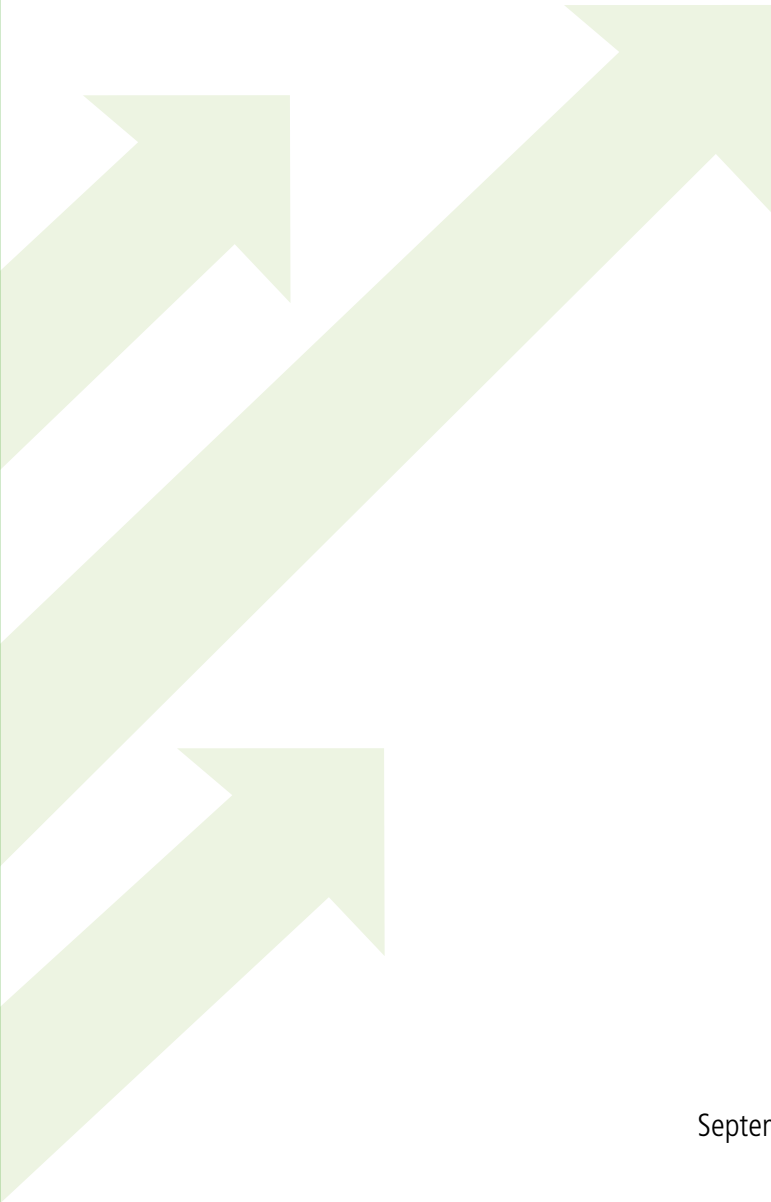


LABOR **PRODUCTIVITY** DETERMINANTS  
for the Strategy on Sustainability and Promotion of the Middle Class





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for the Strategy on Sustainability and Promotion of the Middle Class



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# 1

# INTRODUCTION

Antecedents  
Productivity





*“Productivity isn’t everything, but in the long run it is almost everything. A country’s ability to improve its standard of living over time depends almost entirely on its ability to raise its output per worker”*

**Paul Krugman,**

The Age of Diminishing Expectations, 1994



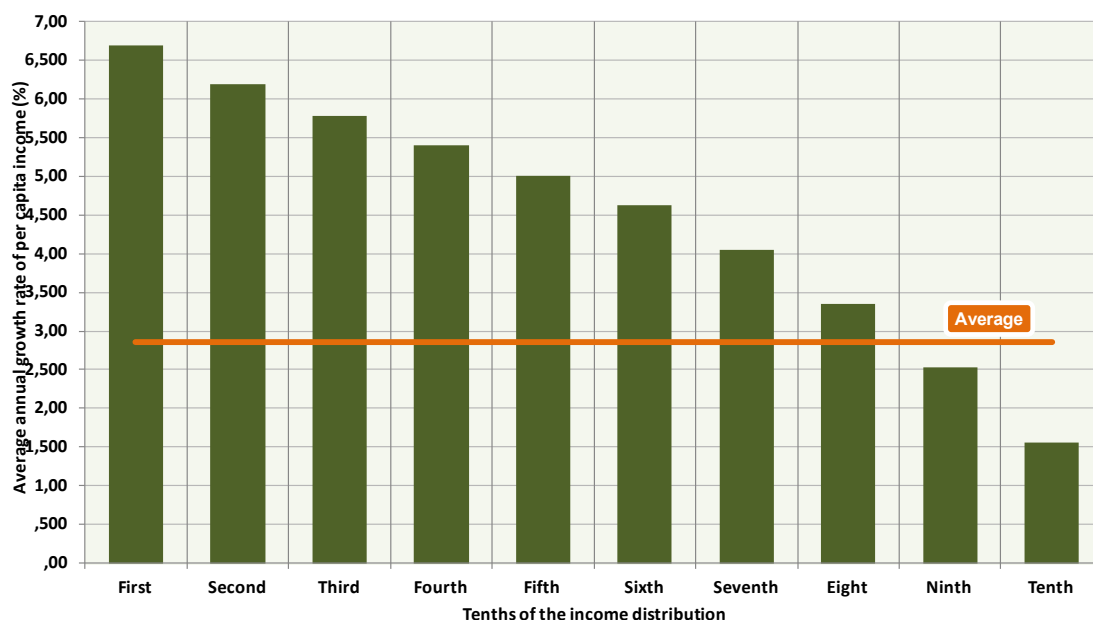


# 1. INTRODUCTION

## 1.1 Antecedents

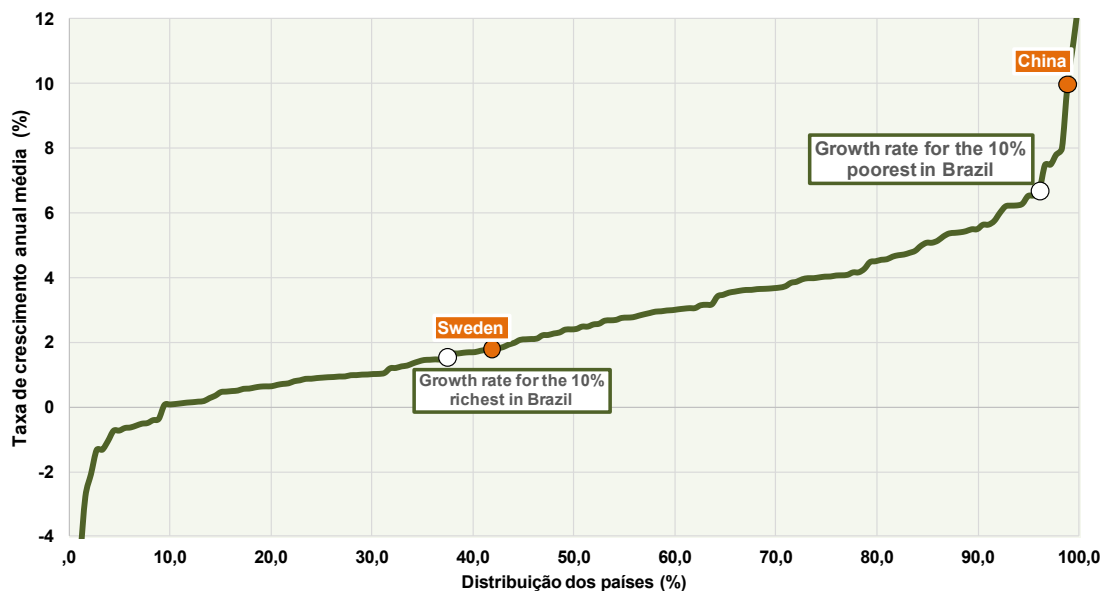
Brazil's distribution of wealth has undergone deep transformations over the course of the last decade. During this period, the country has gone through an extremely inclusive growth process. Not only has per capita income increased across all income classes, but this increase was much more intense among the poorest (see chart 1). As an example, the average annual growth rate of the poorest 10% (6.5% p.a.) was more than four times that of the richest 10% (1.5% p.a.).

Chart 1: Average annual growth rate by tenths of the distribution of family income: Brazil, 2001-2011



With a view to illustrate the magnitude of the inclusion of the Brazilian growth process, we present in chart 2 the position of the growth of Brazil's rich and poor in the distribution of countries with respect to their per capita growth rate. This chart reveals that, if those 20 million that make up the poorest 10% of Brazilians were to form a country, they would be close to China and among those countries that most grew (top 2%) over the past ten years. On the other hand, if those 20 million that make up the richest 10% of Brazilians were to form a country, they would be close to Sweden and have an average growth rate. Thus, we can see that half the countries have a growth rate between that of Sweden (corresponding Brazil's richest 10%) and China (therefore corresponding to Brazil's poorest 10%) For this reason, the gap between rich and poor in Brazil is narrowing at the same speed as that between China and Sweden, which illustrates the speed at which inequality is declining in Brazil.

