Forum: Practical Perspectives

Saving more than R$ 85 billion of the Brazilian Social Security System: the case of the PRBI

Vinícius Botelho [1]
Raquel Maria Soares Freitas [2]
Alberto Beltrame [3]

[1] Fundação Getulio Vargas / Instituto Brasileiro de Economia, Brasília / DF – Brazil
[2] Ministério da Cidadania, Brasília / DF – Brazil
[3] Desenvolvimento Social, Brasília / DF – Brazil

Since 2016, the number of recipients of incapacity allowance in Brazil has been continuously falling. This article presents the program of incapacity benefits assessment (PRBI) to help understand the dynamics around incapacity allowance and similar benefits. The study shows that the PRBI can save more than R$ 85 billion of the budget allocated to social security in the country.

Keywords: social security; incapacity benefits; program assessment.

Economizando mais de R$ 85 bilhões ao Regime Geral de Previdência Social do Brasil: o caso do PRBI

O número de benefícios de auxílio-doença vem caindo drasticamente desde 2016. Este artigo mostra que o Programa de Revisão dos Benefícios por Incapacidade (PRBI) é fundamental para entender essa dinâmica, e estima que o Programa seja responsável por uma economia de mais de R$ 85 bilhões ao Regime Geral de Previdência Social.

Palavras-chave: previdência social; benefícios por incapacidade; auxílio-doença.

Economía de más de R$ 85 mil millones en el Régimen General de Previsión Social de Brasil: el caso del PRBI

El número de beneficiarios de subsidios por incapacidad laboral ha disminuido drásticamente desde 2016. Este artículo muestra que el Programa para la Evaluación de Subsidios por Incapacidad Laboral (PRBI) es clave para entender esta dinámica y es responsable de una economía de más de R$ 85 mil millones para el Régimen General de Previsión Social de Brasil.

**Palabras clave:** seguridad social; subsidios por incapacidad laboral; evaluación de programas.

1. INTRODUCTION

During recent years, Brazilian Social Security has expanded at an accelerated pace (Graph 1), which led to an intense public debate about a reform of the system, carried out and approved by Congress in 2019. Several measures to improve the management of social security benefits emerged from this debate. One example is the continuous assessment of incapacity benefits, an activity that had been neglected despite legal provision.

GRAPH 1   SOCIAL SECURITY BENEFITS (IN MILLIONS), 1999-2019 (DECEMBER)
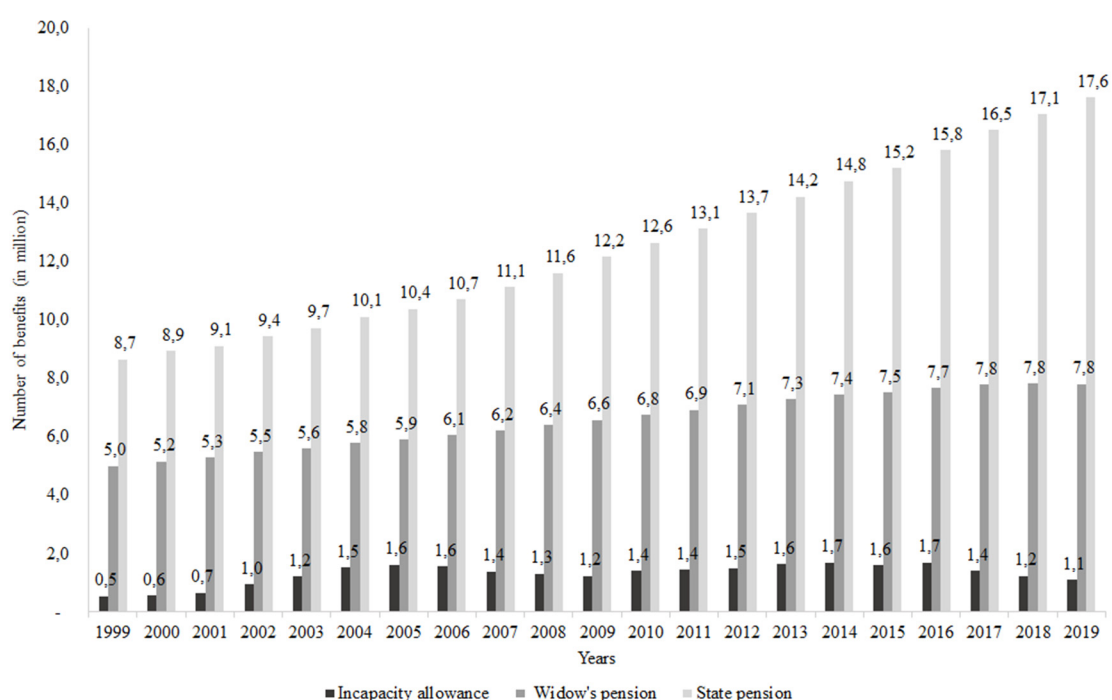
Source: Elaborated by the authors based on data from Boletim Estatístico da Previdência Social – BEPS (Social Security Statistical Bulletin).

