



UNIVERSIDADE DE BRASÍLIA
FACULDADE DE ECONOMIA, ADMINISTRAÇÃO,
CONTABILIDADE E GESTÃO DE POLÍTICAS PÚBLICAS
PROGRAMA DE PÓS-GRADUAÇÃO EM ECONOMIA



JULIANO VARGAS

**Three Essays on Brazilian Labour Market:
Innovation, Legislation
and Macroeconomic Policy Analysis**

BRASÍLIA

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Área de Concentração: Economia Política

Orientador: Dr. Joanelio Rodolpho Teixeira

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“Everyone has the right to work, to free choice of employment, to just and favourable conditions of work and to protection against unemployment” (The Universal Declaration of Human Rights, 1948, Art. XXIII, § 1).

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General introduction

Contemporary Brazil continues to be a country of contrasts between the modern and the backward. Two of the most apparent symptoms of this reality are its bad income distribution and high inequality. Despite advances in these areas in the 21st century, both structurally and institutionally much remains to be done in tackling these problems that plague the country historically¹. In this sense, the world of work constitutes a link that provides a comprehensive interpretation of these issues and, therefore, the design of strategies that favor a model of sustained socioeconomic development.

The period from 1990 to 2019 gives important but not enough subsidies to the understanding of these aspects. In this time interval, the Brazilian economy underwent numerous transformations, such as commercial and financial opening, economic restabilization, greater international insertion, besides considerable legislation and technological changes. These factors profoundly affected and continue conditioning in many ways the labour relations, reconfiguring them incessantly.

However, the combination of these events did not reverberate in overcoming obstacles to the development of the country. Since the global financial crisis of 2008, the uncertainty looms on the national scene. This, reinforced by the internal tensions that broke out in 2015 and the end of the boom period of international commodity prices a year earlier, has extrapolated the economic sphere and overflow to the political and social field, without apparent signaling of which directions will take the national labour market.

The only plausible prediction is that the environment that favored its dynamicity in the last decade will not repeat itself in a foreseeable time horizon. There is a real risk of no progress in alleviating the problems of income distribution and inequality, as well as the vanishing of achievements in these areas. In this scenery of instability that crosses the country, society requires concrete solutions to overcome the challenges posed by the current situation.

¹ We assume that there is bad income distribution and high inequality in Brazil because still a large parcel of its citizenship lives below the minimum conditions of decent life expressed by its Federal Constitution of 1988, corroborating several studies elaborated in this area by the United Nations (UN). With regard to the world of work, our argument along this thesis relies on “The Universal Declaration of Human Rights” (1948, Article 23, § 1) – as showed in its epilogue, which states that “everyone has the right to work, to free choice of employment, to just and favorable conditions of work and to protection against unemployment”.

Given the above, the question to which this doctoral thesis will give an answer is the following: considering the socioeconomic specificities of the Brazilian labour market in the 21st century, what are the convergence links that can be established from this with innovation, labour legislation and the implementation of macroeconomic policies?

Taking this issue as a guide, the general objective to be reached at the end of this research will be to present and analyze some of the conjunctural and structural factors of the Brazilian labour market in the 21st century. In this sense, we present and discuss the dimension of this problem in the three fields previously highlighted, aiming to contribute with new elements to this debate at national level.

The central hypothesis of this research is that Brazil has taken mistaken and/or insufficient economic measures for consistent improvements in the national labour market on the three fronts analyzed – innovation, legislation and macroeconomics. Nowadays this is revealed, for example, in about 12% of the unemployed and 41% of informal workers today, a labour *débâcle* that stands since 2015 (IBGE/PNAD, 2019).

Regarding the analytical aspects, this study is based on the theories developed by authors with similar approaches in socioeconomic and political terms, from the heterodox economic framework. They are mostly related to the proposed approach to the labour market issue in Brazil, presenting a critique of the economist view in general and its harmful effects on the social fabric. This proposal seeks to add new elements to this discussion, in order to bring together two visions that seem to have antagonism, growth and development, through the promotion of equity and social justice.

Based on questions about the functioning of the free market system and its deleterious effects on individuals and on socioeconomic development in general, this theoretical and methodological instrument has been increasingly used for interpretations of labour phenomena. Linked to its theoretical scopes is a systemic and multidisciplinary approach that encompasses the fields of study of economics, social sciences (anthropology, sociology and politics), history and law. It is understood that this is an essential constituent feature of this study as well.

Besides the general introduction and conclusion, this thesis is divided into three chapters. The first two chapters, regarding the methodology to be employed and taking into consideration both the proposed question and the general context that encompasses the subjects, is defined by a predominantly qualitative outline in, both of which are characterized as descriptive and analytical research. The third chapter emphasizes

quantitative aspects and its respective exercises (contextualized throughout the text), supporting the proposed research. It is noteworthy that we seek to transmit together the facts raised and the statistical data presented to the reader the appropriate reasoned explanations relevant to them and not just their mere description.

The first chapter, entitled “Institutional challenges to the labour market and the Fourth Industrial Revolution in the light of a new paradigm in economic thinking: the Brazilian case”, examines the advancement of the Fourth Industrial Revolution (4IR) in developed and developing economies. It is considered that, in addition to the process of technological catching-up, engendering a virtuous circle between 4IR and the Brazilian labour market will require a combination of institutional improvement and dialogue – of an active social and political character, human-centered – with the immersion of Brazil in international and regional development agendas at the domestic and foreign level.

This chapter is mainly based on economic literature developed by Ha-Joon Chang. The author advocates that it is essential to understand the intricacy of culture and institutions, considering the relevance of human agency in institutional change. In addition, the author assumes that the “the capitalist system is made up of a range of institutions, including the markets as institutions of exchange, the firms as institutions of production, and the state as the creator and regulator of the institutions governing their relationships (while itself being a political institution), as well as other informal institutions such as social convention” (CHANG, 2002, p. 8). Following this path makes it possible to implement to formulate and implement appropriate policies to deal with Fourth Industrial Revolution offering to the society new and promising opportunities.

The second chapter, entitled “Impacts of labour legislation on the Brazilian labour market from 2003 to 2018”, examines – from the point of view of the Social Economy and Labour – how the recent changes in domestic labour legislation are acting over the national labour market in this period of time. The main argument is that the justification of balance for the public accounts is relevant in the midst of economic stagnation, but the conflict is in the choice of who should contribute more proportionally to the resolution of this question.

In our interpretation, to achieve socioeconomic development with income distribution and citizenship inclusion is essential to emulate a legal (labour) regulation that is prone to resolve disagreements and guide conducts that improves the correlations of forces in this area. In this sense, we stand with Cardoso Junior (2013), who defends the point of view of that labour market regulation policies and active enforcement

agencies help, playing an important role combined to economic growth and the way the economy is dynamized, in the greater effectiveness of the laws that govern the labour market.

The third chapter, entitled “Magic Hypercube approach applied to twenty economies between 1992 and 2018: a macroeconomic analysis of Brazilian labour market using DEA-Malmquist”, deals with a tool that helps to measure, numerically, the relative effectiveness and frontiers of best practices of twenty selected nations. It was done in the spirit of the four variables of Kaldor (1971): current account balance (CAB), growth, inflation and unemployment.

The biggest novelty offered by this chapter is the use of the referred quantitative methodology applied to the approach of the so-called “Magic Hypercube” (MH), a panorama where through its measuring we quantify a diagram geometry. To the application of the index, we extracted data from the World Bank’s Open Access Indicators System, dividing it in two periods: 1992 to 2007 and 2010 to 2018. The encountered results for these twenty nations allows a macroeconomic analysis on how the parameter unemployment is being tackled by Brazil compared with other nations.

The originality of this doctoral thesis consists of the presentation and discussion of three distinct frontier themes of economic theory, currently essential to Brazil's claims as a developed nation: innovation, legislation and macroeconomic policies. However, although essential and intimately connected to each other, little has been analyzed more closely from the point of view of Economic Sciences. More than that, it is proposed to approach such themes having as a guiding thread the world of work, something unusual as an academic effort. Reflecting and proposing concrete actions to overcome the existing obstacles for the advancement of the country socioeconomically is essential in these times of sudden technological and institutional changes and also in the way of conducting development strategies (when existing). For the new and challenging paradigms that are imposed on the world in general and that of work in particular, renewed ways of focusing on them are needed. This is precisely the main purpose of this research effort.

This research has certain limitations that should be highlighted. By choosing to deal with the labor market in Brazil as a whole, it was impossible to detail some important issues that deserved to be further discussed in the body of the text. Relevant aspects for the study of the theme, such as informal work, gender, race, age group, education, migratory and regional issues appear only to highlight some specific topics. Because they are not directly part of the scope of this study, they will not be addressed further, despite

their recognized relevance. One way or another, when necessary, suggestions of specific bibliographic references will be made.

Last but not least, the conclusion of this thesis contains the main inferences related to the study, as well as suggestions of possible developments that will further favor other approaches and other research on the subjects at hand.

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Chapter 1

Institutional challenges to the labour market and the Fourth Industrial Revolution in the light of a refreshed approach in economic thinking: the Brazilian case

ABSTRACT

Based on an institutional heterodox dialogue, in which the role of institutions is central to understand the different trajectories of the societies, and aiming to contribute to the construction of a refreshed approach of economic thinking, this paper examines the advancement of the Fourth Industrial Revolution (4IR) in developed and developing economies. Such a revolution is in course and Brazil does not present a national strategy to manage this structural change. First, the theoretical elements that underlie the article focus on the role of institutions. Then, the main concepts and implications of 4IR are presented. Next, we discuss how it will affect the labour market in general. From this perspective, an analysis of the Brazilian post-2008 labour market is elaborated, highlighting their potential and difficulties to implement an efficient development trajectory. It is considered that, in addition to the process of technological catching up, engendering a virtuous circle between 4IR and the Brazilian labour market will require a combination of institutional improvement and dialogue – of an active social and political character, human-centered – with the immersion of Brazil in international and regional development agendas at the domestic and foreign level. This will favor better opportunities for macropolicies and structural changes, a path that tends to make feasible sustainable socioeconomic development with equity and a close association of technology with the national labour market. Therefore, now that a new threat of labour precarization is imminent, the theoretical and methodological framework applied in this research can become an alternative to overcome this historic challenge.

Keywords: Brazil, 4IR, institutions, labour market, technology.

1. Introduction

The recent acceleration of the Third Industrial Revolution, already considered by some specialists as the 4IR, is in course and its rapid technological transformations, will significantly impact the economic and social order as a whole, presenting itself to humanity as one of the greatest challenges of the 21st century in terms of risks and opportunities. The most visible disruption caused by this structural change seems to fall on the world of work, in an environment of uncertainty¹, mainly due to the ups and downs of the economic and financial crisis that broke out in 2008. In this context, the world does not present a proper strategy for coping with this reality.

This subject, although incipient, presents a limited bibliography proposing to articulate the relations between 4IR and the Brazilian labour market. Thus, some research

¹ In this article we use the uncertainty view proposed by Minsky (1996, p. 360), expressed as follows: “uncertainty (or unsureness) is a deep property of decentralized systems in which a myriad of independent agents make decisions whose impacts are aggregated into outcomes that emerge over a range of tomorrows”.

efforts should lead to a serious debate and, at the same time, possibly cover this deficit of economic literature.

Here, for the proposed discussion, a theoretical lens with a heterodox approach of the economy has been adopted, following the perspective of Chang's Institutional Political Economy, combining it with conceptual, statistical and analytical studies of international institutions as The World Economic Forum (WEF), the Organization for Economic Co-operation and Development (OECD), the Economic Commission for Latin America and the Caribbean (ECLAC), the International Labour Organization (ILO) and other international, regional and national organizations.

Beyond this introduction and the final considerations, the study is divided into four sections: the second one presents the methodological assumptions underlying the article, focusing on the role of institutions, providing theoretical inputs that will permeate the debate on the proposed economic approach and its application to the 4IR issue; the third presents the main concepts and implications of 4IR; the fourth will discuss how it will affect the labour market in general, and the Brazilian market in particular; the fifth examines data on the performance of the Brazilian labour market since 2008 and in terms of trends, also the challenges and possibilities for a successful insertion of the Brazilian labour market in the context of new technologies and how Brazil must act to make such insertion feasible.

2. Institutions, technology and the world of work: towards a refreshed approach in economic thinking

How have countries become *de facto* developed? This is the question that Ha-Joon Chang sought to answer in the book *Kicking Away the Ladder* (2003a). Based on a denominated Institutional Political Economy approach – that emphasizes the effects of historical and socio-political factors on the evolution of economic policies² – his main argument was that the advanced countries have historically used policies opposed to the orthodox framework currently advocated by them for emerging countries, hindering the development of the latter. He undertook an analysis that reveals the neoliberal fallacy which is to require from developing nations the presence and imitation of a set of

² It should be noted that critics of the approach proposed by Chang point out as somewhat problematic the selectivity of the evidence used by the author, by supposedly randomly choosing success cases and omitting cases of socioeconomic failures of nations, according to the convenience of the argument constructed. The present paper does not exploit such evidences since the effect on selection of criticisms is smaller when it is examined with the full list of considerations.

institutions that would be prerequisites for creating an environment conducive to good governance practices. In this perspective, the fulfilment of institutional and economic policy conditionalities (especially in industry, commerce and technology) – embodied in the so-called Washington Consensus – would be necessary and sufficient to elevate developing countries to the category of advanced nations.

Central to his approach are institutions, understood as “devices which enable the achievement of goals requiring supra-individual coordination and, even more important, which are constitutive of the interests and worldviews of economic actors” (CHANG & EVANS, 2005, p. 101). From this definition, it can be seen that institutions change in time and space, according to the historical specificities of each society and economy, with multi-directional interactions between economic factors and existing institutions themselves, impossible to explain by models based only on mainstream archetype.

Chang (2006) sees institutional, cultural, and economic change as mutually influencing – in complex chains of causality – and that, after all, it is the people who do it, though not in the institutional context of their own choice. He criticizes the determinism of the conventional economic theory, or the neoliberal discourse, and argues that to supplant it, it is essential to understand the intricacy of culture and institutions, considering the relevance of human agency in institutional change. Moreover, he draws attention to the misconception of denying the diversity of institutions; that is, the impetus to simply transplant an institution into a context other than the original without making the necessary adaptations (the notion of “one-size-fits-all”). This is a relevant problem especially now at the beginning of the 21st century, where structural disruptive changes, such as in technology and in the world of work, for example, are evident.

He warns that the success of institutional development is dependent on both formal and informal attributes, institutions are the product of shared patterns of thought, imbued with the daily life of society, determining individual actions and the type of social interaction between different groups. Thus, mere institutional imitation is absolutely insufficient to guarantee successful institutional development, once there are a lot of tacit elements in institutions. Accordingly,

if this is the case, importing the formal institution is not going to produce the same outcome [where it was originally successful] because the importing country may be missing the necessary, supporting informal institutions. So, in the same way in which imported technology needs to be adapted to the local conditions, some degree of adaptation is needed in order to make imported institutions work (CHANG, 2006, p. 11).

Besides, he points out the connection between institutional innovations and society in which the former, when interpreted as technologies for social management, allows the understanding of socioeconomic catching-up as an extract of institutional improvements in developing countries, from the adapted adoption of existing institutions into other advanced realities. Put another way, the latecomers can introduce institutions from the developed countries and thereby engender better institutions without paying the same price for it.

Thus, in the logic of the capitalist system, institutions are those that restrict, constitute and enable human actions, as a complex set of constituent rules of an organization composed, in this specific case, by the market, firms and the State. These three entities interrelate, mold and are shaped by this mode of production, according to the individual circumstances of intentional agents, in a reciprocal dependence between institutions and human action. Then, the notion of a highly pervasive and interdependent institutional web is important, in which:

the capitalist system is made up of a range of institutions, including the markets as institutions of exchange, the firms as institutions of production, and the state as the creator and regulator of the institutions governing their relationships (while itself being a political institution), as well as other informal institutions such as social convention. This suggests that we badly need an explicitly institutionalist perspective that incorporates non-market, non-state institutions as integral elements, and not simply as add-ons (CHANG, 2002, p. 8).

As for the role to be attributed to the State, Chang (2003b) is emphatic: markets, firms and the State are essential institutions for the functioning of the capitalist system and complex societies cannot rule out any of them. The critical point is that the free-market system *stricto sensu* relies exclusively on the law of supply and demand, and it is fundamentally a mistake to generalize it simply because there is no adherence to the reality historically observable. Therefore, the State necessarily has an indispensable active role to play in economic development. The State is, *inter alia*, the last guarantor of property, rights and the most important actor in the definition and execution of the public agenda. Thereby, there is no discourse that can fairly justify an institutional primacy of the market, with which this utopia confines itself only to an ideology like any other.

From the historical-institutionalist analysis which he elaborated, it follows that the possibility of socioeconomic development of any nation is the result of the engenderment of numerous factors in synergy over time, constructed by a certain society under different circumstances that change in time. It should be noted that at the center of events and their

unfolding are citizens. It is in this context that Chang's Institutional Political Economy approach can be improved, connected to a refreshed approach in economic thinking, with a human-centered and sustainable development framework.

Assuming this view, a refreshed vision of socio-economic theory is essential in order to provide new perspectives for the establishment of adequate and effective institutions, in line with the global and national multidimensional requirements of the twenty-first century, with a view to improving the general living conditions of people in general. This type of social science should have a societal scope, be transdisciplinary, with an emphasis on scientific cooperation between economists and other social scientists. It is imperative to restore the economic paradigm as an inseparable component of society, so much so it should be impossible for it to fully exist outside of a whole social context, and conceived as embedded and as a server of the society's needs (JACOBS, 2015, HOEDL, 2017).

It is necessary to overcome the controversial, dichotomous and not infrequently innocuous debates of the mainstream economy, so present between opposing groups of specialists, almost all confined to narrow academic circles, which in large part explains its own limitations. In fact,

we need a new comprehensive and multidisciplinary socioeconomic theory that markedly differs from the present situation and in this vein makes a positive contribution in setting the ground for a new framework. The search for a new vision involves burning political and socioeconomic issues. Without a profound humanistic theory, which can produce significant actions, we are risking increasing uncertainties about democratic civilization (TEIXEIRA & TEIXEIRA, p. 197, 2016).

As it is well known, economic theory is not only dedicated to wealth generation. The economic conception in time and space is closely related to the relations of power established in each society and among societies. There are direct and indirect impacts of this power on institutions, which in turn have repercussions on the economy itself and in the quality of life of citizens. Thus, any economic theory *de facto* has roots in Political Economy, once the economy is strongly influenced by political and social power and vice versa. In this sense, the potential energy of society's achievement is highlighted, from which emerges the concept of social power, that is "the capacity of the society to direct, organize and utilize that energy for effective action by means of laws, social systems, institutions, knowledge and skills to accomplish social objectives" (JACOBS *et al*, p. 21, 2017).

Social power impacts on politics, economics, finance, laws, organizations, technology and innovation, the world of work, culture, education and many other aspects that make it possible to realize the common interests of society. So it is necessary to distinguish potential energy from the effective energy of society, as well as its productive application from the destructive one. The gap between them is a result of power allocation.

Emphasis should be placed on the most effective and positive use of social power, with a view to promoting the quality of life of human beings and sustainable development. A myriad of issues is part of this framework, such as: security, freedom, guarantee of fundamental rights, access to education and information, mobility, cultural diversity, creativity, decent work³ and the alike. These institutional connections democratize and direct the application of social power forcefully (d'ORVILLE, 2015). It is a serious mistake to underestimate human and social capacities, since:

human and social capital are unique in that they possess the ability to mobilize and utilize the other forms of capital to enhance performance. There is no inherent limit to the potential of human resourcefulness and social organization. Thus, there is no inherent limit to human development (JACOBS *et al*, p. 36, 2017).

That is why the participation of civil society in the design of its course is so necessary. Social power must be the key, in which it is important for the individual to have guaranteed their rights to have rights, allowing a qualified qualification in the productive system. This is a perspective of social transformation that seeks to avoid and eliminate the barriers that prevent individuals from having access to what they consider important to their lives. A substantial part of the socioeconomic backwardness is caused by limitations imposed on individuals with regard to restrictions and impediments to the improvement of quality of life and social conditions. Every citizen can and should demand access to a dignified life, through strategies for a more equitable distribution of societal power. The role of the individual in this refreshed approach of economic thought is not suppressed; society is not considered an aggregate of autonomous individuals. Each one of us is capable of unique initiatives, being the catalyst and source of social creativity

³ The concept of decent work is contained in the document prepared by the 90th International Labour Conference, which expressly defines it as the central axis to which the four strategic objectives of the institution converge: i) promote and realize standards and fundamental principles and rights at work; ii) create greater opportunities for women and men to decent employment and income; iii) enhance the coverage and effectiveness of social protection for all; iv) strengthen tripartism and social dialogue (ILO, 2002, non-paged).

and innovation; actions of a single individual can profoundly impact economic performance. In this sense, individual freedom and collective welfare are complementary.

Therefore, it is necessary to inquire how to reconcile the premises of Institutional Political Economy linked to a refreshed approach of economic thought with the rapid structural changes underway, specifically facing the technological and world of work scenarios. It is assumed that this is an urgent discussion, since it has become increasingly apparent that economies and societies have moved from an industrial logic (limited by the scarcity of material resources) to service logic (where knowledge and information – immaterial – are unlimited). Obviously, an absolute convergence of economic thought is not expected, even by its nature as a social science, but it is time to think the economy beyond the dichotomy orthodoxy *versus* heterodoxy, to understand that the true Gordian knot of socioeconomic development is between the past and the future. This finding is paradoxical in the face of a dynamic in which having a reality that is indivisible coexists with an increasingly fragmented scientific knowledge.

In this new era in which knowledge and information will increasingly be the linchpin of economic development, the trend is that the sciences of society will increasingly be judged on their ability to contribute to people's quality of life. In this case, a structural change in its bases must aspire to the formulation of knowledge applicable to this end, in a sustained way. Recognizing the limitations of conventional economic theory is an important start, for example, in what concerns to the narrow concept of economic efficiency, ignoring the social costs and other implications of maximization and minimization in the production chain. The efficiency of society is totally different compared to the efficiency of firms, where the former must be inclusive while the latter is achieved by replacing workers with machines.

In accordance with this reasoning, even the use of technology must be rethought as not having an end in itself but intended to serve human needs in all walks of life. Possibly the most obvious of these is the increasingly technological pattern employed in the world of work, a process that if not well conducted can be pernicious even from the standpoint of conventional economic theory. This is due to the possibility of investing in technology aimed at production without having to worry about mitigating the potential harmful effects on consumption, for example. On the other hand, facing technological advances as progress of mankind, in a broad spectrum, is mandatory in this dynamic.

Therefore, in this refreshed approach of economic thought there will be a special debate and action on the role of work in the 21st century, since the current configuration

of the capitalist system cannot ensure decent work for citizens. Various societies have sought answers to the new global dynamics of the world of work, whether through multilateral agreements or through tensions within nations, which denotes the strength of society in affirming the dignity of workers and, consequently, as a fundamental right of citizenship. Account must always be taken of the importance of the active participation of society and its institutions in order to ensure fairness of opportunities, protection of the social fabric and guaranteeing individual and collective rights at work. Work, in addition to ensuring material prosperity, has fundamental relevance for the autonomy of individuals, the construction of identity and social recognition.

Consequently, a refreshed approach in economic thought must have as its pillars the search for a free, democratic, just, pluralist, supportive and participative society, in which absolute respect for the dignity of the human person is emphasized. The economy should favor the practice of market rules, provided that it has as its main objectives the quality of life and equity among citizens. Economic action must be guided by social values, functioning effectively in a dynamic social market economy.

