

BRAZIL AND INDUSTRY 4.0: IMPACTS ON PUBLIC PENSIONS

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SUMMARY: I. *Introduction*. II. *Development*. III. *Conclusions*. IV. *Research Sources*.

I. INTRODUCTION

The Brazilian Constitution of 1988 established a system of social protection called “social security” (or “*seguridade social*” in Portuguese). This system is composed of three subsystems: public healthcare, public pensions, and social assistance.

Public healthcare was universalized under the aforementioned constitution. Thus, everyone has access to public healthcare, regardless of whether or not he or she is a worker. Social assistance (non-contributory protection) aims to protect citizens who are in social need and are not protected by public pensions or family assistance. Its goal is to ensure the minimum needs for dignified survival.

Public pensions is intended for workers and their dependents, and aims to maintain their standards of living by substituting work income. It is divided into mandatory protection and supplementary protection. Mandatory protection, in turn, is subdivided into the General Public Pensions Scheme and Special Scheme Pensions for Public Servants. The former protects all workers, except public servants, who are protected by the scheme instituted by each of the federative entities (i.e. the Federal Government, the States

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and Federal District, and the Municipalities), for the protection of their respective public servants.

Thus, Brazil's General Public Pensions Scheme protects all workers of the private initiative; those with an employment relationship or those who are self-employed (urban and rural).

The aim of this study is to analyse whether the current Brazilian social protection system, especially the public pensions subsystem, is appropriate to face the challenges arising from the implementation of industry 4.0.

This happens because, at the same time as the new technologies represent advances in several areas, in labor relations they have generated concerns; including the significant reduction of jobs, which brings direct reflections on public pensions, since many working-age people will not have access to a job and, therefore, will not have access to public pensions protection. Many workers will lose their jobs, which will require greater resources to ensure the payment of unemployment insurance. And others will still have work for short periods, which will not allow them to fulfil the minimum time for paying their contributions to obtain public pensions benefits, especially retirement benefits, thus not receiving social protection of public pensions and will therefore seek assistance protection.

Accordingly, this study assumes that the new technologies have repercussions on labor relations, especially reducing the number of jobs, particularly those with an employment relationship, which will have repercussions on public pensions protection and also on the financing thereof.

Therefore, this study will not address the repercussions that the new technologies bring to labor relations or the Labor Courts' jurisprudence on the use of the new technologies. Nor will it address recent legislative changes in labor rights. The study will address the impact of Industry 4.0 on public pensions, as well as whether the Brazilian legal system is appropriate to address these effects.

In order to do so, first, some data related to Brazil will be presented and, subsequently, the public pensions system will be contextualized in the Brazilian social security system, also presenting the sources of financing of the social protection system as a whole and, specifically, public pensions. Additionally, a brief demonstration of current expenditures and income from Brazilian social security will be made in order to analyse whether the Brazilian public pensions subsystem is the appropriate one to face the challenges arising from the implementation of industry 4.0 in Brazil, or whether changes are required.

II. DEVELOPMENT

1. *Data relating to Brazil*

Before addressing the topic *per se*, some data will be presented relating to Brazil, which will allow to better contextualize the social protection granted in the nation.

Brazil is a federation composed of the central entity (the Federal Government), 26 States, the Federal District, and 5,570 Municipalities. The Brazilian population in 2018, according to the Brazilian Institute of Geography and Statistics (IBGE) was 208.5 million inhabitants. In the three-month period from May to July 2018, the workforce (employed and unemployed people) – according to the results of the National Household Sample Survey (PNAD)¹ – was estimated at 104.5 million people, of which 91.7 million were employed and 12.9 million were unemployed.

In the aforementioned period, the survey showed that the number of employees in the private sector with a formal work contract was estimated at 33.0 million people, and the number of those without a formal contract was estimated at 11.1 million. Self-employed workers summed up 23.1 million people; employers added up to 4.4 million; and domestic servants numbered 6.3 million people. On the other hand, the number of employees in the public sector (including statutory public servants and military personnel) was estimated at 11.7 million people.

In July 2018, the number of benefits paid by the General Public Pensions Scheme was 30,067,095, not including unemployment insurance. The number of social assistance benefits (benefit in the amount of the federal monthly minimum wage payable to people over 65 years of age and people with disabilities), (also in July 2018) was 4,723,987.²

In 2016,³ the number of contributors (insured persons) of the General Public Pensions Scheme was 52,489,624, of which 40,020,878 were emplo-

¹ Brazilian Institute of Geography and Statistics - IBGE. <https://agenciadenoticias.ibge.gov.br/agencia-sala-de-imprensa/2013-agencia-de-noticias/releases/22389-pnad-continua-taxa-de-desocupacao-e-de-12-3-e-taxa-de-subutilizacao-e-de-24-5-no-trimestre-encerrado-em-julho>.

² Department Of Public Pensions Scheme, Ministry Of Finance, *Statistical Bulletin of Public Pensions Scheme*, Volume 23, p. 28. <http://sa.previdencia.gov.br/site/2018/09/beps18.07.pdf>.

