national economy to be evaluated. In this sense, some ratios can be counted, the most relevant of which are the labor participation rate and, within this, the employment rate. We also speak of ratios when annual inflation is taken into account, which directly affects employment.

On the other hand, there are some continuous and discrete variables that offer some kind of similar diagnosis, such as labor productivity and the total number of employees in an economy, as well as the counting and grouping of employees divided by age range and gender, in addition to the more structuralist type of classification separated by sector and/or economic activity.

However, there may be other factors that affect productivity and condition long-term development. One of these is labor informality.

The ILO defines labor informality as all those economic activities and occupations that are not covered or are insufficiently covered by formal systems, covering within its definition both legal aspects and under practice (OIT, 2019).

For its part, the Inter-American Development Bank (BID, 2017) considers as informal jobs those jobs that do not have access to social security benefits or similar guarantees from employers to their employees. In other words, we could understand them as those that do

not have a binding legal contract and in which the obligations and rights of workers are clearly stipulated, with relations generally being sealed through verbal agreements.

The presence of labor informality can affect the economic development of a nation and, in spite of this, it is a factor that has not been given the necessary importance to recognize the negative influence it has on progress, nor to implement measures to control the damage that an increase in its presence can bring to individuals and national economies.

Therefore, and expressed in other words, informality is a phenomenon that has not been given sufficient attention in the way it could compromise the growth and progress of a nation or, in other words, it has not been given the necessary emphasis to be able to regulate it adequately, at least in a general way, since its existence is recognized in developing countries but no further information is available on it in those that qualify as developed and, in fact, these do not usually publish data on the subject despite the fact that it is present in certain areas and sectors of their economies.

In addition, informality has a heterogeneous character since it usually groups certain essential characteristics of an economy under an underlying reality and in a way that is not possible to reveal with other indicators. It includes structural and even bureaucratic and institutional aspects, which seem to have a significant impact on wages and labor productivity in aggregate.

The consideration of labor informality and its consequent effect on productivity was possible after reviewing the available documentation based on the reality of Latin American countries in which the presence of the informal sector is widely recognized. In fact, in these countries the informal sector is relevant for several reasons.

First of all, this phenomenon cannot be underestimated in these countries considering the large presence of jobs outside the formal sector in their economies. This in turn alters the labor market and impacts the welfare of their workers. This becomes clearer when analyzing other indicators, such as employment rates or, on the other hand, the unemployment rate within their borders.

Thus, it could be observed that unemployment rates in Latin America are not too high compared to other nations and areas of the world, but even so, it is a region characterized by low labor income and, among this, a low average minimum wage at the regional level.

This would seem to indicate that informality is interfering with the proper functioning of these labor markets, negatively impacting labor productivity in these developing nations and thus influencing wages, given its widely recognized presence in the subcontinent.

Considering the latter, our motivation was to justify a new way of measuring the economic and labor health of a nation, inspired by the case of Latin American nations as a starting point; understanding the determinants of productivity and the role of labor informality on it, would be useful to contribute to the greater welfare of both workers and the economy and labor market as a whole, considering this approach as a measurement of integrated vision,

more realistic and conscious when designing and implementing policies and reforms in this area.

We hope that the results and conclusions of this analysis can be extended to other regions of the world, including developed nations. In other words, we seek to highlight the relevance of labor informality on productivity and economic growth in general. This could help governments to apply strategies to increase the number of jobs covered by the definition of decent work, within the formal sector, and to raise the general welfare of the society where these measures are implemented.

The paper is organized as follows. First, there is a review of the literature that provides theoretical support for this study and conclusions. Second, the hypotheses to be contrasted based on previous literature will be presented, giving shape to the approach and motive pursued. Thirdly, we proceed by estimating under a series of econometric models, carrying out contrasts in search of the most suitable definitive selection to be used for the purpose of this research, analyzing the results of the empirical analysis, as well as the pertinent contrasts of the same. Finally, the conclusions of such results are drawn in the corresponding section, together with the economic implications derived therefrom.

LITERATURE REVIEW

This paper focused on the aspect of job informality, taking into account its influence and consideration as a possible explanatory factor with a causal effect on labor productivity. It should be noted that this quality, measured through the rate of informal employment, is a characteristic annually reported by the national statistics departments on labor issues of the countries of the Latin American region and other developing countries, but not in developed nations.

In this context, and according to the technical notes of the Inter-American Development Bank (IDB), the countries of the Latin American region present an interesting case in terms of the labor issue, since these usually possess a considerable rate of employment or, at least, not out of the ordinary compared to other nations in the world (BID, 2017). However, this fact alone does not guarantee better conditions for the welfare of their individuals.

Without going any further, one out of every two employed people in Latin America belongs to the informal sector of the economy. As a result, labor informality has become an important issue for the International Labor Organization (ILO) in its areas of study and action. Among its priorities on the subject, those concerning the establishment of the framework of international labor standards stand out, as well as technical cooperation beyond national borders and the development of knowledge for public policies that address and confront this issue.

Now, through the launching of the Regional Employment Program for Latin America and the Caribbean (PREALC) issued by the ILO a little over 50 years ago, an ambitious technical cooperation plan was cemented in order to address labor informality and thus mitigate its effects (Infante and Martínez, 2019).

However, labor informality still persists and labor welfare has not progressed as expected since then.

The welfare of workers within a national economy considers wage aspects and other aspects such as social security and bonus payments, which are qualified as non-wage costs by employers to employees. This being so, and despite a greater number of jobs occupied in Latin America, not all of them fall under the definition of decent jobs (IDB, 2017).

According to the International Labor Organization and the World Trade Organization (WTO) (OIT & OMC , 2007), decent work implies the existence of opportunities to ensure high productivity in employees as well as the enjoyment of fair income in terms of payments or remuneration; they must also be guarantors of personal development, with an inclusive approach and granting them non-wage benefits, which translates into contributions on their behalf and on behalf of their employers to social security or by way of compensation and/or various bonuses.

However, the supply of jobs outside the formal sector (informal and precarious jobs) and those that do not cover enough wages to establish a legal wage-earning relationship are predominant in the region. In fact, Latin America has a low average wage, which is directly related to the low productivity of its workers.

In addition, we must consider the importance of labor productivity as a determining factor for growth and socioeconomic development, so that maintaining an upward productivity quota grants sustainability to progress in the medium and long term, with the generalized increase in welfare and the achievement of a better standard of living by workers and inhabitants of a nation.

Due to the above and weighing its importance, the fact that government entities, as responsible for labor policies, have to rely on the unemployment rate as the main parameter to diagnose and measure the welfare of the labor market is worrisome. Measures based primarily or solely on unemployment rates may be biased or incomplete at best.

For his part, Alaimo (2015) draws a series of conclusions for Latin American countries where, in general terms, he qualifies precariousness and informality as an evil for economic and labor growth. One of them is that low productivity in these countries would be influenced by a higher proportion of labor informality, so that both factors would also feedback on each other and together would lead to a loss of social welfare marked by an increase in inequality, the presence of greater poverty and low economic growth reflected in national accounts.

However, despite the fact that informality is a factor that would negatively affect economic development and social welfare, it sometimes emerges as the only response to the need on the part of the workers themselves. It is precisely here where the controversy and interest in this topic is born, which, in fact, has more than one approach to address it today.

However, the explanation for the existence of different approaches to address the issue of labor informality is mainly due to its heterogeneous nature, with many causes and determinants. Thus, these approaches respond to different classifications, each of which groups together similar and related causes of the phenomenon. Thus, there is a dualist, neoclassical, structuralist, orthodox and institutionalist approach. (Cano et al., 2014).

After verifying the available empirical evidence and using it to estimate and contrast hypotheses, two approaches were chosen to address the issue of labor informality in this research: the structuralist and the institutionalist approaches.

At this point, and as García (2008) states, the intention here is not to isolate the approaches and verify which one is better, but to make a synthesis and synergy effort between the two to give a broader explanation to the problem of labor informality, so that it can be covered in an extensive and integrated manner given the available data and variables to be studied.

Likewise, according to Portes (1989), there is no real need to clarify now a criterion that pretends to determine in absolutist terms which vision predominates over the other, but only in the fact of taking common advantage of it, as would be the joint understanding of other phenomena that touch the problem itself.

Now, aware of the above, we should first of all know what both approaches propose separately and, secondly, make an effort to bring together both conceptions so that they harmonize in a broader concept for the understanding of informality without conceptual frictions in between.

The structuralist approach, for its part, rests on the thesis that the formal sector has been unable to absorb all the demand for employment, there being therefore mismatches between labor supply and demand, which would be associated with low industrial development of the economic structure of a country or region or even sociodemographic factors (Cano et al., 2014; García, 2008).

Precisely on this last point, the thesis of Ochoa and Ordoñez (2004) on the study of the causes and effects of labor informality in Colombia, establishes that variables such as gender, educational level or age group have an impact on the possibility of individuals to be part of the informal sector. Thus, despite the existence of a variety of types of informal jobs, these jobs tend to have more flexible working hours, which end up being largely occupied by female workers, as representatives of the female gender, who have a greater participation in the sector.

On the other hand, according to this approach, informal workers in an economy also tend to be characterized by having a lower level of schooling or, equivalently, a lower educational level compared to an average worker in the formal sector.

Whatever the cause of whether a worker belongs to the informal sector or not, the major impact of this is the gap generated by the mismatch between labor supply and demand, creating clear differences also in the quality of jobs and incomes. In fact, the excess of demand over supply of jobs leads to the employment of part of them in the informal sector of the economy, where low-quality and low-paid jobs abound (Uribe and Ortiz, 2006).