To put it in a nutshell, the theory and methodology set forth in this section will be adopted as the basic premises that will permeate the interpretation of advancement of 4IR in the developed and developing economies and their impacts on the Brazilian labour market. It is assumed that such a foundation will favor a better understanding of the proposed analysis, revealing key aspects of the subject that were neglected in similar investigations. Moreover, looking at these phenomena by examining their role in the development process implies that this research offers a different angle of view in relation to this theme, distinct from the way it has been approached until the present moment.

3. The fourth industrial revolution: structural change and its magnitude

The expression “Fourth Industrial Revolution” echoed worldwide firstly in the Hannover Fair 2011 meeting, due to the launch of the German government’s High-Tech Strategy 2020 industry 4.0 program, whose main objective is to establish this country at the forefront of the techno-industrial paradigm shift underway⁴. Industry 4.0 refers to

⁴ It should be emphasized that there is a State policy behind this phenomenon, denoting a deliberate strategy for the productive insertion of Germany in the context of 4IR. Other governments have outlined similar policies, such as: Australia (*National Industry Investment and Competitiveness Agenda, 2014*), China (*Made in China 2025 Initiative*), South Korea (*Action Plan for implementing its 3rd S&T Plan, 2015*), United states (*Strategy for American Innovation, 2015*), India (*Make in India, 2014*), Japan (*5th S&T Basic Plan, 2016*), United Kingdom (*UK Productivity Plan, 2015*), etc (OECD Publishing, 2016). The Brazilian government, for its part, launched the “National Strategy for Science, Technology and Innovation 2016-

smart factories, through decentralization and digitization of productive processes, with which cyber physical systems – characterized by the close union and coordination between physical and computational resources – perform tasks and exchange information autonomously (THE FEDERAL GOVERNMENT OF GERMANY, 2011; KAGERMANN, WAHLSTER & HELBIG, 2013).

From this spectrum emerges the 4IR, which in the words of Schwab (2016a, p. 14-21), is characterized “by a fusion of technologies that is blurring the lines between the physical, digital, and biological spheres”. According to him, highlights of this reality are the technological advances in areas such as robotics, nanotechnology, crypto-currency (digital currency), artificial intelligence, big data, cloud computing, internet of things and 3D printing. In this sense, the 4IR is different from previous industrial paradigms, as observed in table 1.

Table 1 – Comparison among industrial paradigms

| Industrial paradigm | Period | Technological change | Productive structure |
|----------------------------|---|--|---|
| 1IR | mid-18 th century | mechanical production (via water and coal) | mechanical loom, steam engine |
| 2IR | between the end of the 19 th century and the beginning of the 20 th century | electricity, petroleum | assembly line |
| 3IR | early 1970s | automation | electronics, information and communication technologies |
| 4IR | present | digitalization | cyber physics |

Source: adapted from GTAI (2014) and Schwab (2016a).

Although there is no consensus on whether these advances can be considered a 4IR or an acceleration of 3IR, certain technological changes will generate significant impacts on the economic and social order as a whole, presenting humanity with one of the major challenges of XXI century. On this question, Schwab (2016a, p. 1) states that in fact this is a revolution that “entails nothing less than a transformation of humankind”. He also asserts:

we stand on the brink of a technological revolution that will fundamentally alter the way we live, work, and relate to one another. In its scale, scope, and complexity, the transformation will be unlike anything humankind has experienced before. We do not yet know just how it will unfold, but one thing is clear: the response to it must be integrated and comprehensive, involving all stakeholders of the global polity, from the public and private sectors to academia and civil society (non-paged).

2019” (Estratégia Nacional de Ciência, Tecnologia e Inovação 2016-2019, Encti, 2016), which will be discussed in section 5.

Rifkin (2015, p. 11) points out that this process will lead to the replacement of capitalism with a new socioeconomic model, “better suited to organize a society in which more and more goods and services are nearly free”. He predicts that in the not too distant future the set of rapid technological transformations under way will greatly reduce the marginal cost of production, which will trigger a systemic impact on the economy and society as we know it. He also argues that the current capitalist economy is progressively tending to give way to the economy of sharing and common collaborative goods, opening space for a more cooperative society.

The effects of 4IR on all socioeconomic agents present enormous possibilities for improving living conditions in general, and also have unfortunate potential risks. As written by Davis (2016, non-paged), “every period of upheaval has winners and losers. And the technologies and systems involved in this latest revolution mean that individuals and groups could win – or lose – a lot”. He affirms that the fact of this revolution being in its beginning makes its impact imprecise, but points out three great aspects to be addressed: security, identity and inequality.

As for security, the dangers are of fragmentation, segregation and social unrest, which can lead from violent extremism to the transfer of power to spurious non-state actors (see *Global Risk Report 2016 – WEF*, 2016b). Regarding identity, the paradox is that while the expansion of connectivity makes it possible to access different worldviews and increase the interaction between people and groups, it can raise the level of social polarization and tension. On the other hand, inequality, which has grown since the last quarter of the twentieth century – as Piketty (2013) has shown – can be considerably increased among those who will or will not be able to buy, access and enjoy technological innovations (DAVIS, 2016).

The challenge of all nations to form an institutional arrangement that does not break with this dynamic is fundamental to mitigate the risks of global geopolitical instability. The greatest risk in a context of very low marginal cost production – labour saver – is the rapid transfer of world manufacturers to the advanced economies, since wages may no longer be a factor of competitiveness between companies.

This will have significant impacts on the global economy and the organization of the world of work. It will impose on emerging countries – the case of Brazil – to rethink their strategies and development models. The greatest socio-economic threat that 4IR could cause is a dynamic of plays that gives away everything to the winning countries and among them, thus generating an overall insufficient demand for work or labour skills.

4. Labour market 4.0: the juxtaposition of structural changes

According to *The Future of Jobs Report* (WEF, 2016a), the most visible disruption caused by structural change under way will fall on the world of work. As we move forward, production will tend to increasingly incorporate cyber physics, whereby the comparative advantages of the supply of human labour – at least the conventional ones – will gradually decline. Many existing labour activities today will lose relevance and/or be extinguished. The same report indicates that between 2015 and 2020, 7.1 million jobs will be extinguished (especially those related to administrative routines, and also to production), while approximately 2 million new jobs will be created (mainly in areas related to mathematics, architecture, engineering and computing); the net balance will be the elimination of more than five million jobs. The report also estimates that 65% of children currently entering primary school will work in jobs that do not yet exist⁵. It concludes that of the advanced and developing countries/regions, fifteen of them will be hardest hit by 4IR, among which Brazil ranks fifth⁶.

At the 104th International Conference of ILO (2015, p. 2), which was devoted to discussing the future of work, it was stated that 4IR could deepen a paradoxical situation in which:

extraordinary advances in the productive capacity of the global economy now provide the material means to eliminate poverty and meet human needs as never before, but are singularly failing to do so. At the same time, the workings of that economy are generating mass unemployment and underemployment and large-scale exclusion, as well as great prosperity and social advances, which are present in tense coexistence within and between our societies.

This structural change in the productive paradigm occurs simultaneously with the ups and downs of the economic and financial crisis that broke out in 2008, which has since unemployed about two hundred million citizens. Considering that about 40 million people are entering the labour market annually, it is estimated that by 2030 the world economy will need to create about six hundred million new jobs – mostly in developing economies – if it is to equalize this difficulty in an inclusive way. It is also necessary to consider as an aggravating fact that half of the world's population is active in the informal

⁵ Frey & Osborne (2013) developed an econometric study pointing out that 47% of the existing professions in 2010 in the United States labour market were at risk, which meant that their functions could be computerized in the next ten or twenty years.

⁶ The other fourteen countries/regions are in alphabetical order: South Africa, Germany, Association of Southeast Asian Nations (ASEAN), Australia, China, Gulf Cooperation Council (GCC), United States, France, India, Italy, Japan, Mexico, Turkey and the United Kingdom (WEF, 2016a).

economy – a proportion that has increased even in advanced countries – and that the biggest barriers to decent work are imposed on the poorest citizens, young people, women and the elderly.

There are several reasons why unemployment cannot simply be eradicated fully. It takes time for people to move from one job to another: this is said to cause “frictional” unemployment. If people cannot find jobs because they have outdated skills they become “structurally” unemployed. No democratic society could tolerate endlessly rising unemployment.

Therefore, the immediate questions to be asked when discussing the future of the world of work are where the jobs will come from and how they will be. These questions are directly related to 4IR, since their answers lead to the conclusion that the institutional and political instruments currently at the disposal of national and international policymakers are not enough to create the necessary jobs with satisfactory quality and quantity.

With regard to the Brazilian labour market, the promotion by the OIT^{7, 8} (2016a, 2016b) together with its national government, employers and workers of the so-called “National Dialogues on the Future of Work” (*Diálogos Nacionais Sobre o Futuro do Trabalho*) has analysed the impacts of 4IR on the organization of work and production in the country. Corroborating in general with the previous analyses, these meetings added the concern that especially in Brazil the projections for the future put in jeopardy the centrality of the work as the motor of development and also that there is the fear that there is a technological determinism in a moment in which a large part of Brazilian society still does not have access to the most advanced technologies.

Equally relevant is the fear that the global production chain will damage the specific knowledge, the identity of the workers and the bonds of solidarity within that class. In addition, the risks of 4IR have been raised in reducing the capacity to stimulate development models combined with social equity⁹, which may limit the construction of a development model with national sovereignty that takes into account the inclusion of

⁷ The acronym OIT in Portuguese has the same meaning as the ILO in English, with only a distinction between languages. Thus, the original font format was maintained in the references.

⁸ Brazil is one of the founding members of the organization (established in 1919), which implies that the country remains in line with the general guidelines and ratifies a large number of conventions and recommendations of this international organization. According to material provided by the OIT (2017a), Brazil has ratified 78 of the 189 conventions proposed by the institution.

⁹ The issue of equity, which encompasses the improvement of working and living conditions, is at the heart of the debate on ECLAC’s sustainable socio-economic development, progressively integrating its Latin American integration agenda, including 4IR. See ECLAC (2015, 2016).

citizens and decent work. All of these topics are associated with the deepening of Brazil's insertion in interdependent global capitalism, especially with regard to global value chains and the context of increasing financialization of the economy. Its consequences for the labour market are not clear, especially for the most vulnerable Brazilian workers (OIT, 2016a).

A discussion in the meetings promoted by the ILO focused on the case of Brazil suggested that, in addition to being attentive to the rapid technological changes under way, it is also necessary to consider it in an integrated way other aspects of the utmost importance for the labour market. In this vein:

current transformations are not only due to advances in technology, but also to society's values and expectations, as adequate income, [...] these expectations are sharpened by the fact that the wealth that exists today surpasses previous levels, but with great inequality, instability and precariousness of social access (OIT, 2016b, p. 11).

Other concerns that permeated the National Dialogues on the Future of Labour – directly linked to the advancement of 4IR – concern, *inter alia*, issues related to the informal economy, income, labour productivity, investment in research and development (R&D) and competitiveness. The next section will focus on the related analysis of these specific aspects and their relations with 4IR and the Brazilian labour market post-2008, also highlighting their trends.

5. Brazilian labour market in the context of 4IR: challenges and possibilities

In order to face the theory presented in the second, third and fourth section of the article with some of the main indicators of the Brazilian labour market, this explanation is initiated by the most pressing issue: unemployment. While in a large part of the world the international economic and financial crisis of 2008 had a serious impact on the labour market, the trajectory of the gradual decline of unemployment in Brazil remained until 2014. The consolidated data of the “Monthly Employment Survey” (*Pesquisa Mensal de Emprego*, IBGE/PME, 2016) showed that in 2008 and 2014, unemployment rates – based on the months of December – were 6.8% and 4.3%, respectively. This was due, in

particular, to countercyclical policies adopted by the federal government¹⁰, which avoided a more severe impact on the Brazilian labour market.

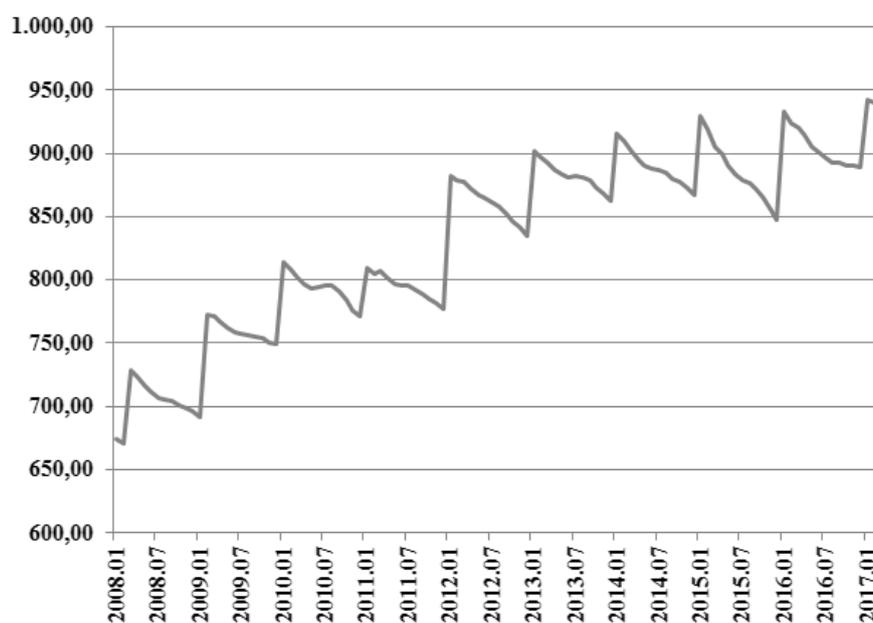
After that, this process receded. The unemployment rate in 2015 rose to 6.9% and in 2016 to 11.9%. The OIT (2017b) observes that at the end of the third trimester of 2017, 13.1% of Brazil's economically active population was unemployed, one of the highest among the G20 economies. Brazil will account for 35% of the new unemployed worldwide this year. The report shows a possibility of slight improvement in the occupancy rate in the Brazilian labour market at the end of 2017, which provides a glimpse into positive evolution for the year 2018, being very dependent on a more stable macroeconomic environment (in a year of general elections) and with a consistent rate of Gross Domestic Product (GDP). Nevertheless, it is emphasized that about half of the national workforce carries out economic activities in precarious and/or informal conditions (see Vargas, 2017).

Regarding the issue of income, the policy of valuing the minimum wage established in 2007 under a specific rule of adjustment¹¹ favored the public regulation of remuneration, once sustained in time – and combined with other mechanisms – it has supported the growth of wages of the categories of less organized workers, while favoring the negotiation of the other categories. The minimum wage increased by almost 30% in real terms (excluding inflation) between 2008 and 2016, implying a significant increase in the salary and the consumption of wage goods. There was considerable improvement in the (functional) distribution of income in this period, mainly due to the dynamism of the Brazilian labour market, but also driven by direct income transfer programs to the most vulnerable population (see Saboia, 2015; Alvarez *et al*, 2017). This improvement was much more significant between 2008 and 2013 (except for 2011), as observed in figure 1.

¹⁰ For a detailed analysis of the policies implemented by the Brazilian government at the time, see OIT (2011).

¹¹ This criterion provides for the adjustment according to the “National Index of Consumer Prices” (*Índice Nacional de Preços ao Consumidor*, INPC) of the previous year plus a real increase corresponding to the variation of the GDP for the previous two years.

**Figure 1 – Minimum real wage (in constant R\$ of January 2017, deflacioated by INPC)
Brazil (2008-2017)**



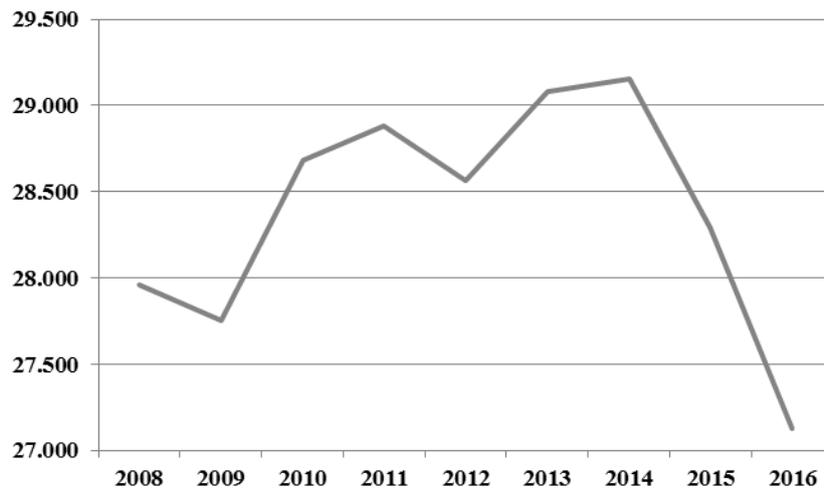
Source: IPEADATA, 2017. Elaborated by the authors.

However, according to official projections, the year of 2017 will be the first since the beginning of the series in which the minimum wage will accumulate a loss of 0.1%. While maintaining the current criterion for the adjustment of the minimum wage, its real value tends to grow very little also in the following years. The question posed by continuing to improve the (functional) distribution of income is that lower wages should grow proportionally higher than the highest levels, in order to reduce the large difference between the lowest and the highest wages in Brazil. But this can become a problem if they grow at a rate well above labour productivity (GDP/employed population), which has been decreasing in the last two years.

Labour productivity is another fundamental character for such an analysis, corresponding in Brazil to 88% of the world average, but only one third of that in advanced economies. In fact, the stagnation of Brazil’s absolute and relative productivity – whatever its measurement categories or the selected productive sector – in relation to the rest of the world is a matter of great concern for the future of the Brazilian labour market (ABDI/IPEA, 2014, 2015).

Data from the Brazilian Central Bank (BRASIL/BCB, 2017) demonstrate that labour productivity showed an average growth rate of 0.5% in the last 20 years, in trend movements significantly correlated to the oscillations in growth. Figure 2 shows that in 2008, labour productivity in Brazil was US\$ 27,962 per worker and that in 2016 it was US\$ 27,129 per worker, a level 0.97% lower. For 2017, the forecast is for Brazil to advance 0.5% in this matter (THE CONFERENCE BOARD, 2017).

Figure 2 – Productivity of work (in constant US\$ of 2014) – Brazil (2008-2016)



Source: The Conference Board, 2017. Elaborated by the authors.

Regarding the R&D, which is central to the 4IR context in terms of generating jobs with quality and income, Brazil presents a performance similar to the topics discussed above, that is, between 2008 and 2014 it advanced in the process of technological catching up, but in 2015 worsened and stagnated at the general level. This is evident, for example, in the so-called Global Innovation Index – the annual ranking of countries based on their capacity and success in the field of innovation. This index, which considers four factors – institutions, political environment, regulatory environment and business environment – in a universe of 127 countries, placed Brazil in the sixty-ninth place in 2016 (same position from 2015). This leaves the country as the worst placed among the so-called BRICS – China (22nd), Russia (45th), South Africa (57th) and India (60th) – and only seventh among Latin American and Caribbean countries, behind of Chile (46th), Costa Rica (53rd), Mexico (58th), Panama (63rd), Colombia (65th) and Uruguay (67th). The report states that the country's strengths in R&D focus on the quality of its scientific publications, high-tech manufacturing and agribusiness (CORNELL UNIVERSITY, INSEAD & WIPO, 2017).

When comparing the total number of patent applications, neither is the outcome encouraging. According to table 2, in the comparison among the BRICS from 2008 to 2015 Brazil occupies the penultimate position, only ahead of South Africa. More than the Brazilian position comparatively, the stagnation of the country stands out in this question between 2012 and 2015, especially in relation to Chinese evolution in the same period.

Table 2 – Total Patent Applications (in units) – BRICS – 2008-2015

| Country | 2008 | 2009 | 2010 | 2011 | 2012 | 2013 | 2014 | 2015 |
|--------------|---------|---------|---------|---------|---------|---------|---------|-----------|
| China | 289.838 | 314.604 | 391.177 | 526.412 | 652.777 | 825.136 | 928.177 | 1.101.864 |
| India | 36.812 | 34.287 | 39.762 | 42.291 | 43.955 | 43.031 | 42.854 | 45.658 |
| Russia | 41.849 | 38.564 | 42.500 | 41.414 | 44.211 | 44.914 | 40.308 | 45.517 |
| Brazil | 23.170 | 22.406 | 24.999 | 28.649 | 30.435 | 30.884 | 30.342 | 30.219 |
| South Africa | 7.941 | 6.735 | 6.393 | 7.245 | 7.444 | 7.295 | 7.552 | 7.497 |

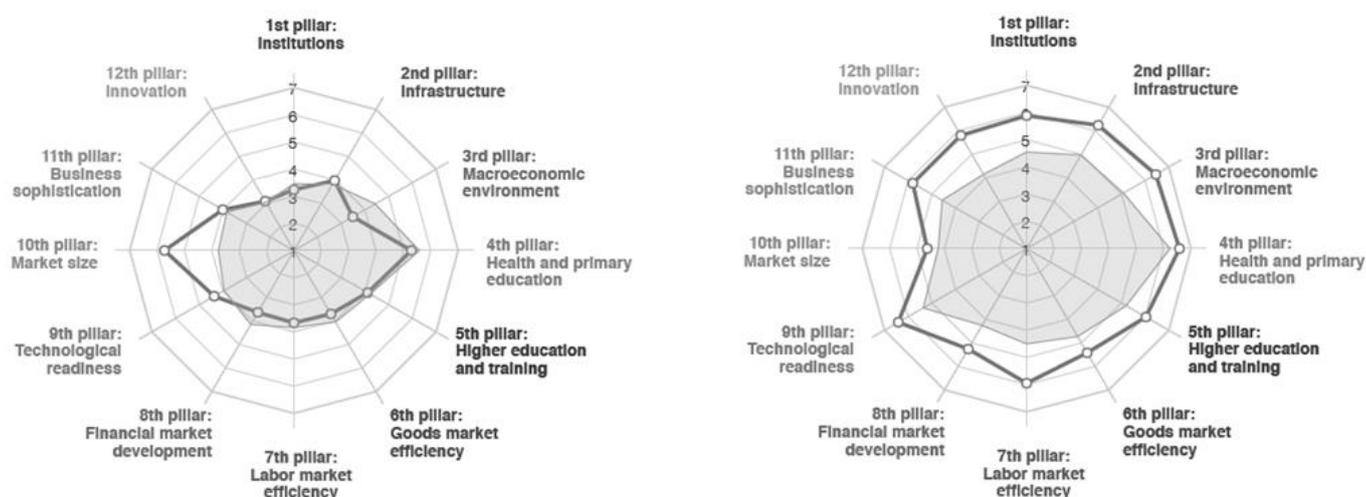
Source: Extracted from *WIPO statistics database*, 2017. Elaborated by the authors.

The objective of the federal government, spelled out in the 2016-2019 National Science, Technology and Innovation Strategy (Encti, 2016) proposal is to invest 2% of the national GDP in R&D by 2019 – which would lead Brazil to a level of investment of the OECD average of 2.4% in 2015 (OECD, 2016). It is noteworthy that by the latest available data, in 2013, R&D investment in the country was only 1.24% (WB, 2017), well below the target to be reached.