³ Department of Public Pensions Scheme. Ministry of Finance. *Statistical Bulletin of Pub-*

yed; 9,602,543 individual contributors (self-employed workers and employers); 1,540,453 domestic servants; 1,323,375 optional contributors; and 2,375 special insured persons, who pay on an optional basis to obtain benefits above the minimum wage. It is worth noting that, the number of employees includes public servants who are not protected by the Special Scheme Pensions for Public Servants.

The figures above demonstrate the importance of Brazilian social protection, especially the General Public Pensions Scheme, in the social and economic context. They also demonstrate the need for a responsible analysis that allows for the adoption of public policies that ensure sustainability, especially considering the effects of population ageing, as well as the challenges arising from the implementation of Industry 4.0.

In the next section, considerations will be put forth on the social security system, particularly the public pension's subsystem.

2. The Brazilian public pensions system as a subsystem comprising of social security

The Brazilian Constitution of 1988 established a system of social protection, called social security, which aims to protect everyone in situations of need. This system comprises a set of initiatives of Public Authorities and society, aimed at ensuring the rights related to healthcare, public pensions, and social assistance.

Thus, the Brazilian social security system must be seen as a system of social protection that is composed of three subsystems: healthcare, public pensions, and social assistance.

Regarding the healthcare subsystem, Brazil's Constitution established universal and equal access to public healthcare, and infra-constitutional legislation provided for free access to public health services, regardless of the economic situation of the user. Prior to 1988, healthcare was directed at workers and their dependents, but since then, there is no difference in access and care between a worker and a person who does not work.

As mentioned previously, Brazil adopted the federative form and, for this reason, the Constitution establishes both the attribution of each of the federative entities for the realization of the rights prescribed therein, as well

lic Pensions, Volume 23, p. 04. <http://sa.previdencia.gov.br/site/2018/09/beps18.07.pdf>. Date of consultation: 09/30/2018. It should also be noted that the data for 2016 is presented by the Department of Public Pensions in the Statistical Bulletin of July 2018.

as the competence to legislate on the matter, including to establish taxes, aimed at funding such rights.

In this regard, in relation to the responsibility for the realization of the right to healthcare, the Constitution stipulates that the administrative competence belongs to all entities of the federation, which executes it through Brazil's National Health System, known as "SUS" ("*Sistema Único de Saúde*" in Portuguese). Financing is guaranteed by the social contributions instituted by the Federal Government and by the revenue from the taxes of each of the federative entities.

Social assistance (non-contributory protection) aims to protect citizens in a situation of social need, who are not protected by public pensions or family assistance. Its objective is to ensure the minimum necessary for survival.

As in the case of healthcare, the federative entities are responsible for the implementation of social assistance policies, which are coordinated by the Unified Social Assistance System, although the two main pecuniary benefits are the responsibility of the Federal Government - family allowance ("*bolsa família*" in Portuguese) and the benefit of continuous receipt of minimum wage payable to seniors (aged 65 years or over) and people with disabilities. The funding of the foregoing benefits is through the social contributions established by the Federal Government.

Social security services, as a rule, are carried out by the States and Municipalities with funds from tax revenues of the federative entities and grants from the Union (which is entitled to institute social contributions earmarked for social protection and, therefore, for social assistance as well).

The public pensions system, in turn, is intended for workers and their dependents and aims to guarantee resources in situations where such resources cannot be obtained by the workers themselves. The aforementioned subsystem is aimed at maintaining the standard of living of those who live off the fruits of labor.

However, unlike the other two areas of social security, public pensions require the insured person to provide consideration so that they and/or their dependents will be entitled to public welfare benefits. The aforementioned consideration is provided through payment of public pensions contributions.

Thus, public pensions assumes the exercise of paid activity and direct consideration from the insured person, which attributes a professional-contributory nature thereto.

The public pensions system is divided into mandatory protection and supplementary protection. Mandatory public pensions is subdivided into General Public Pensions Scheme (protects all workers except public servants) and Special Scheme Pensions for Public Servants (directed only to public servants holding regular positions) and is aimed at protecting all workers, up to a certain limit.⁴

The Constitution also provides for supplementary pension, which aims to protect workers who receive remuneration above the public pensions ceiling. The aforementioned protection is optional.

The financial regime of both mandatory systems (General Public Pensions Scheme and Special Scheme Pensions for Public Servants) is known as a simple distribution system (i.e. “pay as you go”). Its benefits are defined by the Constitution and infra-constitutional legislation.

The General Public Pensions Scheme is the responsibility of the Federal Government, and the benefits are administered by the National Institute of Social Insurance (a federal authority). Social contributions are collected by the Brazilian Federal Revenue Service.

The Specials Schemes Pensions for Public Servants were created by the respective federative entities to protect their public servants holding regular positions. Brazil is a federative republic, the federative entities are the Federal Government, the States (26), the Federal District (Brasília), and the Municipalities (currently 5,570).