Moreover, in developing countries, nascent industrialization has made these differences even more noticeable, separating the economy into a modern, industrial sector and a traditional one.

It turns out that the rate of labor productivity tends to be higher in the modern sector, which has resulted in the enjoyment of better wages and labor guarantees by workers employed in that sector compared to those who perform their functions within the traditional sector, where unskilled workers abound and a shortage in the first instance of physical capital, which in turn leaves lower profits derived from the low productivity to which this association leads, generating instability in the very welfare of the workers that comprise it. (Cano et al., 2014)

In fact, according to Klein and Tokman (1988), companies within the informal sector of the economy tend to be unproductive, since they are characterized by the use of basic or rudimentary technology, in addition to not possessing an abundance of capital. This would also contribute to explain why informal workers tend to be more unproductive, since regardless of their educational level, they would not have good tools to cope with their jobs and obtain a better performance.

However, there are authors who, within the structural approach, suggest other causes for these mismatches. Miranda and Rizo (2009) approach the problem from classical economics and do not agree that labor supply and demand are in discordance. Thus, these authors state that labor informality would arise because the vacancies offered in the economy do not meet the expectations of its workers, prioritizing this fact over a possible inability of the formal sector to absorb part of the labor demand as the cause or origin of the problem.

Thus, like Cano et al. (2014), their conclusions point to the fact that the greatest explanations for the presence of the informal sector can be found in unemployment, arguing that there are three determining factors that determine it as such: frictional factors, where workers are in search of a formal job with greater guarantees while they are employed in an informal one; voluntary factors, until the economic or other expectations of individuals are not met; and finally, other macroeconomic factors due to market failures, which lead to unemployment and, in the end, contribute to generating these mismatches between labor supply and demand.

Secondly, there is the contribution of the institutional approach to the problem which, on the other hand, would define the phenomenon of labor informality as a voluntary and conscious response to the legal limitations and barriers imposed by administrative and economic regulation on the modern and formal sector of the economy.

This is why, from this perspective, informality is a means of escape and evasion, or perhaps a shortcut in the face of high costs for the legal incorporation and start-up of companies to operate; the same response would arise in the face of tax and fiscal procedures, as well as other measures that are frequent in societies governed by inefficient state authorities and with a high level of bureaucratization, which is frequent in less developed economies (De Soto, 2000; García, 2008; Maloney, 2003; Maloney and Núñez, 2003).

That said, it should be noted that this vision does not seek to separate the formal from the informal sector based solely on the productive and performance decisions made by companies, but rather points its efforts to understanding the phenomenon of labor informality as a deliberate and voluntary decision of the individuals who make it up, aware that by doing so they can save certain costs and avoid bureaucratic processes in the process.

For this reason, and also in accordance with Porte and Benton (1984), informal activities may well constitute part of the modern and industrial sector of the economy, so that it is not a residual sector as the structuralist approach suggests and, in another case, their view rests more on conceiving the problem as a voluntary and entrepreneurial decision whose purpose would be to reduce the costs of legal incorporation, as well as its subsequent start-up and productive elaboration.

At this point, the visions would contrast, since the institutionalist approach proposes that workers who are part of the informal sector would have a higher educational level and would enjoy a higher income, since they would make this decision voluntarily, evaluating the benefits and disadvantages of being able to set up in the informal sector as an alternative to the ordinary legal route.

However, as we have already mentioned, the predominance of one approach over another is not the issue that concerns us, but rather the mere conceptualization and explanation of the phenomenon of informality, in an effort to understand its causes and the effects that it could entail.

Particularly interesting is the direct relationship that labor informality may have on productivity, in a sustained manner as proposed by the structuralist approach, which is what this study highlights the most, as well as the interdependence it implies with inequality and the existence of greater poverty, thus indicating a detriment to the welfare of individuals and affecting even in terms of wealth distribution, thus compromising, in short, the full development of nations.

However, it is always good to have other points of view to appreciate the problems and that in a certain way, to a certain degree, manage to mesh and work together within both points of view to explain the phenomenon of informality as a whole.

That is why in this study we intend to quantify the effect that labor informality could generate on productivity, being our main proposal for a new measurement or standard to evaluate economic health and progress, in addition to other determinants already studied as such and which correspond to the unemployment rate, inflation, the rate of commercial openness and skilled labor within a national economy.

Thus, considering the above, we should also be able to explain the isolated effect of each of these factors on productivity.

In this line, and with respect to trade and its influence on labor productivity, there are several studies in the literature that confirm the benefits derived from it. In this paper, we measure trade through the rate of trade openness, evaluating the effect of international transactions on productivity in an open economy.

Santos-Paulino and Thirlwall (2004) argue that the effects of greater trade openness have a direct impact on economic progress and growth, since it generates gains that are used transversally in a national economy, such as, for example, better use of resources, aiming at their efficient use; guaranteeing national participation in the international economy and encouraging greater competition, providing a wider availability of goods and generating consumption alternatives in the domestic market.

In addition, greater trade openness favors economic growth not only through static gains from trade, but also has dynamic benefits understood as flows whose balance is positive for an economy. Thus, the transmission of knowledge is favored and highly correlated with technical progress; likewise, it encourages a higher rate of capital accumulation. All of the above leads to greater economic progress, since it positions a national economy better in terms of competitiveness with respect to other nations in the world, improving its productivity and leading to growth in the medium and long term.

For his part, Winters (2004) manages to relate the effect of trade openness with investment and, likewise, to validate the influence of the latter on inflation, another factor whose effect on productivity we are interested in addressing.

In this way, the author argues that greater trade openness stimulates a greater flow of investment, with which it is closely and positively correlated, with a bidirectional relationship between the two. In this way, high trade openness becomes a skillful resource to combat high levels of inflation, favoring exchange and expanding consumption alternatives, with a consequent increase in individual living standards and social welfare at the aggregate level, increasing national production and, thus, efficiency in the latter process. In other words, it also contributes to an improvement in productivity.

On the other hand, the author highlights other indirect benefits that a higher rate of trade openness brings, such as the improvement of institutions and administrative-governmental

policies, which promote agility for the proper functioning of the economy, in terms of improvements in the articulation of processes linked to the achievement of objectives for economic and social progress.

After the above, the role played by inflation on labor productivity could be understood from this international positioning of an economy. Considering this, it is convenient to insist that this work has focused on developing countries with open economies. In this way, the opening of the economy also generates an inflow of resources and capital, foreign direct investment, which contributes to economic growth explained by an improvement in productivity as already mentioned.

Now, and due to economic openness, Feal-Zubimendi (2007) points out that there is less price distortion since both domestic prices and those of foreign goods have to reconcile or converge, containing excessive inflation.

Therefore, we can argue that high inflation would be inversely related to productivity, since it is negatively correlated with investment, and the latter is positively and directly correlated with productivity improvements.

In addition, Prokopenko (1989) points to inflation and price instability as recurrent causes for a reduction in investment, since they increase the costs of capital which, together with exhaustive, inefficient and direct state intervention in the economy, end up discouraging competition and the mobility of human capital conceived as labor force, with a consequent loss of international competitiveness and in terms of local productivity.

However, and in another line, it is possible to elucidate the effect that inflation has on labor productivity from the approach of macroeconomic theory (Blanchard, 2017; De Gregorio, 2012) and considering the wages of an economy.

To do so, and first of all, it must be understood that in the face of greater efficiency and productive performance, companies will generate higher profits, which they will repay their workers through an increase in their income as should be the case at least when keeping other variables that could affect them as constant.

In this way, and given the improvement in labor productivity that would lead to higher wages, production prices should also rise for this to be profitable for the producing companies and not incur higher costs.

Because of this, it can now be assumed that an increase in the cost of goods and services and, therefore, the consequent increase in the cost of living due to higher price levels, which would be reflected in an increase in the inflation rate, would mean that wages would again have to be adjusted upwards so that workers could maintain their real purchasing power and that this would not be diminished, thus generating a cycle between these variables. Under this scenario, inflation would positively influence productivity and vice versa.

Finally, the causal effect of unemployment on productivity is evaluated.

Carro and González Gómez (2012) propose a temporal separation to understand the effect of unemployment on productivity and vice versa.

The authors suggest that in the short term, partial measures are usually implemented to solve the unemployment issue. Thus, the aim is to reduce unemployment by limiting it to a specific sector, which is facilitated when the technical level and knowledge required in those jobs are not high.

Similarly, it is easier to combat unemployment in a specific sector when the sector does not have greater resources and technology, and only the application of elementary knowledge in the field is necessary. Therefore, higher unemployment may be due to low labor productivity, measured as output or results per unit of time, which is common in jobs that tend to be inefficient and intensive in the use of rudimentary technology.

In turn, high levels of unemployment would induce a drop in productivity, since unemployment as such and in general terms, is due to the increase in the number of unemployed individuals, including any type of training or educational degree they possess.

In this way, the combined efficiency of labor and aggregate results decreases, reducing production and labor productivity when there could still be increasing returns to scale in terms of economic-productive efficiency, which frequently occurs when the economy is booming and has not yet reached its potential or stagnation in the growth rate, as happens in more advanced economies.

On the other hand, the authors also point out that productivity could considerably reduce unemployment in the long term, when it is supported by efficient methods and there is adequate coordination and internal functioning among the country's various economic and institutional activities. Because of this, productivity would be negatively related to unemployment.