The analysed aspects, although they do not cover all the structural and productive complexity of the Brazilian economy, assert that Brazil is in an internationally unfavorable competitive position. Such a claim is endorsed, for example, by *The Global Competitiveness Report 2016-2017* (GCI) (WEF, 2016c), in which the country appears eighty-first in a ranking of 138 countries. Since 2012, Brazil has lost twenty-three positions in this annual survey – with a deteriorating trend in subsequent years – that takes into account twelve pillars of competitiveness¹². In the report, this is justified as a result of the “context of negative terms of trade shocks and political turmoil” (WEF, 2016c, p. 126). It can be seen from figure 3 that the country stands out, due to its population size, in the market size compared to Latin America and the Caribbean and Switzerland (first place overall, which is precisely its weak point), which shows that this factor is not preponderant. The aspect in which Brazil presents the worst performance is that in institutions, mainly due to the increase in insecurity and the perception of worsening quality of the public sector.

¹² The closer to the number seven—from the edge of the dodecagon, therefore—the better positioned one is in some specific pillar. From the weighted calculation of these twelve pillars is determined the ranking of the countries that make up the ICG.

Figure 3 – Global Competitive Index 2016-2017



Brazil versus Latin America and the Caribbean

Switzerland versus Europe and North America

Source: International Monetary Fund; World Economic Outlook Database, 2016. Extracted from WEF, 2016c, p. 126 e 332. Note: in the figure, Brazil and Switzerland are represented by the darker lines, while Latin America/Caribbean and Europe/North America are represented by gray areas.

It is also important to note that in this ranking, Brazil shows itself to be equivalent – in absolute terms – compared to Latin America and the Caribbean, but far from the European and North American countries, showing its great competitive gap in relation to the advanced economies. In addition, in the pillar of innovation – the most correlated to the 4IR of the GCI – Brazil ranks in the hundredth position (the country’s worst note among the twelve pillars of the index in 2016, 3.1), while in the labour market efficiency issue the country ranks 117th.

Based on the argument above, it is evident that the Brazilian labour market presents great challenges and as well as significant possibilities in the context of 4IR. The first challenge is directly related to a structural transformation aimed at technological catching up, and having only conventional economic policies will be insufficient. If this process does occur, it will necessarily be in a more uncertain environment – in a world of globalization and financialization – where information, value-adding, and economic integration are the chief determinants of development. In order to do so, it is urgent that Brazil accelerates the step in the quantitative and qualitative development of knowledge.

The second challenge for the technological catching up is the creation of a virtuous circle between 4IR and the Brazilian labour market, which will require: i) internally: the achievement of a (re)structuring agenda of the Brazilian labour market, especially with regard to the institutional improvements in the labour sector and to the deepening of

tripartite dialogue, with an active social and political character; ii) externally: among the many aspects in which Brazil needs to move forward (foreign trade, internationalization of companies, professional and intellectual exchange, foreign direct investments, *etc.*). It is considered as the most important with its progressive involvement in the various international and regional development agendas – without, however, giving up its autonomy – both in the labour field and in the socioeconomic area (such as ILO and ECLAC, for example).

It is precisely in the spirit of these agendas that the structural changes suggested at the domestic and foreign level should be promoted, taking into account Chang's Institutional Political Economy conceptions and the need to rethink Economic Sciences, in a human-centered way. The *momentum* for economic approach as a whole has increased, especially with respect to the heterodox theory and methodology, to recognize Economic Sciences as interdependent with other fields of human knowledge, based on processes, principles and premises shared by society, tied to its power. Therefore, its aim should be to contribute to the improvement of the general living conditions of human beings.

Given the circumstances, it is imperative to implement national strategies, adapted to the Brazilian reality and specificities in a way that makes it possible to overcome conjunctural short-term and structural long-term problems. More than holding the reins of their destiny, one must be clear about what to do with them. In this sense, it is necessary to take advantage of the concrete possibilities that Brazil has, recognized worldwide in several documents and reports analysed in this research: its great internal market, its potential in relation to the environment, renewable energies, agriculture and other correlated factors. These characteristics need to be better exploited, in the sense of propelling jobs of the future for the Brazilian labour market. This path tends to enable sustainable socioeconomic development with equity and in close association with technology.

6. Concluding remarks

Based on an institutional heterodox approach, and aiming to contribute to the construction of a refreshed approach of economic thinking, the objective of this article was to examine the progress of 4IR in developed and developing economies and their impact on the Brazilian labour market. In general terms, it can be seen that the economy

and global society are at a crossroads. The 4IR has tremendous potential for improving living conditions in general, and it also has lamentable potential risks. It is necessary to reflect how this structural change is to be conducted, especially with regard to the relations between the advanced and the developing economies. However, reflection is not enough. It is essential to implement desirable actions (or goals).

The 4IR will have a strong impact on the organization of the world of work. It will urge emerging countries – the case of Brazil – to rethink their strategies and development models. The greatest socio-economic menace of 4IR in this area is to generate insufficient demand for labour or available labour skills, threatening to throw millions of workers into structural and/or precarious unemployment.

As the 4IR moves forward, production will tend to increasingly incorporate cyber physics, with which the comparative advantages of the supply of human labour – at least its conventional standards – will progressively decline. More seriously, this structural change in the productive paradigm occurs simultaneously with the ups and downs of the economic and financial crisis that broke out in 2008 and still impacts the nation.

Concerning the Brazilian labour market, the main consternations are that the centrality of labour as a motor of development is put at risk and that a technological determinism comes at a time when a large part of Brazilian society still does not have access to technology. Also of relevance is the fear that the global production chain will isolate the specific knowledge, the identity of the workers and the bonds of solidarity within this class. Consequently, the risks of 4IR have been raised in reducing the ability to stimulate development models combined with social equity, which may limit the construction of a development model with national sovereignty, which takes into account the inclusion of citizens and decent work. All of these challenges are associated with the deepening of Brazil's insertion in interdependent global capitalism, especially with regard to global value chains and the context of impacting on the financialization of the economy.

Analytically, it has been shown that Brazil – and its labour market in particular – has been revealing important advances in several significant areas from the point of view of socioeconomic development, such as: employment and income, labour productivity, investment in R&D and competitiveness. However, especially from 2014 onwards the country has stagnated or regressed in these aspects because of both conjunctural and structural issues. Unfortunately, *ceteris paribus*, the trends are not too promising in the years to come.

It is clear that the national labour market presents major challenges, but it also presents potential possibilities in the context of 4IR. In addition to the process of catching up technologically, engendering a virtuous circle between the two will require a combination of institutional improvement and tripartite dialogue at the domestic level – of an active social and political character, human-centered – with the simultaneous immersion of Brazil in the various international and regional development agendas of different institutions on the external plane. This will require the best use of the concrete possibilities that the country has, recognized worldwide, a path that tends to make feasible sustainable socioeconomic development with equity and in close association of technology with its labour market. To this end, policymakers need to place more attention on such issues.

Last but not least, it is recognized that for a structural change in the Brazilian labour market in this direction to take place, it is necessary to architect more synergy with the advanced economies, and for that to happen, not only is a national disposition in promoting the necessary adjustments and transformations needed, given the current conditions quite asymmetric in terms of international competitiveness. In order to contemplate this goal, it will be necessary to progressively improve the regulation of economy and governance (of work) and also greater social and political power of Brazil. International institutions have a key role to play in this regard.

History has shown that technology, in spite of the inevitable setbacks it has caused, has created more jobs than it has destroyed and has also raised living standards overall, in the long run. In the future we hope to reach the same encouraging conclusion about the consequences of this debate, which is emerging with all the needed strength in the present time. In this challenging beginning of the twenty-first century, globalization continues to dismantle socio-economic and technological frontiers. Society can only improve through thought and conscious actions that can positively modify existing adversities, by better taking advantage of new technologies and embracing sustainable development. It is of fundamental and of immediate importance and an extended vision of this reality, through a deep examination of the changes and transformations, can occur on our planet.

The theory elaborated by Chang is promising in this context. His criticisms of the neoliberal conceptions of institutions highlight the urgency of rescuing the historical perspective of development, respecting the particularities of each society. The possibility of socioeconomic development of any nation is the result of the engenderment of

numerous factors in synergy over time, constructed by a certain society under different circumstances that change in time. It should be noted that at the center of events and their unfolding are citizens.

The 4IR will play a decisive role in our way of life and production. The need to formulate and implement appropriate policies gives decision makers a unique opportunity to offer society new and promising possibilities. At this moment, when the threat of a new era of labour precarization in the world in general and in Brazil in particular is imminent, attention must be paid to the Institutionalist Political Economy approach, linking it to the construction of a new human-centered paradigm in economic thinking as an alternative to overcome this historical challenge!

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Chapter 2

Effects of labour legislation on the Brazilian labour market from 2003 to 2018

ABSTRACT

The beginning of the 21st century is characterized by rapid and profound socioeconomic transformations, which are directly reflected in the configuration of the relations between capital and labour. At this time when elements of a conjunctural and structural nature hinder Brazil from developing in a sustained way, changes in the laws that govern its world of work have been implemented under the justification of contributing to boost the economy and balance the public accounts. In this perspective, this article examines the effects of labour legislation on the labour market from 2003 to 2018. First, the period between 2003 and 2014 is analyzed, which presented favorable results both economically and from the point of view of employment and income generation, although under ambiguous legal modifications. Then, the 2015-2018 interregnum is evaluated, emphasizing that especially the 2017 labour reform has reconfigured the national labour market without having the socioeconomic consequences advocated by the proponents of such reforms. We conclude that the justification of boost the economy and balance for the public accounts is relevant, but what really generates jobs and income are the economic recovery, which did not result from the flexibilizing and restrictive changes in labour legislation. The conflict is in the choice of who should contribute more proportionally to the resolution of this equation. This implies choosing between the (uncertain) growth path with income concentration and deepening inequalities or that of socioeconomic development with income distribution and citizen inclusion. In view of the potential effect of labour legislation on the labour market, it is necessary to emulate a legal regulation that is prone to resolve disagreements and guide conducts that improves the correlations of forces between workers and employers.

Keywords: Brazil. Growth. Development. Labour Legislation. Labour Market.

1. Introduction

Marked by heterogeneities of all sorts, labour relations in Brazil reflect the socio-economic formation of the country. Its labour market officially arose with the sanction of the *Áurea* Act (1888), which was the historical landmark of the end of slavery. Since then, there have been numerous reconfigurations of labour, with less emphasis on development and more on economic growth, with which inequality and social exclusion have raged. In this sense, the legal norm is an important variable – above all determining the level of social protection and the (functional) distribution of income generated – by helping to guide the direction of the relationship between workers and employers.

Two aspects allow to historically illustrating how labour legislation influenced the formation of the labour market in Brazil¹. The first was the replacement of the slave by

¹ For a historical review of the Brazilian labour market formation, see Barbosa (2008) and Vargas (2017b).

the European labour force, a process started even before the abolition of slavery. This preference for European workers (supported by specific policies and laws) to the detriment of the nationals was motivated, among other reasons, by the claim that the ex-captives would not adapt to the routine of work. The developments of this practice persist in current national life – its greatest example is the structurally widespread informality.

The second aspect was the Consolidation of Labour Laws (*CLT*, acronym in Portuguese) in 1943, in the first government of Getulio Dornelles Vargas (1930-1945), unifying all existing labour legislation to time. The *CLT* was born as a constitutional necessity to regulate labour relations after the creation of Labour Justice in 1939. It played an important role in promoting a certain social cohesion and endowing the Brazilian economy, already in the process of rapid industrialization² and growing internal market. This initiative also reverberates contemporaneously in the working and living conditions of Brazilian citizens, in the direction of affirming labour rights.

The beginning of the 21st century is characterized by rapid socioeconomic transformations, reflected in the configuration of the bonds between capital and labour. At this time when important elements of a conjunctural and structural nature hinder Brazil from developing in a sustained way, changes in the laws that govern its world of work have been implemented under the justification of contributing to boost the economy and balance the public accounts. In this sense, the objective of the article is to examine – from the point of view of the Social Economy and Labour – the effects of labour legislation on the labour market from 2003 to 2018. In order to do so, it is embraced a heterodox economic approach.

Assuming that the legal adjustments are important for the configuration of the labour market, it is sought to evaluate the aspects considered relevant to the theme that occurred first in the period between 2003 and 2014 and then between 2015 and 2018. Theoretical considerations throughout the text are articulated with secondary data from official research institutions, taken by indicators such as the degree of informality (DI), unemployment rate, employment balance, labour claims, income, Gross Domestic Product (GDP) and others. Thus, it is intended to contribute to this debate filling this theoretical gap.

² It is emphasized that industrialization (that is, the development of the capitalist system) can occur without having labour laws, as shown by international historical experiences. In Brazil, its introduction can be interpreted – as in Oliveira (2002) – as part of the project of the forces that were conducting the country in the period under the influence of positivism and organic Catholicism.

2. Ambiguities in labour legislation and advances in the labour market (2003/2014)

From 2003 to the middle of 2014 there have been important advances in the labour market, movements that can be observed through innumerable indicators that lend themselves to the evaluation of the recent trajectory in this field³. In the period, there was a greater role of the State in the conduction of the economy, through public policies, credit enhancements, direct income transfer programs, *etc.* A favorable macroeconomic environment prevailed in this interregnum, in particular as regards the external context, which, even in the face of the 2008 financial crisis, only strongly affected the Brazilian economy from mid-2014.

In this scenario, was central the contribution of the internal market to the improvement of the living conditions of Brazilian society as a whole, with the generation of jobs that helped to mitigate inequalities in an inclusive way. The formal labour market generated more than 20 million net jobs in the period and, despite continuing to present a high degree of informality, also advanced considerably in this last spectrum.

According to Baltar, Krein & Leone (2009), the reduction in informality rates is directly linked to the economic dynamics, in addition to the performance of labour institutions. For Saboia (2014), the fall in informality can be explained by several factors, such as the awareness of labour rights (“legal literacy”) and the greater efficiency of supervision in the area.

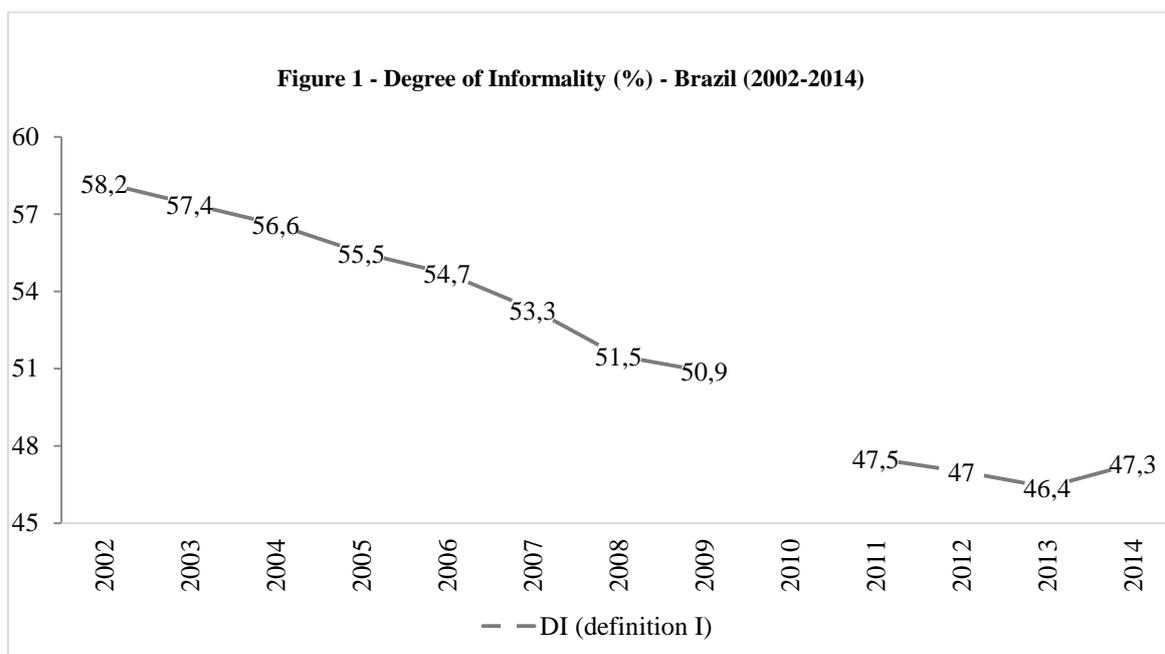
Filgueiras (2012, p. 92) argues that the Brazilian State contributes greatly to the maintenance of high informality. He questions the *modus operandi* of labour law enforcement institutions which, in his view, often operate as attenuators that adapt to the actions undertaken by capital. He recognizes, however, that Labour Law transcends this role, being “an active and imposing agent of interference in the movement of the relationship, engendering reorganizations in the pattern of hiring, organization and use of the labour force”.

In turn, Cardoso Junior (2013) addresses this theme by relating the spheres of the world of work and social (de)protection in Brazil, suggesting the universalization of social policies as the best strategy to face the socioeconomic challenges of the country in general and of informality of work in particular. Therefore, it is observed that labour market regulation policies and active enforcement agencies help, playing an important

³ For a more robust descriptive statistical overview of this period, see the dossier on unemployment published in n. 85 of *Estudos Avançados* Journal (2015).

role combined to economic growth and the way the economy is dynamized, in the greater effectiveness of the laws that govern the labour market.

The DI⁴ in 2002 was 58,2% of the Brazilian working force. As a result, labour informality fell year by year and reached 46,4% of total employment in 2013 (figure 1). The decline in informality occurred for a number of reasons, especially the decline in the share of the underground economy in GDP from 21% in 2003 to less than 16% in 2013 (IBRE/FGV-ETCO, 2013).



Source: IBGE/PNAD (2019a). Own elaboration. Note: the PNAD was not carried out in 2010, since the data are not calculated for the years of preparation of the Demographic Census, when the series are interrupted by IBGE.

From the greater optimism with the evolution of the Brazilian economy and the consequent intensification of the demand for formal labour, derived a significant decrease in unemployment rates, from 10,5% in 2003 to 6,7% in 2012 (figure 2). Emphasis to the fact that, decomposed, this fall was not homogeneous. For example, there was a slight increase in the unemployment rate in rural areas, especially because of incentives to mechanization in the countryside. Even so, this time span was the most positive in the country's history in terms of job creation in the metropolitan areas (VARGAS, 2017a).

⁴ The definition of the degree of informality I, which is one of the three provided by IPEADATA based on IBGE/PNAD microdata, corresponds to the result of the following division: (unregistered workers + self-employed) / (workers protected + unregistered workers + self-employed). The definition adopted does not imply prejudice to the elaborated analysis.



Source: IBGE/PNAD (2019b). Own elaboration.

Although the indicators cited above show good results for the labour market, Amitrano & Squeff (2014) argue that the considerable growth of formal jobs in the 2000s was linked to the creation of vacancies with low productivity and remuneration, mainly in the service sector⁵. Therefore, it is necessary to consider the successive increase in the proportional share of this sector as a component of GDP in relation to the fall of the industrial sector – the latter, in general, formally exercised.

Duarte (2006) points out three legal aspects that favored working conditions in the 2000s: i) greater effectiveness in its supervision (an aspect also relevant to the fall in informality); ii) improvements in working conditions – via changes in labour legislation seeking to promote a better level of social protection to activities such as outsourced and domestic workers, for example; iii) the reduction of child labour.

Ramos (2007), who says that the policies implemented for the area directly influenced the workers decisions, also addressed the relationship between formal and informal labour market. According to the author, this means that, with effective measures and/or specific changes in legislation, both the transfer of workers from the informal to the formal labour market can occur, as well as the opposite. For example, a more (less) protective legal context for workers increases (decreases) the power of individual and collective bargaining, in thesis stimulating (discouraging) the formalization of work.

⁵ In this aspect, there is no consensus in the literature. For example, Leone & Baltar (2016) argue that while in absolute terms the low-paid jobs created were the majority, proportionately the generation of jobs with higher pay and qualification were higher.

In addition, it must be taken into account that economic growth itself was important for the improvement of labour market indicators (between 2003 and 2008 the average rate of Brazilian GDP was 3.5% – considering -0.13% in 2009), coupled with the expansion of the domestic consumer market, the slowdown in population growth since the early 2000s and the relative decrease in the labour force participation rate (economically active population/working age population) (see MATTOS & LIMA, 2015). Therefore, the advances achieved in the period are due to complementary reasons, particularly the favorable economic dynamics and focused public policies.

Contextualizing the above, it follows the analysis of some relevant changes in the labour legislation from 2003 to 2014, aiming to identify the effects of these on the Brazilian labour market. During this period, there were measures that pointed to the deepening of flexibilization and others that tended to reinforce the perspective of resumption of labour regulation. Post 2002 flexibilization was not conceived generically, but rather for specific audiences (especially young people, legal entities, micro and small companies) and implemented through punctual changes in labour relations.

This reality has largely resulted from the logic of a greater international insertion of the country into globalization and financialization, hindering public regulation and favoring autonomous solutions, increasing the discretionary power of employers to determine the conditions of use and remuneration of work. Flexibilization has advanced, as can be seen schematically summarized in table 1.

Table 1 – Main flexibilizing measures of labour relations in Brazil (2003-2014)

| | |
|--|---|
| <p>Consigned credit (Law n.10.820/2003)</p> | <p>Authorizes the granting of loans by banks, to employees and retirees, through the salary discount to be processed by the employer or Social Security. The innovation challenges the principle of wage intangibility (see rule in article 7, § VI e § X, of Federal Constitution – FC/88).</p> |
| <p>First job (Laws n. 10.748/2003; 10.940/2004), regulated by Decree n. 5.199/2004</p> | <p>Tax incentives for companies that hire young people, allowing them to be hired for a fixed term, provided that for a minimum period of 12 months. It advises companies to avoid replacing workers and limit to 20% of their workforce those hired by the program.</p> |
| <p>Pension reform Constitutional amendment (CA) n. 41/2003</p> | <p>Extinguishes the public pension scheme for public servants admitted after the publication of the CA, with the aim of completeness and parity, setting the limit to be perceived as retirement benefits, according to the ceiling of the general regime of the <i>INSS</i>, and determination that the pension funds should be established. It also taxed the inactive servers, increased the age limit and set harder conditions for the server to achieve retirement.</p> |

| | |
|--|---|
| New bankruptcy law and judicial recovery (Law n. 11.101/2005) | The <i>CLT</i> establishes that, in bankruptcy, the total salaries and indemnities due to the workers would be privileged credits, but the new law reduces the labour credit preference limit to 150 minimum wages. Contrary to what happened previously, in the new law, in the case of judicial recovery of the firm, employees no longer receive their labour claims for a year and begin to discuss their form of payment with other creditors, in General Meeting; and, in the sale of the assets of the bankrupt company, there is no more labour succession, so that the bidder is not obliged to remain with the employees or to pay the labour debt. |
| New regulation for work in intellectual activities (Law n. 11.196/2005) | It establishes that, even if it presents all the elements of an employee, the individual who provides intellectual services can be materially conceived as a legal entity. It moves from the field of labour rules to that of civil and commercial ones. For both the borrowing enterprise and the service provider, there is a reduction in taxes, but the latter no longer counts on labour rights. |
| Super Simple Complementary Law (CL) n. 123/2006 | Micro and small enterprises are still exempt from: establishing a framework in their premises, note the holidays of the employees in the book or record sheet, to enroll apprentices in the courses of National Services of Learning, possession of the Labour Inspection Book and communicate to the supervisory body regarding the concession of collective vacations. Before the Labour Court, the employer may be replaced by a legal representative. |
| Domestic servants (Law n. 11.324/2006) | It guarantees temporary stability to the pregnant employee, paid annual leave of 30 days and the prohibition of discounts for supplying food, clothing or hygiene to domestic employees. However, the president vetoed the mandatory <i>FGTS</i> , the 40% termination fine, family salary and unemployment insurance, arguing that it could contribute to rising unemployment. As a result, the president's veto prevented full equivalence with the rights of workers supported by the <i>CLT</i> . |
| Work in road freight transport activities (Law n. 11.442/2007) | It considers that there is no employment relationship, but only commercial relations between the driver and the company of the sector, because the worker is required to own the vehicle. This category has lost its labour rights. |
| Intra-bound interval (<i>MTE</i> Ordinance n. 42/2007) | The Ministry of Labour and Employment (<i>MTE</i>) authorizes the reduction of intra-bound interval through collective bargaining, giving prevalence to the negotiated over the legislated. |
| Work of commerce on Sundays (Law n. 11.603/2007) | It ratifies the work on Sundays for the merchants. But it has put two limits: the permission of work in holidays and Sundays in the activities of the commerce passes through collective agreement, provided that the municipal legislation is observed; and the guarantee of slack of 2 Sundays in the month. |
| Rural worker contract for short term (Law n. 11.718/2008) | Authorizes the hiring of rural employees without registration in the Workbook, for short services (up to 2 months). Labour rights are paid directly to the employee, by adding to the agreed remuneration. |
| Cooperatives of work (Law n. 12.690/2012) | Establishes the National Program for the Promotion of Labour Cooperatives (<i>PRONACOOP</i>), legitimizing them. Revokes the sole paragraph of art. 442 of the <i>CLT</i> . |
| <i>PLR</i> . Provisional Measure n. 597, transformed into Law n. 12.832/2013 | Exempt from personal income tax the receipt of up to R\$ 6.000 in the form of participation in profits and results (<i>PLR</i>). The potential is flexible because it reduces the contribution to the constitution of a public fund; there is fiscal renunciation and stimulating the fight for the expansion not of the direct salary, but of the participation in the profits, of indemnity nature. |
| Simplified taxation system (LC n. 147/2014) | Its membership criterion only the size and enterprise billing instead of the activity performed. Thus, several liberal professionals are included in Super Simple, reducing the funding sources of the public fund. |

Source: adapted and modified from Krein & Biavaschi (2015) and Vargas (2017a).