The Federal Government, all of the States, the Federal District and approximately 40 per cent⁵ of the Municipalities have instituted Scheme Pensions for their respective public servants.

The servants of Municipalities that have not instituted their own scheme pensions are linked to the General Public Pensions Scheme, which protects all workers except the public servants who are linked to the Special Scheme Pensions for Public Servants of the federative entities that instituted such scheme.

For employees who joined public service up to the publication of Constitutional Amendment 41/2003, retirement based on the time of contribu-

⁴ The ceiling of protection of the General Public Pensions Scheme, for 2018, is R\$ 5,645.80.

⁵ Although only 40 per cent of the municipalities have instituted public pensions for their servants, these are the most populous Municipalities, accounting for 70 per cent of all municipal public servants. It is worth noting that in Brazil there is a municipality with more than 12 million inhabitants (Municipality of São Paulo) and there are municipalities with fewer than one thousand inhabitants, which justifies the foregoing percentages.

tion corresponds to the last remuneration, provided that the requirements established in the transition rules are fulfilled. For employees who joined public service after the aforementioned constitutional amendment, benefits are calculated based on the average remuneration.

In addition, constitutional amendments allowed the federative entities to adopt the same protection ceiling of the General Public Pensions Scheme (the ceiling for 2018 is R\$ 5,645.80),⁶ for the Special Scheme Pensions of their servants.

Article 201 of the Brazilian Constitution states the rules applicable to the General Public Pensions Scheme. The precepts directed to Special Scheme Pensions for Public Servants are set forth in Article 40 of the Constitution.

The precepts of the Special Scheme Pensions for Public Servants do not apply to military servants. The rules addressed to them are established only in infra-constitutional legislation.

Union military personnel do not contribute to their retirement, but only for pensions directed to their dependents. In some states, military personnel also contribute toward their retirement, as is the case in the State of São Paulo.

Therefore, all Brazilian workers are protected by the General Public Pensions Scheme, except for public servants (who hold regular positions), of the federative entities that have instituted Special Scheme Pensions for Public Servants, and military personnel.

Thus, the General Public Pensions Scheme encompasses all workers of the private sector, public servants who do not hold regular full-time positions (positions in commission, temporary agents, etc.) and servants who hold regular positions of the federative entities that have not established Special Pensions Scheme for them.

The General Public Pensions Scheme calls all workers “mandatory insured persons” and subdivides them into five groups: employees, domestic servants, temporary workers,⁷ individual contributors (self-employed workers and employers) and special insured persons (small farmers and artisanal

⁶ The federative entities may adopt the same protection ceiling of the General Public Pensions Scheme, provided that they institute supplementary pension plans for their employees. There are entities that have already adopted it, as is the case of the Federal Government (central entity) and several States, including São Paulo, Rio de Janeiro, and Rio Grande do Sul.

⁷ Workers – whether unionized or not – who provide services of an urban or rural nature to several companies, without an employment relationship, with the mandatory inter-

fishermen). All those who exercise paid activity and are not servants holding regular positions or military personnel shall be included in one of the types mentioned. Therefore, the Brazilian General Public Pensions Scheme included all types of paid work, whether through employment relationship or self-employment, both urban and rural workers.

Although all workers are included as mandatory insured persons under the General Public Pensions Scheme, the legislation sometimes states different obligations and benefits. For example, as a rule, the contribution of employees (with an employment relationship), domestic servants and temporary workers is 8, 9 or 11 percent of remuneration, while the contribution of individual contributors is 20 percent, which may be 5 or 11 per cent, cases in which they will not be entitled to retirement based on time of contribution and will receive benefits in the minimum amount (equal to the federal minimum wage). If a self-employed worker works for a company, without an employment relationship, he or she will pay the 11 per cent rate and have access to all the benefits.

The contribution of special insured persons (small farmers and artisanal fishermen) is different from the contribution of other mandatory insured persons, since it is not levied on the remuneration of the work, but rather on the proceeds from the marketing of their production. In this case, they will receive benefits equal to the amount of the minimum wage.

In addition to mandatory insured persons (workers), Brazilian legislation admits that those who do not exercise paid activity can be insured under the General Public Pensions Scheme, under the condition of “optional”.

The law does not require any prerequisite for someone who is not a worker, to enrol in system public pensions, as an optional insured person, unless they are over 16 years of age and pay the corresponding contributions to the General Public Pensions Scheme. Nor does it impose any restriction on access to benefits, because it grants the same benefits to optional insured persons as it grants to individual contributors.

In addition to mandatory protection, the Constitution provides for supplementary pension, which is optional and has the purpose of allowing the continuity of the same standard of living that the worker had when he or she worked,⁸ especially when his or her income exceeds the ceiling of

mediation of the labor manager or trade union of the category. For example, workers who perform wharfage activity.