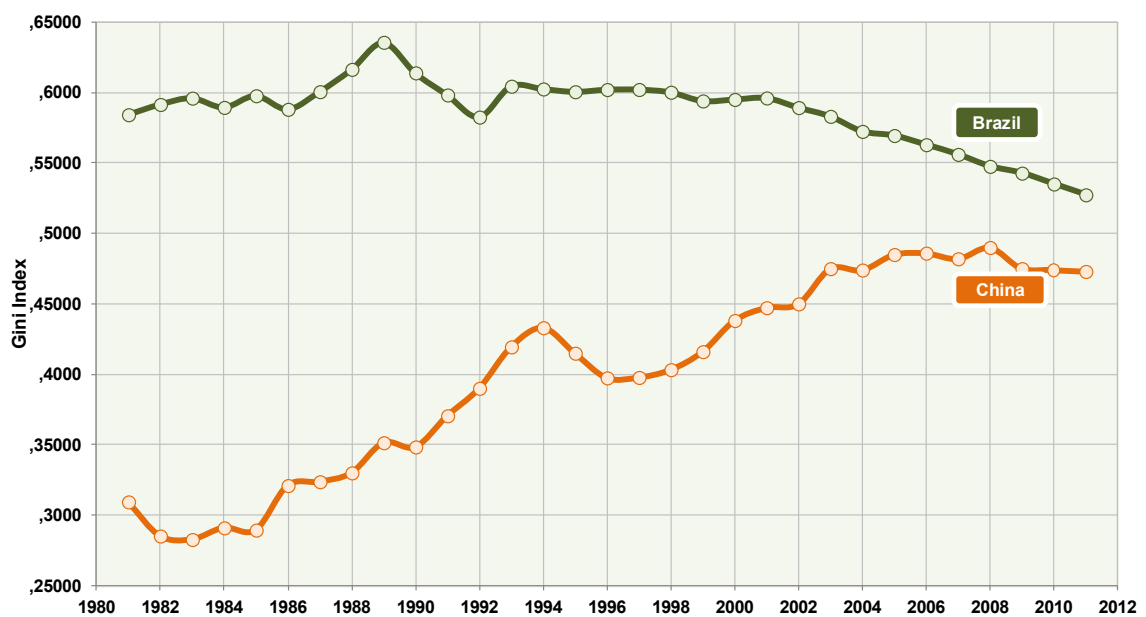
Chart 2: Distribution of countries according to their average annual growth rate of per capita GDP: 2001-2011



Source: SAE/PR based on WB data (<http://data.worldbank.org/indicator/NY.GDP.PCAP.KD>).  
 Note: Only 179 of the countries were considered due to data availability for the period.

As a consequence of this strongly inclusive growth, the degree of Brazilian inequality, historically high and resiliently so, starts to fall in a continuous and significant fashion. In the last 30 years, the country went from a Gini coefficient of 0.6 to one of 0.5, a reduction of very similar magnitude to that of the increase of inequality in China over the same period of time (see chart 3).

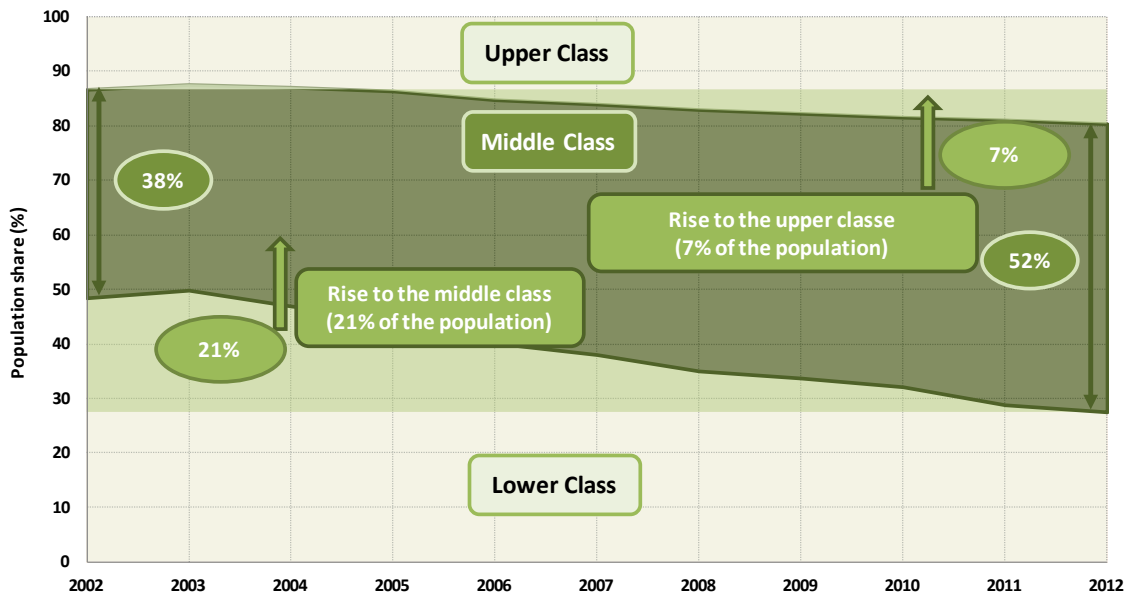
Chart 3: Evolution of the degree of inequality, Brazil and China: 1981-2011



Source: 1976-2009 Instituto de Pesquisa Econômica Aplicada (IPEA), averages for the years of 1980, 1991, 2000; 2011 PNAD 2011.

Growth with equity led to a marked decline of the lower class and a concomitant expansion of the middle class. During this period, the lower class fell by 21 percentage points (see chart 4).

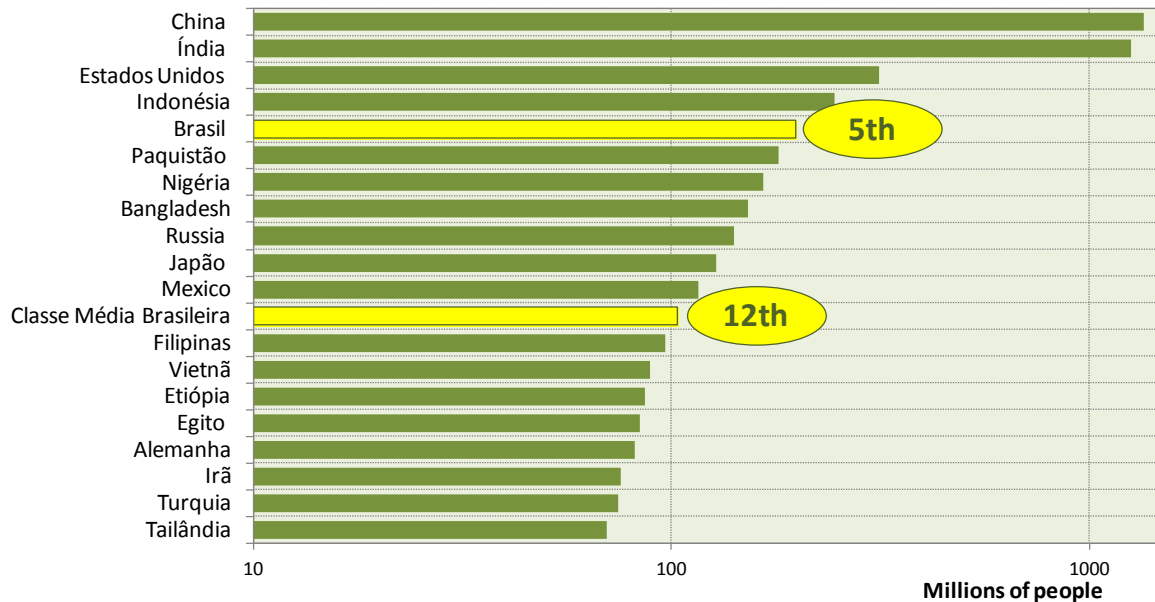
Chart 4: Evolution on the size of income classes, Brazil: 2002-2012



Source: SAE/PR based on the PNAD.

This reduction of the lower class led to an expansion of the middle class of 14 percentage points, as 7% of the Brazilian population moved progressed to the upper class. The final result is a middle class representing more than half of all of Brazil's population. If it were a country, the Brazilian middle class would be the 12th most populous country of the world, with more than 100 million inhabitants, right after Mexico (see chart 5). As an economy, Brazil's middle class represents the 18th largest consumer market in the world.

Chart 4: Evolution on the size of income classes, Brazil: 2002-2012

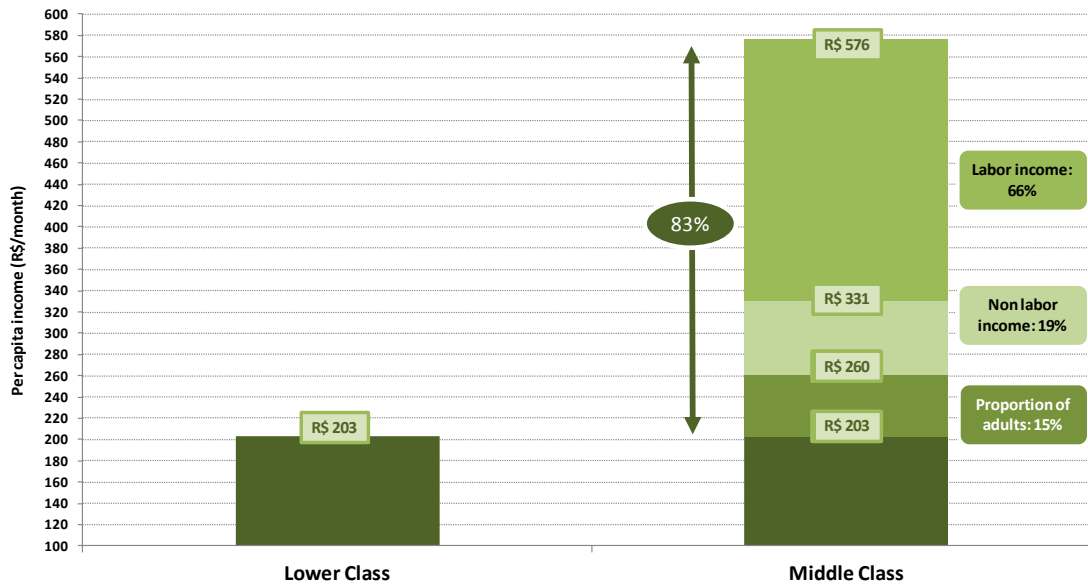


Source: World Bank - *World Development Indicators*.