HIPOTHESIS

Considering the previous literature review, we could formulate some initial hypotheses on the influence that labor informality will have on productivity, as well as the effect that the other variables considered in this study, namely unemployment, inflation, trade openness rate and skilled labor, will have on productivity.

Hypothesis 1: Labor Informality will have a negative impact on Productivity

First of all, although labor informality has many aspects and is therefore a heterogeneous field, the evidence seems to agree on the negative role of its presence for an economy,

especially in terms of the individual welfare of its workers and their productivity in aggregate, which affects the development of the economy.

The heterogeneous nature of the context in which informality is contextualized or originates is reflected in the existence of a variety of approaches to address it. As previously mentioned, the structuralist and institutionalist approaches are the predominant and most cited in their study, due to the scope of their conclusions on the subject.

From a structuralist viewpoint, we can link the existence of labor informality with a negative effect on productivity, since this approach links the presence of the former with low records of the latter and, in turn, it is usually accompanied with a lower level of economic and social welfare, since it is linked to the presence of greater poverty, a larger inequality gap, and a lower degree of economic development, characterized by slow and low growth of national accounts (Alaimo, 2015).

On the other hand, although the institutionalist approach proposes informality as a voluntary and informed decision for the sake of greater benefits on the part of employers, this type of decision would not contribute, again, to the social welfare of workers, demotivating them and decreasing their efficiency and labor productivity as a consequence.

This is justifiable in view of the low wages of workers in less developed economies, which have a greater presence of informal labor, compared to those who are part of the labor force in better-off countries with more advanced economies.

Thus, regardless of the reasons that led entrepreneurs and employers to consciously and voluntarily take refuge in the informal sector, whether to avoid mediation costs or to speed up legal incorporation, the low wages offered by this sector would reduce the motivation of workers, negatively affecting their performance and productivity, which would eventually lead these individuals to seek other labor options within the formal sector.

Thus, informality would only have a preponderant role of a partial nature, as a subsistence alternative for those individuals who have not been able to find and work in a formal job, thus providing an effective and quick solution to cover their needs and support their families. In this case, these workers have found in the informal occupation an outlet that has allowed them to alleviate their economic problems momentarily.

For all these reasons, being apparently disparate views, we can assume that the effect of labor informality on income is predominantly negative, that is, that both labor informality and productivity have an inverse relationship with each other.

The effect of the other variables to be considered on productivity will also vary depending on the case. For these, the following hypotheses have been considered:

Hypothesis 2: Skilled Labor will have a positive impact on Productivity

Skilled labor would be relevant in our opinion and would have a positive influence on labor productivity in general terms. We say this is a general belief, because it will vary from country to country anyway. It may be that a particular economy does not have increasing marginal returns to the productive factor of labor, so that an increase in the number of workers, even if they are skilled, would tend to decrease the efficiency of the productive process, having the opposite effect on productivity as such to the initial assumption.

Even so, we are confident of an increasing marginal return to the labor factor in these developing economies, which have not fully exploited their economy and have considerable under-occupation due to unused or inefficiently used labor.

Hypothesis 3: The Rate of Trade Openness will have a positive impact on Productivity

The rate of trade openness would also have a positive influence on labor productivity, since with greater openness and rate of international trade, the economy improves its competitiveness with respect to the rest of the world by obtaining greater productive efficiency, thus also improving the income and earnings of its workers.

This is because higher productivity is reflected in greater effectiveness and more efficient workers, which leads to greater production and efficiency per time unit of measurement. The latter also contributes to increasing the competitive position of that economy. Thus, considering labor income as the payment or retribution of workers, it is normal that in the face of higher productivity, their payments will also increase.

Hypothesis 4: Inflation will have a positive impact on Productivity and Unemployment will have a negative effect on it

As reviewed in the previous literature, there is some discrepancy between the effect that inflation could have on productivity.

On the one hand, high or at least non-negligible inflation may reduce investment, which would discourage production, lowering productivity.

However, it should be clarified that the arguments that assume this are valid considering the relationship between inflation and investment, and indirectly related to trade openness, so we would not be analyzing the isolated effect that inflation has on productivity per se.

In order to understand the isolated effect of inflation on productivity, it is useful to consider its relationship with wages in the economy, with which it is positively or directly correlated, as we have seen following macroeconomic logic. In the same sense, inflation could affect productivity positively if viewed from the point of view of consumption.

Thus, as previously reviewed, inflation would lead to higher prices, increasing the value of consumer goods and also of productive factors such as labor, thus raising wages, which would be due, in the first place, to an increase in productivity.

On the other hand, it would only be possible to control an upward inflation with an increase in national productivity, so that indistinctly from whichever approach one looks at it, higher productivity would be linked to higher inflation, and would therefore have a direct relationship with a positive effect on the dependent variable in this case and in a concrete way.

Finally, and to complement the above, as we know from the Phillips curve, inflation and unemployment are negatively related to each other, so that an increase in the unemployment rate reduces the inflation rate and vice versa.

Therefore, it is to be expected that according to what has been analyzed and the assumed individual effects on productivity, the consummated contribution on productivity should follow the macroeconomic theory, so that it would vary in a different direction with respect to unemployment and inflation, although in any case this is something that should be clarified when the results of the empirical analysis are obtained.

DATA USED

In order to measure the impact of labor informality together with the other factors on productivity, we have collected the relevant data from a total of 26 countries, the choice of which was based on the availability of data on the variables of interest, with those relevant to informality being the ones that most limited the search and its definitive selection. Thus, these countries are: Albania, Armenia, Bolivia, Bosnia and Herzegovina, Brazil, Colombia, Costa Rica, Dominican Republic, Ecuador, Egypt, El Salvador, Guatemala, Honduras, North Macedonia, Mali, Mauritius, Mongolia, Panama, Paraguay, Peru, Serbia, South Africa, Sri Lanka, Thailand, Uruguay and Vietnam; for the period 2015-2018, with annual frequency.

Thus, we have 104 observations organized within a panel data structure, whose values were collected from the World Bank and those published by the ILO Department of Statistics, ILOSTAT, collecting the following variables:

Dependent Variable

- $PIBpc$, corresponding to the annual national Gross Domestic Product per Capita, which has been used as a proxy variable for productivity. A logarithmic functional

form has been considered to measure its effect on the model (l_PIBpc). Expressed in 2011 international dollars (USD) at current prices, adjusted for PPP.

Independent Variables

- *Informalidad*: Informal employment rate of total employment in the economy. It consists of the ratio between the number of people employed in the informal sector over the total number of workers (total employed) in the economy. A logarithmic functional form has been considered to measure its impact on the model ($l\_Informalidad$). Expressed in percentage points (%).

- *Desempleo*: Annual unemployment rate of the economy. Considered in logarithmic functional form that measures its impact on the model ($l\_Desempleo$). Expressed in percentage points (%).

- *Inflación* : Annual national inflation rate. Expressed in percentage points (%).

- *Comercio*: Rate of trade openness of the economy. Considered in logarithmic functional form that measures its impact on the model ($l\_Comercio$). Expressed in percentage points (%).

- *Std_Profesionales*: corresponding to the standardization of the number of labor force with advanced educational knowledge (highly skilled labor force). The standardization was carried out to reduce the asymmetry in the scale of its values with respect to those of the other variables considered.

The main univariate statistics for this data set are as follows:

Variable	Observ.	Media	Mediana	Mín.	Máx.	Desv. Estándar
l_PIBpc	104	4,081758122	4,103365932	3,330360104	4,492050125	0,216287738
l_Informalidad	104	1,719279856	1,781015509	1,209515015	1,982723388	0,190011115
l_Desempleo	104	0,819279458	0,84644283	-0,22184873	1,442322964	0,366131133
Inflación	104	3,296266655	2,340475282	-4,62060229	22,93255423	3,582602446
l_Comercio	104	1,833184562	1,821206089	1,386101297	2,318703168	0,197686025
Std_Profesionales	104	0	-0,4529081	-0,56400679	5,461832414	1

Table 1. Summary of Univariate Statistics

Spearman's correlation coefficients between variables are also shown as multivariate statistical analysis:

Variable	l_PIBpc	l_Informalidad	l_Desempleo	Inflación	l_Comercio	Std_Profesionales
l_PIBpc	1					
l_Informalidad	0,21836925	1				
l_Desempleo	0,23976048	-0,677461859	1			
Inflación	0,10690547	-0,194590846	0,208687187	1		
l_Comercio	0,03651712	0,215532647	-0,338186813	-0,324087805	1	
Std_Profesionales	0,01199456	0,201213592	0,207540275	0,297802198	-0,302752587	1

Table 2. Spearman's Correlation Coefficients for the Variables

According to the results observed in Table 2, there is a non-negligible negative correlation between labor informality ($l\_Informalidad$) and unemployment ($l\_Desempleo$), standing out above the others.

In order to corroborate the significance of this correlation and considering the size of the sample, we could use a t-test with n-2 degrees of freedom, being n=104 in this particular case.

Specifically, we could calculate the t-value for the correlation coefficient between $l\_Informalidad$ and $l\_Desempleo$ by:

$$t = r_s \frac{\sqrt{n-2}}{\sqrt{1-r_s^2}}$$

Where r_s is the Spearman correlation coefficient between $l\_Informalidad$ and $l\_Desempleo$, so in this case, r_s=-0.677461859.

Comparing the t-value obtained from the above (t= -9.25453957) it is easily seen that it far exceeds the value given in tables of a one-sided t-test distribution and with n-2 degrees of freedom, for a significance of 5%, so there would be an effective correlation between informality and unemployment in the population.