⁸ According to the Beveridge Report, supplementary pension meets the real needs of workers. BEVERIDGE, William. *Seguro social y servicios afines: informe de Lord Beveridge*, Madrid,

mandatory protection. The aforementioned protection, which is private in nature, is organized independently in relation to mandatory protection. Its financial system is a capitalization system.

Supplementary pension is regulated by infra-constitutional legislation, and is operated by closed (non-profit) entities and open entities. It is regulated, supervised and overseen by the Federal Government.

Thus, it is verified that Brazilian social security is a system of social protection formed by the subsystems of healthcare, public pensions and social assistance. In order to ensure entitlement to the benefits of the aforementioned system, the Brazilian Constitution sets out the means of financing, to be borne by all of society, which will be the object of the next section.

3. *The financing of social security*

As previously mentioned, the Brazilian social protection system is financed by all of society, directly and indirectly, under the terms of Article 195⁹ of the Constitution. The indirect form is affected by the allocation of resources of the fiscal budget of each of the federative entities, especially from tax revenue. For example, there are the rules that require the Federal Government, the States, the Federal District and the Municipalities to allocate a percentage of the tax revenue to healthcare.

Centro de Publicaciones del Ministerio de Trabajo y Seguridad Social, 1989, p. 240.

⁹ Article 195 of the Brazilian Constitution: Social security shall be financed by all of society, either directly or indirectly, as provided by law, with funds coming from the budgets of the Federal Government, the States, the Federal District and the municipalities and from the following social contributions:

I – of employers, companies, and entities defined by law as being comparable to companies, assessed on:

a) the payroll and other labor earnings paid or credited, for any purpose, to individuals who render services thereto, even when there is no employment bond;

b) income or revenues;

c) profits;

II – of workers and other persons insured by public pensions, no contribution being assessed on retirement pensions and other pensions granted by the general public pensions scheme referred to in article 201;

III – on revenues from lotteries.

IV – of importers of goods or services from other countries, or of other parties defined by law as being comparable to such importers.

The direct form is carried out through the payment of social contributions, which are presumed in the Constitution and, according to the Federal Supreme Court, have a tax nature.

The Brazilian Constitution, by virtue of the adopted form of state (federalism), establishes rules that ensure funds to all federative entities, so that they can fulfil the duties attributed thereto. The aforementioned funds come primarily from their respective tax competencies, as well as transfers¹⁰ of tax resources.

In this regard, the Brazilian Constitution of 1988 establishes that all federative entities have the power to institute taxes, having distributed specific triggering events to each of the entities.

However, it attributed to the Federal Government only the competence to institute social contributions, among those which are destined to social protection (social security). The only exception for the institution of contribution by the States, Federal District and Municipalities is the social contribution of their respective public servants, which is directed to the respective Systems of protection.

Thus, the competence to institute social security contributions, as a general rule, is the responsibility of the Federal Government, since the States, the Federal District and the Municipalities only have the authority to institute a social contribution of their respective public servants.

The Constitution establishes the assumptions of seven contributions allocated to social security. Six are set forth in Article 195 of the Constitution (contribution of the company on payroll and other income paid to individuals, even if without an employment relationship; company contribution on revenue or billing; company contribution on earnings; workers' contribution; contribution on revenue from lotteries; and the contribution from importers of goods or services from abroad), and one is set forth in Article 239 (contribution to the Social Integration Program / Public Servant Savings Program - PIS/PASEP-, which, as a general rule, also affects companies' revenue).

The company's contributions on payroll and the workers' contribution are exclusively allocated to the payment of the General Public Pensions Scheme's benefits. As a result, the two contributions are called "public pensions contributions". Furthermore, the contribution to PIS/PASEP (also

¹⁰ Transfers of tax resources from one federative entity to another: from the Federal Government to the States and to the Municipalities, and from the States to the Municipalities.

paid by the companies), is earmarked for the payment of unemployment insurance, which is also a benefit of the public pension system.

Therefore, there are seven contributions destined to social security (social protection) and, although three of them are linked only to public pension, it is possible to call them “social security contributions”, since public pension is one of the subsystems of social security. The other contributions (the remaining four) can also be allocated to public pension, since they are intended for social security as a whole.

However, this does not mean that all of them must be attributed to public pension, since – in addition to public pension – healthcare and social assistance are also part of social security and require funds.

Thus, the other four contributions (from the company on revenue or billing, from the company on earnings, from lottery revenue, and from the importation of goods or services) should be allocated to the three social security subsystems and should meet the interests of the entire population and not only a part of it, as is the case of public pension recipients (only workers and their dependents).

It is worth mentioning, considering the subject matter of this study, that the Brazilian Constitution states, in Article 195, §9°, that the company’s social contributions “may have differentiated rates or assessment bases, according to the economic activity, the intensive use of workforce, the size of the company, or the structural situation of the labor market.”

Hence, one can see that the Brazilian Constitution authorizes lawmakers to establish differentiated rates and assessment bases for social protection contributions, among other things, by virtue of intensive use of labor.