There are two kinds of incapacity benefit: incapacity allowance (IA), a temporary benefit targeted to formal workers who are ill and cannot perform their labor activities, regardless of whether their occupation caused the illness, and incapacity retirement, which is a permanent benefit. Graph 2 shows that the benefits present different patterns, as incapacity retirement is consistently growing over time.

GRAPH 2   IA AND INCAPACITY RETIREMENT (IN MILLIONS), 1999-2019 (DECEMBER)
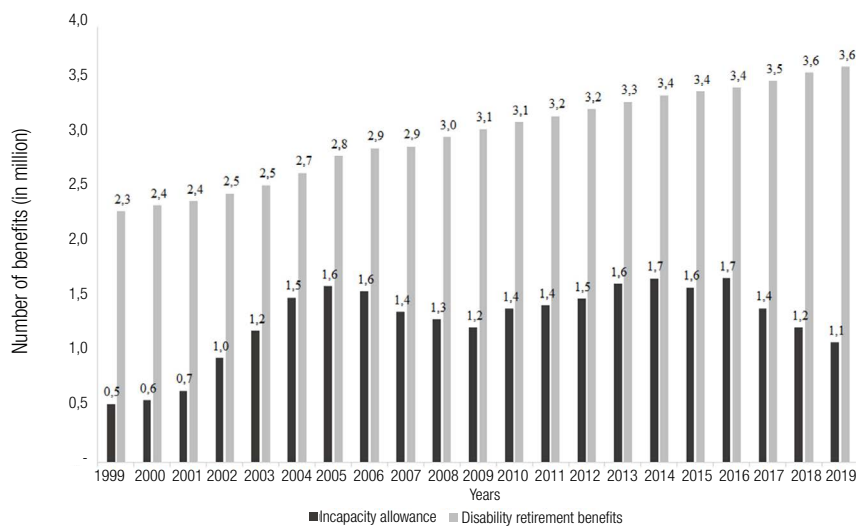
Source: Elaborated by the authors, based on data from Boletim Estatístico da Previdência Social – BEPS (Social Security Statistical Bulletin).

A visual analysis of peaks and valleys on the number of IA beneficiaries (Graph 3) shows two peaks (October 2005 and February 2010) and one valley (August 2016). These results are somewhat surprising because such volatility in the incidence of incapacity among the population is unexpected: as Marinho, Resende, and Lucas (2017) point out, IAs are benefits that do not depend directly on beneficiaries' choices. In many countries, such as in the US (Liebman, 2015) and the UK (Banks, Blundell, & Emmerson, 2015), this volatility led to debates about reforming the benefits system.
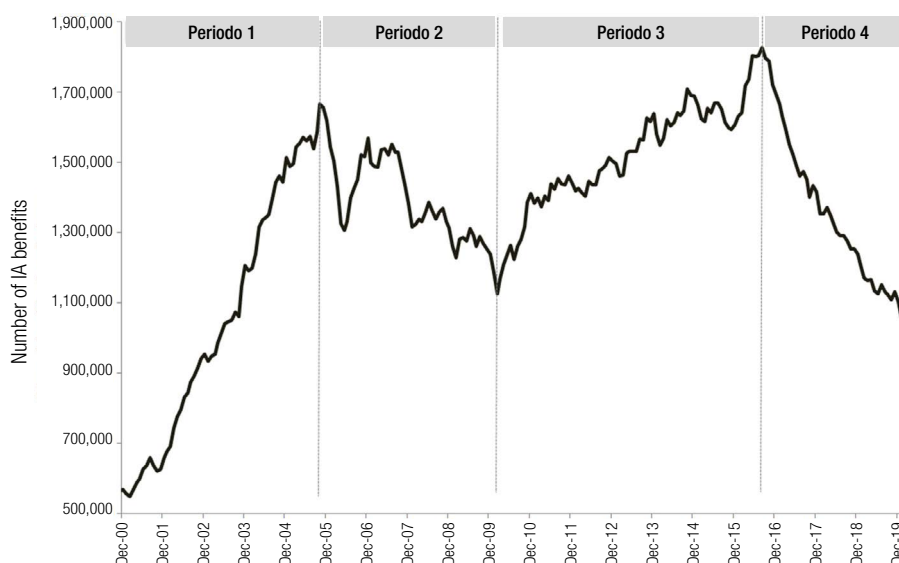
GRAPH 3   IA BENEFITS (2001-2019)

Source: Elaborated by the authors, based on data from Boletim Estatístico da Previdência Social – BEPS (Social Security Statistical Bulletin).