Although some more anecdotal perceptions seek to associate the pronounced contraction of the lower class and the expansion of the middle class with the strengthening of a social protection network in the country, the available empirical evidence points unequivocally toward labor as the primordial mechanism of ascension. Indeed, almost 70% of the difference in income per capita between the lower and middle classes in Brazil are due to differences in labor remuneration (see chart 6) and close to 60% of the growth in income per capita of the group that makes up the middle class today also came from the rise in labor remuneration (see chart 7).

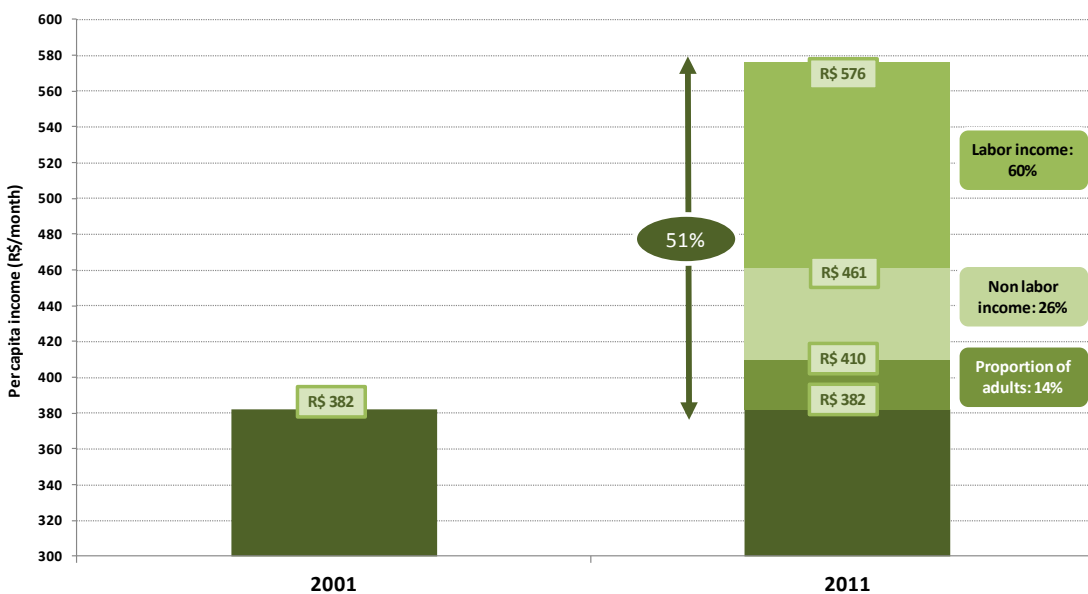
Thus, although the increase in generosity of public transfers was fundamental as a first step toward the eradication of extreme poverty, it was productive inclusion of many small entrepreneurs and the access to formal labor of many informal workers – who could switch from a survival strategy to a livelihood strategy – which effectively led to the formation of a new middle class. Slightly more than 30% of the difference of per capita income between the lower and middle classes is due to the differences in access to public transfers (see charts 6 and 7).

Chart 6: Determinants of the income gap between the lower class and the middle class, Brazil: 2011



Source: SAE/PR, based on the PNADs 2001 e 2011.

Chart 7: The determinants of growth in the middle class income Brazil: 2001-2011



Source: SAE/PR, based on the PNADs 2001 e 2011.

However, it is intriguing and worrisome that so many families have left poverty via productive inclusion in periods during which labor productivity has increased so little. Indeed, as illustrated by chart 8, between 2003 and 2009, while real average income per occupied worker grew by more than 30%, GDP per worker increased by less than 20%. Of all the periods of productivity growth experienced by the Brazilian economy since the 60s until today, the period between 2001 and 2010 was that in which the growth rate of labor productivity was smallest in relation to the growth rate of the economy.

Thus, while it remains controversial, one might say that Brazil's recent success is more likely a result of an improvement in terms of trade – which allowed for a substantial and successful formalization process of the economy and of work relations— rather than a result of an accelerated incorporation of new Technologies and investment in physical capital, which would lead to significant advances in the physical productivity of labor.

Consequently, in Brazil, over the last decade, the growth rate of labor remuneration was supported much more by an increase of value of national production on international markets (improvement in terms of trade) than by actual progress in physical productivity. Indeed, commodity price increases and low capital costs in the rest of the world characterize the last decade. An international setting favorable to Brazil allowed for an expansion of credit in the country at the same time as a reduction of internal interest rates was underway. The baseline interest rate (Selic) was 1.27% per month in January 2001, it fell to 0.93% per month at the end of 2010 and reached a low point of 0.49% in February of 2013. In this way, it was possible to sustain growth at a much higher level than that of labor productivity. In order to reduce Brazil's vulnerability to fluctuations in international markets, however, it is fundamental that the country adopt a new strategy of growth rooted in productivity growth.

If a continued ascension of the middle class per way of labor is to be sustained, it seems essential that the physical productivity of labor begin to grow at rates compatible with those of labor earnings. The growth of labor remuneration above the

average growth rate of physical productivity of labor can be attained for a certain period of time, but not in a sustainable manner. While the rise of a new middle class has been reached with negligible progress in productivity, the expectation is that more than a decade of mismatch between growth in remuneration and growth in labor productivity can hardly be reproduced.

It is, therefore, crucial that the country rely upon a vigorous set of policies directed at promoting productivity gains. The country already counts on a wide array of federal actions, apart from the variety of actions stemming from the initiatives of State and municipal governments and from civil society organizations geared toward promoting gains in labor productivity. While there are gaps to be filled in this wide array of actions, what makes its absence most felt is, perhaps, adequate coordination between actions. The lack of coordination makes it difficult to have a clear perception of what is available. The consequence is that very few beneficiaries of these actions and very few of their managers know the full range of actions and are capable of describing them with a degree of detail necessary to their full usage. Moreover, because of the lack of systematization, large gaps go unidentified and therefore remain unsolved.

It is undeniable that the country has an implicit strategy for the promotion of productivity gains, particularly for posts important to the middle class. However, the fact that such a strategy is not found in a duly explicated form brings with it under-use, difficulties for the articulation and integration of actions and identification and bridging of gaps. It has not been a simple task to create a systematic and effective policy for increasing labor productivity in Brazil. The outcome takes the form of bad positions relative to other countries. Between 1960 and 2010, labor productivity in Brazil was on average 23% that of the USA, and 70% that of Argentina. In 1950, labor productivity in Brazil was 33% bigger than in South Korea, in 1980 they were almost identical, and in 2010, labor in Brazil was only 29% as productive as labor in South Korea.



The goal of this document is to present an analytical framework which would clearly state the determinants of labor productivity and the resulting actions turned toward promoting its growth. This Framework intends to be a reference permitting, on the one hand, the understanding of determinants of productivity in a logically consistent manner, and on the other, the organization of the myriad government and non-government actions both federal and local. We believe that, based on this map of mechanisms and the promotion of labor productivity, it will be possible to better articulate the actions, identify those that need to be reinforced and gaps which need to be bridged.

## 1.2 Productivity

There are many different notions of productivity. Total Factor productivity, average labor productivity and marginal labor productivity are some of the most common examples. There is sometimes little interest in distinguishing these notions in the design and evaluation of public policies, as actions directed at promoting total factor productivity end up also promoting all types of productivity.

There are, however, specific actions which can promote one type of productivity and have an adverse effect on the other. One classic example is the more intensive use of one substitute input which increases production and thus average labor productivity, but that can at the same time have a negative impact on the marginal productivity of labor.<sup>1</sup>

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1 The simplest form of illustrating the movement in opposite directions of average productivity of labor and marginal productivity of labor would be to consider a production function given by  $y = F(L + bK)$  where K is a substitute input to L, labor. In this case, average labor productivity,  $e$ , would be given by  $e = \frac{F(L+bK)}{L}$  and the marginal labor productivity,  $g$ , would be given by  $g = \frac{\partial F(L+bK)}{\partial L} = F'(L + bK)$ . Under the hypothesis that there are decreasing returns to scale in the use of the input substitute to labor, we have that average labor productivity increases with an increase in K,  $\frac{\partial e}{\partial K} = \frac{bF'(L+bK)}{L} > 0$ , but marginal productivity of labor decreases with a rise in the use of K,  $\frac{\partial g}{\partial K} = F''(L + bK) < 0$

Our concern regards the capacity of the Brazilian economy to guarantee significant, continued and sustainable increases in labor remuneration. At least in the long term, gains in the remuneration of workers will be inextricably linked to the value of that which a worker is capable of producing at the margin. For this reason, in this document, the focus is on marginal labor productivity. More specifically, the focus is the value of marginal labor productivity, as this is the one that defines its remuneration. In this sense, how much a worker is capable of producing is as important as the value of the good or service they produce.

As every increase in total factor productivity leads to increments in marginal labor productivity, all ways and means geared toward the promotion of total productivity are part of our interest. The same, however, does not occur to average productivity. For example, due to the differences in production technology, some sectors are naturally more intensive in natural resources or in capital. Consequently, these sectors tend to have higher value of average labor productivity. Nevertheless, when the labor factor can move freely between sectors, the value of marginal labor productivity tends to be similar between sectors, independently from the intensity with which the different production factors are used. In this case, actions directed at concentration in the sectors less intensive in labor would not necessarily lead to increases in the value of marginal labor productivity.

In the long term, in an ideal competitive environment with constant returns to scale, the price will be equal to the average cost and the remuneration of labor will be equal to the marginal productivity of labor. Thus, in this environment, the value of productivity of labor will be equal to the value added by labor, per worker, where the value added by labor is understood as the total revenue minus all production costs, except labor remuneration. For this reason, in this document we use as the focus is at times on the value of marginal labor productivity, and at others on the value added by labor per worker, or simply on average added value. The use of value added is often useful for highlighting determinants that can be difficult to identify

based directly on marginal labor productivity, such as, for example, the importance of acquiring complementary inputs to labor at the lowest possible price. We stress, however, that the ultimate goal of this document is to identify the determinants of value of marginal productivity of labor, the concept of value added being useful only in the moments in which it is in accordance with the value of marginal productivity of labor.