Accordingly, if the use of new technologies reduces the use of labor, the company may – if the legislation so determines – contribute at higher rates or even calculated from different assessment bases.

Finally, it is worth noting that the contributions from public servants and contributions from the States and Federal District, on the remuneration of their public servants, are exclusively allocated to the payment of the benefits of the Special Scheme Pensions for Public Servants.

Given the social contributions destined to social security, the next section will address the main aspects of public pensions contributions.

A. *The contributions to public pensions system*

Public Pensions, as mentioned above, aims to protect workers and their dependents in situations of incapacity to work (real or presumed), substituting work income, for public pension's benefits. This gives it its "professional" characteristic. The other "contributory" characteristic derives from the need for direct contribution of the workers, not only those linked to the General Public Pensions Scheme, but also civil servants linked to the Scheme Pensions for Public Servants.

Thus, because public pensions have both professional and contributory characteristics, public pensions contributions must be assessed on the income earned through the performance of work activity. As a result, the calculation base thereof is income from work, assessed both for those who receive the remuneration (workers, including public servants) and those who benefit from their work and therefore pay the remuneration (employers and federative entities, the latter with regard to public servants).

In this sense, the Constitution establishes that earnings from work are considered for the purposes of contribution and repercussion on benefits. This means that workers pay contributions on their remuneration and the public pensions benefits they receive are related to their income. It is precisely for this reason that one can affirm that the aim of public pensions is to substitute income from work in order to maintain the worker's standard of living.

This is the basis of the contribution of the company on payroll as well as that of the worker, in addition to the contributions of the public servants and the federative entities that remunerate them.

Both contributions on work income (of the one who pays and the one who receives) form the basis for the financing of the social insurance model implemented by Bismarck in Germany in 1883. Such model was followed by the Eloy Chaves Act of 1923, considered the first Brazilian public pensions law, and by all subsequent public pensions laws that followed.

The Brazilian Constitution of 1988 maintained the aforementioned form of financing but, additionally, it established other bases for financing social protection, especially in view of the increase in protection, since it instituted non-contributory protection (social assistance) as a subjective right, and universal access to public healthcare, as previously mentioned in this study.

The only exception – that the public pensions contribution is assessed on work remuneration – is related to the contribution of special insured persons (small farmers and artisanal fishermen), who pay a public pensions contribution on the proceeds from the marketing of their production. This form of financing has existed since 1971, when public pensions protection was established for rural workers, having had a specific scheme of protection up to the 1988 Constitution.

The Brazilian Constitution of 1988, although maintaining this form of financing for one kind of rural worker (specially insured, small farmers and artisanal fishermen), included them in the General Public Pensions Scheme. It is worth noting that the other rural workers' pay contributions as urban workers do, i.e., on remuneration from work activity.

As previously mentioned, the Brazilian General Public Pensions Scheme includes all workers, except the public servants of federative entities that have instituted protection to their own servants. This happens because, if the federative entity has not created a Special Scheme Pensions for its public servants, the respective public servants are also linked to the General Public Pensions Scheme.

The revenue of both contributions (of the company on payroll and of the worker) is exclusively allocated to the payment of the benefits of the General Public Pensions Scheme. The contributions of public servants and federative entities are also earmarked to pay the benefits paid by the Special Scheme Pensions for Public Servants.

The Constitution, by establishing the “worker” as a participant in the funding of public pensions, included all forms of service provision. This is because, unlike the other two areas of social security, public pensions require a contribution from workers so that they and/or their dependents are entitled to public pensions benefits. Therefore, regardless of how the service is provided, workers must contribute to public pensions.

In this regard, Law 8212/1991 states that workers are considered mandatory insured persons for the purposes of public pensions and are classified into five¹¹ types: employee, domestic servant, temporary worker, special insured worker, and individual contributor (self-employed workers, including employers).

¹¹ It is worth noting that until the enactment of Law 9876/99, there were seven types of mandatory insured persons. The aforementioned law created the “individual contributor” type by uniting self-employed workers, workers considered as equivalent to self-employed workers, and business owners, since not only the benefits but also the contributions were the same for the three types of insured persons.

The calculation base of public pension's contributions, both of the company that remunerates workers and the workers themselves, is based on one's remuneration from work, except for the contribution of special insured persons, which is assessed on the proceeds from the marketing of their production, as mentioned above.

It is thus verified that the contributions exclusively for public pensions purposes are assessed on remuneration from work. Accordingly, if there is a significant reduction of jobs, especially those with an employment relationship, there will also be a reduction in the inflow of public pensions contributions. This will require the use of more resources from other contributions, which may jeopardize the sustainability of both public pensions and social security as a whole.