Among the flexibilizing measures listed above, the pension reform is highlighted. Initiated and approved in 2003 under the guidance of the Federal Government, it relied

on the commitment and use of available political and institutional resources. There was a deepening of the position adopted by the previous government in this regard. This loss of rights greatly influenced the interpretation of the economic agents regarding the government's performance in the labour issue, generating discomfort within the political party of the government itself.

Another modification of the labour legislation occurred in this same year, the approval of Law n. 10.748, launching the National Program to Encourage First Employment (*PNPE*), with the main objective of generating opportunities for youngsters from 16 to 24 years old, from low-income families with low schooling levels. The proposal produced modest practical results, generating only around 10.200 jobs.

Also important were the stimuli focused on formalization in the service sector, with the creation of Super Simple, through Complementary Law n. 123/2006, in which small and micro enterprises were encouraged, for example, to reduce the tax burden, to facilitate the tax deed and the social security contribution. This sector had a significant expansion in the period, from 65.83% in 2003 to 71.18% of GDP in 2014. It is worth noting how proportionally this expansion has been due to changes in labour legislation and how much resulted from the economic growth verified in the period – discussion that goes beyond the scope of this investigation.

Regarding the resumption of public regulation of the labour market (Table 2), mention should be made of the valuation of the minimum wage, the expansion of unemployment insurance at the height of the crisis of 2008 and 2009, the implementation of the Individual Microentrepreneur (*MEI*) program and of the National Program of Access to Technical Education and Employment (*Pronatec*).

Table 2 – Measures contrary to the trend of flexibilization of labour relations in Brazil (2003-2014)

| | |
|---|---|
| <p>a) Message n. 132/2003 to the Senate, requesting withdrawal of the urgency of PLC 134/01. b) Message n. 389/2004 to the Clearinghouse, to withdraw the project on outsourcing.</p> | <p>a) Message calling for withdrawal of the urgency of the process in the Senate of the Bill project approved by the Chamber, which provided for the prevalence of the negotiated over the legislated. b) Message calling for the withdrawal of the project that regulated outsourcing, expanding its possibilities of use.</p> |
| <p>Adoption of a Minimum Wage Policy (2005)</p> | <p>It foresees a readjustment according to the National Consumer Price Index (<i>INPC</i>) of the previous year plus a real increase corresponding to the variation of the GDP of two previous years. The policy has been applied since then, although it was approved by the National Congress only in 2007. Repeated through an interim measure, the formalization into Law only took place in the Dilma Rousseff government.</p> |
| <p>Internship (Law n. 11.788/2008)</p> | <p>Regulation, creating some rules for its adoption, such as the 6-hour day limit and the holiday pay.</p> |

| | |
|--|---|
| Veto to the Amendment 3 of Super Revenue | This EC proposed to prohibit the tax auditor from fining companies that had a disguised employment relationship ⁶ . It stimulated the spread of hiring as a Legal Entity (<i>PJ</i>), which circumvented labour legislation. |
| Unemployment insurance | Expansion installments for 7 months to the sectors most affected by the economic and financial crisis of 2008/2009. |
| Cancellation of the subsidies for contracting for a fixed term (2003) | Elimination of incentives for contracting for a fixed term by canceling subsidies on social contributions. It was a provisional measure created to stimulate the adoption of the contracting by determined term (Law n. 9.601/1998). |
| Revocation of Ordinance n. 865/1995 | Revocation of the ordinance of the <i>MTE</i> that prevented the auditors from monitoring the clauses in collective bargaining agreements. |
| Payment of maternity leave | Cancellation of maternity leave changes made in 1999, which established the payment of the maternity salary directly by the <i>INSS</i> and no longer by the employer, which was later reimbursed. |
| Experience period (Law n. 11.644/2008) | Prohibits the required period of experience from being longer than 6 months. |
| Individual Microentrepreneur (LC n. 128/2008) | It reduces the value of the social security contribution of the autonomous or individual microentrepreneur. |
| Disabled (Law n. 12.470/2011) | People with disabilities receiving the Continuous Benefit Provision (<i>BPC</i>) will no longer lose the benefit when they enter the job market; it happens to be just suspended. |
| Proportional prior notice (Law n. 12.506/2011) | It establishes that the advance notice is proportional to the working time. For each year work is added 3 days notice. It presents controversy, especially for those fired before a year of service. |
| Home-based work (Law n. 12.551/2011) | It shall include work performed at the employer's place of business, work performed at the employee's home and work carried out at a distance, provided that the employment relationship assumptions are characterized. |
| <i>Pronatec</i> (Law n. 12.513/2011) | Grants scholarships in technical and continuing training courses in private and public technical education institutions. |
| Negative certificate of labour debts (Law n. 12.440/2011) | Document that proves the inexistence of debts with the Labour Court, allowing, therefore, access by companies to loans, tax incentive programs and participation in public bidding. |
| Social Security. Provisional measure n. 529, transformed into Law n. 12.470, de 2011 | It reduces from 11% to 5% the rate of contribution to <i>MEI</i> that proves annual income of up to R\$ 36.000. It also makes it possible for women dedicated exclusively to domestic work in their residence with a family income of no more than 2 minimum wages, to contribute to Welfare with a differentiated rate, equivalent to only 5% of the minimum wage. |
| Driver's Journey (Law n. 12619/2012) | Regulates the profession. Among the main changes is the control of the drivers' journey, which could be included in the exception of article 62 of the <i>CLT</i> , which provides that workers who carry out external activities are excluded from the chapter of protection of the journey. Law requires the inspection that can be done by means of annotation in logbook, ballot or worksheet, or by electronic means, such as GPS. |
| Stability for pregnant women (Law n. 12.812/2013) | It adds to <i>CLT</i> Article 391-A to ensure provisional stability to the pregnant woman, including to employees who have confirmed pregnancy in the course of the prior notice, whether it is worked or replaced by payment in cash. |
| Penalty for non-domestic registration (Law n. 12.964/2014) | It provides for a fine of R\$ 295 for the employer who fails to register the formal contract of the domestic, an obligation that, moreover, was already expressed in Law n. 5.859, dated December 11, 1972. |

⁶ The disguised employment relationship is characterized by salaried work, but without the contractual labour contract. In a classic employment relationship, four interacting aspects are identified: i) the individual himself is the executor of the activity; (ii) it is non-contingent in nature; iii) remuneration corresponding to its execution is received; 4) its realization occurs under the command of others, subject to the rules that determine its accomplishment.

| | |
|---|---|
| Motorcycle at work Law n. 12996/2014, regulated by the Ordinance n. 1565/2014. | Approved payment of hazard pay for couriers and other professionals who use the motorcycle at work. At <i>CLT</i> , the activity of motorcycle workers is considered dangerous. In this way, motoboys are entitled to an additional 30% of the salary. |
| Constitutional Amendment of domestics (EC n. 72/2013) | Changes the sole § of art. 7 of the Federal Constitution establishing equality of labour rights between domestic and other workers. |
| Gives new wording to article. 243 of the FC (EC n. 81/2014) | [New] Art. 243. Sole paragraph: “any property of economic value seized as a result of illicit traffic in narcotics and related drugs and exploitation of slave labour shall be confiscated and revert to special fund with specific destination, in the form of Law.” |

Source: adapted and modified from Krein & Biavaschi (2015) and Vargas (2017a).

Of the measures listed above, the public policy of valorization of the minimum wage was the one with the greatest effect, increasing the purchasing power of the workers. Its real increase between 2003 and 2016 was above 77%, with positive effects mainly on consumption, but also on the economic dynamics as a whole. With more than 48 million Brazilians earning one minimum wage, Saboia and Neto (2016) showed that the amounts paid in the informal sector were not able to keep up with the policy of increasing real wages (even though they continued their high bias), leading to reducing the advantages of participating in this market and thereby encouraging workers to formalize themselves.

The outbreak of the international crisis in 2008 resulted, among other things, in countercyclical policies, in the labour market especially the expansion of unemployment insurance turned to the most affected labour activities. It should be noted that the flexibility of wages and workers accepting payment of up to two minimum wages in order to maintain employment meant that the unemployment rate did not rise significantly during the crisis – the Growth Acceleration Program (*PAC*, 2007), the creation of the *Minha Casa, Minha Vida* Program (2009) and the works for the 2014 World Cup contributed greatly to this crossing. Civil construction went through the crisis of 2008-2009 without serious problems and reached its best performance in 2012, with a 6% share of the labour market. These programs required skilled labour, raising the salaries of the various professionals involved (SABOIA & KUBRUSLY, 2014).

That same year, the *MEI* program was designed with the purpose of encouraging the formalization of work and giving access to the National Registry of Legal Entities (*CNPJ*), as well as a series of labour rights and benefits guaranteed by laws. Therefore, the self-employed professionals and microentrepreneurs could choose to legalize themselves by opening an *MEI*.

With the definition of the electoral scenario in 2010, similar measures in content to that of the previous government in the labour field were highlighted, focusing on public

policies on work and income generation. For example, *Pronatec* (linked to the Ministry of Education) was put into practice in 2011, which registered 6.8 million people for (re) qualification and subsequent re-employment.

Given the above, it is inferred that for the period between 2003 and 2014 there was a strategy aiming a virtuous economic circle, backed by the design of specific public social and labour policies – directed to the most vulnerable portion of Brazilian citizenship. It resulted in advances of the general performance of the national labour market, with a significant improvement of formal vacancies and progressive reduction of the DI, for a number of complementary reasons.

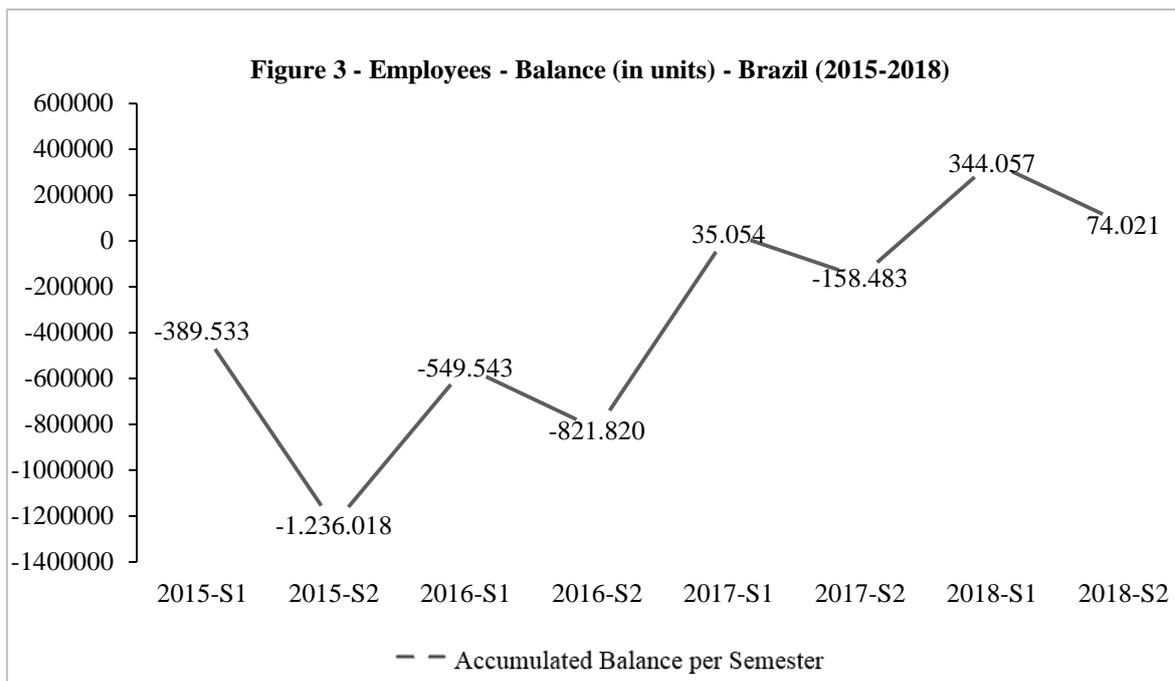
Important to emphasize that the advances achieved were insufficient to overcome the complexity, heterogeneity and fragmentation of the labour market or to substantially alter the occupational structure, which followed – in several spheres – characterized by underemployment and precariousness of work. We must also take into account that the economic dynamics and public policies in this interregnum interacted with a more uncertain world of work and, even so, it favored the generation of jobs and helped to reduce the DI.

In this panorama, the balance of the effects of the evolution of labour legislation in the period was ambiguous, with contradictory signs, with changes both aimed at deepening flexibilization and resumption of labour regulation.

This until the mid-2014, when the Brazilian economic crisis has recrudesced, dragging itself until the present time. The following section examines this process, focusing on how a series of measures to flexibilize and restrict labour legislation have affected the labour market, without presenting the economic results that justified them.

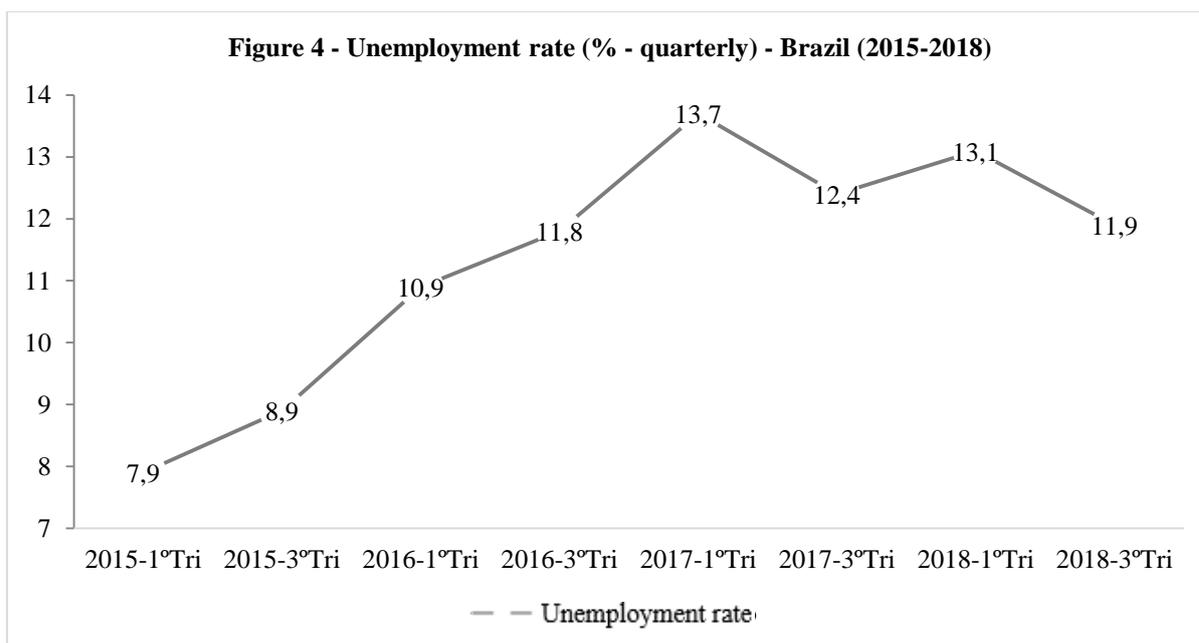
3. Labour flexibilization and setbacks in the labour market (2015/2018)

Differently from that discussed in the analysis of the interregnum 2003/2014, the period between 2015 and 2018 was marked by setbacks in the Brazilian labour market. This was in the wake of an acute economic crisis and weakening of the role of the State, with a sharp contraction of supply and aggregate demand (deepened by the implementation of austere public policies). It resulted in a negative GDP in 2015 and 2016 of 3.77% (the worst result since 1980) and 3.59%, respectively – cumulative GDP per capita shrank by more than 9.5% between 2014 and 2017 (IBGE/SCN, 2019). This framework captiously served to justify significant changes in labour legislation, in the sense of making it more flexible and restricting labour rights. In this context, dismissal have far exceeded the admissions, as observed in figure 3.



Source: MTE/CAGED (2019). Own elaboration. Note: the balance refers to the total admissions and dismissal of employees, under the *CLT* regime.

With the conditions unfavorable to employment, the country reached 38% of its underemployed population in 2015, without significant recovery in the following years. According to the General Register of Employed and Unemployed Workers (MTE/CAGED, 2019), more than 2,7 million formal jobs were closed between the first half of 2015 and the first half of 2018. In the first quarter of 2017 the unemployment rate reached 13.7% and in the third quarter of 2018 closed the series at 11.9%, 5.2% higher than the average rate of the year 2012 (figure 4).



Source: IBGE/PNAD (2019b). Own elaboration.

Initially, economic analysts' predictions for 2015 were relatively optimistic in relation to 2014. However, due to the combination of successive misunderstandings in the conduct of economic policy and growing political and institutional instability, the Brazilian economy plunged into crisis, with pernicious effects on the whole society. From there begins a series of important legislative changes, promising *per se* a reversal of the situation in which the Brazilian economy and labour market were located.

Some labour measures deserve attention. For example, the law n. 13.134/2015, which sanctioned changes in unemployment insurance, in the Social Integration Program (*PIS*) and in salary bonuses, making their regulations more rigid. In the first case, the worker, who previously had to work for at least 6 months to receive the benefit, with the new standard will have to work at least 12 months of the last 18 months in order to fully request its unemployment insurance. In the second, to be entitled to *PIS*, labour activities now must be exercised for 3 consecutive months during the base year. In the third case, the new rule establishes that it is possible to receive at most one minimum wage, calculated by working time.

Also in 2015, the Provisional Measure n. 664/14 approved changes, guaranteed through new status as ordinary law n. 13.135. The new standard regulates aid granted through diseases and pensions in case of death. From that moment on, the new rules came into force to obtain aid, in cases of illness, just after a month of removal from the worker.

Aiming to extend the labour rights of domestic workers, the most significant change in labour legislation occurred in 2015, taking effect with complementary law 150. Its main points were the right to overtime, the night shift, the deposits of the Fund for the Guarantee of Time of Service (*FGTS*) and possible compensation in case of breach of contract unmotivated. As the main objective of this measure was to correct inequalities in access to the formal labour market regulation, there was much debate about the difficulties these workers might have, and the new law would promote unemployment in the area (given the higher costs involved in employment contract).

After three years of its implementation, about 70% of domestic workers are in the informal sector. In addition, with the law in force, the number of legal disputes increased, being an indication of the loss of rights newly acquired by the domestic ones. It is necessary to take into account the coincidence with the beginning of the recession in the country, increasing by 200.000 the number of domestic workers without a formal contract – to 4.400.000 workers (CONTINUOUS IBGE/PNAD, 2017).

The year 2015 already immersed in economic crisis and under the influence of the above-listed changes labour globally showed unemployment rate of 8.9% in the third quarter, with an upward bias for the following periods. This same year, about 1.625.000 jobs were closed, by far the worst result since the beginning of the historical series (RAIS/CAGED/MTE, 2018).

Data from the IBGE/PME (2018) showed that in 2016 24 million people of working age were underemployed⁷ in the labour market. In addition, between 2014 and 2016, double the number of people in search of work for at least one year, but that did not find any. Still, ratifying the inequality and social exclusion proper to the Brazilian socio-economic formation, those most affected by high unemployment rates were young women between 14 and 20 four years old, women and black citizens.

The year 2016 was marked by the debate about the labour reform (and social security reform, which was not approved), sent as Draft Law (*PL*) to the National Congress. In general terms, in the negotiation period, its proponents adopted as an argumentative strategy the defense of the adaptation of the *CLT* to the national challenges, since it no longer corresponded to the complexities of the modern economy and also that it no longer responded satisfactorily to the installed economic crisis (see SILVA, 2018). After all, it was allegedly one of the imperative reforms to equalize public accounts. Their supporters, for example, argued that soon after the reform approval, about 6 million formal jobs would be created.

Draft Law n. 6787/2016 aimed to change several points of the *CLT*, such as: the prevalence of the directly negotiated over the legislated (allowing to determine rules and working conditions other than those provided by law, since they do not violate the Federal Constitution), vacation installment, working hours up to 12 hours a day, possibility of temporary agreements, regulation of outsourcing, intermittent and part-time work, work of pregnant women in an unhealthy environment, payment of labour costs incurred and lost by plaintiff, among others. After all, in November of that year the labour reform was approved, with important effects on the relations between capital and labour.

With 54 altered articles, 9 revoked and 43 other created, the instrumentalization of law n. 13.467/2017 was responsible for the biggest change that has occurred in this regulatory field since the enactment of *CLT*. One of the main changes was the possibility

⁷ The underemployed population comprises unemployed workers, those who work at least 40 hours a week, the discouraged (who gave up looking for work) and those who might be employed, but do not work for various reasons.

of labour agreements directly between the employer and the employee (or unions). This made it possible, for example, for the employer to receive up to 20% of the fine from the *FGTS*, in the event of an agreement between the employee and the employer regarding the termination of the employment contract. In addition, prior to retirement, the worker dismissed for just cause by termination of employment contract had no right to claim, but now, by direct agreement, there is the possibility of receiving some amount from this fund (depending on contract time). In this case it continues without unemployment insurance.

Also highlight the changes that have taken place in the field of holidays and working days. For the first, which before 30 days could only be divided into two parts, with the current law holidays can be split in up to three according to negotiation, provided that one of these periods have at least 15 days. For the second, which was previously characterized by 8 of work a day and 44 hours a week, with the possibility of 2 extra hours, the new law established that the working day could have 12 hours a day, 36 hours of rest, remaining 44 hours a week.

As for the time in the company, *CLT* previously regulated the effective service as the period in which the employee was available to the employer. With the changes established by the reform, activities such as study, rest, interaction with colleagues, personal hygiene, food and uniform change transportation time spent by the worker are no longer considered during the workday.