# 2

## ANALYTICAL FRAMEWORK

- A. Producer Price
- B. Total Factor Productivity: Institutional Aspects
- C. Total Factor Productivity: Technology
- D. Complementary Inputs
- E. Use of Substitute Inputs
- F. Quality of the Workforce
- G. Matching between Workers and Jobs





## 2. ANALYTICAL FRAMEWORK

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As it has been said, the main purpose of this initiative is to identify and organize in an extensive way all factors that can affect labor productivity. It is not the intention of this study to measure the impact of each factor in Brazil's labor productivity, nor to establish any relation of cause and effect between the factors. The proposed analytical framework departs from the hypothesis that the value of labor productivity can be decomposed into producer price, total factor productivity, marginal effects of the use of substitute and/or complementary inputs and labor efficiency.

Each one of the components of the value of labor productivity listed above has been associated with one or more key elements called macrofactors. The first macrofactor relates the determinants of producers price. As the value of marginal labor productivity in a given firm is determined by the product of the physical productivity of labor and the price of the good or commodity produced by the firm, variations in price can lead to variations in the value of productivity.

Total factor productivity produced two more macrofactors: the second one, which relates to the business environment of the economy and the third, that regards the process of innovation and adoption of new technologies. Both are determinants of productivity, although their determinants are different. The business environment is related to the adequate use of public policy and instruments of regulation.

At this point, it becomes necessary to clarify certain matters regarding the nature

of regulation measures. Some might even be harmful to labor productivity, but are associated to increases in social well-being; such is the case of environmental restrictions effective for fighting pollution and the degradation of the environment, or of labor legislation which prohibits work in insalubrious conditions. In this text, such restrictions will be classified as “due”. On the other hand, there are regulations that do not generate well-being gains and prevent productivity gains; this is the case of excess red tape needed to open a company or to import machinery or inputs which incorporate new technologies. These restrictions will be classified as “undue”.

Innovation and adoption of new technology relates to the use of modern production techniques, in other words, to the narrowing of the gap between the country’s productive process and the global technological frontier.

The fourth macrofactor deals with the use of inputs complementary to labor. Among the determinants of this macrofactor, one can highlight determinants of supply and demand of complementary inputs as well as determinants of price not strictly linked to the inputs market itself, as it is the case of regulation on the acquisition and use of capital. It should be noted that capital could be seen as either complementary or substitute to labor, it all depends on how the production process occurs. If it is a fact that, in order for production to take place, capital needs to be used, thereby making capital and labor complement each other, it is also a fact that in many occasions machinery and equipment can replace the use of labor. The importance of this substitution vis-à-vis the complementarity of these two factors depends primordially on the level of aggregation and on the horizon of analysis. In what pertains to this study, both aspects shall be considered.

The fifth macrofactor concerns the possibility of substitution of a worker by other inputs and its effects on labor productivity. As labor productivity is inversely linked to the quantity of capital used in production, measures leading to an increase in the use of capital have positive effects on the productivity of labor. In this case, the



positive effect on labor productivity does not necessarily imply larger growth<sup>2</sup>, but the objective of this study is not to focus on the determinants of growth, but those of labor productivity.

Just as total factor productivity, the efficiency of labor was also split into two macrofactors. Thus, the sixth macrofactor deals with human capital and the seventh with the adequate use of labor. There exists a wide literature showing that human capital is one of the principal determinants of labor productivity. In order to deal with it, one needs to consider the determinants of general human capital, usually associated with formal education, as well as specific human capital, normally associated with that developed at the workplace, by experience. Finally, the seventh and final macrofactor deals with the functioning of the labor market and how it correctly matches each worker's abilities to the abilities demanded by the companies.

All the macrofactors above listed as well as their identified microdeterminants can be found on the following version of the proposed analytical framework. This draft is to be discussed - either with regard to missing or to misplaced determinants - and improved by the important thinkers and institutions invited to the International Conference on Sustainability and Promotion of the Middle Class.

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<sup>2</sup> Such will be the case when the increase in use of capital leads to a drop in total factor productivity

## Analytic Framework for the Strategy of Sustainability of the Middle Class through Promotion of Labor Productivity

A. Producer Price	B. TFP*: Institutional Aspects	C. TFP*: Technology
A.1 Increasing demand	B.1 Elimination of unwarranted barriers to opening and closing companies	C.1 Legal constraints to production
A.2 Production profile	B.2 Support to new and alternative methods of organizing production	C.2 Production inefficiencies
A.3 Losses and inefficiencies in transportation and storage	B.3 Elimination of unwarranted barriers and costs to the operation of production units and protection of rights	C.3 Use of existing technologies
A.4 Taxes and social contribution associated to circulation and sales of good and services		C.4 Innovation and development of new technologies

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\*TFP: Total Factor Productivity

D. Complementary Inputs	E. Use of Substituting Inputs	F. Quality of Workplace	G. Matching of Workers and Job Posts
D.1 Legal constraints to the purchase or use of inputs	E.1 Legal constraints to the purchase or use of inputs	F.1 Formal Education	G.1 Frictional unemployment
D.2 Increase of supply and reduction of input prices	E.2 Reduction of supply and increase in input prices	F.2 Professional Qualification	G.2 Unemployment through mismatching
D.3 Diversification of use of inputs		F.3 In-Job Experience	G.3 Professional qualification adequate to production needs
			G.4 Adequate matching of workers and job posts

## A. Producer Price

The value of labor productivity depends not only on the amount produced (physical productivity of labor), but also on the unit value (price) of what is produced. Even if a producer uses, year after year, the same inputs to produce the same quantity of the same product, such producer will face changes in the value of productivity if product price varies from year to year.

Likewise, two producers using the same inputs to produce the same tonnage may also have significantly different productivity values if they are paid different prices per ton produced. This price differences have two possible explanations. On the one hand, they may be due to differences in what they produce: a producer may be producing a good A, while the other produces good B, with different prices per ton. Thus, the productivity value may be different even when the production volume is identical.

On the other hand, even when the two manufacturers produce the same amount of the same product using the same manufacturing process, the unit value may differ if they face different difficulties to place their product into the consumer market. For the producer who is closer to the consumer market and has good logistics for production transportation, storage and distribution, the price received may be much closer to that paid by consumers, as compared to another who produces far from consumer markets and does not have the same logistics to place the product in the consumer market. In this case, both produce using with the same inputs, the same product, they sell to the same consumer, at the same price. However, due to locational differences, producer prices are different, which results in different labor productivity values.

As a consequence, several public policies have been designed to enhance domestic production, in order to seek, in a sustained manner, for better prices for what is produced domestically. There are four major channels that can and are being used

by public policies aimed at improving internal production. Firstly, one can promote an increase in demand by means of various mechanisms, as greater demand unequivocally leads to price increases. Secondly, one can seek for better prices through increased market power by domestic producers in international markets. Thirdly, one can modify or improve the profile of what is produced, allocating the workforce primarily to products with higher productivity value. Fourth, one can enhance production by reducing the gap between producer and consumer prices, either through avoiding losses in transportation, storage and distribution, or through the payment of taxes and fees without the appropriate social benefit in return. The following sections address each of these issues separately.

### A.1 Increasing demand

Perhaps the clearest demonstration of the value of a product is the increase in its demand. After all, an increase in demand reflects greater propensity on the part of consumers to pay for the demanded product. When everything else is constant, increases in demand result in price increases.

Increases in demand may occur in intensive or extensive margins. In the former case, they derive from the fact that individual consumers confer greater value to a certain good, thus increasing the individual demand for it (intensive margin). An example of this occurs when, at the current price, each individual consumer would like to purchase a larger amount, or would be willing to pay a higher price for the amount they already intended to purchase. In the latter case, increases in demand for a product result from the expansion of the volume of consumers (extensive margin) interested in buying it and with access to it.

Both extensive and intensive margins may be reduced or expanded, with the use of a variety of tools. In the case of the extensive margin, the opening of new markets for domestic products is one of the more traditional ways to expand demand. These new markets may result from improvements in national market integration, or from the opening of international markets to domestic producers. The outreach of new

markets derives from overcoming institutional barriers that used to prevent or hinder the marketing of domestic goods, or from the lack of knowledge about Brazilian products by the agents operating in these markets.

Since the expansion of demand depends on products supplied being adequate to consumer needs, one way to increase demand is to make the supply more adequate to consumer needs. A classical way to promote this adequacy is increasing the variety of goods supplied. The greater the range of goods supplied, the greater the likelihood that individual consumers will find a good in their interest, and also, the greater the value they will be willing to pay for such good. Therefore, diversification is a tool to expand demand and raise the value of production. These, however, are not the only advantages of diversification. As discussed below, diversification facilitates the adaptation of the range of products to market conditions and, as will be seen later, can also reduce production costs through economies of scope, and, thus, increase the value of labor productivity.

Diversification is only one way to make production better suit consumers' needs and interests, and, therefore, to increase demand. Other examples of adaptation to consumers' needs that can stimulate demand are: adjustments ranging from profound changes in product design to superficial changes in color, shape and presentation, including changes in name, form of presentation, and marketing.

In the scenarios presented so far, consumer preferences were considered unchanged. All mechanisms to increase demand were based on information or on better matching the product to consumer needs. However, consumer preferences are not immutable. For example, promotional campaigns and other forms of communication can change preferences and, thus, increase the amount consumers demand and the price they are willing to pay.

Finally, it is noteworthy that even in traditional markets comprising consumers who know a given product in depth, the scale of demand can expand, if changes occur

in other prices or if consumers become wealthier. In fact, the demand for a given good (a beverage, for example) should increase when the price of a substitute good (another beverage, for example) rises significantly. It also happens that the demand for a certain good (rice) shall increase, if the price of a complementary good (beans) decline significantly. Since, in general, the demand for a given good increases with the availability of consumer income, the growth of household income also tends to be an important mechanism for demand expansion.