It was mentioned that the situation worsens when the number of jobs with an employment relationship decreases, because the company's contribution on remuneration from work represents, on average, to twice the percentage paid by the worker. This is because, while employees pay 8, 9 or 11 percent of their remuneration, limited to the protection ceiling, the company pays 20 per cent of the total remuneration, even if it exceeds that ceiling. In addition to the aforementioned percentage, the company pays another 1, 2 or 3 per cent for occupational accident insurance. These additional payments may be reduced by 50 per cent or increased by 100 per cent, depending on the company's performance, in relation to the measures taken to prevent work-related accidents.

Thus, although self-employed workers are included in the General Public Pensions Scheme and their benefits are the same as those of employees, the amount paid by them, as a rule, is 20 percent of the maximum, up to the ceiling paid by General Public Pensions Scheme. When they pay their contribution based on the minimum wage in order to receive benefits of the same amount, the rate can be 11 or 5 percent.

It should be noted that if the self-employed worker provides a service to a company, he or she pays 11 per cent, but the company, in this case, pays 20 percent of what it pays to the worker, without application of the maximum limit. It is also worth noting that, since 2003, Brazilian legislation requires the company to withhold the contribution of workers who provide services without an employment relationship and pay to public pensions, which had already been occurring with employees.

Such a measure was adopted in order to reduce the percentage of workers who are engaged in paid employment without an employment relationship, who do not pay public pensions contributions.

However, this only occurs when the worker provides services to a company. When he or she is self-employed and does not receive remuneration from a company, but rather from individuals, he or she must pay the corresponding contributions, which often does not occur.

Non-payment is even greater in cases where the self-employed worker is low-income, since Brazilian social assistance (non-contributory protection) grants a benefit equal to the amount of minimum wage to senior citizens (over 65 years of age) and persons with disabilities, who do not have financial conditions for their upkeep. The amount of said benefit, which is equal to the lowest benefit paid by public pensions, has discouraged the payment of public pensions contributions so as to obtain future public pensions protection.

Under Brazilian law, self-employed workers (even when working for a company with no employment relationship), as well as business owners who work at the company, are called individual contributors and, as already mentioned, are included in the protection granted by the General Public Pensions Scheme.

Therefore, even with the reduction of jobs with an employment relationship, Brazilian system of public pensions protects all workers, regardless of whether they are employed or self-employed.

The problem is whether self-employed workers pay or do not pay social contributions, because if they do not pay these contributions, they will not be protected. Moreover, when there is no employment relationship, the inflows are smaller, since there is no contribution from the company.

Thus, despite the fact that Brazilian system of public pensions includes all workers, the shift in labor relations – resulting from the use of new technologies – may jeopardize the sustainability of the public pensions system specifically, and of social security as a whole, which will be the object of analysis in the next section.

4. The impacts of industry 4.0 on Brazilian system public of pensions

As mentioned above, the system of public pensions protects workers, but, in order to do so, it requires them and those who use their services (if a legal entity) to pay social contributions, which are assessed on income from work.

These contributions represent the basis of financing of the public pension system. This is because the company's contributions on payroll and the

workers' contributions, as mentioned above, are exclusively allocated to pay the benefits of the General Public Pensions Scheme (administered by the National Institute of Social Insurance). The same happens with the contributions of public servants and contributions of the federative entities, which are assigned only for the payment of the benefits of the Special Scheme Pensions for Public Servants.

Therefore, the financing of Brazilian public pensions corresponds to the model of protection established by Bismarck (social insurance) in 1883, with some particular traits.

It is noteworthy that this model was maintained in the protection conceived by Beveridge, which – in addition to mandatory social insurance – provided for access to healthcare for all and social assistance for people who were not socially insured and who needed protection. It also established voluntary insurance, with the aim of providing protection beyond the protection limit established by mandatory insurance. Therefore, the Beveridge model is a mixed model, since it combines both contributory and non-contributory protection.

So, in addition to maintaining social insurance and making it mandatory for all workers, Beveridge considered it the main form of protection, since social assistance (non-contributory protection) would be subsidiary.

The Brazilian Constitution of 1988 adopted a model very similar to the one proposed by Beveridge, because in addition to maintaining Bismarck's model for public pensions, it guaranteed universal access to healthcare and social assistance to those in need, regardless of contribution.

Regarding workers' protection, contributory protection has been maintained, and social contributions, as a general rule, are assessed on remuneration from work (both for workers and for those who use their services, if they are legal entities). The benefits are calculated based on the average remuneration, except for specially insured persons (small farmers and artisanal fishermen) who, because they do not pay their contributions on work remuneration (the contribution is assessed based on the proceeds from the marketing of their production), their benefits always correspond to the amount of minimum wage.

One difference of Brazilian social protection, in relation to the Beveridge model, lies in the fact that the non-contributory benefit corresponds to the minimum limit of the contributory benefits, which, in a way, ends up discouraging the payment of contributions to public pension. As mentioned previously, this occurs when workers receive low income and the payment of contributions depends on the initiative of the workers themselves.

In the Brazilian model, contributions on remuneration from work represent the basis of financing of the public pensions system, as mentioned above. Thus, if there are losses of jobs, there will automatically be less revenue from these contributions, which will require more resources from other contributions to maintain the benefits already granted.