Regarding rest, in *CLT* pre-reform was set for it at least one hour and after it was regulated that the period will be negotiated with the worker, as long as it has a minimum of 30 minutes. Besides, the employer does not grant the correct period to the employee, he can pay a fine of 50% of the value of the working hour over the time not granted.

With respect to compensation, it settled not minimum payment or wage for production. Moreover, the company and worker can negotiate all forms of payments, not necessarily having to be part of the salary. With these and other changes, the union contribution became optional.

With regard to outsourced work, it is forbidden to the employer for 18 months to dismiss a worker and then reinstate him in this condition. Being outsourced, the worker has the right to attend outpatient services, training, safety, transportation and food. There was also a prohibition of working pregnant women in places considered unhealthy and, with the changes in *CLT*, it is allowed⁸, provided the company presents a medical certificate that proves the non-risk to the baby and the mother.

⁸ Practice vetoed under any circumstances by the Federal Supreme Court (STF) in May 2019.

This change in labour legislation – law n. 13.467/2017 – directly affected the world of work in Brazil, meaning, in general, a setback from the point of view of the relations between capital and labour – actually, it favors the first to the detriment of the second. Particularly the conditions of direct negotiation between employers and employees – given the scenario of recession and prolonged economic stagnation, deindustrialization and weakening (driven by the state itself) of the unions – remained very unequal in disfavor of the workers.

In fact, the fundamental question of the reform was to increase the freedom of employers to determine the conditions of use and remuneration of work, which implied in weakening the institutions that have some power to regulate labour relations. The perspective was of cost reduction. The effort was made to strengthen the insertion of workers in the competitive market, restricting their protection and rights, which increased their vulnerability and insecurity (see CESIT/IE/UNICAMP, 2017).

None of the 6 million formal jobs propagated were created from the flexibilization of *CLT* in 2017. Their articulators then changed their discourse, arguing now that it is recent and that many of the effects of the labour reform of 2017 has not been felt or even could be assessed/interpreted accurately. Table 3 summarizes the main changes in *CLT*.

Table 3 – Main changes of the labour reform – Law n. 13.467/2017

| Theme | Prior rule | New rule |
|--|---|--|
| Pregnant in an unhealthy environment | Can not work. (Art. 394-A of <i>CLT</i>). | It can work depending on the degree of risk. Exception for risky pregnancy and health attestation. |
| Union contribution | It is mandatory the annual discount equivalent to 1 day of the employee's salary every March. | The union contribution is optional, only having the discount of 1 day of salary if the employee himself authorizes. |
| Conventions and collective agreement | Collective agreements are valid as long as they are not contrary to the law and bring benefits to the employee. | The convention and collective bargaining agreement take precedence over law when, among others, it is: working hours, breaks, job plans, salaries, duties, <i>etc.</i> |
| Vacations | They can be divided into a maximum of 2 periods; 1/3 of the vacation period can be sold. | They can be divided into up to 3 periods, not less than 5 calendar days and one of them must be at least 14 calendar days. |
| Dismissal without just cause (agreement between the parties) | The employee is entitled to a fine of 40% of the <i>FGTS</i> balance and to the withdrawal of 100% of it deposited. If you quit, you have no right to remove it. The company must give at least 30 days' notice. The employee receives the unemployment insurance. | Dismissal may occur by mutual agreement. The payment of the 40% fine will be in half, that is, 20% of the <i>FGTS</i> balance. The employee may only withdraw 80% of the <i>FGTS</i> deposited and the company must give at least 15 days' notice. The employee does not receive unemployment insurance. |
| Intra-bound interval | Journey over 6 hours: minimum interval of 1 hour (Art. 71/ <i>CLT</i> and Summary 437/ <i>TST</i>). | Journey over 6 hours: the rest period is at least 30 minutes, negotiated between employee and employer. |

| | | |
|------------------------|---|---|
| Working day 12 x 36 | Forecast by collective agreement. | 12 hours a day or 48 hours a week. Every 12 hours worked there should be 36 hours of rest. It can be agreed by individual or collective agreement. |
| Intermittent work | There is no forecast. | The employee can be hired (in writing) to work for periods (not continuous), receiving the hours, days or months worked, being guaranteed the payment of vacations, 13th salary and social security at the end of each service period services. |
| Part-time work | Up to 25 hours per week. There can be no overtime. Salary proportional to the workday. You can not convert 1/3 of the holiday to credit. (Article 58-A, § 4 of article 59 and article 143, paragraph 3rd of the <i>CLT</i>). | Up to 30 hours a week, with no possibility of overtime. Up to 26 hours a week, with the possibility of making up to 6 extra hours, with an increase of 50% over the normal time value. Salary proportional to the workday. |
| Outsourcing | For activity-middle of the borrower. | Activities-middle-end of the borrower. |

Source: adapted and modified from Pantaleão (2018).

As the most immediate effect of the promulgation of the reform, according to the National Justice Council (*CNJ*, 2018), the actions filed by workers in the Labour Court in 2017 have dropped substantially. Litigation generally declined from about 289.700 in November to 82.300 in December. In addition, labour lawsuits with an emphasis on moral damages decreased by 60% from 2017 to 2018. Another important effect was the change in the union contribution, which became optional, and after the change in *CLT*, revenue declined by 86%, from R\$ 1,9 billion to R\$ 246 million.

The dismissals via direct agreements had low adherence. As of September 2018, one 125.621 severances occurred in this category, representing less than 2% of the dismissals that occurred throughout the country. The creation of intermittent job vacancies has also been limited to date, taking up only 7% of new jobs. Nor were the promised jobs generated, with the average unemployment rate between January and December 2018 being 12,3%, directly afflicting over 12.500.000 workers. Formal employment did not react as suggested, with the number of employees with a portfolio falling by 1% (IPEA, 2018).

Given the above, it is inferred that changes in labour legislation have led to substantial changes in the functioning of the Brazilian labour market, by reconfiguring it. However, the signs of a recovery in employment and income – one of the central justifications for its implementation, together with the expectation of economic recovery – were poor for 2018. According to IEDI (2018), four reasons explain this observation:

- i) low intensity of the improvement in the unemployment rate: between November 2017 and November 2018 as it fell only 12% to 11,6%;
- ii) low quality of jobs created: from 1.24 million admissions occurring between the third quarter of 2017 and the third quarter of 2018, informal work and self-signed job added – both with lower and irregular income – increased by 1.29 million, while employment with a formal contract showed a decrease of 256.000 thousand employed persons;
- iii) underutilized work is not falling: despite the decrease in unemployment of 2,9% in the same period mentioned above, the number of those who work less than they could/would have increased by 8.8% and the potential workforce by 3,7% mainly due to the 9,9% advance of discouragement – underemployment was the reality of more than 27 million working age population;
- iv) stagnation of household income: the mass of real income reduced its average quarterly growth from 3,7% in the second half of 2017 to only 1,6% in the third quarter of 2018 compared to the same period of the previous year.

It is corroborated the thesis that there was labour market flexibilization accompanied by reduction of labour rights between 2015 and 2018, but without the socioeconomic consequences advocated by the proponents of such reforms. See anemic GDP growth in 2017 (0,98%) and in 2018 (1,1%) (IBGE/SCN, 2019). At this rate, the pre-crisis economic level of 2014 will only be reached in 2024. With this, the social question becomes more and more complex, since the effects of the various negative indicators of the world of work overflow to the other spheres of citizenship (increasing violence, poverty, child mortality, *etc.*).

This denotes that the current crisis is not due to obsolescence *per se* of the regulation between capital and labour, but is embedded in and backed by multiple aspects peculiar to the Brazilian socioeconomic formation. In order to allow for the recomposition of capital in times of economic crisis, the distributive conflict has intensified, acting to restrict, for example, changes in labour legislation – decent access to the labour market, resulting in greater precariousness of the conditions of work and life of the population.

4. Concluding remarks

This article examined – from the point of view of the Social Economy and Labour – the effects of labour legislation on the labour market from 2003 to 2018. In the period between 2003 and mid-2014, the effects of the evolution of labour legislation

were ambiguous, with contradictory signs, with changes aimed at deepening flexibilization and resumption of labour regulation. It should be noted that the various labour market flexibility measures implemented at the time were not in line with what was expected for a government elected by a progressive political platform to affirm workers' rights.

Nevertheless, the results obtained were for a significant evolution – for reasons that complement each other – of labour market performance, with an improvement in many of its indicators, illustrated in this study particularly by the drop in the unemployment rate and the DI. However, these advances were insufficient to address the complexity, heterogeneity and fragmentation of the labour market and substantially change the occupational structure.

From the middle of 2014 until the end of 2018, labour flexibility generally accompanied the reduction of labour rights, the most significant of which was embodied in the 2017 labour reform. The changes promoted – still without fully verified/interpreted results – sealed substantial changes in the functioning of the Brazilian labour market, reconfiguring it. Notwithstanding, the indicators show that there was no consistent recovery of the economic/labour dynamics, denoted that the flexibilization and restriction of labour market *per se* do not generate employment and income, once its level is determined by the economic dynamic and government political options – in this interregnum marked by austerity policies. Note that the flexibilization policies stipulated in this period were much broader for the work process than in the previous period.

The real justification behind the implementation of flexibilization of labour market is the alleged imperative to boost the economy and balance the public accounts. Certainly, the intertemporal sustainability of growth and national (especially public) accounts must be pursued, with the need for structuring (microeconomic and macroeconomic) reforms virtually agreeing among those who study the subject. This fundamental basis for the sound functioning of an economy and society that transmutes over time. The point is that what really generates jobs and income is the economic recovery and it was not achieved whatsoever from the recent flexibilizing and restrictive changes in labour legislation.

The conflict is in the choice of who should contribute more proportionally to the closing of this equation, especially in the course of a crisis like the current one. This means choosing between two alternatives: the path of (uncertain) growth with income

concentration and deepening inequalities and social exclusion, or socioeconomic development with income distribution and citizen inclusion. The legal norm that regulates labour relations is key in this process.

In the light of the formation of the labour market in Brazil and the exam elaborated here with a focus on the 21st century, unfortunately the pendulum seems to hang in the first direction. It will be hoped that the policy makers, with active participation of the Brazilian society, make a broader reading of the Brazilian reality, with a long-term horizon, and move the pendulum in the opposite direction.

Meanwhile, it is understood that labour legislation should act as an instrument aimed at the development of Brazil, considering, *inter alia*, to ensure decent work and living conditions for the workers, favoring the socioeconomic dynamics as a whole. In the face of the potential effects of labour legislation on the labour market, it is necessary to emulate a legal rule that is dedicated to resolve disagreements and guide conduct that improves the correlations of forces in this area. Therefore, labour legislation should contribute to equity, with a primary focus on social peace between workers and employers.

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Chapter 3

Magic Hypercube approach applied to twenty economies between 1992 and 2018: a macroeconomic analysis of Brazilian labour market using DEA-Malmquist

Abstract

This chapter deals with a tool called DEA-Malmquist method that helps to numerically measure, within the magic hypercube approach, the relative effectiveness and frontiers of the twenty selected economies according to the four variables of Kaldor: current account balance (CAB), GDP growth, inflation and unemployment. We start from the Kaldor's (1971) view, which led to the construction of a diagram known as the "Magic Square" (MS) by taking into account these four parameters of a country's macroeconomics. The original idea of the MS offer only a contextual perspective. Then we turn to the scope of the "Magic Hypercube" (MH), a broader panorama where through the Data Envelopment Analysis (DEA) procedure and Malmquist index we quantify its geometry. To the application of the index, we extracted data from the World Bank's Open Access Indicators System, dividing it in two periods: 1992 to 2007 and 2010 to 2018. As an outcome, we reached numerical results that intend to capture the global performance of the sample. The encountered relative effectiveness and frontiers of these twenty nations allows a macroeconomic analysis on how the variable unemployment is being tackled by Brazil compared with other nations.

Keywords

Brazil; DEA-Malmquist Method; Magical Hypercube; Effectiveness and Frontiers; Unemployment.

1. Introduction

The dynamics of the world of work is closely related to the behaviour of a series of macroeconomic variables, both internal and external to a given country. Brazil, as an intermediate economic power that aspires to the status of a so-called advanced nation, presents a myriad of diversities and complexities that must be considered for a better articulation and socioeconomic insertion in global terms in general and with regard to the labour market in particular.

In this sense, the content of the seminal paper of Kaldor (1971) – called *Conflicts in National Economic Objectives* – is a relevant academic reference. Going beyond the scope of United Kingdom (UK), Kaldor's main purpose was to present a logical and empirical reconsideration of a basic macroeconomic framework of necessary relations to achieve some desirable targets, or economic policy objectives. We aim, assuming similar proposal, to shed light specifically on the macroeconomic analysis of the Brazilian labour market, adopting for the purposes of analysis the four *kaldorian* variables: CAB, GDP

growth, inflation and unemployment. The option to investigate the labour category – focusing on the results obtained for the variable unemployment – is directly related to the conducting wire of the doctoral thesis. In fact, any other *kaldorian* variable could be inquired in a similar perspective. Nonetheless, we consider that employment should not be analysed as an isolated variable, so the importance of observing it interacting with three other macroeconomic variables.

Kaldor's (1971) pioneering analysis did not benefit from quantitative nor graphical instruments. However, through a series of other studies it has unfolded into the construction of a diagram known as the "Magic Square" (MS), which further in time was continuously improved until achieve the format of the "Magic Hypercube" (MH) (SAAVEDRA-RIVANO & TEIXEIRA, 2017). We embrace the last structure in this paper as a beacon.

Our proposal consists of integrating this framework to the Data Envelopment Analysis (DEA) procedure and Malmquist index to quantify the geometry of the MH. It allows investigating quantitatively the relative effectiveness and frontiers of a selection of the twenty economies. Thus, we reach numerical results that intend to capture the global performance of the sample, which allows a macroeconomic analysis on how the variable unemployment is being tackled by Brazil compared with other nations. To put it forward, we extracted data from the World Bank's Open Access Indicators System concerning the four variables of Kaldor, dividing it in two periods: 1992-2007 and 2010-2018. Doing so, this study aims to contribute in an original way to the economic analysis.

In this chapter, after this introduction, we deal with the oversight just mentioned. Section two bring forward an historical view of the configuration of the magic hypercube according to the four *kaldorian* variables. Section three uncovers the methodology, starting by exposing the production possibility set, the frontier of best practices and its shift, followed by the explanation regarding the source and treatment of data. Section four present and analyse the results for both periods and their Malmquist index, thus allowing the interpretation of changes in effectiveness and frontier. Section five summarizes the main conclusions of the research, accompanied by a macroeconomic analysis focusing on the Brazilian labour market.

2. History of the Magic Hypercube: rethinking the model

Aiming to contribute with a measurement by means of indicators that are multi-varied, the use of the Magic Square of *Kaldorian* inspiration appears as an appropriate analytical tool, since it allows the comparison of results between countries of different levels of development. It permits the study of several variables simultaneously and a more direct comparative performance, evolving socioeconomic issues.

The idea of evaluating and comparing the accomplishment of countries first appeared in a seminal research of Kaldor (1971), in which the author has studied the UK macroeconomic performance. The analysis was performed using four variables (inflation, balance of payments, unemployment and income), but did not contain mathematics or diagrams. With this in mind, Schiller (1973) introduced a graphical representation of the ideas of Kaldor. Such geometric figure became known as “Magic Square” (MS).

In 1987, economists at Organization for Economic Co-operation and Development (OECD) began using this tool with a minor modification (GDP growth was used instead of income), preserving the fundamental Kaldor’s idea⁹. Bernard *et al.* (1988) indicated a basic illustration of this approach to the MS. Such view has been conceived in a way that its four directions (north, south, east and west) were aligned with growth, inflation, trade and unemployment indexes, respectively. All four directions were at different scales, even though expressed in percentages. The state of the economy would then be related to the size “area” of the resulting quadrangle.

It is interesting to notice that Medrano-B and Teixeira (2013) considered that the area of such quadrangle cannot be properly calculated, because of the non-uniform scales of the axes. To solve this problem they re-defined the figure to make the axes uniform. In order to accomplish this task new bounding conditions, given by historical circumstances, were introduced in a kind of ideal country (wonderland macroeconomic configuration).

This concept was constructed by means of intervals that establish values of maximum and minimum for each variable. The larger the area of the country in the Magic Square, the better will be the results obtained and the closer the country will be in relation to the optimal performance. However, it is very difficult for a nation to achieve a good result in all the parameters present in the geometric figure. In this way, the definition of an ideal country, even being a stimulating quantitative criterion of comparison, is virtually impossible to be achieved.

⁹ That is why we assume in this study the expressions “*kaldorian* variables” or “variables of Kaldor”.

The use of the MS as an analytical instrument is not limited to the macroeconomic performance. The index may favour different interpretations, depending on the variables chosen to compose it. This theory was tested in the article of Teixeira, Pinheiro & Vilasboas (2015), where it was used to compare the performance of China and the United States of America (USA) in relation to their respective paths of socioeconomic development. The chosen variables were CO₂ emissions, access to basic sanitation, human development index (HDI) and the percentage of renewable resources in energy matrix. In this new geometric form (with only three variables), the results of the index are indifferent to its ordination, because it provides always a single value for the indicator.

In a recent work of Saavedra-Rivano & Teixeira (2017), a problem in the ordering of the variables has been observed, showing that different results may be generated for the index. Since the geometric figure chosen has more than three dimensions, its graphical representation becomes problematic. This is not an inconsequential oversight and, in order to avoid this problem, they proposed a solution called “Magic Hypercube” (MH), which was a normalization of the four used variables: CAB, GDP growth, inflation and unemployment.

The use of this new mathematical approach involves a hypercube diagram, which produces the same index, regardless the ordering of the variables. An empirical application of the new concept was offered using economic data from Brazil and Chile. Essentially, except in the case of particular symmetry, the ordering of the variables around the square is fundamental to avoid multiple values for an index composed by more than three variables.

In the present work, it was chosen the approach of Saavedra-Rivano & Teixeira (2017) to calculate the index of the MH. In our geometric diagram, we chose the same four *kaldorian* variables. This approach, rethinking their model in an original way, is applied analyse twenty selected economies between 1992 and 2108 through Malmquist-DEA method, as explained in the next section.

3. Methodology

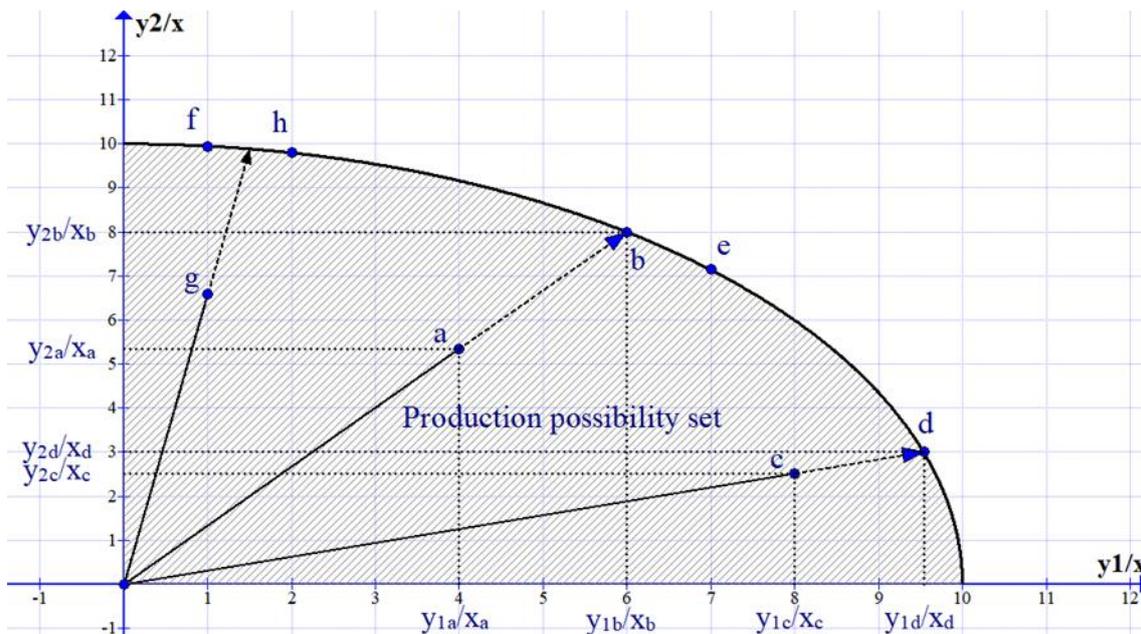
Two subsections compose this section. The first will present – through concepts, figures and equations – the production possibility set, the frontier of best practices and its shift. The second will explain the database source and how it will be treated in this research.

3.1. The production possibility set, the frontier of best practices and its shift

In evaluating performance, the concepts of productivity, efficiency and effectiveness are used. Productivity can be defined as the relationship between the quantity of goods and services produced (objectives) and the quantity of resources used (means). Efficiency is about achieving the objectives of the production unit in an optimized way, with maximum productivity. Effectiveness refers to doing the right task, achieving the intended objectives and disregarding the resources used. In the literature, these definitions are used to evaluate firms, organizations, public policies and others (AVKIRAN & ROWLANDS, 2008).

The quantification of productivity, efficiency and effectiveness often uses the productive frontier methods. These methods start from the definition of the production possibility set (PPS) (or frontier, PPF) and its properties. To illustrate these concepts, consider figure 1, where the PPS frontier is represented for the case of a production process that uses a given amount of inputs (x) to generate two products (y_1 and y_2). The shaded area is the PPS and the curve is the boundary of this set, which represents the maximum possible combinations with a given level of input and the existing technology at a given point in time. The points **a**, **b**, **c**, **d**, **e**, **f**, **g** and **h** represent eight production units, an observed subset of the PPS.

Figure 1 – Production possibility set (PPS)



Source: own elaboration.

The coordination of these points (vectors) indicate the partial productivity (y_1/x and y_2/x) of the respective units. These productivities can be measured at different scales, which makes comparison difficult. We can only compare the length (norm and therefore the magnitude of the productivities) of the vectors if their directions are the same. Note that **a** and **b** are collinear (have direction) and the length of vector **b** is greater than the fulfilment of vector **a**, therefore, in terms of productivity, point **b** exceeds the performance of **a**. Similarly, point **c** is surpassed by **d**.

However, if the vectors have different directions, the production mix is different, and if we do not have weights or market prices for the evaluated products, it is impossible to compare the productivity of the points. For example, the productivity of the set with mix of **a** and **b** ($\frac{y_{2a}}{y_{1a}} = \frac{y_{2b}}{y_{1b}}$) is not comparable to the performance of units **c** and **d** that have a different mix ($\frac{y_{2c}}{y_{1c}} = \frac{y_{2d}}{y_{1d}}$). In this case, there being free will in the choice of “what and how much to produce”, nothing authorizing us to assume that **b** > **d** or **c** > **b** regarding productivity. Nevertheless, when prices or the relative importance of products are available, we arrive at a new concept that allows comparisons, which is the total factor productivity:

$$PTF = \frac{y_1v_1 + \dots + y_nv_n}{x_1u_1 + \dots + x_mu_m} \quad (3.1)$$

where v_i , for $i = 1, 2, \dots, n$, are the weights (or prices) of n products and u_j , for $j = 1, 2, \dots, m$, are the weights (or prices) of m inputs.