It should be pointed out that, regardless of their origin, the extent to which an increase in demand ultimately leads to labor productivity increases depends on an effective growth of production arising from it and on the magnitude of the diseconomies of scale that may be in place. The greatest impact on productivity value occurs when the factors of production are inelastic. In this case, there is no possibility for increases in supply, i.e., increases in demand translate into price increases without changes in physical productivity of factors of production and labor, in particular.

At the other extreme, however, if the supply of all factors of production is elastic and there are diseconomies of scale, the increase in demand will lead to increased supply with higher product prices resulting from the drop in productivity that derives from diseconomies of scale. In this case, the remuneration and the value of labor productivity may remain unchanged with the increase in product price, and it is completely offset by a decrease in physical productivity coming from increases in production scale, in the presence of diseconomies of scale.

## A.2 Production profile

In any economy, there is a variety of goods and services that are or could be produced, given the availability of technology and factors of production. The choice of what to produce determines the manner the available workforce is allocated and, in general, has great influence on the value of labor productivity. The goal should be to increase the production of goods that add to the demand for labor, and one avenue is to increase the willingness to pay for labor, and, thus, the added-value of labor.

The ideal situation is not necessarily to produce the higher priced products, since higher prices could also mean higher production costs (labor excluded). In fact, the ideal here is always allocating the workforce to goods and services with the largest gap between the selling price and the unit cost of production, not including the cost of labor (added-value of labor). That is, ideally one should allocate the workforce to the production of goods and services with higher added-value of labor.

But who would produce something with lower added-value when one can produce something of higher added-value? There are two reasons for this form of inefficiency. Firstly, the issue of incomplete information. Not all producers can be well informed about all the possibilities of production and the gains involved in each case.

Secondly, there may be barriers to entry in certain markets, such that, even acknowledging that certain products have higher added-value, producers find themselves unable to produce and market them. This may happen for legal reasons, such as market reserves and non-tariff barriers imposed on Brazilian products, or due to technological barriers, by means of patents and other forms of intellectual property protection.

The choice of the range of goods to be produced is a decision both structural and situational. To the extent that some goods and services systematically show higher added-value than others, their priority on the production agenda is structural, not varying according to economic conditions. In other cases, such as in agriculture, for example, large fluctuations in relative prices hinder a structured production agenda. The best range of goods to be produced depends on the current situation, which requires regular evaluation.

Since a series of fixed costs and inertia make it harder to start production of a certain good than to adjust the volume already produced, it is important in these volatile situations, to maintain diversified production, adjusting the quantities of each good to be produced according to price variation. Therefore, production diversification has



the additional advantage of facilitating the adjustment of the production agenda to market conditions.

It is worth mentioning that in an environment of very high volatility and uncertainty, when changes in relative prices are so sudden and unexpected that cannot be anticipated, without notice enough to allow for changes in the production agenda, diversification can also be of great importance. In such an environment, when the optimal situation cannot be pursued, diversification guarantees a stable average added-value in a world of high volatility, but specialization may lead to serious added-value fluctuations.

Having highlighted all the advantages of diversification, it is worth noting that there are also costs, derived mainly from losses from specialization gains. In general, the search for efficiency, the learning by doing, and innovation require repetition and specialization, gains that may be difficult to achieve with a diverse production agenda. Section C addresses production and the role of technology, and will also return to the advantages and disadvantages of specialization and diversification in the context of production. In this section, which addresses marketing, the benefits of diversification tend to dominate, particularly when the economic environment is more volatile.

### A.3 Losses and inefficiencies in transportation and storage

There is always a gap between the price paid by consumers and the price received by producers. Part of this gap is a consequence of the remuneration of agents in charge of transportation, storage and marketing. After all, a good in the consumption place is different from the same good at the production site. Transportation, storage and marketing are economic activities that add value, like all the others. Thus, their costs constitute neither losses nor waste that would need or deserve to be eliminated, but ways to benefit or confer value to production.

Part of the gap between the price paid by consumers and the price received by producers, however, results in economic losses (benefits outweigh costs) and avoidable inefficiencies. All goods damaged during transportation and storage constitute a waste of work. If a producer produces one ton at one thousand reals and can only deliver seven hundred kilograms at the value of seven hundred reals, the numerator relevant to the calculation of productivity will be seven hundred (reals or kilograms, depending on whether one is calculating physical productivity or productivity value). The other three hundred, although they are accounted for in the calculation of the production unit, are wasted in the perspective of the economy. Due to this loss, there will be a reduction in the consolidated added-value of producer and transporter, and this reduction entails a decline in the labor productivity value.

These losses through inefficiencies in transportation, storage and marketing and unnecessary costs due to inadequate infrastructure available represent a gap that deserves to be eliminated between the price paid by consumers and the price received by producers. These losses and inefficiencies, when eliminated, represent increases in the value of goods produced (including costs with transportation, storage and marketing), which means increases in the value of labor productivity.

#### A.4 Taxes and social contributions associated to the circulation and sales of goods and services

The entire production process uses, to some extent, public services that are often free of charge. It is natural that productive sector agents contribute their taxes and social contributions to the public budget. Undoubtedly, these contributions open a fiscal gap between the gross sales price and the net price received by sellers or producers. Part of it may be perfectly justifiable, as the taxes paid are used for investment in infrastructure to support production (transportation, storage, power, communications, etc.), and to finance productive services provided in a subsidized manner. Another part is a solidarity contribution by the productive sector to the public budget, which is efficiently and effectively used to improve living conditions and opportunities of the most vulnerable social groups. None of these aspects of the fiscal gap constitute a loss, a waste or deserve to be eliminated.

There is always, however, a portion of the public budget that is used inefficiently or ineffectively, whether in pursuit of providing productive services, or when dedicated to the provision of social programs. This is the portion, which, if eliminated, would not cause any losses in the quantity and quality of public services, as it represents an unwanted gap between the price paid by consumers and the price received by producers. Its suppression would, in fact, lead to an increase in the value of labor productivity.

## B. Total Factor Productivity: Institutional Aspects

Not everything that can be produced should be produced. Some products are considered socially undesirable and, therefore, their production is discouraged by legislative acts or public policies. On the other hand, the production of other goods, frequently called merit goods, is fostered by means of social actions and public incentives. Society is not completely indifferent to what is produced. To a certain extent, it is interested in modifying the constitution of production. Thus, it legislates, persuades and engages itself in sophisticated incentive systems in order to adjust the production profile to something it considers socially desirable.

Society's concerns are not exclusively limited to what is produced. In general, society is much more concerned with *how* goods and services are produced than with *what* is actually being produced. Definitely, not all technologically feasible production forms are considered socially desirable. Every society has rules that establish limits on what is and what is not allowed in the productive process, giving rise to legislation concerning the environment, labor issues, sanitary problems, accident-prevention matters, and the guarantee of property rights, including intellectual property.

The eagerness to make "*what is produced*" and "*how it is produced*" socially desirable, or at least socially acceptable, inevitably leads to unnecessary costs and excesses. Consequently, economic life in society may become unjustifiably bureaucratic, complicated or cumbersome. These excesses may denote that socially desirable activities will not occur, or will be discouraged, and that socially adequate productive practices will not be used.

These unjustified impediments to economic activity penalize the value of labor productivity through at least two routes. From a direct perspective, they make part of the available labor force focus on activities that do not have any real economic or social value. Examples of this are the time and energy spent by workers when trying to deal with the unreasonably high number of documents and procedures that are required to fulfill the steps that are necessary to ensure a company's operations, such

as: (i) starting (opening a company) and closing a business, (ii) registering property, including patents, and other intangible assets, (iii) paying taxes, fees and social contributions, (iv) accessing public services, (v) obtaining permits to build and operate, including documents and procedures for product sale (specially in case of imports and exports), and (vi) filing lawsuits, executing legal contracts and solving disputes.

Indirectly, the existence of unnecessary and socially unjustifiable costs and uncertainties may preclude economically and socially desirable activities from being carried out. In this case, these restrictions to economic life would curtail the level of economic activity, preventing real economic opportunities of social interest from taking place and, therefore, reducing the demand for work, given that they unreasonably limit the use of the labor force. Thus, as occurs whenever there is a retraction in the demand for work, these barriers will reduce the value of labor productivity.

Not all unwarranted barriers have the same effect on the productive process. Some are gratuitous limitations on the purchase or use of production inputs. These barriers will be subsequently analyzed in Sections D and E, when we address the relationship between input use and productivity value. Others represent unjustifiable obstacles to the use of certain types of technologies or of production or management methods. These topics will also be analyzed in Section C, when we focus on the relationship between technology and the value of labor productivity.

Finally, although part of these barriers do not hinder the internal operations of companies - regarding the choice of what to produce, or how to produce - they hamper or elevate the cost of their relationship with the public sector or with customers, suppliers or competitors. Typically, the prevalence or not of these hurdles is associated to the "business environment". A "good" business environment is characterized as a situation in which the relationship among the economic agents and between them and the public sector is not subject to a lot of bureaucracy and is based on fair and clear rules and laws, which are fulfilled in a safe and predictable manner.

## B.1 Elimination of unwarranted barriers to opening and closing companies

From the perspective of promoting economic activity, the easier it is to open and to close companies the better. Obviously, starting a company represents the creation of a series of responsibilities that must be meticulously considered, documented and carefully fulfilled. Otherwise, a predictable and unnecessary series of disputes will arise and revolve around the benefits and responsibilities for future actions of the company. Similarly, closing an enterprise is a process that requires careful consideration, given that during its operations the company made several commitments to other economic stakeholders and to the public sector that must be honored, paid, negotiated or forgiven before the company can be liquidated.

Therefore, there is no doubt that it is impossible to reconcile justice, predictability, reliability, and safety in the relationship among economic agents and between them and the public sector if there are no thorough and transparent processes to open and close companies. Nonetheless, given the sensitivity of this issue, it is quite easy to find cases in which excessive legislation and public policies generate unnecessarily lengthy and cumbersome procedures. Although it is hard to determine the best legal approach for this theme, there are international experiences that demonstrate how we can at least come close to the best possible balance, avoiding complicated and extended procedures.