In spite of this, the correlation exists in the sample, but it is not excessively high, so it would not be a matter of concern to think now about a problem of collinearity between $l\_Informalidad$ and $l\_Desempleo$, and even less so in the case of the relationships with and among the other variables.

ECONOMETRIC MODEL

Based on previous literature and inspired by the case applied to developing countries, we have chosen a model that includes the informal employment rate as an influential factor on aggregate economic welfare and progress, materialized through GDP per capita as a proxy or instance of productivity. Consistent with this, the following model specification has been chosen:

$$l\_PIB_{pc_{it}} = \beta_0 + \beta_1 l\_Informalidad_{it} + \beta_2 l\_Desempleo_{it} + \beta_3 Inflación_{it} + \beta_4 l\_Comercio_{it} + \beta_5 Std\_Profesionales_{it} + \alpha_i + \varepsilon_{it}$$

Where,

- l_PIB_{pc} represents the logarithm of GDP per capita, as a proxy variable for Productivity.
- $l\_Informalidad$ represents the logarithm of the informal employment rate of the total number of jobs in the economy.
- $l\_Desempleo$ corresponds to the logarithm of the unemployment rate of the economy.
- $Inflación$ represents the national annual inflation rate
- $l\_Comercio$ represents the logarithm of the rate of trade openness of the economy
- $Std\_Profesionales$ represents the standardized values of the labor force with advanced educational knowledge (skilled labor force)
- α_i, dichotomous variable that captures the differences between the countries analyzed in the sample.
- ε_{it}, corresponding to the error term of the estimation and that collects unobserved effects that affect Productivity.

Thus, in the specified model we relate productivity to the independent variables whose variation or impact that originates from the effect of the latter on the former will be explained in percentage form. Therefore, the interpretation of the coefficients that accompany each variable in the model will be expressed as the percentage variation in the dependent variable that generates a unit increase (decrease) in each independent variable. This is the reason for the decision regarding the functional form adopted, where we have chosen to use the natural logarithm of labor productivity instead of expressing it directly.

ESTIMATION

Before deciding on the concrete and final specification of the econometric model, it was estimated using 4 different methods (Merged OLS, Fixed Effects, Random Effects, Individual Fixed Effects and Temporal Fixed Effects). Thus, we look for the model that offers the best fit and values that are consistent and/or efficient as far as possible for the analyzed sample, understood as the best approximation to a population value.

Estimation by Fused Least Squares (Fused OLS)

We started with this method because it is the simplest to estimate.

Under this type of econometric estimation for panel data, the spatial and temporal dimension of the pooled data is omitted and a usual OLS regression is estimated. Therefore, the initial heterogeneity in the data is not considered and, in this case, the model would be specified as follows:

$$l\_PIB_{pc_{it}} = \beta_0 + \beta_1 l\_Informalidad_{it} + \beta_2 l\_Desempleo_{it} + \beta_3 Inflación_{it} + \beta_4 l\_Comercio_{it} + \beta_5 Std\_Profesionales_{it} + u_{it}$$

Using Stata statistical software, we obtain the output shown below (Table 3), for which standard deviations robust to heteroscedasticity have been considered:

```
. reg log_PIBpc log_Informalidad log_Desempleo Inflación log_Comercio std_Profesionales, robust

Linear regression                                    Number of obs   =        104
                                                     F(5, 98)        =      12.89
                                                     Prob > F        =     0.0000
                                                     R-squared       =     0.4588
                                                     Root MSE        =     .37559
```

log_PIBpc	Coef.	Robust Std. Err.	t	P>|t|	[95% Conf. Interval]	
log_Informalidad	-1.01271	.1501641	-6.74	0.000	-1.310706	-.7147144
log_Desempleo	-.2822416	.0636982	-4.43	0.000	-.4086486	-.1558346
Inflación	.0004057	.0060114	0.07	0.946	-.0115238	.0123352
log_Comercio	-.2504779	.0698231	-3.59	0.001	-.3890394	-.1119163
std_Profesionales	.0078776	.024585	0.32	0.749	-.0409104	.0566657
_cons	14.99608	.8113918	18.48	0.000	13.3859	16.60626

Table 3. Merged OLS estimation

According to the output results shown, labor informality, together with unemployment and trade, would be the variables with the highest statistical significance within the model, even with a significance α=1%, given the p-value of each one, null to three decimal places for the first two and practically zero for the latter variable, respectively.

However, according to this, both inflation and skilled labor would not be statistically significant.

In addition, both inflation and skilled labor have a positive relationship with labor productivity.

Thus, according to the estimated data, with a one-unit increase in the inflation rate, labor productivity would increase by 0.04 dollars per capita, under ceteris paribus conditions. Although, as has already been mentioned, it would not have any statistical relevance in the model proposed.

As for skilled labor, it is expected that the additional contribution of a single worker with an advanced level of education would lead to an increase in aggregate productivity by 0.79 USD, ceteris paribus. However, as previously mentioned, the rate of trade openness would also not be statistically significant in income according to the model proposed, as is the case with inflation.

On the other hand, informality has a negative relationship with labor productivity, validating our main suspicion given in our initial assumption and hypothesis. Specifically, under ceteris paribus conditions, with an increase of one percentage unit in the informal employment rate, labor productivity would decline by 1.01%, revealing a proportionally similar relationship between them, in the inverse direction.

Unemployment and trade also have a negative relationship with labor productivity. If we focus on unemployment, with a 1% increase in the unemployment rate, labor productivity would decrease by 0.28%, ceteris paribus.

With respect to trade, with a 1% increase in the rate of trade openness, labor productivity would decrease by 0.25% of its value.

Finally, within this first analysis, we note that the fit of the model, given by the R-squared of the regression performed, takes an approximate value of 46%.

Estimation by Fixed Effects

Having first estimated our model by Fused Ordinary Least Squares, we now proceed to perform a fixed effects estimation, thus including heterogeneity to the model, in order to make it more representative each time.

The fixed effects estimation corresponds to another way of modeling certain individual behaviors of each of the 26 countries in the sample that persist over time.

Technically, this type of estimation allows the incorporation of dichotomous variables (α_i) in order to incorporate heterogeneity into the model, since they include the individual, differentiating characteristics of each of the 26 countries included in the sample, which do

not vary over time and which are assumed to be fixed differences (constants) between them and not of a random nature.

Thus, the model equation will now incorporate a different constant for each of the countries considered, while they will only share the slope coefficient.

Thus, the model is now formulated as follows:

$$l\_PIB_{pc_{it}} = \beta_0 + \beta_1 l\_Informalidad_{it} + \beta_2 l\_Desempleo_{it} + \beta_3 Inflación_{it} + \beta_4 l\_Comercio_{it}$$
$$+ \beta_5 Std\_Profesionales_{it} + \alpha_i + v_{it}$$

Again, using Stata, we obtain the output shown in Table 4.

```
. xtreg log_PIBpc log_Informalidad log_Desempleo Inflación log_Comercio std_Profesionales, fe

Fixed-effects (within) regression              Number of obs      =         104
Group variable: id                             Number of groups   =          26

R-sq:                                          Obs per group:
    within  = 0.3806                                         min =           4
    between = 0.3338                                         avg =         4.0
    overall = 0.3320                                         max =           4

                                               F(5,73)            =        8.97
corr(u_i, Xb)  = 0.3431                         Prob > F           =      0.0000
```

log_PIBpc	Coef.	Std. Err.	t	P>|t|	[95% Conf. Interval]	
log_Informalidad	-.3452986	.0826047	-4.18	0.000	-.5099296	-.1806676
log_Desempleo	-.0506786	.035679	-1.42	0.160	-.1217866	.0204295
Inflación	.0028538	.0017093	1.67	0.099	-.0005529	.0062605
log_Comercio	.0655977	.0596771	1.10	0.275	-.0533387	.184534
std_Profesionales	.0007955	.0066221	0.12	0.905	-.0124023	.0139932
_cons	10.57486	.4244682	24.91	0.000	9.7289	11.42083
sigma_u	.43888228					
sigma_e	.03102539					
rho	.99502751	(fraction of variance due to u_i)				

```
F test that all u_i=0: F(25, 73) = 571.57                      Prob > F = 0.0000
```

Table 4. Fixed Effects Estimates

Compared to the previous case of estimation by means of Merged OLS, the most significant changes are seen in inflation, trade and unemployment, as far as the statistical significance of the estimated coefficients is concerned.

Thus, inflation would be marginally significant, since it is not yet significant at a 95% confidence interval.

A different result is obtained for trade, which considerably decreases its statistical significance and relevance, which even becomes directly or positively related to productivity according to this specification.

As for unemployment, the estimator continues to suggest a negative relationship with productivity, although in this particular case, it ceases to possess the statistical significance as previously estimated, even at a significance $\alpha=10\%$.

Finally, both labor informality and skilled labor see considerable alterations in terms of the statistical significance they possess in the model. In fact, labor becomes less relevant as it goes from a p-value 0.75 to 0.91, which was clearly no longer relevant even in the previous model, so it is not subject to further qualification and, for its part, labor informality continues to have considerable statistical significance in this specification.

Having said this, we must now evaluate the size of the effect or impact of these explanatory variables on productivity.

Starting with the effect caused by labor informality, it is predicted that with a 1% increase in the informal employment rate, the economy's labor productivity would be reduced by 0.35%, ceteris paribus, not affecting the amount of the latter to a greater degree as it did in the previous model, where they had an inverse relationship at a ratio of approximately one to one.