This is because both the General Public Pensions Scheme and the Public Servants' Scheme adopt a simple distribution system (i.e. "pay as you go"). Therefore, the contributions that are collected from active workers are used to pay the benefits to the current beneficiaries. This is the inter-generational pact, although currently – in the case of Brazil – it is not only the contributions of workers and companies on the remuneration from work that finance public pension, since funds from other social contributions mentioned above are increasingly being used.

Accordingly, in 2015, according to the Summary Report of the Federal Government Budgetary Execution,¹² the Federal Government spent 431 billion *reais* on the payment of General Public Pensions Benefits, and the income from the company's contributions on remuneration from work and the contribution of workers totalled 324 billion *reais*.

Thus, since the expenses on the General Public Pensions Scheme were 431 billion *reais* and the income from contributions, exclusively for the payment of the benefits of said system, were 324 billion *reais*, the difference of 107 billion *reais* was paid with the revenue from other social security contributions.

It is worth noting that the aforementioned amounts do not include the payment of unemployment insurance, which, also in 2015, exceeded the amount of 40 billion *reais*. Therefore, only with the workers' public pensions in general, excluding public servants,¹³ more than 470 billion *reais* were spent.

Also, in that year (2015), the total income from the seven social contributions was 670 billion *reais*, which – in addition to public pensions – were allocated to healthcare (102 billion *reais*) and social assistance (73 billion *reais*).

¹² Summary Report of the Federal Government Budgetary Execution Brasília, DF. National Treasury. 2015. <https://www.tesouro.fazenda.gov.br/documents/10180/352657/RRO-dez2015.pdf/a6524837-7907-4716-b607-062d8b081c61>

¹³ In 2015, the Federal Government spent the amount of 104.6 billion *reais* on the Special Scheme Pensions for Public Servants and on the payment of the reserve of its military personnel. This amount does not include the expenses of the States, the Federal District and the Municipalities on the public pensions of their respective public servants.

In 2016,¹⁴ the Federal Government's expenses on benefits from the General Public Pensions Scheme were 499 billion *reais*. This amount does not include expenditure on unemployment insurance. Income from contributions from companies assessed on remuneration from work plus workers' contributions totalled 360 billion *reais*, which means that 139 billion *reais*, allocated to the payment of the benefits of the General Public Pensions Scheme, refer to revenue from the other social security contributions.

In 2017,¹⁵ 549 billion *reais* were spent on the payment of the benefits of the General Public Pensions Scheme, and around 50 billion spent on unemployment insurance, which amounts to nearly 600 billion *reais* on public pensions, without including the amount allocated to the payment of public pensions benefits for civilian and military public servants.

In the analysis of the data above, especially those related to the Brazilian General Public Pensions Scheme and unemployment insurance, in the last three years, it was found that expenditure has increased at a greater proportion than the amount collected, and this alone would already be quite troubling.

However, there are two factors that will certainly aggravate the situation described above: longevity of the population, which is already demonstrating the challenges that must be faced in all areas of social security and, therefore, also in public pensions; and the effects of Industry 4.0, since estimates indicate that there will be fewer jobs, especially those with an employment bond.

Said decrease in jobs will lead, among other consequences, to the reduction of income from public pension's contributions, since, with fewer people working, there will be a reduction of remuneration from work (the basis of assessment of social contributions). Hence, there will be a need to increase revenues to finance social protection or to make adjustments to existing ones.

However, public pension's expenditures will not decrease, because the benefits that are currently being paid will be maintained, and for a longer period of time as a result of increased longevity. Therefore, there will be a decrease in specific revenue to public pensions, by at least maintaining expenses related to public pensions benefits.

¹⁴ Summary Report of the Federal Government Budgetary Execution Brasília, DF. National Treasury. 2015. <<http://www.tesouro.fazenda.gov.br/documents/10180/352657/RROdez2016.pdf/19a25934-21d9-4e40-9304-a488555c8dbf>>

¹⁵ National Treasury. *Summary Report on Federal Government Budgetary Execution – 2017*. <http://www.tesouro.fazenda.gov.br/documents/10180/352657/RREOdez2017.pdf>.

Furthermore, the reduction of jobs will increase claims for unemployment insurance, and, accordingly, there will be an increase in expenses, which will require resources from other contributions, in addition to those from the PIS/PASEP contributions. Unemployment insurance is a public pensions benefit, although in Brazil, it is not paid by the National Institute of Social Insurance.

It should also be emphasized that there will be a larger contingent of people who will seek non-contributory protection (social assistance), since many will not even perform work activities, and others, even if they do, will do so for brief periods of time, thereby not fulfilling the minimum time required for the granting of social protection. This is because, as a general rule, the legislation requires a minimum number of contributions for the benefits to be granted. Thus, only workers who pay contributions for the period established in the legislation (Federal Law 8213/1991) will have access to social protection.