The greater the distance from the best practices, the greater are the bureaucratic requirements, the costs, and the duration of the process. Therefore, this represents an unjustifiable impediment to economic activity and it leads to the allocation of the scarce human resources to activities that have no economic or social value. These barriers reduce the value of labor productivity, either because they promote an inadequate allocation of the available labor force, or because they limit the demand for work by discouraging economic activity.

## B.2 Support for new and alternative methods of organizing production

In the previous section we highlighted the importance of having a suitable regulatory framework for opening and closing companies. This is the result of an interest in not unnecessarily discouraging economic activity. Nevertheless, if the objective is to foster economic activity, we must acknowledge that the entrepreneurial approach is not the only form of organizing production. Cooperatives, producer associations, local productive arrangements, among other alternatives for production organization (frequently called “solidarity economy”) have proven to be relevant for the purpose of generating wealth and using the available human resources in a productive way.

Hence, the dissemination of new or alternative methods of organizing production should promote economic activity, and, consequently, increase the value of labor productivity. There are several ways to support new or alternative forms of organizing production. The provision of subsidized productive services (usually technical and financial assistance, capacity-building, accreditation, and sales support) is the most frequently used method. The use of “solidarity economy” as an instrument to promote the value of labor productivity will be addressed in section D, where we will focus on the use of production inputs.

Regarding this specific point, we should note the importance of promoting the creation and organization of solidarity and community production units. In this case, the actions focus on providing guidance to small isolated producers about the possibilities and legal, economic and social advantages of establishing cooperatives or other producer organization systems. On the other hand, these initiatives may also be geared towards providing incentives to create such associations, either through technical and legal support or by reducing financial costs and expediting their development.

### B.3 Elimination of barriers and unwarranted costs that hinder the operations of productive units and the guarantee of rights

The relationship among economic agents and between them and the public sector is not limited to the moment in which a company or producer association is opened or closed. There is also intense interaction among these stakeholders throughout the period in which these enterprises are operational. This relation must be suitably regulated, documented, concerted and settled. Among these interactions, the following ones are noteworthy: *i)* property registration, including patents; *ii)* tax payment; *iii)* access to and payment of public services; *iv)* procurement of permits to operate and sell, and *v)* dispute resolution and legal execution of contracts.

The most challenging part of regulating these interactions is achieving an adequate balance between the respect for economic rights and for different forms of property, safety and legal predictability; as well as between the implementation of quick and straightforward solutions for payment of taxes and compensations, the establishment of agreements and contracts, and dispute resolution.

If these relationships are excessively regulated or bureaucratic, the costs and the time spent in each of the transactions will increase. These unjustified costs and delays are translated into inadequate human resource allocation to unproductive activities with no economic or social significance, directly reducing the value of labor productivity. From a different perspective, unnecessary rises in the production costs may hinder certain economic activities and make others artificially and pointlessly unfeasible. Thus, excessive regulation and bureaucracy will result in the contraction of economic activity and, consequently, in reductions in the demand for work, jeopardizing the value of labor productivity.

If too much regulation and bureaucracy have a negative effect on the value of labor productivity, the same thing is true in the case of defective or insufficient regulation. This is clearly demonstrated in cases in which the lack of rules and norms generates problems such as legal uncertainty, disregard for property rights, and nonobservance



of contracts and agreements. Insufficient regulation may lead to legal uncertainties that tend to increase the risk premium required to finance a certain activity. Therefore, it discourages investments and growth in the economic activity level, as well as in the value of labor productivity.

Inadequate or deficient regulation may also delay and increase the costs of legal dispute resolution, tying-up productive assets and generating losses for all parties. Typically, insufficient or inadequate regulation leads to a negative sum game, where all participants lose.

## C. Total Factor Productivity: Technology

Labor productivity is determined, on the one hand, by the amount of each production factor that is used, and, on the other, by the way in which these production factors are combined. Product factor availability and usage will be covered in sections D and E. In this segment we will focus on the way in which these production factors are combined and how this has an impact on productivity.

Since there is a limited supply of inputs, it will never be possible to attain an infinite production level. In general, bearing in mind the input availability, we might conclude that there is a way of combining these factors in order to guarantee the greatest production possible. This would represent the efficient combination of the available inputs, taking into consideration the production possibilities (technologies) within our reach. Consequently, productivity depends on how close (efficient) or how distant (inefficient) production is from the maximum possible level that can be obtained by using the available technology, and whether it may limit the production capability.

### C.1 Legal limitations on production

Complete efficiency may be impossible to achieve because of legal limitations or management flaws. Legal limitations are legitimate when they aim to prevent the use of socially undesirable production forms. In principle, not all technologically feasible and economically efficient production methods are socially desirable. There are economically efficient production means that are socially inadequate because of their environmental or social implications. The purpose of the legislation on the environment, labor issues, sanitary problems, accident-prevention matters, and others, is to avoid the use of these socially undesirable production methods.

The major challenge with regards to the enforcement of this legislation is how to avoid abuses. When trying to prevent the utilization of socially undesirable production forms, it is important to refrain from excessive legislation, which could compromise the use of desirable production methods and reduce productivity without any social justification.

Not only can the legislation restrict the range of use of production inputs, but it can also (and this is generally the case) limit production scale and the array of goods to be produced. That being the case, legislation may prevent the adoption of socially undesirable production scales and product types (restrict production variety). On the other hand, inadequate legal instruments may also inhibit socially desirable economies of scale and scope, and stave off expressive productivity rises.

Therefore, each provision of the legislation on environmental concerns, labor issues, sanitary problems, accident-prevention matters, and others, should be carefully studied and assessed, both in terms of the social risks it aims to eliminate, as well as the harmful impacts it may have on labor productivity.

## C.2 Productive inefficiency

In many cases the production level is below the volume that could be attained with the used inputs and available and authorized technologies. Having said that, there are many reasons for a company not to operate in conditions of total efficiency. Regardless of the motives, production inefficiency invariably leads to a decrease in labor productivity.

Production inefficiency may occur in three distinct moments. First, it may be a result of an inadequate process of purchasing inputs, in which the prices were higher than what could actually have been paid for such products. The higher the price of the inputs is, the higher the production costs and the lower the value added of labor. Secondly, inefficiency may be caused by an economically inefficient choice of inputs when, given the production possibilities, this combination does not minimize production costs and, consequently, does not maximize the value added of labor. These two sources of inefficiency refer to the purchase of inputs, and not their actual use. Hence, they will be incorporated as determinant factors for labor productivity in section D, which will focus on input purchase and use.

Thirdly, inefficiency can be caused by the underuse of production inputs. In this case, the production level is below the attainable limit, either because of lack of knowl-

edge about the productive process, or because of misuse or underuse of inputs. Misuse or underuse of inputs is usually caused by management errors that allow for machines and equipment to be left out of use without any reasonable explanation, or that acquiesce to keeping the work force under occupied. Regardless of the situation, inefficiency is a result of production drops and it leads to a reduction in the value of labor productivity.

Finally, apart from deciding how to produce a certain amount of a given good, it is also important for companies to choose what to produce (decision about production scope or diversification) and how much to produce of each particular product. This is yet another case in which a company's decision may be inefficient, affecting the value of labor productivity. Ideally, the company should identify the diversification level and the production scale that make the most of the existing economies of scope and scale.

Competition can be essential for companies to adopt efficient production strategies because it provides adequate incentives for them to be as efficient as possible. Competitiveness can be crucial in view of the fact that the implementation of more efficient procedures generates more costs. If competition did not exist, companies would lack the proper incentives.

### C.3 Use of existing technologies

For each type of technology there is a maximum production capability using a given group of inputs. Therefore, this would be the efficient production level, the greatest achievable value of labor productivity, bearing in mind the technological constraints and input availability. Technology, however, is not something certain or immutable. On the contrary, in the long run the incorporation of technology is the main determinant of productivity gains.

Eventually, the assimilation of technology inevitably requires innovation, meaning the development of new technologies. On the other hand, at some point in time a company or economy may not necessarily require innovation in order to incorporate

technology. A company or economy that has not yet been using the most advanced technologies can progress simply by incorporating the technologies that have not yet been assimilated.

If these existing technologies are in fact to be used, they must be made effectively available. Therefore, the barriers that previously prevented their application must be eliminated. These restrictions may be caused by unwarranted legal impediments, patents and other forms of intellectual property protection, or simply lack of knowledge about the availability of these technological alternatives or of suitable technical assistance to facilitate their use.

Thus, the adoption of existing and socially desirable technologies may require: *i*) changing the current legislation; *ii*) eliminating barriers that apply to the protection of intellectual property rights, or *iii*) disseminating information about these technologies, and *iv*) providing technical assistance to facilitate their adoption and implementation. In some cases, the use of new technologies depends on the authorization to use restricted materials for production.

Insofar as the existing legislation and bureaucracy make it difficult for new companies to enter the market (especially foreign companies that own high-end technology), they may also prevent the introduction of technologies and innovative management methods developed by the companies that are discouraged from operating in the country.

Competition may also be quite useful to facilitate the adoption of existing technologies because it creates incentives for companies to use the most efficient technology available, which might otherwise not happen in the absence of competition because of the costs involved. Then again, the earnings significantly compensate for the costs. In a competitive environment, the cost of not adopting a new technology may mean that a company will be excluded from the market. Be that as it may, the use of more advanced technologies promotes labor productivity.

#### C.4 Innovation and development of new technologies

The first step in any program to promote productivity is, undoubtedly, the elimination of productivity losses caused by inefficiencies in production or lack of socially desirable technologies (regardless of the reason). After all, this path requires significantly less resources than the development of new technologies.

Nevertheless, this specific approach is a lot less dynamic. There are clear limits when it comes to eliminating inefficiencies and adopting existing technologies. In spite of the fact that highly inefficient and technologically outdated economies have a lot to gain from this process, in the long term technological innovation will always be the best instrument to improve productivity.