In addition to continuing to have a negative relationship with productivity, labor informality continues to be the variable with the greatest statistical relevance in the model, maintaining the trend previously estimated, as mentioned above.

As for unemployment, when the unemployment rate increases by 1%, labor productivity would be reduced by 0.05% of its value, although, as has become clear, its effect would not have statistical relevance on the dependent variable studied under this new specification.

In the case of inflation, given an increase of 1 unit, labor productivity would increase by 0.29%, ceteris paribus.

As for trade, the present estimate predicts that a 1% increase in the rate of trade openness would lead to a 0.07% increase in productivity, ceteris paribus. However, as previously mentioned, the rate of trade openness would no longer be statistically significant according to this model, contrary to the case estimated by MCO Fused.

With respect to the last explanatory variable of the model that remains to be described, skilled labor, the marginal effect that the employment of 1 additional highly skilled worker would have on labor productivity would translate into an increase of the latter by 0.08%, although again, this effect would not be statistically significant in the model.

Finally within this analysis, we note that the fit of our model, given by the mean R-squared of the regression performed, registers a value of approximately 33%.

At this point, it is worth asking whether there is any problem of autocorrelation and heteroscedasticity in the model proposed, since not taking this into account, when there are some of these problems in the data analyzed, would lead to biases, generating inefficient and inconsistent estimators.

Thus, the presence of autocorrelation between the residuals of the data collected in the sample is studied. For this purpose, the Pesaran test is applied, considering that in this case we have a greater number of countries than time units, i.e., we possess a micro panel where N>T, being N=26 countries and T=4 years (period 2015-2018). The results can be seen in Table 5.

```
. xtcsd, pesaran abs

Pesaran's test of cross sectional independence =     15.402, Pr = 0.0000

Average absolute value of the off-diagonal elements =     0.708
```

Table 5. Pesaran Test for Cross Dependence of Residuals

The Pesaran test proposes the non-correlation of the residuals as the null hypothesis. In this case, and given the p-value of the contrast performed, the null hypothesis is rejected, so there would be a problem of autocorrelation in the model based on fixed effects.

On the other hand, to evaluate its heteroscedasticity, the Wald test is applied in its modified version for fixed effects, according to the *xttest3* command in Stata. The result is shown in Table 6.

```
. xttest3

Modified Wald test for groupwise heteroskedasticity
in fixed effect regression model

H0: sigma(i)^2 = sigma^2 for all i

chi2 (26)  =    2105.20
Prob>chi2 =      0.0000
```

Table 6. Wald Test for Heteroscedasticity in Fixed Effects Model

The modified Wald test for fixed effects models posits homoscedasticity of the model as the null hypothesis, i.e., that the variance of the errors remains constant in all the observations made. Again, due to the p-value reported in Table 6, it is not possible to accept the null hypothesis and it is rejected, consequently finding a problem of heteroscedasticity in this specification.

Therefore, we must now be able to estimate a fixed effects model that is able to consider the existence of both autocorrelation and heteroscedasticity. This is achieved through the *cluster(id)* option in Stata, yielding the results shown in Table 7.

```
. xtreg log_PIBpc log_Informalidad log_Desempleo Inflación log_Comercio std_Profesionales, fe cluste
> r(id)

Fixed-effects (within) regression                Number of obs      =        104
Group variable: id                               Number of groups   =         26

R-sq:                                            Obs per group:
    within  = 0.3806                                          min =          4
    between = 0.3338                                          avg =        4.0
    overall = 0.3320                                          max =          4

                                                 F(5,25)            =       9.63
corr(u_i, Xb)  = 0.3431                           Prob > F           =     0.0000

                                     (Std. Err. adjusted for 26 clusters in id)
─────────────────────────────────────────────────────────────────────────────
                             Robust
        log_PIBpc      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
─────────────────────────────────────────────────────────────────────────────
  log_Informalidad   -.3452986   .0809026    -4.27   0.000    -.5119206   -.1786766
     log_Desempleo   -.0506786   .0531384    -0.95   0.349    -.1601192    .058762
         Inflación    .0028538   .0014719     1.94   0.064    -.0001776   .0058853
      log_Comercio    .0655977   .0742663     0.88   0.386    -.0873566   .2185519
 std_Profesionales    .0007955   .0027719     0.29   0.776    -.0049134   .0065043
             _cons   10.57486    .4135029    25.57   0.000     9.723238   11.42649
─────────────────────────────────────────────────────────────────────────────
           sigma_u   .43888228
           sigma_e   .03102539
               rho   .99502751   (fraction of variance due to u_i)
─────────────────────────────────────────────────────────────────────────────
```

Table 7. Estimation by Fixed Effects considering Autocorrelation and Heterocedasticity

According to these new results, it can be seen that although the estimator that quantifies the effect on productivity of each independent variable remains unchanged, there are some changes in the statistical significance of the latter on the former, although without major importance.

In particular, it can be observed that inflation is even more statistically significant than when compared to the previous estimate, with a p-value of 6.4%, being relevant at a 90% confidence level but not yet at a 95% level.

Similarly, unemployment becomes even less statistically relevant with a p-value of approximately 35%, although already since the previous estimation it ceased to be

relevant at a significance level α=10%. The same happens with trade, which goes from having a p-value of 27.5% to one of approximately 37%.

The statistical significance of labor informality on productivity also remains unchanged, even under a 99% confidence level.

Considering this analysis, it is now convenient to ask whether the inclusion of time dichotomous variables is appropriate for the model.

Estimation by Fixed and Time Effects δ_t

Now, in addition to adding dichotomous variables to measure the individual differences in the intercept of each country (α_i), we add other dichotomous variables but of a temporal nature this time, that is, those that will allow us to collect relevant information that may affect all the countries analyzed at some point in time within the period analyzed, whose consideration and inclusion in the model would manage to reduce and/or eliminate those biases that could affect the consistency and efficiency of the estimators.

Thus, by adding to the model the 3 dichotomous time variables for each year within the period analyzed, grouped in δ_t and except for the one for the base year 2015, the model is as follows:

$$l\_PIB_{pc_{it}} = \beta_0 + \beta_1 l\_Informalidad_{it} + \beta_2 l\_Desempleo_{it} + \beta_3 Inflación_{it} + \beta_4 l\_Comercio_{it} + \beta_5 Std\_Profesionales_{it} + \alpha_i + \delta_t + v_{it}$$

Considering, in addition, the presence of autocorrelation and Heterocedasticity previously found in the fixed effects model, the results are obtained in Stata and are reflected in Table 8.

```
. xtreg log_PIBpc log_Informalidad log_Desempleo Inflación log_Comercio std_Profesionales i.year, fe clus
> ter(id)

Fixed-effects (within) regression              Number of obs     =        104
Group variable: id                             Number of groups  =         26

R-sq:                                          Obs per group:
    within  = 0.7842                                        min =          4
    between = 0.3390                                        avg =        4.0
    overall = 0.2839                                        max =          4

                                               F(8,25)           =      50.86
corr(u_i, Xb)  = 0.4403                         Prob > F          =     0.0000

                                (Std. Err. adjusted for 26 clusters in id)
─────────────────────────────────────────────────────────────────────────────
                   │              Robust
       log_PIBpc   │    Coef.   Std. Err.      t    P>|t|    [95% Conf. Interval]
───────────────────┼─────────────────────────────────────────────────────────
  log_Informalidad │ -.1456547    .07173    -2.03   0.053   -.2933853    .0020759
     log_Desempleo │ -.0671246   .0304088   -2.21   0.037   -.1297526   -.0044965
         Inflación │  .0012176   .0009132    1.33   0.194   -.0006632    .0030983
      log_Comercio │ -.0034923    .045149   -0.08   0.939   -.0964784    .0894938
 std_Profesionales │ -.0010987   .0012675   -0.87   0.394   -.0037093    .0015118
                   │
              year │
              2016 │  .0217432   .0040621    5.35   0.000    .0133773    .0301092
              2017 │  .0406371   .0066227    6.14   0.000    .0269975    .0542767
              2018 │  .0637989    .009672    6.60   0.000     .043879    .0837189
                   │
             _cons │  10.08102   .3142011   32.08   0.000    9.433913    10.72813
───────────────────┼─────────────────────────────────────────────────────────
           sigma_u │ .47603048
           sigma_e │ .01870371
               rho │ .9984586   (fraction of variance due to u_i)
─────────────────────────────────────────────────────────────────────────────

.
```

Table 8. Estimation by Fixed and Time Effects considering Autocorrelation and Heterocedasticity

Then, considering the results, we note that the new estimates differ significantly compared to the previous case, which was estimated only under the inclusion of individual fixed effects. In particular, the informal employment rate is no longer statistically significant at the 95% confidence level, but only at the 90% level.

Inflation also ceases to be statistically significant, going from a p-value of 6.4% to 19.4%. Unemployment has a different fate, going from a p-value of approximately 35% to 3.7%, being significant at a 95% confidence level.

On the other hand, although skilled labor improved in terms of significance for the model, it is still irrelevant in this aspect for the levels of significance usually used.

We can also note that the estimated coefficients for the time effects are positively related to labor productivity, which is also on the rise and increasing with respect to the previous year. Along these lines, for example, the 2018 coefficient indicates that labor productivity, within the 26 countries analyzed, was 0.06 units higher than that recorded in 2017.

In addition, it is also worth noting that all the estimated coefficients for the time effects have turned out to be statistically significant, as each p-value indicated in them is relevant even at a 99% confidence level.