For Farrell (1957), the quantification of efficiency takes productivity as a reference and follows the logic represented in figure 1. According to the author, the empirical demarcation of the PPS can be built with the productive units that maximize production for a given level of input (with Pareto’s optimal points), which are achieved when it is impossible to increase the level of one product without worsening that of another. Convex linear combinations of the k efficient units, type (3.2), result in a linear boundary per part that mimics that represented in figure 1.

$$\lambda_1 \begin{bmatrix} y_{11}/x_1 \\ y_{12}/x_1 \end{bmatrix} + \dots + \lambda_k \begin{bmatrix} y_{1k}/x_k \\ y_{2k}/x_k \end{bmatrix} \quad (\text{in which } \sum \lambda_r = 1, \lambda_r \geq 0, r = 1, \dots, k) \quad (3.2)$$

Thus, in the example in figure 1, the points **b**, **d**, **e**, **f** and **h** form the boundary, representing the efficient units and points **a**, **c** and **g** are the inefficient ones.

With the PPS demarcated, the level of efficiency can be estimated by the shortest distance that separates each unit from the border. The smallest relative distance from the frontier determines a value called by Farrell (1957) index of relative technical efficiency (IE) that must be greater than or equal to one: $IE = 1$ for efficient units and $IE > 1$ for inefficient units, in such a way that the farther from the border the unit is evaluated, the more inefficiency must be evident. For example, for the point **a** this distance is estimated by dividing the length of the vector **b** $(y_{1b}/x_b, y_{2b}/x_b)'$ by the length of the vector **a** $(y_{1a}/x_a, y_{2a}/x_a)'$, that is, $IE_a = \overline{0b}/\overline{0a}$.

This (scalar) value, being greater than one, indicates the projection of **a** at the border, $IE_a^* \begin{bmatrix} y_{1a}/x_a \\ y_{2a}/x_a \end{bmatrix}$. Similarly, the relative inefficiency index of point **c** (IE_c) takes as reference the point of border **d**, the closest target and with the same production mix, that is, the same technological profile. This results in the relationship $\overline{0d}/\overline{0c} = IE_c$ which is used to project the vector **c** on the efficient frontier, $IE_c^* \begin{bmatrix} y_{1c}/x_c \\ y_{2c}/x_c \end{bmatrix}$ and estimate how much both products should be increased, with the same inputs, to make **c** efficient.

Note that there may be some inefficient units without real benchmarks at the border. See the case of point **g** in figure 1. For these cases, a virtual reference can be estimated, formed by the linear combination of the nearest optimal points. Thus, the virtual reference of **g** must be defined with the vectors **f** and **h** (reference set) and denoted by (3.3), where λ_f and λ_h indicate the proportion in which **f** and **h** respectively contribute to determine the projection point of **g** on the efficient frontier. Therefore, the projection point at the border is equivalent to the weighted sum of the coordinates of the units of the reference set:

$$\lambda_f \begin{bmatrix} y_{1f}/x_f \\ y_{2f}/x_f \end{bmatrix} + \lambda_h \begin{bmatrix} y_{1h}/x_h \\ y_{2h}/x_h \end{bmatrix} \quad (3.3)$$

Thus, it is evident that in order to calculate efficiency, the performance of each evaluated unit is compared with the best technologically closest practices, contemplating the possibility of each unit emphasizing individual competitive advantages. Hence, we

can conclude that if productivity is how much is produced in relation to the inputs used, efficiency is how much is produced in relation to how much could be produced.

Using Farrell's (1957) concepts and measures as a reference, Charnes, Cooper & Rhodes (1978) modelled a linear programming problems (LPP) to estimate the relative efficiency indexes and the weights (or relative importance) of the multiple inputs and products considered in the analysis of production units. This method is called Data Envelopment Analysis (DEA).

The choice of the DEA method in this work is justified by its popularity in the literature and by the great advantages over the other frontier method, the so-called stochastic frontier analysis. The DEA determines the relative efficiency indexes and the weights of multiple inputs and outputs for each unit evaluated, eliminating the need to define *a priori* a functional relation of the aggregated product and inputs. However, like all methods, it has limitations. As it is a deterministic (non-statistical) approach, it disregards the random effects of the production process and is very sensitive to extreme values with measurement errors (COELLI, PRASADA & BATTESE, 1998).

In honour of their creators (CHARNES, COOPER & RHODES, 1978), the basic DEA models are called CCR-OO (output-oriented) or CCR-IO (input-oriented). The CCR-OO estimates the efficiency oriented to maximize the outputs with the given inputs and the CCR-IO calculates the efficiency oriented to minimize the inputs with the fixed products. These two models assume technologies with a constant return of scale (CRE). Nevertheless, there are others (outside the scope of this study), which allows the calculation of technical efficiency with variable returns of scale, allocative efficiency and scale efficiency (COOPER, SEIFORD & TONE, 2000).

The CCR-OO LPP is given by system (3.4) for any unit \mathbf{O} (from a group of \mathbf{S} organizations evaluated) that produces the vector y_{no} , using the input vector x_{mo} and a technology with constant scale return. The solution for this programming involves: i) obtaining a minimum $IE_{\mathbf{O}}$ value that multiplied by the vector y_{no} , project this on the border; ii) the calculation of the vectors u_j and v_i , which represent the weights (relative importance or shadow price) of the inputs and outputs respectively. This formulation (also called the multiplicative model) is calculated for each of the units evaluated, in such a way that the weights of the inputs and outputs can be different in each unit depending on the mix of inputs and the production mix.

$$\text{Min } IE_o = \sum_{j=1}^m u_j x_{jo} \quad (3.4)$$

subject to:

$$\sum_{i=1}^n v_i y_{io} = 1$$

$$\sum_{i=1}^n v_i y_{ir} - \sum_{j=1}^m u_j x_{jr} \leq 0, \quad r = 1, \dots, k, \dots, o, \dots, S$$

$$u_j \text{ e } v_i \geq 0$$

The dual LPP of the system 3.4 determines the same IE, but adds another important information: the vector *lambda* (λ) – the coefficients of the linear combination determining the boundary, which determines the point of the virtual benchmark at which y_{no} must project to make the unit **O** efficient. Therefore, this LPP is known in the literature as an envelope model. If **O** is efficient, $IE_o = 1$ and λ_s must be zero, except $\lambda_o = 1$. If **O** is inefficient, $IE_o > 1$ and the λ_s greater than zero indicated the reference units in which **O** must mirror to be efficient.

Intrinsically linked to efficiency is the concept of effectiveness. As seen, effectiveness is related to the main objectives of organizations and assesses the extent to which these objectives were achieved, regardless of the resources used and the way in which the results were obtained¹⁰. In this way, the closer a unit gets to the desired goal or best practices, the more effective it is.

The measurement of relative effectiveness is complicated when there are multiple objectives to be achieved simultaneously. This measurement requires weighing the objectives, defining the relative importance of each one. On-call decision-making agents generally weigh and prioritize these objectives, but economists often have conflicting views and different value judgments, which can lead to subjective and arbitrary considerations.

If a single hierarchy of objectives is inadequate, if it is recognized that each production unit may have different priorities or should take greater advantage of its competitive advantages and seek an objective method to weigh these criteria, the frontier analysis that can be used part of the demarcation of the boundary between the obtained and the possible.

¹⁰ In the context of economic policy, effectiveness can refer to the measure of the success of governmental actions related to the issue of economic development and the social welfare of the country.

Therefore, to quantify the relative effectiveness, an adaptation of the CCR-OO envelope model is used. In this adaptation, inputs are disregarded, estimating the frontier with previously defined objectives or with the organizations with the highest outputs. The envelope model used to calculate the relative effectiveness for an **O** unit is given by (3.5):

$$\text{Max } EC_o \tag{3.5}$$

subjected to:

$$\sum_{r=1}^S y_{ir} \lambda_r \geq EC_o y_{io} \quad r = 1, \dots, k, \dots, o, \dots, S$$

$$\sum_{r=1}^S \lambda_r = 1$$

$$EC_o \geq 1, \quad \lambda_r \geq 0, \quad \forall r$$

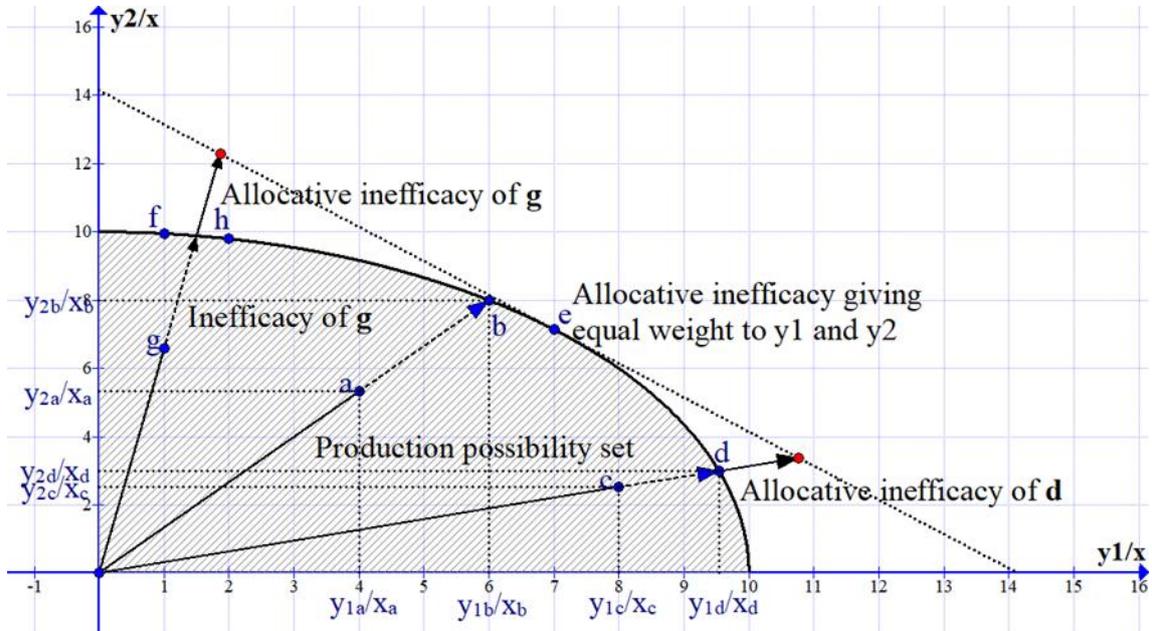
This formulation estimates the relative distance of unit **O** from the border, considered as the EC_o effectiveness index and determines the projection point at the border, resulting from the weighted sum of the coordinates of the units of the **O** reference set. If the unit evaluated is below from the border it will have an $EC > 1$ that will indicate how much all outputs must be increased simultaneously to become a good practice. In addition, the inverse of the effectiveness index shows the performance related to best practices. Thus, if $EC = 1.25$, the evaluated unit must simultaneously increase its objectives by 25%. Using the inverse ($1/1.25 = 0.8$) it can be said that the performance of the evaluated unit is 80% of what it could be, that is, of the indicated by the best practices.

The dual LPP of (3.5) derives the multiplicative model that determines the same EC effectiveness index and additionally calculates the weights (v_i) of the products that the evaluated unit inputs. Being called the shadow price, the vector v_i plays an important role in the sensitivity analysis of the effectiveness index (COOPER, SEIFORD & TONE, 2000) and can be used to define the most similar groups of units. In addition, the LPP dual (3.5) can be reformulated by giving the same weight to the outputs considered in the research. This is interesting in determining which units perform best on all variables.

To make the idea clear, consider figure 2, which represents the frontier of best practices, of a sample of production units, considering two objectives (y_1 and y_2) achieved regardless of the resources used and the way in which the results were obtained. It is observed that unit **d** prioritizes objective y_1 , to the detriment of objective y_2 . On the other hand, unit **f** behaves differently, giving greater weight to objective y_2 . If we give the same weight to both objectives we can find an isorevenue curve (dotted line) that touches the

border at point **e**. Hence, **e** is the unit that maximizes both objectives when they have the same weight. Based on these weights, it is also possible to calculate the allocative effectiveness, using the distance that separates the border points from the isorevenue. Note in figure 2 the allocative inefficiency of **d** and **g**.

Figure 2 – Frontier of best practices



Source: own elaboration.

It should also be noted that there is great research potential with regard to the effectiveness of socioeconomic policies. The analysis of the effectiveness indices developed so far was static, since variables are used and units are compared in a given period. The introduction of observations made sequentially over time allows the creation of a dynamic model, which shifts the central question to other very important problems, such as: i) the evolution of the effectiveness of each unit in relation to the evolution of the set of units evaluated; ii) the decomposition of the dynamic efficiency index in terms of changes in the frontier and changes in efficiency.

To estimate the evolution of the relative effectiveness of the continuation, the adapted Malmquist index (IM) is approached, following one of the most popular IM developments, the one carried out by Färe, Grosskopf, Norris & Zhang (1994). Suppose that the best practice boundary, shown in figure 2, does not change between the period t and $t + 1$ and that the point **a** represents the performance of a country (α) in the period t and **d** the performance of the same country in $t + 1$. Thus, the change in relative effectiveness (ΔEc_α) over time is given by (3.6):

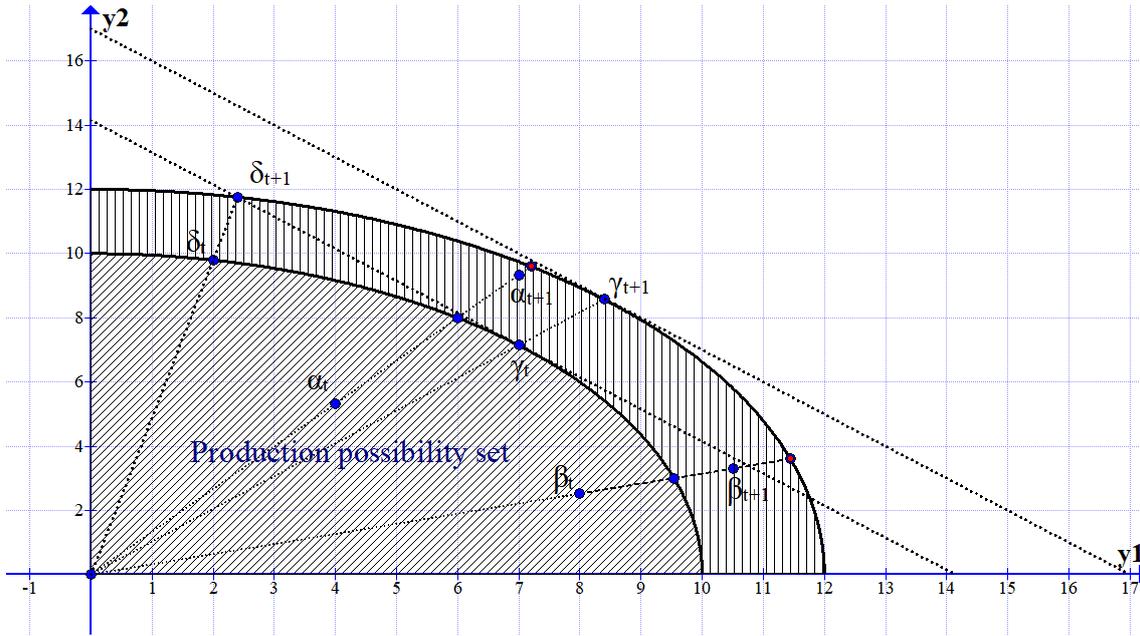
$$\Delta Ec_{\alpha} = \frac{Ec_{\alpha,t+1}}{Ec_{\alpha,t}} = \frac{Ec_b}{Ec_a} \quad (3.6)$$

In this case, $\Delta Ec_{\alpha} > 1$, once $Ec_{\alpha,t+1} > Ec_{\alpha,t}$. It means that the distance of the boundary is reduced, so there is an improvement in the effectiveness on the given period. The opposite would happen if $\Delta Ec < 1$, showing a decrease in effectiveness. On the other hand, $\Delta Ec = 1$ indicates no change in relative effectiveness.

If the analysis considers a much longer period of time, a shift in the best practice boundary is likely, upwards or downwards. It is now possible to distinguish two processes. The first captures the change in efficiency related to the evolution of the set of units evaluated in the given period, that is, the catching-up effect, for which less effective production units tend to grow faster than best practices, since they imitate and copying is always easier than innovating. The second expresses the displacement of the border that requires learning and innovation.

To relate these two processes, figure 3 is shown. It is observed that in the first period the points γ_t and δ_t are on the t border, representing the best practices. The points α_t and β_t show ineffectiveness, with α_t being farther from the boundary than β_t . In the second period, with the displacement of the boundary ($t + 1$), the point α_{t+1} is closer to that than β_{t+1} , therefore, the variation in the relative effectiveness of the first point is greater than the second. It is also noted that the displacement of the border was performed by the points γ_{t+1} and δ_{t+1} . However, if the products receive the same weights, the relative allocative effectiveness of γ_{t+1} is greater than that shown by δ_{t+1} .

Figure 3 – Shifting the frontier of best practices



Source: own elaboration.

The measurement of these two processes follows the development of Färe, Grosskopf, Norris & Zhang (1994) of the Malmquist index. Equation (3.7) expresses how to quantify the dynamic index of relative effectiveness (IDEc) of the α unit, separated in terms of changes in efficiency (MEc) and changes in frontiers (MF). The first element on the right (between parentheses) expresses the change in relative efficiency in the period studied; the second (between brackets) expresses the border changes.

$$IDEc = \left(\frac{Ec_{\alpha,t}^t}{Ec_{\alpha,t+1}^{t+1}} \right) \left[\frac{Ec_{\alpha,t+1}^{t+1} Ec_{\alpha,t}^{t+1}}{Ec_{\alpha,t}^t E_{\alpha,t}^t} \right]^{0,5} \quad (3.7)$$

For the calculation of four DEA is required: 1) the relative effectiveness of the unit evaluated in period t in relation to the boundary $t + 1$ ($Ec_{\alpha,t}^t$); 2) the relative effectiveness of the unit evaluated in period $t + 1$ in relation to the border $t + 1$ ($Ec_{\alpha,t+1}^{t+1}$); 3) the relative effectiveness of the unit evaluated in period t in relation to the border $t + 1$ ($Ec_{\alpha,t}^{t+1}$); 4) the relative effectiveness of the unit evaluated in the period $t + 1$ in relation to the boundary t ($E_{\alpha,t}^t$).

In this case, the MEc, MF and IDEc of the evaluated unit can take different directions with positive values greater than, less than or equal to one. When $MEc > 1$ the distance from the border is reduced, therefore, there is an improvement in relative efficiency in the given period. If $MEc < 1$, there is a decrease in relative effectiveness;

$MEc = 1$ indicates no change in effectiveness or relative inefficiency. $MF > 1$, on the other hand, means that the displacement of the border was positive, upward; $MF < 1$ one shift down; $MF = 1$ means immobility of the border. Thus, MEc and MF can evolve in opposite directions, that is, in the same period of time, an improvement in one and a worsening in another will occur.

As $IDEc$ is the product of the two previous changes, $IDEc > 1$ indicates a positive evolution of the unit's efficiency in relation to the evolution of the set of units evaluated, a positive balance when the setback of one change is overcome by the progress of the other. If $IDEc < 1$ the balance of the two processes indicates a decrease in relative efficiency and if $IDEc = 1$ there are zero sum gains and losses.

3.2. Source and treatment of data

The extraction of the data comes from the World Bank's Open Access Indicators System (<https://data.worldbank.org/indicator>). We select the twenty economies in America, Europe, Africa, Asia and Oceania. However, due to shortages in the data sequence, we exclude some countries (e.g. Argentina) from the sample. To "run" all the data extracted from World Bank we use *MaxDEA 8 Basic Free DEA software* (<http://maxdea.com/MaxDEA.htm>).

The four variables in the Magic Hypercube model of Saavedra-Rivano & Teixeira (2017) were selected: GDP growth (annual %), inflation – consumer prices (annual %), unemployment – total (% of total labour force) (modelled ILO estimate) and current account balance (CAB, % of GDP). We grouped the historical series of these variables into two periods. The first considers the time series from 1992 to 2007 and the second from 2010 to 2018. In this way, we sought to eliminate the influence of the international financial crisis of 2008-2009 and observe whether the effectiveness of economic policies changes in the period before and after the crisis. Similarly, we follow the one carried out by Bernard *et al.* (1988), who compare the pre-crisis economic performance in the 1960-1973 period and during the crisis in the 1974-1980 period in France, Japan and England, but using the four variables of the Kaldor model (also substituting income for inflation).

Like Medrano & Teixeira (2012) and Teixeira, Pinheiro & Ferreira (2014), the variables were normalized to mitigate possible biases due to their different orders of magnitude. This process started from calculating the median of each variable for each period. Subsequently, from the median, all variables were transformed in the same order

of magnitude within the range of 0 and 1. The normalization of GDP growth and CAB were using the formula (3.8) and for unemployment and inflation the formula (3.9) is used. In this way, the same direction is obtained (the bigger, the better) and the maximum value 1 that allows representing an ideal country (wonderland macroeconomic configuration), which would have its indicators optimized.

$$\frac{x_{median} - x_{minimum}}{x_{maximum} - x_{minimum}} \quad (3.8)$$

$$\frac{x_{median} - x_{maximum}}{x_{minimum} - x_{maximum}} \quad (3.9)$$

Given the above, table 1 shows the initial results of the normalized medians for the four variables of Kaldor, according to the selected economies in the relevant periods for the proposed analysis.

Table 1 – Initial results of the four variables of Kaldor (normalized medians)

| Country | Country Code | Period 1 (1992-2007) | | | | Period 2 (2010-2018) | | | |
|---------------|--------------|----------------------|------------|-----------|---------|----------------------|------------|-----------|---------|
| | | CAB | GDP Growth | Inflation | Unempl. | CAB | GDP Growth | Inflation | Unempl. |
| Australia | AUS | 0,205 | 0,641 | 0,998 | 0,802 | 0,237 | 0,595 | 0,998 | 0,853 |
| Brazil | BRA | 0,300 | 0,620 | 0,996 | 0,716 | 0,249 | 0,544 | 0,996 | 0,764 |
| Canada | CAN | 0,335 | 0,604 | 0,998 | 0,768 | 0,248 | 0,586 | 0,999 | 0,794 |
| China | CHN | 0,375 | 0,855 | 0,998 | 0,948 | 0,377 | 0,759 | 0,998 | 0,898 |
| France | FRA | 0,340 | 0,582 | 0,999 | 0,661 | 0,301 | 0,544 | 0,999 | 0,694 |
| Germany | DEU | 0,306 | 0,568 | 0,999 | 0,720 | 0,497 | 0,580 | 0,999 | 0,878 |
| India | IND | 0,304 | 0,752 | 0,996 | 0,973 | 0,262 | 0,754 | 0,996 | 0,973 |
| Indonesia | IDN | 0,359 | 0,688 | 0,995 | 0,832 | 0,276 | 0,685 | 0,997 | 0,905 |
| Italy | ITA | 0,329 | 0,560 | 0,998 | 0,673 | 0,346 | 0,535 | 0,999 | 0,619 |
| Japan | JPN | 0,390 | 0,549 | 0,999 | 0,915 | 0,391 | 0,548 | 0,999 | 0,935 |
| Korea, Rep. | KOR | 0,335 | 0,716 | 0,997 | 0,944 | 0,438 | 0,607 | 0,999 | 0,935 |
| Mexico | MEX | 0,278 | 0,615 | 0,995 | 0,937 | 0,279 | 0,607 | 0,997 | 0,885 |
| Netherlands | NLD | 0,437 | 0,611 | 0,998 | 0,897 | 0,532 | 0,559 | 0,999 | 0,843 |
| Russian Fed. | RUS | 0,515 | 0,676 | 0,989 | 0,745 | 0,423 | 0,568 | 0,996 | 0,858 |
| Saudi Arabia | SAU | 0,390 | 0,583 | 0,999 | 0,850 | 0,563 | 0,632 | 0,998 | 0,850 |
| Spain | ESP | 0,233 | 0,625 | 0,998 | 0,477 | 0,344 | 0,553 | 0,999 | 0,196 |
| Switzerland | CHE | 0,536 | 0,557 | 0,999 | 0,932 | 0,555 | 0,564 | 0,999 | 0,886 |
| Turkey | TUR | 0,287 | 0,732 | 0,970 | 0,730 | 0,194 | 0,717 | 0,995 | 0,659 |
| UK | GBR | 0,272 | 0,599 | 0,998 | 0,844 | 0,226 | 0,567 | 0,998 | 0,831 |
| United States | USA | 0,239 | 0,628 | 0,998 | 0,866 | 0,262 | 0,583 | 0,999 | 0,829 |

Source: own elaboration based on World Bank's Open Access Indicators System (2020).