The development of new technologies involves two dimensions. The first corresponds to the improvement of the production process of a good that is already manufactured. This represents the expansion of the production frontier. It is possible to expand the production level using a fixed group of inputs, or to reduce the volume of inputs required to obtain a certain amount of the product. In this case, the objective of innovation is to reduce production unit costs and, therefore, increase labor productivity.

In the other dimension, which is probably more important, innovation affects the value of labor productivity when it involves the incorporation of new goods in the production agenda. Singularly, innovation leads to possibilities of producing goods with greater added value, expanding the value of labor productivity.

## D. Complementary Inputs

Although labor can be one of the main factors of production, it is certainly not the only one. Countless others not only contribute to labor in production, but also modify labor productivity, either raising it or reducing it. We say that a factor is complementary to labor when a greater use of this factor leads to a greater demand and higher productivity; it is a substitute, in turn, when a greater availability of this factor leads to a lower demand and lower labor productivity. In Section E, we shall address the factors of production that are substitutes to labor and their relation to productivity. In this section, the focus is on complementary factors. In this case, the higher its availability and utilization, the higher the labor productivity.

The use of inputs has three basic determinants: *i)* it may be limited due to the existence of legal barriers to their acquisition; *ii)* there may be no barriers to access, but its use is restricted by law or *iii)* there may be no legal barriers, but economic ones, be it due to a complete lack of supply of this raw material supply or the lack of an oligopolistic supply, where prices are high. In either case, the use, although legally permitted, will not occur or will occur in a very limited instance for purely economic reasons.

### D.1 Legal restrictions to the acquisition or use of inputs

In principle, it may be the case that the use of a given input will raise the productivity of labor, but its use is considered socially inappropriate. In this situation, restrictions on the acquisition of inputs would be valid. In general, however, the existing barriers are improper. The elimination of such barriers to the acquisition of complementary inputs to work, when it allows the incorporation of these inputs to production, will raise the demand for labor, and then its productivity. Again, too much legislation appears as a limiting factor to labor productivity.

In other situations, there may be no legal restrictions to the acquisition of a given input, but a broader legislation limiting its use in the production process. In general, the existing restrictions to the use are also improper, and their elimination, when al-

lowing the intensification of the use of these inputs in the production process, also increases the demand for labor and hence its productivity.

## D.2 Expansion of supply and reduction in input prices

For businesses to effectively use the inputs, it is not enough that there are no restrictions on access and use. It is also necessary that the market conditions are favorable. In Section A we saw that the greater the demand for what is produced and the higher the market price of such goods, the greater the value of labor productivity. After all, what matters to the added value of labor is the difference between the product price and the production cost. Therefore, with respect to prices, what effectively determines the added value are the terms of trade. What the whole economy or the businesses are looking for is to sell their products the more expensive as possible and buy the cheapest possible inputs.

The greater the supply, and then the lower the price of inputs, the higher the added value of labor. All public policies and other actions that can be taken to increase the supply of inputs and to reduce their prices will make them more accessible to companies and they will start to use them more intensively. Gains in terms of trade and in a more intensive use of inputs cause the increase of the added value of labor.

One way to reduce the price of production inputs is through subsidies, as it is typically done through productive credit. The direct impact of this strategy on labor productivity is certainly positive. The issue is the need for funding. If to finance a subsidy on inputs used in the production we introduced a tax on production, on the one hand we would be reducing the price paid by producers for inputs used, but on the other, we would be reducing the net revenue received (prices received) by the producers, with an uncertain impact on the terms of trade and thus on the added value of labor.



### D.3 Diversification in the use of inputs

In the presence of diminishing returns, the greater the diversification of production inputs, the higher the labor productivity. Moreover, a greater diversification in the use of complementary inputs reduces the risk of interrupting the production due to lack of a specific input. While the interruption of the production may not have an effect on the productivity of the hours effectively worked, it has an effect on the productivity of hired labor.

## E. Use of Substitute Inputs

Not always the intensification of the use of a particular input leads to increases in labor productivity. Those whose intensification of the use generates reductions in demand and then in labor productivity are called substitute inputs. Thus, the use of substitute inputs to labor follows an inverse logic compared to the one used in the analysis of the effect of complementary inputs. The most immediate example of a substitute input to labor is the use of foreign labor. In fact, the traditional fear of immigration is its potential effect of expanding the labor supply, reducing the demand for domestic labor.

As in the case of complementary inputs, the use of substitute inputs also has three basic determinants. Firstly, the use of the input may be restricted due to the existence of legal barriers to the acquisition (barriers to the immigration of foreign labor, for example). Secondly, there may be no barriers to access, but the use of the input may be restricted by law (such as the requirement that at least  $\frac{2}{3}$  of the workforce of each firm is national). Thirdly, there may be no legal barriers, but economic ones, be it due to the complete absence of a supply of this input or to a limited supply, where prices end up getting prohibitive. In either case the use, although legally permitted, will not occur or will occur in a very limited instance for purely economic reasons.

### E.1 Legal restrictions to the acquisition or use of inputs

When the use of a given input reduces labor productivity, there is often interest of workers to impose restrictions on that input. The case of the use of foreign labor is classic, but not unique. Sometimes, some equipment and machines are not introduced, despite their economic viability, for fear that they will replace manpower, reducing demand and labor productivity, or contributing to the generation of unemployment.

In some cases, restrictions on the acquisition and use of certain substitute inputs to labor is socially valid. A prime example is the fight against precarious or slave work, that replace and reduce the demand for decent work and its productivity.

## E.2 Restriction of supply and increase in prices of inputs

For companies to restrict the application of a given input, it is not necessary that there are limits to access or to the use. Unfavorable market conditions may also restrict it.

The greater the scarcity of the input, and thus the more restricted its supply, the greater should be its market price and thus the lower is its use by businesses. If the input is a substitute to labor, reductions in its use will lead to increases in demand and labor productivity.

One way to raise the price of production inputs would be to do it via taxes, as it is done with some imported inputs. The direct impact of this strategy on labor productivity is positive when the input is a substitute to labor. The issue is the subsequent increase in production costs and loss of competitiveness. To the extent that these inputs are of significant importance, high prices due to taxes imply higher production costs, which in turn lead to one of two disadvantageous results to the demand or the added value of labor. On the one hand, higher production costs may result in higher sale prices and therefore less demand both for the product and for work. On the other, when the demand for the product is elastic, its price may remain unchanged, resulting in a lower added value of labor.

## F. Quality of the Workforce

Consider the situation in which worker I is in job X and worker II is in job Y. Suppose the combination IX has productivity well above IY. It is always possible to decompose the difference in productivity between those combinations in two components: One that is permissible to be assigned to the given job could be estimated by comparing the productivity of worker I in job X with the one which he would have if he was in job Y. In this case, we are comparing the same worker in two jobs, and therefore it would be appropriate to assign the productivity gap to differences in the intrinsic quality of the jobs. This difference would be that associated with technology and the intensity of inputs used.

The rest of the difference in productivity that would constitute the second component could be estimated by comparing the productivity that the worker would have if he was in job Y with the one that worker II produces in this job. In this case, we are comparing the productivity of two workers in the same job. It would be appropriate to assign the productivity gap to differences in the intrinsic quality of workers associated with differences in formal education of workers, in their professional training and in their experience in the labor market, the company and the job being considered.

### F.1 Formal Education

Countless studies have demonstrated a strong association between labor remuneration, productivity and formal education (schooling). There are at least three reasons why education should increase labor productivity. First and directly, more education implies more knowledge and thus better skills to perform certain activities. The worker with more schooling is capable of performing a wider range of activities, takes less time and tends to perform each activity more accurately.

Secondly, and perhaps most importantly, workers with more education are better able to learn new activities and more easily incorporate management or production

techniques. For this reason, they find it easier to acquire new technical, technological and management skills, determining a cost of training that decreases with schooling.

Last but not least, more education means more ability to process information. Thus, education is associated with the ability to make better decisions, particularly in volatile environment or one that is in rapid transition.

For all these reasons, it is natural to observe a strong correlation between education and productivity. It is noteworthy, however, that education is often measured by taking into account only the number of years that were completed successfully by the workforce without considering the actual learning achieved in each year. Of course, the quality of the education received is as important as the number of completed years of school. Therefore, appropriate measures to increase the schooling of the workforce should take into account both the quantity and the quality of the education offered.

## F.2 Professional training

Although essential for the formation and productivity of the workforce, education is largely only a necessary condition. In general, a good professional training is essential to transform well educated people into highly productive workers. The training is essential for building an effective bridge between general education and the specifics of a given occupation.

In the case of professional training, it is very important to recognize the difference and the complementarity between the initial education (technical or technological) and the continuing education. Initial education - typically of longer duration - serves as the first bridge between the academic and theoretical knowledge and the practical knowledge necessary for the proper performance of a profession. It is what promotes a successful transition to the employment world.

In an economy or in a dynamic company, production and management techniques are not static; rather, they are constantly changing. In these environments, it is of fundamental importance to ensure that each employee has access to a training program that allows him to continuously upgrade his skills.

It is noteworthy that the continued education on productivity operates through two possible channels. On the one hand, it allows greater control of the functions currently performed, and thus promotes productivity. On the other hand, it facilitates the transition between occupations or jobs in the pursuit of career advancement, to the extent that the knowledge acquired allow access to processes with a higher added value.

So for these reasons, the greater the access to both initial and continuing education, the greater must be the labor productivity, emphasizing the complementarity between different forms of knowledge. Thus, it is expected that the impact of education should be so much greater the higher the education of the workforce.

### F.3 Experience in the labor market

Much of the knowledge of how to make it better and more quickly, accurately and with a higher quality, can not be obtained in training courses. The experience is essential to promote productivity. In many cases, it is only possible to learn something by doing it. Therefore, the experience of the workforce is also crucial to determine its productivity. After all, one of the major deleterious effects of long- duration unemployment is exactly the loss of experience and contact with the productive activities, which necessarily affect the productivity of the workforce.