Thus, the inclusion of the time effects in the fixed-effects model is expected to be feasible and definitive, which we can ascertain by making use of the *testparm* command in Stata to perform a joint significance test, F, of the time fixed effects. The result of this is presented in Table 9.

```
. testparm i(2015/2018).year

 ( 1)   2016.year = 0
 ( 2)   2017.year = 0
 ( 3)   2018.year = 0

       F(  3,    25) =   15.36
            Prob > F =    0.0000
```

Table 9. Joint Significance F-Test for Time Effects

As indicated, we obtain a statistic F (3, 25) = 15.36 which has a null p-value associated to 4 decimal places, so we proceed to reject the null hypothesis H_0 of joint non-significance of the coefficients of temporal effects, so they should be considered and included in the final model.

Therefore, if it is decided to use a fixed effects model as the final specification, the time effects should also be considered since, as has been shown, they give better results according to the tests and contrasts carried out and shown.

Finally, it is worth asking about the precision in the estimation that the random effects method can provide, which considers the inclusion of the heterogeneity of the data in the model from another approach, providing more efficient but less consistent estimators than those obtained through fixed effects.

Estimation by Random Effects

We proceed next to make use of a random effects estimation of the model. Similar to the previous case of fixed effects, this model also relaxes the assumption of equality of intercept for the 26 countries analyzed, as assumed by the Fused OLS model, but unlike the fixed effects criterion, the difference between the intercept values of each country are not fixed and vary randomly having a mean value and a non-zero variance.

Furthermore, it should be noted that for this estimation criterion to be consistent, there must be no correlation between the unobserved effects and the explanatory variables of the model itself, in other words, there must be no covariance between the two.

Thus, the model is expressed as follows:

$$l\_PIB_{pc_{it}} = \beta_0 + \beta_1 l\_Informalidad_{it} + \beta_2 l\_Desempleo_{it} + \beta_3 Inflación_{it} + \beta_4 l\_Comercio_{it} + \beta_5 Std\_Profesionales_{it} + \alpha_i + \varepsilon_{it}$$

Again, as has become customary for our calculations, we will make use of Stata to obtain practical and quantified results about the data. Thus, the computed results are shown in Table 10.

```
. xtreg log_PIBpc log_Informalidad log_Desempleo Inflación log_Comercio std_Profesionales, re

Random-effects GLS regression                    Number of obs      =        104
Group variable: id                               Number of groups   =         26

R-sq:                                            Obs per group:
    within  = 0.3777                                         min =          4
    between = 0.3487                                         avg =        4.0
    overall = 0.3472                                         max =          4

                                                 Wald chi2(5)       =      53.15
corr(u_i, X)   = 0 (assumed)                     Prob > chi2        =     0.0000

─────────────────────────────────────────────────────────────────────────────
        log_PIBpc │      Coef.   Std. Err.      z    P>|z|     [95% Conf. Interval]
──────────────────┼──────────────────────────────────────────────────────────
 log_Informalidad │  -.4016319   .0741764    -5.41   0.000    -.5470151   -.2562488
    log_Desempleo │  -.0466225   .0327502    -1.42   0.155    -.1108117    .0175667
        Inflación │   .0032031   .0017015     1.88   0.060    -.0001319     .006538
     log_Comercio │   .0448404   .0575364     0.78   0.436    -.0679289    .1576098
std_Profesionales │   .0002566   .0066728     0.04   0.969    -.0128218     .013335
            _cons │   10.87669   .4124107    26.37   0.000     10.06838      11.685
──────────────────┼──────────────────────────────────────────────────────────
          sigma_u │  .41135809
          sigma_e │  .03102539
              rho │  .99434372   (fraction of variance due to u_i)
─────────────────────────────────────────────────────────────────────────────

.
```

Table 10. Estimation by Random Effects

This time, we intend to study the presence of autocorrelation before analyzing and presenting the results in Table 10.

Thus, we evaluate the autocorrelation or serial correlation using the Wooldridge test, which is run under Stata's *xtserial* command. The results are shown in Table 11.

```
. xtserial log_PIBpc log_Informalidad log_Desempleo Inflación log_Comercio std_Profesionales

Wooldridge test for autocorrelation in panel data
H0: no first-order autocorrelation
    F(  1,      25) =    108.191
          Prob > F =      0.0000
```

Table 11. Wooldridge test for Autocorrelation

As can be seen, the null hypothesis of the Wooldridge test assumes the non-existence of autocorrelation among the residuals but, given the p-value obtained, it is not possible to accept this hypothesis, which is discarded thus corroborating the existence of an autocorrelation problem in the specified model (as was found for fixed effects).

Therefore, considering this and also standard deviations to heteroscedasticity, the fixed effects model is estimated with the *cluster(id)* option for *xtreg*, re as shown in Table 12 together with its results.

```
. xtreg log_PIBpc log_Informalidad log_Desempleo Inflación log_Comercio std_Profesionales, re cluster(id)

Random-effects GLS regression                    Number of obs     =        104
Group variable: id                               Number of groups  =         26

R-sq:                                            Obs per group:
    within  = 0.3777                                         min =          4
    between = 0.3487                                         avg =        4.0
    overall = 0.3472                                         max =          4

                                                 Wald chi2(5)      =      48.73
corr(u_i, X)   = 0 (assumed)                     Prob > chi2       =     0.0000

                                    (Std. Err. adjusted for 26 clusters in id)
```

log_PIBpc	Coef.	Robust Std. Err.	z	P>|z|	[95% Conf. Interval]	
log_Informalidad	-.4016319	.081251	-4.94	0.000	-.560881	-.2423828
log_Desempleo	-.0466225	.0401069	-1.16	0.245	-.1252306	.0319856
Inflación	.0032031	.0012197	2.63	0.009	.0008125	.0055937
log_Comercio	.0448404	.0631165	0.71	0.477	-.0788656	.1685465
std_Profesionales	.0002566	.0022541	0.11	0.909	-.0041613	.0046745
_cons	10.87669	.4258609	25.54	0.000	10.04202	11.71136
sigma_u	.41135809					
sigma_e	.03102539					
rho	.99434372	(fraction of variance due to u_i)				

Table 12. Estimation by Random Effects considering Autocorrelation and Heterocedasticity

According to the results, it is observed that the statistical significance of the effect of labor informality on productivity persists even now that heterogeneity has been introduced under the random effects model. In fact, the significance is higher in the case of fixed and time

fixed effects, and equally relevant in the case of the merged OLS or individual fixed effects, even at a 99% confidence level.

Inflation is also relevant, even at the same 99% confidence level.

On the other hand, unemployment, trade and skilled labor lack statistical significance according to this specification, as was the case in the individual fixed effects estimation.

Analogous to the fixed effects estimation, the size of the effects of these independent variables on labor productivity must also be evaluated.

Having said this, and starting with the effect caused by labor informality, it is expected that with a 1% increase in the informal employment rate, the economy's productivity will be reduced by 0.4%, causing a greater percentage reduction than the effect estimated by fixed effects, ceteris paribus.

As for unemployment, when the unemployment rate increases by 1%, labor productivity will decrease by 0.05%, ceteris paribus. However, as has been shown, its effect would have no statistical significance on the dependent variable according to this specification and as occurred for individual fixed effects.

In the case of inflation, a 1 unit increase in inflation would increase productivity by 0.32%, ceteris paribus.

As for trade, the present estimation predicts that a 1% increase in the rate of trade openness would lead to a 0.04% increase in productivity, ceteris paribus. However, as previously mentioned, the rate of trade openness would no longer be statistically significant according to this model, as was already the case in the specification estimated by fixed effects.

Finally, as for skilled labor, the marginal effect that the employment of 1 highly skilled worker would have on productivity would be an increase of 0.03%, although again, this effect would not be statistically significant for the model and study, as has been the case in the previous specifications.

Finally, it should be noted that the fit of the model indicated by the mean R-squared of the regression performed, registers a value of approximately 35% for this case.

SPECIFICATION SELECTION

Finally, having already made the pertinent estimations, it should be possible to decide between which specification should be used in the final model, so that its results provide the greatest efficiency and consistency in the estimators, as well as allowing greater explanatory power for the problem posed in the study.

For this reason, some contrasts are presented below to validate the best option to be used given the objectives of the work.

Joint Significance of Fixed Effects F Test

This test is usually used for the comparison between the specification collected by merged OLS and that modeled under fixed effects.

Thus, the model proposed under merged OLS criteria corresponds to a restricted model if compared to the model proposed by fixed effects, since it poses the equality of intercept for the 26 countries considered in the sample by not including dichotomous variables as in the latter case.

Thus, we can perform a joint significance test, restrictive F-test, in order to contrast and decide on this issue.