It should be noted that the amplitude of the Brazilian General Public Pensions Scheme is a positive factor, given the changes in labor arising from new technologies, because it includes all workers except public servants, who are protected by Special Scheme Pensions allocated specifically to them.

Thus, the reduction in the number of jobs with an employment bond will not exclude the public pensions' protection of self-employed workers, which appears to be a trend with the advancement of new technologies.

For example, drivers who provide private urban passenger transportation services through apps or network communication platforms are mandatory insured persons under the General Public Pensions Scheme, with the status of individual contributor (self-employed worker) and must pay the corresponding contributions in order to obtain the benefits.

However, it has been found that many individual contributors do not pay the due contributions and therefore will not have access to the corresponding benefits.

In light of this, the law should be amended in such a way as to ensure the registration of self-employed workers in public pensions, as well as the regular payment of the corresponding contributions, which can be done by assigning to third parties (such as the platform administrators) the responsibility for withholding and paying the contributions.

In this regard, Federal Law 13.640 of March 26th, 2018 set out the new wording to Federal Law 12.587/2012 (act establishing the National Policy on Urban Mobility), determining the competence of Municipalities and the Federal District to regulate and oversee paid individual private passenger

transportation services, for individualized or shared trips, requested exclusively by users previously registered in apps or other network communication platforms.

In said regulation and oversight activities, the Municipalities and the Federal District must observe the following guidelines: effective collection of municipal taxes due for the provision of the service; requirement to purchase Personal Accident Insurance for Passengers and Compulsory Insurance for Personal Injury caused by Road Vehicles; and requirement for the driver to be registered as an individual contributor to the General Public Pensions Scheme.

Regarding the requirement to register as an individual contributor, the aforementioned legislative amendment is awaiting regulation, by means of a federal decree, since the Federal Government is responsible for the General Public Pensions Scheme, which it administers through the National Institute of Social Insurance.

It should be noted that the Funding Act can also be amended to make platform administrators responsible for the withholding and payment of contributions.

The foregoing regulation shows that the legal system can and should be changed, aimed at the effective registration and payment of contributions, with the corresponding future protection provided by public pensions.

Therefore, the modification of the way in which work will be performed – whether with or without an employment relationship – will not be a factor of absence of protection in Brazil, especially if legislative measures are adopted with respect to the responsibility for the withholding and payment of contributions on remuneration from “new” work.

What may occur is the even greater insufficiency of revenue from contributions, on remuneration from work, for the payment of the benefits of the General Public Pensions Scheme.

In this context it should be analysed whether the current rates, payable by workers and companies on work remuneration are sufficient to ensure financial and actuarial equilibrium, as referred to in the Brazilian Constitution, or whether they need to be adjusted. However, this can be subject to adjustments in infra-constitutional legislation.

And, as already seen, infra-constitutional lawmakers may increase rates or change the calculation basis of companies’ contributions in the event of a reduction in the use of workforce.

Finally, it should be analysed whether the Brazilian public pensions model, set forth in the 1988 Constitution, is suitable for the current context,

or whether a model with a financial capitalization system should be adopted, which complements a basic non-contributory income guaranteed to all. In this model, only contributions levied on remuneration from work would finance public pension's benefits.

However, in order to adopt such a model, there would be a transition cost, since current benefits should be guaranteed by means other than contributions on income from work. Therefore, any measure should be preceded by feasibility studies that also consider the aspects of social and fiscal justice.

III. CONCLUSIONS

In the course of this study, it was verified that Brazilian public pensions are just one part of a larger context of social protection, which the Brazilian Constitution of 1988 designates as "social security." This system, in addition to public pensions, consists of social assistance and public healthcare.

It was verified that there are seven social contributions allocated to the financing thereof, two of them being exclusively assigned for the payment of the benefits due by the General Public Pensions Scheme, which are insufficient, so part of the revenues from the other contributions are used, which are intended for the social security system as a whole, and not just for public pensions.

It was also found that expenditures on public pension benefits have increased, at higher percentages than the increase in revenue, which in mid-term may jeopardize the effectiveness of other social security rights (public healthcare and social assistance).

In light of the foregoing, Brazilian society, through its representatives, may decide that – even in the face of insufficient contributions on work remuneration, which even tends to increase with the advance of Industry 4.0 – the current model should be maintained, with or without adjustments, even to the detriment of other social security rights.

Or, on the contrary, it may decide that the Brazilian State should guarantee a basic income to all (non-contributory) and that public pensions' protection should be granted only in a financial model of capitalization. However, as seen previously, there is a transition cost, which may make it impossible to do so.

At any rate, the continuation of the current model, without any adjustment, or continuation thereof with the adoption of adjustments, or even a

change of model, should be preceded by clarification and transparency of data. This must be done in a responsible manner, in order not to jeopardize the rights of future generations or the effectiveness of other current rights, both within the social security system (including public healthcare and social assistance) and outside it, such as education, which is essential to address the new context created by Industry 4.0.

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