In this sense, the next section present and discuss the resulting numbers derived from the selected data for the twenty economies, allowing then a critical macroeconomic analysis on how the variable unemployment is being tackled by Brazil compared with other nations.

4. Analysis of results

This section is divided into three subsections. The first and second have static character and in them will be analysed: i) the main results, discussing the general score, projections, benchmarks (with its respective *lambdas*) and weights that each country assumes for each variable; ii) the general score of the twenty countries that make up the sample when the *kaldorian* variables assume the same weights. In these cases, the MH forms the geometric figure that summarizes the general argument of both subsections.

On the other hand, the analysis of the third section is dynamic (comparative), consisting of considerations on the effectiveness and changes in the frontier based on the results found for the Malmquist index and its decomposition. Lastly, we discuss the magic hypercube comparing the possibility frontier with the frontier achieved in the first and in the second periods, besides the performances of Brazil in the same time frame.

4.1. Analysis of the results of the first period (1992 a 2007)

With regard to the main results of the first period (tables 2 and 3), let us start with the general score. It is observed that Switzerland, China, India, Japan and the Russian Federation have the maximum score (one), with which they are the countries that conform the existing frontier of best practices between 1992 and 2007. Brazil is in the seventeenth position in this regard, with a score of 0.996906, just ahead of Mexico (0,996783), Indonesia (0,99619) and Turkey (0,971867)¹¹. These indices indicate that countries with low performance should increase the value of the four variables in those registered in the table as projections. One could note that the difference between the first and the last country's score is less than 0,5 (a similar thing occurs in the table 5). Once we use a deterministic method, it is just a matter of scale, which means that the calculation is relative (not dimensional).

¹¹ Being currently the main world economy, it is interesting to note that (along this chapter) the USA always appear in intermediate positions according to the numbers revealed by the DEA-Malmquist method. Differently from China, the second economic power, which appears ahead in most of the numerical results.

Considering the free will in determining the priorities and weights of the Kaldorian variables, the countries that form the border are those with the best performance in these variables (in red): in the CAB was Switzerland (0,536497), in GDP growth was China (0,855437), in inflation was Japan (0,999313) and in unemployment was India (0,972844). It should be noted that in the specific case of inflation, the values are very close to each other for all countries (in both periods), possibly due to the adoption of similar monetary policies in order to privilege the control of this parameter. It is also relevant that, according to the data, the Russian Federation appears with a score of one due to the good performance in one of the variables (CAB), being a major exporter of natural resources (mainly oil and gas).

Table 2 – Main results for the first period (1)

| Country | Score | Projection (CAB) | Projection (GDP Growth) | Projection (Inflation) | Projection (Unemployment) | Benchmark ($\lambda_s = \text{Lambdas}$) | Times as a benchmark for another country |
|---------------|----------|------------------|-------------------------|------------------------|---------------------------|--|--|
| Switzerland | 1 | 0,536497285 | 0,557485157 | 0,998924862 | 0,93219247 | CHE(1.0000000000) | 8 |
| China | 1 | 0,375025074 | 0,855437451 | 0,998227057 | 0,947933134 | CHN(1.0000000000) | 30 |
| India | 1 | 0,303736315 | 0,75220602 | 0,996407251 | 0,972843721 | IND(1.0000000000) | 0 |
| Japan | 1 | 0,389630368 | 0,548600456 | 0,999312948 | 0,914663569 | JPN(1.0000000000) | 26 |
| Russian Fed. | 1 | 0,515133745 | 0,675571357 | 0,989312886 | 0,745383857 | RUS(1.0000000000) | 0 |
| Saudi Arabia | 0,999899 | 0,389544184 | 0,583226918 | 0,999186623 | 0,918593708 | CHE(0.0106050711); CHN(0.1125426193); JPN(0.8768523096) | 0 |
| Netherlands | 0,999339 | 0,437194135 | 0,611256886 | 0,998968817 | 0,927142132 | CHE(0.3431749825); CHN(0.1942641324); JPN(0.4625608851) | 0 |
| France | 0,999309 | 0,388000195 | 0,582848124 | 0,999191746 | 0,918376957 | CHN(0.1116151848); JPN(0.8883848162) | 0 |
| Germany | 0,9993 | 0,388708853 | 0,567960204 | 0,999244434 | 0,916762698 | CHN(0.0630945685); JPN(0.9369054324) | 0 |
| Canada | 0,99928 | 0,386951137 | 0,604887389 | 0,999113749 | 0,92076662 | CHN(0.1834424583); JPN(0.8165575427) | 0 |
| UK | 0,999159 | 0,387212756 | 0,599391125 | 0,9991332 | 0,920170673 | CHN(0.1655298064); JPN(0.8344701936) | 0 |
| Australia | 0,999147 | 0,385205766 | 0,641555212 | 0,998983983 | 0,92474242 | CHN(0.3029450744); JPN(0.6970549256) | 0 |
| Korea Rep. | 0,999107 | 0,409031293 | 0,792688382 | 0,998374016 | 0,944618133 | CHE(0.2106010618); CHN(0.7893989382) | 0 |
| United States | 0,998937 | 0,38584226 | 0,628183346 | 0,999031305 | 0,923292542 | CHN(0.2593653685); JPN(0.7406346315) | 0 |
| Italy | 0,998849 | 0,389065349 | 0,560470715 | 0,999270939 | 0,915950631 | CHN(0.0386858800); JPN(0.9613141210) | 0 |
| Spain | 0,998646 | 0,38596485 | 0,6256079 | 0,99904042 | 0,923013292 | CHN(0.2509718343); JPN(0.7490281657) | 0 |
| Brazil | 0,996906 | 0,386145437 | 0,621814016 | 0,999053846 | 0,922601931 | CHN(0.2386073421); JPN(0.7613926589) | 0 |
| Mexico | 0,996783 | 0,455778722 | 0,706428934 | 0,998576035 | 0,940061092 | CHE(0.5001086421); CHN(0.4998913579) | 0 |
| Indonesia | 0,99619 | 0,382855806 | 0,690924615 | 0,998809265 | 0,93009542 | CHN(0.4638428905); JPN(0.5361571095) | 0 |
| Turkey | 0,971867 | 0,379871376 | 0,753623353 | 0,998587375 | 0,936893687 | CHN(0.6681818053); JPN(0.3318181947) | 0 |

Source: own elaboration based on World Bank's Open Access Indicators System (2020).

Analysing the benchmarks and the λ_s (proportional importance of a country as a beacon) (table 2), we can see that only three countries among those that obtained the maximum score serve as a reference for best practices for another countries. They are, in order and with their respective frequencies: China (30 times), Japan (26 times) and Switzerland (8 times). For the specific case of Brazil, it indicates that the best strategy to reach the existing frontier is to assume a linear combination between Japan ($\lambda_{JPN} = 0,7613926589$) and China ($\lambda_{CHN} = 0,2386073421$).

Table 3 also reveals this contour, once identical values (weight) for the same parameters among nations suggest the same profile. Brazil presents zero for CAB and unemployment, 0,003534548 for GDP growth and 0,998747137 for inflation. Thus, it reinforces the same profile of Japan and China, among others. Relevant is the fact that the five countries that have score one shows four distinct weights composition. It seems that better performances give different weights to one or the another variable, being able to occupy this position precisely by “betting” on (at least) one of them. Therefore, the weight of each variable is determined by the country’s priority profile.

Table 3 – Weights of Kaldorian variables in determining the effectiveness index (2)

| Country | Weight Dual Price (CAB) | Weight Dual Price (GDP Growth) | Weight Dual Price (Inflation) | Weight Dual Price (Unemployment) |
|---------------|-------------------------|--------------------------------|-------------------------------|----------------------------------|
| Switzerland | 1,86394233 | 0 | 0 | 0 |
| China | 0 | 0,003534548 | 0,998747137 | 0 |
| India | 0 | 0 | 0,936788416 | 0,068435688 |
| Japan | 0 | 0,003534548 | 0,998747137 | 0 |
| Russian Fed. | 1,568985307 | 0,283852655 | 0 | 0 |
| Saudi Arabia | 0,002415906 | 0,003645994 | 0,997743998 | 0 |
| Netherlands | 0,002415906 | 0,003645994 | 0,997743998 | 0 |
| France | 0 | 0,003534548 | 0,998747137 | 0 |
| Germany | 0 | 0,003534548 | 0,998747137 | 0 |
| Canada | 0 | 0,003534548 | 0,998747137 | 0 |
| UK | 0 | 0,003534548 | 0,998747137 | 0 |
| Australia | 0 | 0,003534548 | 0,998747137 | 0 |
| Korea Rep. | 0 | 0 | 0,961307192 | 0,042616034 |
| United States | 0 | 0,003534548 | 0,998747137 | 0 |
| Italy | 0 | 0,003534548 | 0,998747137 | 0 |
| Spain | 0 | 0,003534548 | 0,998747137 | 0 |
| Brazil | 0 | 0,003534548 | 0,998747137 | 0 |
| Mexico | 0 | 0 | 0,961307192 | 0,042616034 |
| Indonesia | 0 | 0,003534548 | 0,998747137 | 0 |
| Turkey | 0 | 0,003534548 | 0,998747137 | 0 |

Source: own elaboration based on World Bank’s Open Access Indicators System (2020).

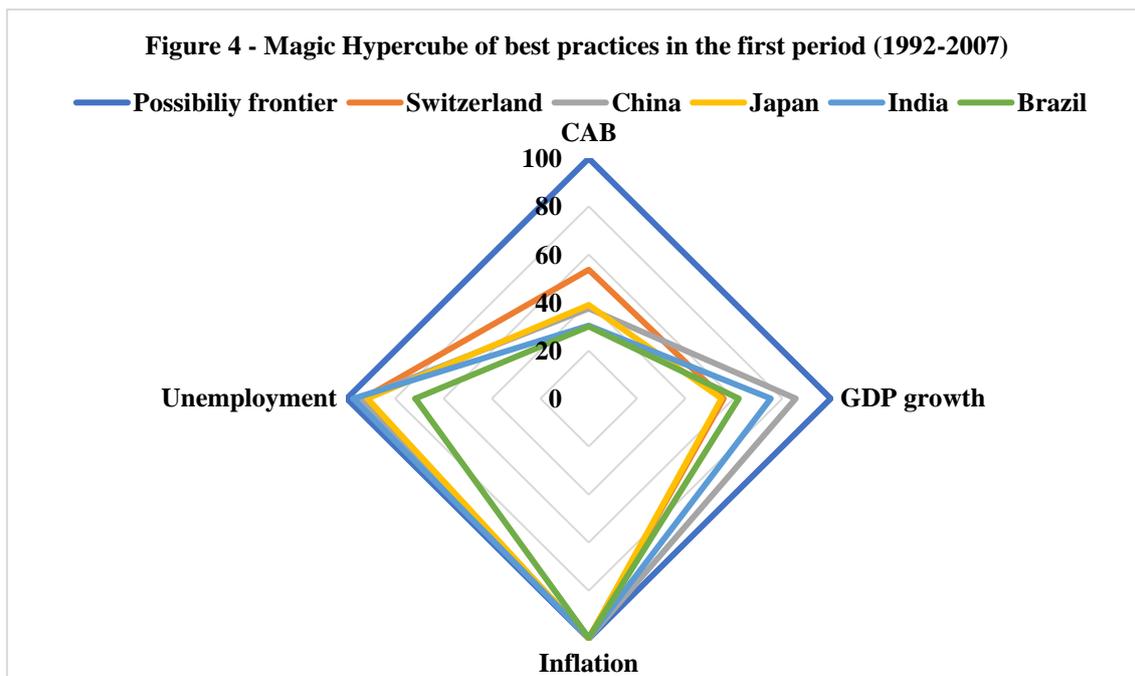
In the sequence, table 4 shows the general score of the twenty countries when the four *kaldorian* variables assume the same weight (0.25 each). China is the country with the best performance (score one), followed by India (0,952330062), Switzerland (0,952300618), Korea Republic (0,941797331) and Netherlands (0,926538824). Brazil (0,82860491) occupies only the sixteenth position, ahead only of mature economies – all members of the European Union – such as Germany, France, Italy and Spain, which is undesirable for a developing country that aims to catch-up in relation to the so-called advanced countries.

Table 4 – General score of the first period with the same weight for the four variables

| Ranking | Country | Score | Ranking | Country | Score |
|---------|--------------|-------------|---------|---------------|-------------|
| 1 | China | 1 | 11 | United States | 0,859465211 |
| 2 | India | 0,952330062 | 12 | Turkey | 0,856189571 |
| 3 | Switzerland | 0,952300618 | 13 | UK | 0,854027326 |
| 4 | Korea, Rep. | 0,941797331 | 14 | Canada | 0,851964062 |
| 5 | Netherlands | 0,926538824 | 15 | Australia | 0,833060091 |
| 6 | Russian Fed. | 0,920915735 | 16 | Brazil | 0,82860491 |
| 7 | Indonesia | 0,904899516 | 17 | Germany | 0,816187752 |
| 8 | Japan | 0,897874125 | 18 | France | 0,81279071 |
| 9 | Mexico | 0,889460563 | 19 | Italy | 0,805636035 |
| 10 | Saudi Arabia | 0,88815021 | 20 | Spain | 0,734091421 |

Source: own elaboration based on World Bank's Open Access Indicators System (2020).

Concerning the analysis of the magic hypercube for the first period (figure 4), it geometrically denotes the limits of the frontier of possibility (wonderland macroeconomic configuration, in blue = 100, in %), the results of the countries that stood out in each of the four variables respectively and the Brazilian performance in relation to it.



Source: own elaboration based on World Bank's Open Access Indicators System (2020).

The magic hypercube makes evident the distance of Brazil (except in the case of inflation, as described before) both in relation to the possibility frontier and the best practices of each leading country in a specific variable. From this perspective, the worst performance of the country is in CAB, followed by GDP growth (also the biggest gap – in relation to China, which has the best performance on it) and unemployment.

4.2. Analysis of the results of the second period (2010 to 2018)

Observing the main results (tables 5 and 6), the country (in red) that stood out the most numerically in CAB was Saudi Arabia (0,563), in GDP growth was China (0,759), in inflation it was Japan ($\cong 1$) and unemployment was India (0,973). Korea Republic and Switzerland were also countries that got maximum score (one), not in isolation in the leadership in any parameter. The case of Saudi Arabia can be interpreted as the increase in the prices of the oil commodity in the analysed in most of the period. It is also worth noting that India was the country that most emphasized the issue of unemployment in both periods compared to any other nation, unlike Brazil, which, although it has presented a recent relative improvement in this aspect (see further analysis of table 7), such improvement in effectiveness occurred at a lower level than the other countries.

Concerning the benchmarks and the λ_s (table 5), Switzerland (28 times) and China (18 times) are among those that obtained the maximum score and serve as a reference for

best practices for other countries. For the specific case of Brazil in this period, it indicates that the best strategy is to integrally assume the Swiss practices as a benchmark ($\lambda_{CHE} = 1$). This means that in order to improve efficiency, Brazil must fully imitate Switzerland and increase the values of the variables indicated in the projections in Table 5, which are consistent with the original values of Switzerland.

It is interesting to note that Brazil and Switzerland (his reference) do not give the same weight to the variables as indicated in table 6. This means that Brazil is setting priorities that are very different from those adopted by best practices. But, of all the benchmarks the most similar to Brazil is Switzerland.

Table 5 – Main results for the second period (1)

| Country | Score | Projection (CAB) | Projection (GDP Growth) | Projection (Inflation) | Projection (Unemployment) | Benchmark ($\lambda s = \text{Lambdas}$) | Times as a benchmark for another country |
|---------------|-------|------------------|-------------------------|------------------------|---------------------------|--|--|
| China | 1 | 0,377 | 0,759 | 0,998 | 0,898 | CHN(1.000) | 18 |
| India | 1 | 0,262 | 0,754 | 0,996 | 0,973 | IND(1.000) | 0 |
| Japan | 1 | 0,391 | 0,548 | 0,999 | 0,935 | JPN(1.000) | 2 |
| Korea Rep. | 1 | 0,438 | 0,607 | 0,999 | 0,935 | KOR(1.000) | 0 |
| Saudi Arabia | 1 | 0,563 | 0,632 | 0,998 | 0,85 | SAU(1.000) | 0 |
| Switzerland | 1 | 0,555 | 0,564 | 0,999 | 0,886 | CHE(1.000) | 28 |
| Australia | 0,999 | 0,527 | 0,595 | 0,999 | 0,887 | CHN(0.159); CHE(0.841) | 0 |
| Canada | 0,999 | 0,535 | 0,587 | 0,999 | 0,887 | CHN(0.116); CHE(0.884) | 0 |
| France | 0,999 | 0,555 | 0,564 | 0,999 | 0,886 | CHE(1.000) | 0 |
| Germany | 0,999 | 0,54 | 0,581 | 0,999 | 0,887 | CHN(0.085); CHE(0.915) | 0 |
| Italy | 0,999 | 0,555 | 0,564 | 0,999 | 0,886 | CHE(1.000) | 0 |
| Netherlands | 0,999 | 0,555 | 0,564 | 0,999 | 0,886 | CHE(1.000) | 0 |
| Spain | 0,999 | 0,555 | 0,564 | 0,999 | 0,886 | CHE(1.000) | 0 |
| UK | 0,999 | 0,552 | 0,568 | 0,999 | 0,886 | CHN(0.020); CHE(0.980) | 0 |
| United States | 0,999 | 0,537 | 0,584 | 0,999 | 0,887 | CHN(0.101); CHE(0.899) | 0 |
| Indonesia | 0,998 | 0,398 | 0,686 | 0,999 | 0,906 | CHN(0.648); JPN(0.257); CHE(0.095) | 0 |
| Mexico | 0,998 | 0,515 | 0,608 | 0,999 | 0,888 | CHN(0.225); CHE(0.775) | 0 |
| Brazil | 0,997 | 0,555 | 0,564 | 0,999 | 0,886 | CHE(1.000) | 0 |
| Russian Fed. | 0,997 | 0,55 | 0,57 | 0,999 | 0,886 | CHN(0.029); CHE(0.971) | 0 |
| Turkey | 0,997 | 0,414 | 0,719 | 0,999 | 0,895 | CHN(0.796); CHE(0.204) | 0 |

Source: own elaboration based on World Bank's Open Access Indicators System (2020).

Table 6 – Weights of Kaldorian variables in determining the effectiveness index (2)

| Country | Weight Dual Price (CAB) | Weight Dual Price (GDP Growth) | Weight Dual Price (Inflation) | Weight Dual Price (Unemployment) |
|---------------|-------------------------|--------------------------------|-------------------------------|----------------------------------|
| China | 0 | 0,008622 | 0,9708 | 0,02709 |
| India | 0 | 0,008622 | 0,9708 | 0,02709 |
| Japan | 0 | 0 | 0,934 | 0,07137 |
| Korea Rep. | 0,0002423 | 0,0087 | 0,9703 | 0,02745 |
| Saudi Arabia | 0,01188 | 0,01592 | 0,9851 | 0 |
| Switzerland | 0 | 0,004801 | 0,9935 | 0,005015 |
| Australia | 0 | 0,005145 | 0,9978 | 0 |
| Canada | 0 | 0,005145 | 0,9978 | 0 |
| France | 0 | 0 | 1,001 | 0 |
| Germany | 0 | 0,005145 | 0,9978 | 0 |
| Italy | 0 | 0 | 1,001 | 0 |
| Netherlands | 0 | 0 | 1,001 | 0 |
| Spain | 0 | 0 | 1,001 | 0 |
| UK | 0 | 0,005145 | 0,9978 | 0 |
| United States | 0 | 0,005145 | 0,9978 | 0 |
| Indonesia | 0 | 0,004801 | 0,9935 | 0,005015 |
| Mexico | 0 | 0,005145 | 0,9978 | 0 |
| Brazil | 0 | 0 | 1,001 | 0 |
| Russian Fed. | 0 | 0,005145 | 0,9978 | 0 |
| Turkey | 0 | 0,005145 | 0,9978 | 0 |

Source: own elaboration based on World Bank's Open Access Indicators System (2020).

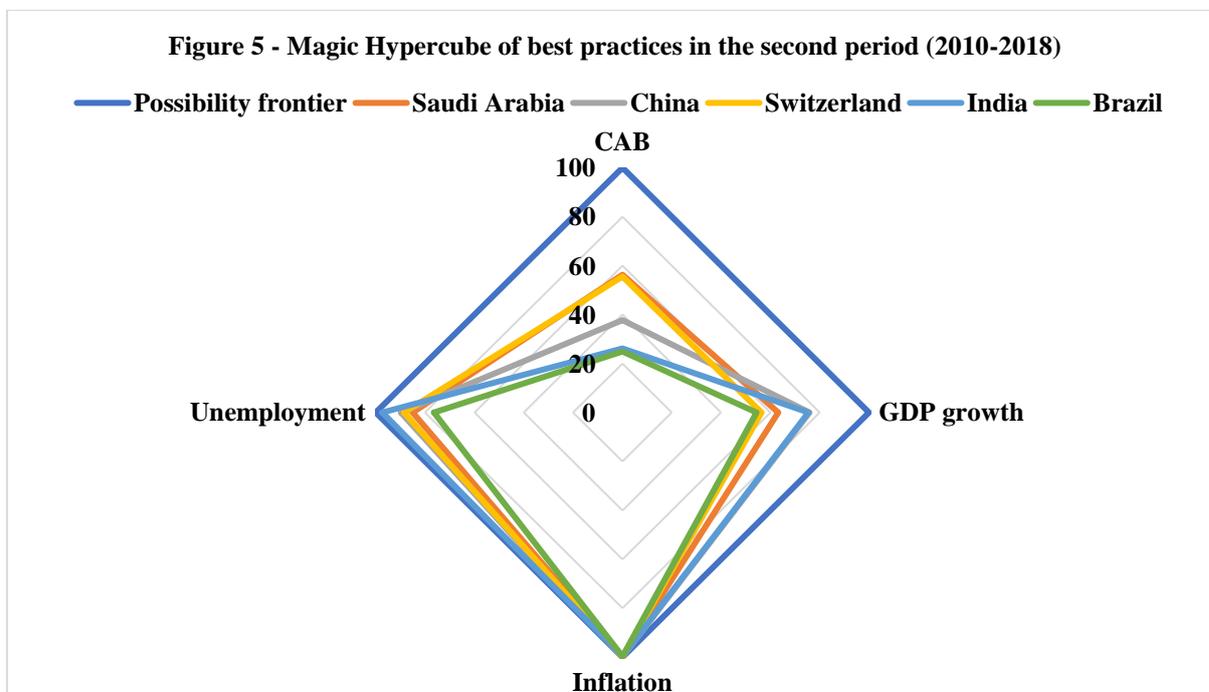
Following in the analysis is the general score of the second period with the same weight for the four variables (table 7). Saudi Arabia is the country with the best performance (score one), followed by China, Switzerland, India and Korea Republic. Brazil (0,838968205) occupies just the seventeenth position, ahead only of mature economies – again all members of the European Union – such as France, Italy and Spain.