Thus, under this test we pose the respective hypotheses:

$$H_0: \alpha_1 = \alpha_2 = \ldots = \alpha_{26}$$

$$H_1: H_0 \text{ is not true}$$

In view of this, and using Stata, we obtain the following:

```
. xtreg log_PIBpc log_Informalidad log_Desempleo Inflación log_Comercio std_Profesionales, fe

Fixed-effects (within) regression              Number of obs      =         104
Group variable: id                             Number of groups   =          26

R-sq:                                          Obs per group:
    within  = 0.3806                                           min =           4
    between = 0.3338                                           avg =         4.0
    overall = 0.3320                                           max =           4

                                               F(5,73)            =        8.97
corr(u_i, Xb)  = 0.3431                         Prob > F           =      0.0000
```

log_PIBpc	Coef.	Std. Err.	t	P>|t|	[95% Conf. Interval]	
log_Informalidad	-.3452986	.0826047	-4.18	0.000	-.5099296	-.1806676
log_Desempleo	-.0506786	.035679	-1.42	0.160	-.1217866	.0204295
Inflación	.0028538	.0017093	1.67	0.099	-.0005529	.0062605
log_Comercio	.0655977	.0596771	1.10	0.275	-.0533387	.184534
std_Profesionales	.0007955	.0066221	0.12	0.905	-.0124023	.0139932
_cons	10.57486	.4244682	24.91	0.000	9.7289	11.42083
sigma_u	.43888228					
sigma_e	.03102539					
rho	.99502751	(fraction of variance due to u_i)				

```
F test that all u_i=0: F(25, 73) = 571.57                    Prob > F = 0.0000
```

Table 13. Joint Significance F-Test for Fixed Effects

As could be seen for the case of individual fixed effects and in the last output line of Table 13, the Welch F statistic (25.73) = 571.57 and has an associated null p-value to 4 decimal places, so the null hypothesis of joint non-significance of the explanatory variables is rejected and, therefore, it is possible to affirm that using the fixed effects method is preferable to using the merged OLS model.

Breusch-Pagan Test for Random Effects

If we emphasize the model posed by random effects and the model posed above under merged OLS, it is observed that if the variance of the dichotomous variables is zero $(\sigma_\alpha^2 = 0),$ then there is no difference between the two models. Hence the importance of the above assumption for the variance of these variables. Therefore, the Breuch-Pagan test is used to contrast the specifications given under merged OLS and under random effects.

Having said this, it is necessary to compare the effectiveness of explaining the model under both criteria, that is, to be certain about the convenience of using the merged OLS model compared to the random effects model.

To clarify this question, the Breusch-Pagan test is used. Under this test, the following hypotheses are assumed:

$$H_0: \sigma_\alpha^2 = 0$$

$$H_1: H_0 \ is \ not \ true$$

Thus, using the *xttest0* command in Stata, we obtain the results shown in Table 14.

```
. xttest0

Breusch and Pagan Lagrangian multiplier test for random effects

        log_PIBpc[id,t] = Xb + u[id] + e[id,t]

        Estimated results:
                           Var      sd = sqrt(Var)

           log_PIBpc      .2480248        .4980209
                   e      .0009626        .0310254
                   u      .1692155        .4113581

        Test:   Var(u) = 0
                           chibar2(01) =    148.52
                       Prob > chibar2 =    0.0000
```

Table 14. Breusch-Pagan Test for Random Effects

From the above, we obtain that the statistic $\chi^2=148.52$ with a p-value equal to zero in 4 decimal places, so the null hypothesis is rejected and, therefore, the random effects collected in α_i are relevant for this analysis, so it is preferred to use the estimation by random effects rather than that given under merged OLS.

According to previous contrasts, at this time it is preferable not to make use of the merged OLS model, both because of the recent results obtained through the Breusch-Pagan test, as well as the results recorded after applying the joint significance F test, performed to contrast the suitability of the latter specifications, random effects and the other for fixed effects respectively, before that modeled under merged OLS.

However, between both fixed and random effects, we still do not know for sure which specification to choose to use in the final model. To clarify this issue, we will use the Hausman test.

The Hausman test is based on the possible correlation between the individual error term for each country and the explanatory variables of the model.

As we have seen recently, a zero correlation is assumed between the error term, which captures the unobserved effects, and the explanatory variables. However, the Hausman test relaxes this assumption and allows us to evaluate and check its veracity. Thus, in the case of correlation, the fact of not adding the effects collected in the individual error terms as other explanatory variable(s) of the model would generate a bias on the final specification.

Thus, and based on the difference between the coefficients of the fixed and random effects $(\beta_{fe} - \beta_{re})$, the following hypotheses are established:

$$H_0: \beta_{fe} = \beta_{re}$$

$$H_1: H_0 \; is \; not \; true$$

That is, the null hypothesis of the Hausman test states that the estimated coefficients of the fixed and random effects do not differ greatly.

Using Stata to corroborate the result with our data, we obtain that:

```
. hausman fe re, sigmamore

                    ──── Coefficients ────
                   (b)          (B)          (b-B)      sqrt(diag(V_b-V_B))
                   fe           re          Difference        S.E.
    ────────────┼─────────────────────────────────────────────────────────
    log_Inform~d │  -.3452986    -.4016319    .0563333       .0388921
    log_Desemp~o │  -.0506786    -.0466225   -.004056        .0153649
       Inflación │   .0028538     .0032031   -.0003492       .0003293
    log_Comercio │   .0655977     .0448404    .0207572       .0187272
    std_Profes~s │   .0007955     .0002566    .0005388       .0007448
    ────────────┴─────────────────────────────────────────────────────────

                          b = consistent under Ho and Ha; obtained from xtreg
                  B = inconsistent under Ha, efficient under Ho; obtained from xtreg

          Test:  Ho:  difference in coefficients not systematic

                    chi2(5) = (b-B)'[(V_b-V_B)^(-1)](b-B)
                            =        7.53
                  Prob>chi2 =      0.1838
```

Table 15. Hausman's Test for Fixed vs. Random Effects

From the above it is possible to observe that the p-value is 0.1838 which would indicate that there is no evidence of a systematic difference between both estimations, so the use of Random Effects is preferred as it is more efficient.

Therefore, within the specification selection, the use of the Random Effects model is chosen, since it estimates more efficient values according to the results of the tests and contrasts shown, which are shown in Table 12.

CONCLUSIONS

At the conclusion of the research, it is desirable and necessary to review the objective that motivated its realization, and then verify its fulfillment by evaluating the significance of the results, as well as the judgments and affirmations that derive from it.

The main motivation resided in the desire to contribute to the progress and development of nations, providing significant results that can contribute to the dialogue for the generation

and implementation of labor policies that consolidate the formal sector of the economy, ensuring the development and implementation of legal contracts that protect their workers, provide them with guarantees and contribute to reducing the negative influence that labor informality has on economic progress at the aggregate level.

Given this, we aim towards a more integrated and inclusive development in terms of social issues, which considers the improvement in the individual welfare of their workers as a fundamental axis for their progress and that allows to increase productivity at the aggregate level given the favorable conditions for the benefit of employees.

Being thus, and being aware that productivity is the preponderant factor for the progress and development of nations, it is useful and necessary to know which factors contribute to its benefit or, on the other hand, to worsen its figures within an economy and then, given this, to classify which of them makes a more significant contribution to its value.

Thus, unemployment, inflation, trade openness, skilled labor and labor informality were considered as factors.

Therefore, among the variables involved are four rates: informal employment, inflation, unemployment and trade openness. In addition, there is the skilled labor force, expressed as the number of professional workers. These five factors constituted the five explanatory variables of the model. In turn, GDP per capita was considered as a dependent or endogenous variable of the model, being considered as a proxy measure of productivity for these purposes.

Then, based on the data collected from the 26 countries observed in the sample (Albania, Armenia, Bolivia, Bosnia and Herzegovina, Brazil, Colombia, Costa Rica, Dominican Republic, Ecuador, Egypt, El Salvador, Guatemala, Honduras, North Macedonia, Mali, Mauritius, Mongolia, Panama, Paraguay, Peru, Serbia, South Africa, Sri Lanka, Thailand, Uruguay and Vietnam), South Africa, Thailand, Uruguay and Vietnam) for which there was complete data in the period studied, between 2015-2018, a micro panel was constructed, being in number of observations (N) greater than the number of time units considered (T), with N=26 (countries) and T=4 (years) in this case, constituting a total of 104 observations.

Having said this and carried out the econometric analysis, we are in a position to draw conclusions based on the results obtained, for which it is convenient to separate econometric and economic conclusions.

I.   Econometric Conclusions

With the micro panel data available, an econometric model was proposed to explain the impact of the informal employment rate, unemployment rate, inflation, trade openness rate and skilled labor, considered as the five explanatory variables of the model, on labor productivity, measured through GDP per capita as a proxy variable and considered the dependent variable for our purpose.

In order to have a wider range of options when defining the model, it has been estimated by four different methods, starting with the Merged OLS, followed by Fixed Effects, Individual Fixed Effects and Temporal Fixed Effects and then concluding with the one obtained from the Random Effects.

The selection of the specification was possible after carrying out a series of tests and contrasts that concluded after the application of the Hausman test to compare the Fixed Effects versus the Random Effects, where it was not possible to demonstrate a systematic difference between both estimations. For this reason, the use of Random Effects was preferred. In this way, efficient estimators were obtained for the coefficients of the explanatory variables.

Taking this into account and based on the results, it is possible to state that:

- First, we observe that there are two significant values according to the estimation of the model, which turn out to be those indicated for labor informality and inflation, both being relevant factors within a 99% confidence level (1% significance).

  On the other hand, unemployment, trade and skilled labor did not turn out to have statistical significance on productivity according to the data recorded in the sample.

  We will now analyze the estimated coefficients on a case-by-case basis:

  1. Starting with the parameter that accompanies the labor informality variable ($l\_Informalidad$), this indicates a negative relationship between this variable and productivity. Thus, according to the final specification selected,

a 1% increase in the rate of informal employment would result in a 0.4% decrease in productivity, ceteris paribus.

This would indicate that there is much to be gained for those who create and apply labor norms and policies, the effort to reduce as much as possible the weight of the informal sector in the economy, considering that the impact it has on productivity is not negligible and would compromise its growth and development.

2. The estimated parameter for inflation shows a positive relationship between this variable and productivity. Specifically, an increase of 1 unit in the annual inflation rate would cause an increase of 0.3% in productivity, ceteris paribus.