As production and management techniques vary, not all accumulated experience in a company becomes productivity gains if the employee changes companies. In general, experience increases productivity of a worker that remains in the company more than the one who moves to another. The same also applies to activity changes in the same company. The experience in an occupation generally has a greater im-

pact on the productivity of those who remain engaged in the same occupation than on those that exchange or advance in their career.

In short, experience in the labor market is a determinant of productivity gains, with gains being greater, the greater the time that workers remain in the same company and in the same occupation. It is noteworthy that this relationship between accumulation of experience, immobility and productivity is clearly only one side of the issue. As we highlight in the next section, despite the loss of specific experience that it represents, the mobility of workers between firms, occupations and jobs can also promote productivity gains. These gains are a result of the improvement that mobility fosters in the union between workers' skills and the needs of businesses and jobs.

## G. Matching between Workers and Jobs

In previous sections, we dealt with two fundamental determinants of the value of labor productivity: i) the quality of the work (sections A to E) and ii) the qualification of workers (section E). In an environment where both workers and jobs are heterogeneous, when determining productivity, how workers are allocated to jobs is just as important as the quality of the job and the skills of workers.

To achieve maximum productivity, it is necessary, on the one hand, that the degree of utilization of labor be as high as possible, so that the unemployment rate reaches its frictional level. On the other hand, it is necessary that employed workers be allocated to available jobs as efficiently as possible.

### G.1 Frictional unemployment

Training a suitably-qualified worker and having good quality jobs available means nothing if the employee remains unoccupied and the job post is vacant because the employee is unaware of the availability of the job and the company offering the job is unaware of the worker's availability (frictional unemployment).

Unquestionably, any form of frictional unemployment represents a loss in productivity. Thus, in seeking to raise labor productivity, all actions must be committed to the purpose of eliminating information asymmetries and, as such, reducing purely frictional unemployment. It is noteworthy that reducing the duration of frictional unemployment is just as important as reducing its incidence. What matters for productivity is how many workers are idle, and for how long they remain so.

### G.2 Unemployment by mismatch

Unemployment by mismatch has an identical impact on labor productivity. As with the frictional case, it represents unused labor, with obvious effects on labor productivity. The origin of unemployment by mismatch, however, is different. In fact, its origin stems from the mismatch between the supply of skills in the workforce and the demand for available jobs. A mere mechanical allocation of workers throughout



available jobs would not have the desired impact, since workers simply do not have the skills required to perform the tasks and activities typical of the available jobs. In this case, the actual reduction in unemployment requires either the retraining of a sizeable portion of unemployed workers or the re-ordering of activities so that jobs compatible with available skills start to become available in larger quantities.

Just as in frictional unemployment, all forms of unemployment by mismatch lead to lost productivity. In seeking to raise labor productivity, large vocational training initiatives should be put in place, in order to meet the demands of the labor market and, as such, reduce unemployment by mismatch. As much as possible, one should seek to ensure that companies have the right incentives for offering jobs that value the skills already held by the workforce.

### G.3 Adequacy of professional training to production needs

The adequacy of professional training to production needs must always be pursued, even in the absence of unemployment by mismatch. In fact, the occurrence of unemployment by mismatch reflects only one acute stage in the process. Only when the degree of mismatch between the skills held by workers and those necessary for carrying out the typical activities of the job exceeds a certain level must there be a separation. Up to that point, the working relationship persists, albeit with limited productivity. From that point, it follows that the continued training of employed workers to continuously combat the mismatch serves not only to prevent separations and unemployment, but also to ensure that the level of productivity of labor relations remains, at least, very close to its potential.

### G.4 Adequacy of the Matching between Workers and jobs

In an economy where workers and jobs are heterogeneous, labor productivity is not independent from how labor is allocated. Consider, for example, a situation in which there are two workers, I and II, with skills 2 and 3, respectively, to be allocated into two jobs, X and Y, of quality 4 and 5, respectively. Suppose that the productivity of a combination is given by the product of the worker's qualification and the quality of the job. In this case, there are two possible allocations to consider (IX, IY) or (IY, IIX).

In the first case, the productivity of the combinations involving worker I, IX, and IY, would be 8 and 10, respectively, while for worker II, IIX and IYY would be 12 and 15, respectively. It follows that, in the case of allocation (IX, IYY), productivity per worker would be 13.5, whereas in the case of allocation (IY, IIX), productivity per worker would be 11.0. That means that allocation does matter. The allocation that leads to greater productivity per worker is the one where the most highly-skilled worker goes to the best job (IX, IYY).

In short, in an environment where workers and jobs are heterogeneous, the assignment of workers to jobs has a bearing on labor productivity. In such an environment, it is essential that there be information and incentives for more efficient allocation. In ensuring that workers are allocated to the right jobs, the job market can raise the productivity of workers and that of the economy as a whole. The adequacy of allocations (matches) allows the work to be performed by those who are most qualified for the activity at hand, resulting in increased productivity.

3

FINAL  
CONSIDERATIONS





# 3. FINAL CONSIDERATIONS

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Increasing labor productivity is the surest way to sustain the increasing new middle class and keep Brazil on track towards growth with the income distribution that characterized the last decade.

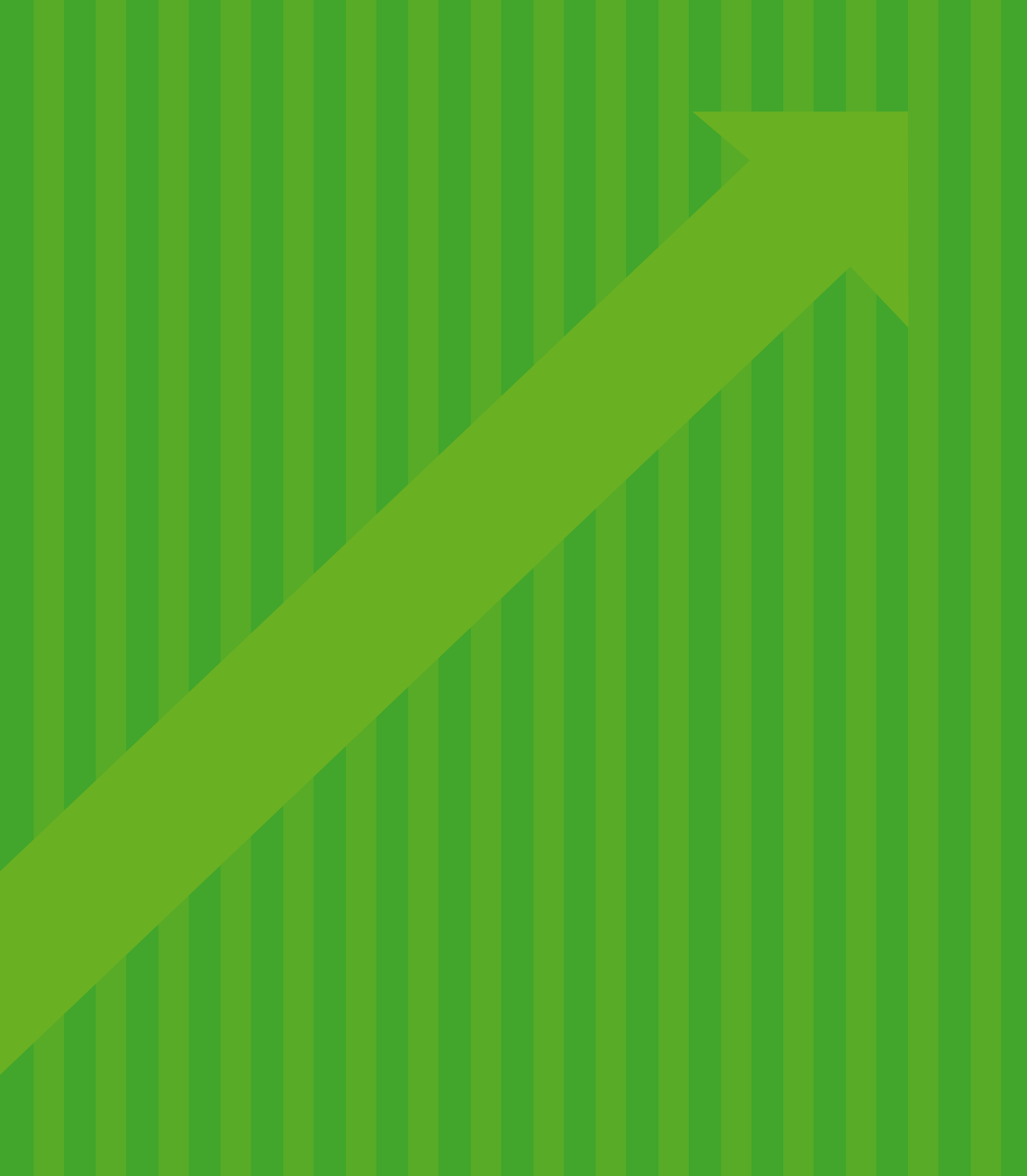
The goal of this effort is to provide an analytical framework to identify the channels through which the changes occur in the value of labor productivity. The proposed structure does not lend itself to being the basis of a theory on labor productivity or an econometric model to estimate the impact of each of the determinants on labor productivity, or even to establish an order of importance among different factors. In summary, the purpose is to systematically and exhaustively catalog and classify each of the possible determinants of labor productivity value.

Thus, the measure of success of the proposed structure is the ability to classify how external shock, public policies, structural changes and other phenomena that affect the economy may affect the value of labor productivity. It is possible that, at some point in time, an example will be presented which is not represented in the analytical framework; in such a case, the structure must be expanded.

By classifying the channels that affect productivity, the analytical framework can contribute to the construction of theoretical and econometric models about the topic. Immediately, the structure allows us to identify and classify existing policies that affect - directly or indirectly, intentionally or not - labor productivity. In the future, once the possible paths and those already trodden have been revealed, the structure is intended as a tool to prioritize, complement and enhance the current range of policies available in Brazil.







Secretaria de  
**Assuntos Estratégicos**