Table 7 – General score of the second period with the same weight for the four variables

| Ranking | Country | Score | Ranking | Country | Score |
|---------|--------------|-------------|---------|---------------|-------------|
| 1 | Saudi Arabia | 1 | 11 | Mexico | 0,909771331 |
| 2 | China | 0,996467618 | 12 | Australia | 0,881374583 |
| 3 | Switzerland | 0,987086351 | 13 | United States | 0,878145569 |
| 4 | India | 0,981027772 | 14 | Canada | 0,863013147 |
| 5 | Korea, Rep. | 0,978934824 | 15 | UK | 0,861744474 |
| 6 | Germany | 0,970628915 | 16 | Turkey | 0,842803514 |
| 7 | Netherlands | 0,963822731 | 17 | Brazil | 0,838968205 |
| 8 | Japan | 0,944176009 | 18 | France | 0,833806966 |
| 9 | Indonesia | 0,940697533 | 19 | Italy | 0,821039666 |
| 10 | Russian Fed. | 0,934932351 | 20 | Spain | 0,687008693 |

Source: own elaboration based on World Bank's Open Access Indicators System (2020).

Concerning the analysis of the magic hypercube for the second period (figure 5), equally to the figure 4 it geometrically denotes the limits of a frontier of possibility (wonderland macroeconomic configuration, in blue = 100), the results of the countries that stood out in each of the four variables respectively and the Brazilian performance in relation to it.



Source: own elaboration based on World Bank's Open Access Indicators System (2020).

Once again, the magic hypercube makes evident the distance of Brazil (except in the case of inflation) both in relation to the possibility frontier and the best practices of each leading country relating to a specific variable. From this perspective, the worst performance of the country is in CAB, followed by GDP growth and unemployment.

4.3. Malmquist index and changes of effectiveness and frontier

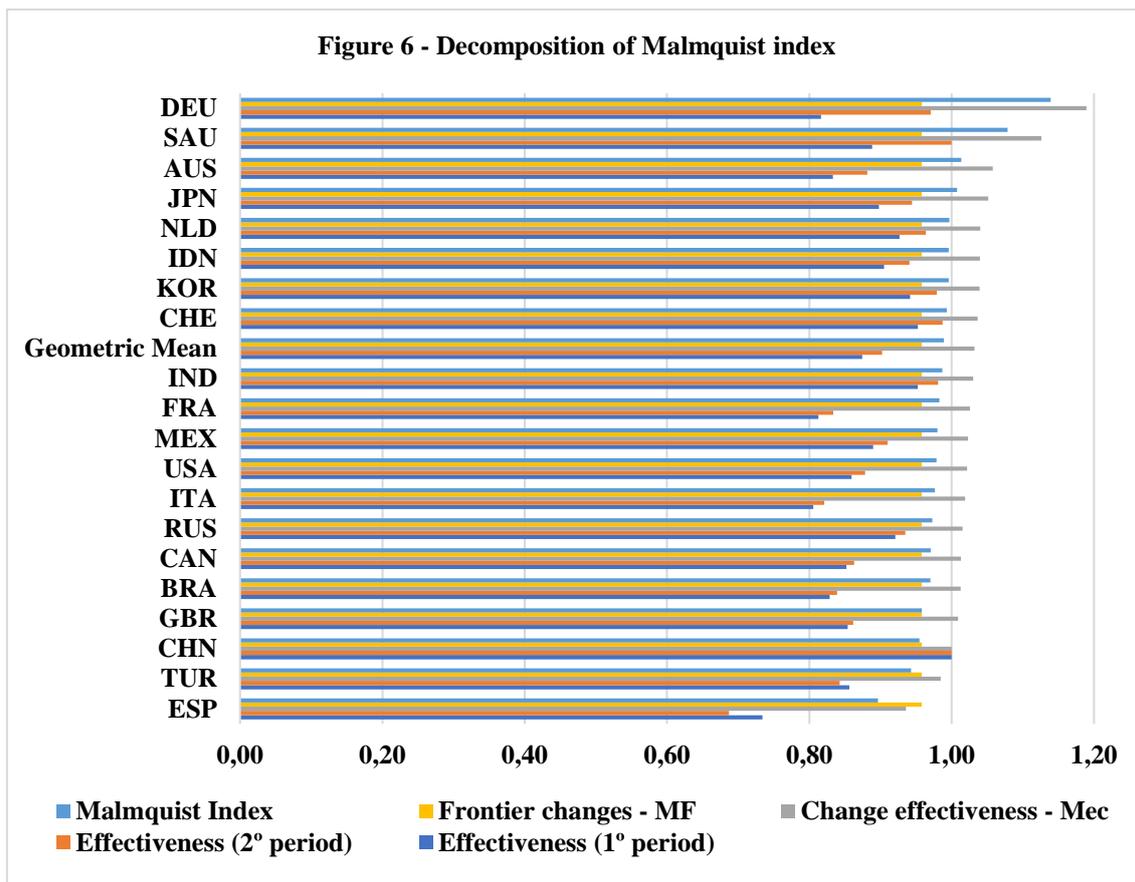
From equation (3.7) and the data obtained, the dynamic index of relative effectiveness (Malmquist index - IDEc) of the selected countries was determined, separated in terms of change of effectiveness (MEc) and changes of frontier (MF) that happened between the two periods. These results were obtained by giving the same weight in the four *kaldorian* variables and are recorded in table 8. Remember that values below the unit here indicate the fall, that is, the negative variation; those greater than one correspond to growth; those equal to one show that there were no changes.

Table 8 – Dynamic index of relative effectiveness (IDEc), changes in effectiveness (MEc) and changes in frontier (MF)

| Country | Change effectiveness | Frontier changes | Malmquist index |
|-----------------------|----------------------|------------------|-----------------|
| Australia | 1.06 | 0.96 | 1.01 |
| Brazil | 1.01 | 0.96 | 0.97 |
| Canada | 1.01 | 0.96 | 0.97 |
| Switzerland | 1.04 | 0.96 | 0.99 |
| China | 1.00 | 0.96 | 0.95 |
| Germany | 1.19 | 0.96 | 1.14 |
| Spain | 0.94 | 0.96 | 0.90 |
| France | 1.03 | 0.96 | 0.98 |
| UK | 1.01 | 0.96 | 0.97 |
| Indonesia | 1.04 | 0.96 | 1.00 |
| India | 1.03 | 0.96 | 0.99 |
| Italy | 1.02 | 0.96 | 0.98 |
| Japan | 1.05 | 0.96 | 1.01 |
| Korea | 1.04 | 0.96 | 1.00 |
| Mexico | 1.02 | 0.96 | 0.98 |
| Netherlands | 1.04 | 0.96 | 1.00 |
| Russian Fed. | 1.02 | 0.96 | 0.97 |
| Saudi Arabia | 1.13 | 0.96 | 1.08 |
| Turkey | 0.98 | 0.96 | 0.94 |
| United states | 1.02 | 0.96 | 0.98 |
| Geometric mean | 1.03 | 0.96 | 0.99 |

Source: own elaboration based on World Bank's Open Access Indicators System (2020).

In the table 8 and in the figure 6 it is observed that the geometric mean of the countries' Malmquist index indicates a reduction of 1% in the effectiveness of macroeconomic policies expressed by the four *kaldorian* variables. This retraction was due to the 4% shift down the border in the second period, because the slow recovery after the 2008-2009 financial crises. It helps to justify why we eliminate these two years of the time series. In this way, we sought to remove the influence of the international financial crisis of 2008-2009 and observe whether the effectiveness of economic policies changes in the period before and after it. However, the geometric mean shows that this effect was dampened by the positive evolution of average effectiveness (3%).



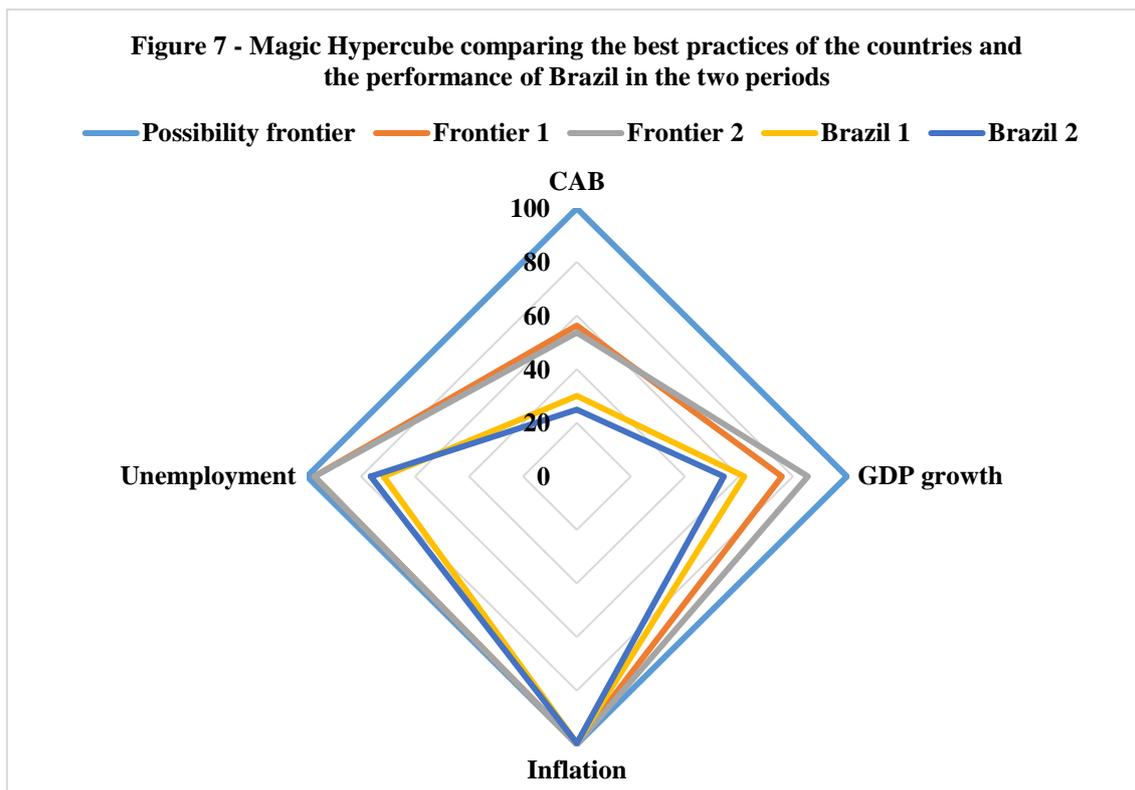
Source: own elaboration based on World Bank's Open Access Indicators System (2020).

In what concerns the magic hypercube (table 9 and figure 7), here we compare the possibility frontier (100) with the frontier achieved in the first and in the second periods, besides the performances of Brazil in the same time frame. In the first case, the frontiers are almost the same for inflation and unemployment, while the second frontier shrinks for CAB and expand considerably in GDP growth (most responsible for the boundary change). For Brazil, we observe that in the second period CAB and GDP growth retract considerably, inflation slightly expand and unemployment expand reasonably.

Table 9 – Comparison of the best practices of the countries and the performance of Brazil in the two periods

| Variable | Frontier 1 | Frontier 2 | Brazil 1 | Brazil 2 |
|---------------------|-------------|-------------|-------------|-------------|
| CAB | 56,28635508 | 53,64972853 | 30,01019953 | 24,90453822 |
| GDP growth | 75,89959733 | 85,5437451 | 61,98900002 | 54,4065145 |
| Inflation | 99,93317039 | 99,93129477 | 99,59625757 | 99,63385901 |
| Unemployment | 97,33011742 | 97,2843721 | 71,62106084 | 76,38692593 |

Source: own elaboration based on World Bank's Open Access Indicators System (2020).



Source: own elaboration based on World Bank's Open Access Indicators System (2020).

In this scenario, Brazil indicates a certain resilience to this shift from the border downwards. The change in Brazilian effectiveness was positive ($IDEc = 1.01$), indicating that it approached the frontier of best practices (figure 6). China, in this context, differently registered a significant drop in the effectiveness of its macroeconomic policy, but, as indicated by its $MEc = 1$ and figure 7, the country remained on the border in both periods.

The (majority of the) other countries have adapted better to changing the border, with emphasis on Germany, Saudi Arabia, Japan and Australia. This gain in relative effectiveness can be interpreted as an indication of the “catching-up” effect of countries that are below the border and of the greater vulnerability of the countries that form the border. If this indication becomes evidence, we can talk about a process of convergence.

5. Concluding remarks

In this chapter, the DEA-Malmquist method enabled to measure the relative effectiveness and frontiers of the twenty selected economies between 1992 and 2018. This was proceeded according to the magic hypercube approach, using the four variables of

Kaldor: CAB, GDP growth, inflation and unemployment. Given the presentation and analysis undertaken along the study, we reached numerical results to capture the global performance of these nations.

In the first period (1992-2007), the magic hypercube makes evident how far Brazil is (except in the case of inflation) both in relation to the possibility frontier (wonderland macroeconomic configuration = 100) and the best practices of each leading country with reference to a specific variable. From this perspective, the worst performance of the country was in Current Account Balance (CAB), followed by GDP growth and unemployment.

In the second period (2010-2018), Brazil's results shows that its CAB and GDP growth retracted considerably, inflation slightly expanded and unemployment expanded reasonably. Thus, it can be seen that there is ample room for improvement of Brazil regarding the frontier of possibilities, since it is far from the leading nations, whatever the criteria discussed along this research.

For the general changes of effectiveness and frontier, it is observed that the geometric mean of the countries' Malmquist index indicates a reduction of 1% in the effectiveness of macroeconomic policies expressed by the four *kaldorian* variables – due to the 4% shifting down the border in the second period. In this perspective, Brazil indicated a certain resilience to this shift from the border downwards, changing its effectiveness positively (approaching the frontier of best practices – the so-called “catching-up” effect).

Consider that the magic hypercube compared the possibility frontier with the frontiers achieved in the first and in the second periods, besides the performances of Brazil in the same periods. In the first case, the frontiers were almost the same for inflation and unemployment, while the second frontier shrunk for CAB and expands considerably in GDP growth. The case of Brazil was a simple (but revealing) juxtaposition of the results of the first and second periods.

These outcomes allows a macroeconomic analysis specifically on how the variable unemployment is being tackled by Brazil compared with other nations, shedding light on some points that may be of interest for reflection and action with regard to the development of the country in general and its world of work in particular. Nevertheless, it should be clarified that this numerical exercise do not intend to explain this variable only by a single (or a set) of indicator(s) derived from one quantitative tool, once it is not enough to capture all the many aspects of the diverse and complex Brazilian labour

market. Besides, we have to be aware that with distinct or additional variables interacting with unemployment we possibly could reveal a different panorama, even more realistic.

In this sense, we agree with Jones (1976, p. 7) when he affirms that “no economic theory could ever be constructed in a total vacuum of no facts at all”. In contrast, he also asserts that “the suggestion that the study of facts can be substitute for, rather than a complement to, explicit theorizing seems very misleading.

That pointed out, it can be assumed that the numerical results found revealed that the unemployment situation in Brazil is consistent with the observable empirical reality. In fact, the movements of the Brazilian labour market with regard to unemployment show great volatility resulting from the different internal and external movements in relation to the other three Kaldor variables. Suffice it to mention that since mid-2014 the unemployment rate has remained at around 12% (with more than 40% of employees performing informal jobs), with a high rate of inflation (above the central target stipulated by monetary policy), low GDP growth and exports basically of low value added commodities (following as dependent on imported technology). It is true that it was not that different since the 1990s, although with some favourable nuance here and there. This pleads the question: are we on the right path for the country’s development?

The fundamental consideration to be highlighted is that in Brazil, labour market institutions are poorly compatible with the desired promotion of business competitiveness and increased investment, generating jobs in unsatisfactory quantity and quality. Essentially, the country has labour market institutions that are not yet fully adequate to promote the effective and sustainable reduction of historically existing unemployment, even though cyclical movements have contributed in specific periods of our history in this aspect. Furthermore, the need for institutional improvements is challenging in order to provide the Brazilian labour market with an arrangement that favours its production to compete in more equitable conditions in the international markets and, at the same time, guarantees the protection of workers in national scope. In this sense, proposals such as the universal minimum income and the state as an employer of last resort are new and promising.

Last but not least, it is worth noting that this research did not intend to exhaust the subject, nor to draw definitive conclusions regarding the theme of (un)employment in Brazil. Actually, the picture that lies ahead is not at all encouraging if deliberate actions are not engendered aiming at a more solid, effective and sustainable reduction in relation to this chronic problem in Brazil and its economy, which affects a large part of its citizens. Indeed, it is urgent to have and implement a national development strategy suited to the twenty-first century and the many challenges in course.

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Conclusion

This doctoral thesis presented and analysed some of the conjunctural and structural factors of the Brazilian labour market mainly in the 21st century. Our central objective was critically examining its dimensions by three distinct (although very connected) angles: innovation, legislation and macroeconomic policies. We seek to expose the magnitude of these issues and to point out alternatives for sustainable development. It allowed the introduction of new elements that contributes to the debate on the category “world of work” in Brazil.

The nexus of convergence established between the Brazilian economy and the three topics was shown to be analytically useful for the investigation of the labour market as a conducting wire of the research. Considering it through the lenses of the heterodox economic framework, we shed light on comprehending the complexity of the theme in a multidisciplinary way, with a focus on socioeconomic and political issues with a human face.

It answered the main question that guided this study, converging the links among innovation, labour legislation and the implementation of macroeconomic policies. It reveals that it is urgent to think and act on these three frontier for the development of any nation these days. For Brazil, in particular, it potentially means its transition from an intermediate economic country to a more relevant space in the concert of nations. Otherwise, it will (again) lose the pace of history.

With this spirit, the first chapter focused on the issue of innovation, examining the advancement of the Fourth Industrial Revolution in developed and developing economies. Our analysis was based on economic literature settled by Ha-Joon Chang. The central concern was that, in addition to the process of technological catching-up, engendering a virtuous circle between 4IR, will require a combination of institutional improvement and social dialogue. It should be done with an active social and political participation, human-centered – with the immersion of Brazil in international and regional development agendas at the domestic and foreign level.

The second chapter addressed the question of the Brazilian labour legislation. It investigated how the recent changes in domestic legislation are acting over the national labour market from 2003 to 2018. On this matter, we concluded that to achieve socioeconomic development, is essential to emulate a legal (labour) regulation that is prone to resolve disagreements and guide conducts that improves the correlations of

forces. Besides, we agree with the justification that balance for the public accounts is relevant in the midst of economic stagnation. The real conflict is in the choice of who should contribute more proportionally to the resolution of this question. In our evaluation, the present-day Brazil's is mistakenly pending this "heavy bill" for workers.

In the third chapter it was used the DEA-Malmquist method to numerically measure the relative effectiveness and frontiers of best practices of twenty selected economies between 1992 and 2018. In this vain, the "Magic Hypercube" approach was applied in the light of the four *kaldorian* variables: current account balance, growth, inflation and unemployment. We hope it is clear that a single quantitative tool may not be able (and in general is not) sufficient to capture the many diversities and complexities of the economy and society.

We consider that, the last magic hypercube, contained in the third chapter, summarized the main encountered results from DEA-Malmquist method. It compared the possibility frontier with the frontiers achieved in the first (1992-2007) and in the second period (2010-2018), besides the performances of Brazil in relation to itself in the same two periods range. In the first case, the frontiers were almost the same for inflation and unemployment, while the second frontier shrunk for CAB and expands considerably in GDP growth. The case of Brazil was a simple (but revealing) juxtaposition of the results of the first and second periods. The main conclusion was that there is ample room for improvement of Brazil regarding the frontier of possibilities (unemployment ahead), since it is far from the leading nations, whatever the criteria discussed along the research.

With regard to the overall conclusion of this doctoral thesis, we asserts that Brazil lacks a national development strategy, which certainly involves improving its labour market, especially in what concerns the three frontier themes discussed here. This is crucial in order to an envision raising the country to the status of a developed nation.

Despite many obstacles to the Brazilian development, there is no doubt that an adequate and aligned to the 21st century labour market is a core question to be tackled to achieve it in a sustainable path. To advance in innovation, legislation and macroeconomic policies are key forces that may drive the socioeconomic process of better opportunities for the whole country and its citizens. In this vain, it is desirable to make substantial changes in what concern competence and political power to implement a sustainable policy of economic development. This should be done taking into account a society's most precious "asset": its people. Policy makers must be aware of it (they need a different mindset) in such a way that attends the reality of the majority of the Brazilian citizenship.

What is clear is that something has gone tragically wrong with the country. The present crisis is not an isolated phenomenon associated with conjunctural problems. Some structural features are responsible for the fact that repercussions caused by long term internal and external reasons have reached the present magnitude and seriousness. If nothing moves in a renewing wind of changes, the next few years seem likely to presenting a vanishing perspective in terms of sustainable development. Once again, the Brazilian labour market plays a central role on this scene.

However, just suggest dialogue regarding possible improvements in the institutional arrangements, specifically with regard to the labour market, is not enough. The society is aiming advances in the sense of not allowing high unemployment and precarious work to rise (see the recent insurgences in many countries of Latin America). It is a fact that issues related to the labour market are complex, since they involve divergent interests. Thus, it cannot be seen as just a conventional market reduced to a competitive price system for allocating scarce resources, as is commonly the traditional focus. A systemic and interdisciplinary approach which considers a sustainable economic process should be (re)thought from a multidimensional perspective, allowing a new and important elements to be included in the discussion in the face of current challenges.

As explained in the general introduction of this study, it is appropriate to offer some suggestions of possible developments that will further favor other approaches and other researches on the subjects at hand. A vast range of specific issues is admittedly very important for the Brazilian labour market debate. Aspects such as job informality, gender, color/race, age group, education, migratory and regional issues. This expands the possibilities for future research. Comparative studies can also be developed, in order to clarify the discussions above and others through quantitative and computational methods, identifying differences and similarities in a broader fields of analysis and understanding the national reality *vis-à-vis* others countries and/or regions. The methodological changes/breaks and their diverse impacts on the results obtained are another interesting field of study, which can be both examined in isolation or permeating the aforementioned researches possibilities.

Nevertheless, the elaboration of researches that uses the approaches proposed by the main theories who guided this study offers another promising possibility of investigation, once that: a) they favor a theoretical foundation shaped by systemic and multidisciplinary theories; b) consider the historical specificities of each period, enabling the evaluation of numerous aspects related to the object of study to be analyzed;

c) relevant quantitative measuring supporting the analysis of economic theory. In fact, the theories used here can be themselves studied both in particular and comparatively in relation to other socioeconomic researchers.

Perhaps we should conclude this doctoral thesis stating that it is not too difficult to make models on stated assumptions. The difficulty is to find the assumptions that are relevant to reality. We think that while our approach captures some important features of reality, there are many factors which have not be taken into account. The value of our approach derives not from its realism but rather from the fact that it helps to lay there some economic problems in countries envisions to orient economic efficiency and effectiveness. We hope the analysis adopted in this research can be expanded or incorporated in a more realistic socioeconomic process.