3. Similarly, the parameter estimated for trade also shows a positive relationship between this factor and the variable of interest or to be explained. Thus, a 1% increase in the rate of trade openness would lead to a 0.04% increase in productivity, ceteris paribus.

4. Otherwise, the corresponding parameter estimated for Unemployment would indicate a negative relationship between this factor and the dependent variable. Thus, a 1% increase in the unemployment rate would cause a decrease in productivity equivalent to an approximate reduction of 0.05% in its value, ceteris paribus.

5. Finally, the estimated parameter for Skilled Labor indicates a positive relationship between it and the variable to be explained in the model. In particular, a 0.03% increase in productivity is caused when it is possible to employ 1 more highly skilled worker in the economy's labor force, ceteris paribus.

- The model presents an overall coefficient of determination of $R^2 = 0.3472$, indicating that through this choice of factors, the corresponding independent

variables manage to explain a proportion of 34.72% of the dependent variable (productivity).

Therefore, it consists of a discrete adjustment given the proportion of productivity that the selected variables manage to explain, which is partly due to the heterogeneous nature of the economies analyzed and the differences between the values provided for each of them, a fact that was not possible to ameliorate given the lack of available data especially regarding labor informality, a variable that we were mainly interested in introducing.

II.   Economic Conclusions

Taking into account the results obtained after the selected estimation, it is possible to verify that the hypotheses foreseen for this study and analysis have been fulfilled. Thus, and supported by previous literature, it is possible to make the following statements.

To begin with, skilled labor has a positive influence on productivity, despite the fact that its contribution was not statistically significant enough to make a relevant contribution to this issue given the sample analyzed. According to the sense of the relationship between the variables, the economies included in the sample show increasing marginal returns to the labor factor, so that an increase in the number of skilled workers would increase the efficiency of the internal productive processes, contributing to an increase in productivity.

Furthermore, this would be in line with macroeconomic theory when considering that undeveloped economies have not reached their full potential and efficient use of their resources, nor the full utilization of their productive factors, so they tend to register higher growth rates when applying progress-oriented measures than those economies that are already developed, which tend to register less accelerated rates.

In turn, and according to the empirical results obtained from the sample, the rate of trade openness also has a positive influence on labor productivity. This may be due to the fact that, as argued by Santos-Paulino and Thirlwall (2004), greater trade openness and the degree of international trade generate static gains that lead to an efficient use of resources.

This would encourage an economy to focus its efforts on those sectors and/or products in which it has a comparative advantage over the rest of the world. In this way, it encourages and enhances the specialization of the economy, which is also supported by imports that, in addition to expanding the consumption alternatives of the individuals that make up the economy, manage to cover those sectors that are left more adrift given their low contribution to the economy in terms of net profit, so that they could now be supplied with foreign production from other countries.
Although this argument deals with the general advantages derived from trade, the characteristics described are even more accentuated in undeveloped economies such as this case, which find in international trade a support to direct their productive efforts towards the areas where they can obtain better results, thus raising their productivity with increases in their performance.

This is also in line with Winters (2004), who argues that a higher rate of trade openness facilitates foreign direct investment, so that there would be a greater inflow of capital and resources in general; in addition, it favors exchange, expanding the available consumption options as mentioned above, which would increase the standard of living of individuals and inhabitants of each nation involved, directly influencing productivity and then favoring their aggregate development.

Furthermore, given the new international scenario in which economies find themselves, it is necessary to review and control other aspects in order to maintain a good position with respect to the rest of the world and favor their competitiveness. Therefore, Winters (2004) also argues that one of the indirect benefits of a higher rate of trade openness is the improvement of government institutions and entities, which are necessary to streamline the processes that lead to real economic and social progress, making it possible to detect possible

obstacles that could hinder it and that, therefore, must be corrected, such as an excessive bureaucracy in terms of efficiency or a high rate of corruption, which would hinder the administrative management of these functions.

However, the contribution of trade openness does not turn out to be statistically significant according to the data analyzed, in spite of agreeing with our previous assumptions regarding the meaning and nature of its relationship as a determinant of productivity. This may be due to the fact that although the greater presence of international trade can mediate benefits for the achievement of development objectives, it is necessary to have a solid political and institutional framework at the national and international levels, as discussed above, which is not normally the case in developing economies. Aware of this, it is possible to support the support provided by international trade towards the achievement of development when solid and efficient institutions are in place.

With regard to the latter, the effects of trade on productivity can be positively assessed when national institutions are efficient and there is a guaranteeing international plan in the case of producers in less developed nations; on the other hand, there is a negative or irrelevant balance, as in this case, when the adequacy of policies is not appropriate and their application is far from effective.

Likewise, the contribution of unemployment on productivity and the development of an economy can be understood by taking into account the undeveloped nature of the economies analyzed.

The justification lies in the fact that developing economies have not yet managed to exploit their full productive potential and, in general terms, have an underutilized labor force while they are still learning to make more efficient use of the resources at their disposal.

Thus, in sum, the inverse relationship between unemployment and productivity can be understood by considering that an increase in unemployment would lead to a greater under-employment of the labor force, worsening even the current situation

in undeveloped economies, supporting the negative contribution of unemployment on productivity.

In the opposite sense of this logic, with an increase in the effective labor force and an efficient use of resources, companies will obtain higher returns, which they will have to pay their workers given the increase in productivity, which makes it possible to understand the contribution of inflation on the latter variable.

That said, this would result in a rise in the price of labor, which would be reflected in wage increases, causing an upward adjustment of the general price level for production and consumer goods in the long term, resulting in a higher inflation rate. As mentioned in the hypotheses and supported by previous literature, it would only be possible to control this rise in inflation by increasing productivity.

In other words, given the higher productivity, wages in the economy will increase and it will be possible to contain the damage that inflation could generate to the extent that the wage adjustment is such that it allows workers to at least preserve their real purchasing power, which is achieved when the growth of the wage rate manages to outpace the growth rate of the inflation rate.

Considering this, inflation would have a direct relationship with productivity, which has been validated in the empirical results, once again validating our assumptions. Finally, it only remains to analyze the effect and impact of labor informality on productivity.

It is precisely at this point where, given the evidence found in the literature, we decided to include labor informality by means of the informal employment rate of an economy, with the main emphasis on the impact it could have on productivity.

Furthermore, the consideration of this phenomenon and its influence on productivity is the main proposal arising from this study, which aims to make intensive use of it in these matters, considering that there is no widespread or commonly used accounting as such of the phenomenon among countries and, therefore, a consideration of the problem that makes clear the havoc it can wreak

on their economic and social progress, at least in more advanced economies, which do not have published data on this matter.

Furthermore, and despite the fact that the issue of labor informality is already recognized in less developed economies, it continues to be a controversial issue, which has not been given the importance it deserves in order to confront and control it so that its effects do not further harm economic and social progress.
On this point, precisely the results of this work and the conclusions derived from it have an important repercussion.

The findings point to the fact that labor informality has a negative effect on productivity, and also makes a significant contribution to its detriment, thus slowing down and impeding the growth and socioeconomic development of nations, as was initially assumed.

Even if approached in a different way, the same conclusion could be reached about the detrimental effect of labor informality on productivity and development. Specifically, the issue could be evaluated from the labor demand side and thinking about the economic incentives behind the public policies in charge of regulating and improving the condition of their workers.

Thus, the policies dictated and applied in order to consolidate and extend the coverage of the formal sector will end up increasing labor participation in the economy. This happens because formal jobs, being legally regulated and benefiting workers with guarantees that are not provided to informal sector employees, such as health coverage and work insurance, among others, will lead to a greater appreciation of them by the population. If the supply of this type of employment is sufficiently adequate, it could counteract the detrimental effects that the rate of informal employment generates for the nation's development in the long term. In other words, the formal sector could absorb greater market demand, reducing the mismatch attributed as the structural cause of labor informality.

Likewise, in the short term, the greater demand for jobs would lead to competition for available jobs, ideally awarded to those most suitable for the positions and

tasks to be performed. Given this, it would be natural to think that, on the one hand, and given the greater motivation of employees to obtain and keep a job that offers them greater guarantees and comfort and, on the other hand, to have those skills that merited the award of the position and the subsequent gain of experience in the position, their productivity will increase, generating greater benefits for the companies where they work and, in turn, obtaining greater retribution from them in the form of higher salaries.

This generates a virtuous circle between productivity and salaries that leads to greater generalized growth, which brings with it greater aggregate development in the long term. In this case, once again, the conclusion is the same: labor informality is reduced, and consequently productivity is on the rise, favoring long-term aggregate progress.

Thus, it is imperative to consider and become aware of the detrimental impact that informality has on the economy, society and, in general, on the progress of a nation. Thus, developed countries are also expected to consider its correct accounting, on a regular basis, and to place emphasis on its control.

In addition, emerging and developing nations should apply some effective improvements in the latter, since mere accounting only helps to have the clarity to recognize the problem, but does not solve it by itself and, in particular, they should ensure the proper functioning of their institutions to make it clear and ensure that this issue does not wreak havoc or further compromise their growth.

Finally, it is hoped that the results obtained and the conclusions derived from their analysis will bring us closer to the fulfillment of Goal 8 of the SDGs, to the extent that they are considered for the promotion of inclusive economic and social growth, protecting employment and guaranteeing decent work, for which attention should be paid to those individuals who are part of the informal sector and who are at a disadvantage compared to those who are not part of it. Undoubtedly, paying attention to these aspects would lead to progress that would translate into comprehensive and sustainable socioeconomic development.

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