The fall in the fourth period is so significant that IA payroll has fallen every year since 2017. Moreover, the number of benefits at the end of 2019 was the lowest since 2003. In 2019, the Brazilian social security system spent R$ 20.1 billion on IA.

This article aims to discuss how much of the fall in the number of IA benefits since August 2016 can be explained by the program of incapacity benefits assessment (PRBI). Launched in mid-2016, it changed important aspects of IA design. International evidence (Coile, Milligan, & Wise, 2014; Autor, Duggan, Greenberg, & Lyle, 2015; Mullen & Staubli, 2016) shows that changes in the generosity of incapacity benefits affect the labor market – particularly the participation of the population in the labor force – and have socioeconomic impacts.

This study contributes to the literature by extending the model employed by Liebman (2015) to evaluate the impact of nonlinear changes in benefit duration rules on the number of IA beneficiaries. Another contribution lies in showing how to use the model to calculate the economic impact of reevaluating benefits. Finally, this research applies the extended model to provide the first (to our knowledge) evaluation of the PRBI.

The article is divided into five sections, including this introduction. The second section presents and discusses IA and the PRBI. The third part extends and calibrates Liebman's (2015) model. The fourth section estimates the PRBI impact on the social security budget and the number of IA beneficiaries, followed by the conclusion.

2. IA AND PRBI

When social security contributors believe they are unable to work, they can apply for IA. The National Social Security Institute (INSS) evaluates their medical condition and may grant the benefit. The IA is always temporary and has a termination date. Since it is hard to anticipate the incapacitation period, if the beneficiary believes they cannot return to work by the termination date, they can schedule another medical examination and ask for a benefit extension. Termination dates cannot exceed two years, so benefits are reevaluated timely. Very often, beneficiaries try to revert application rejections in court. In many cases, successfully.

Periodic medical examinations are important since many incapacity determinants are temporary. Okpatu, Sibulkin, and Schenzler (1994) and Marasciulo (2004) show that granting incapacity benefits is not an objective process because incapacity is more subjective than the concept of sickness. Moreover, there is a recent rise in several incapacity determinants that are hard to diagnose, such as back pain (Meziat & Silva, 2011).

As previously discussed, there is no obvious explanation for the high Brazilian IA volatility. Although weak, since the 90s (Mueller, Rothstein, & Watcher, 2016), there is international evidence IA applications are countercyclical, related to unemployment rates (Coe, Haverstick, Munnell, & Webb, 2011; Duggan & Imberman, 2009; Mueller et al., 2016; Von Watcher, Song, & Manchester, 2011). However, according to Maestas, Mullen, and Strand (2015), although recessions may impact IA applications, many are rejected. Liebman (2015) and Banks et al. (2015) recognize that incapacity benefits and employment may be linked. They also suggest that demographic trends, population medical conditions, and benefit rules are important factors to explain IA trends. In particular, Coile et al. (2014) argue that benefit generosity explains the majority of variation in incapacity benefit incidence across countries.

In Brazil, there is no clear association between the business cycle and IA applications: formal employment and IA trends do not correlate (Graph 4); IA applications and the unemployment rate do not correlate either (Graph 5).

GRAPH 4   IA APPLICATIONS AND THE NUMBER OF FORMAL WORKERS (2012-2018)
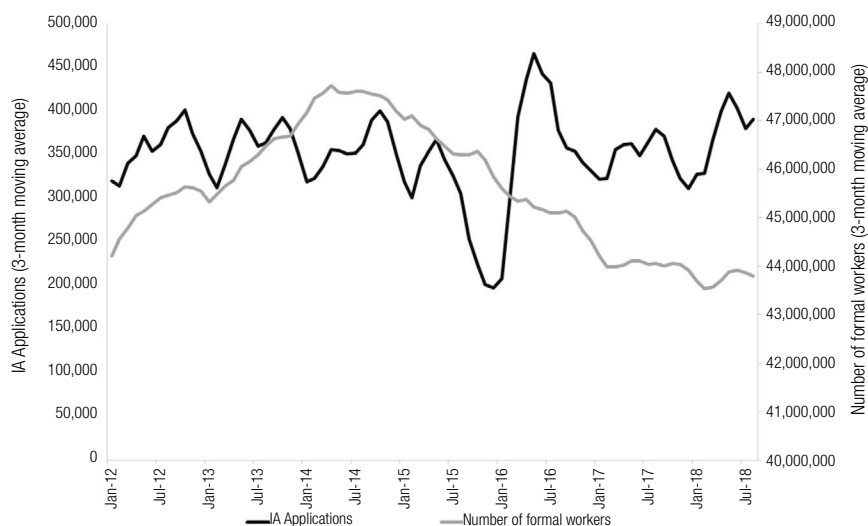
Source: Elaborated by the authors, based on data from Boletim Estatístico da Previdência Social – BEPS (Social Security Statistical Bulletin) and Continuous National Household Sample Survey (PNADC – IBGE).

GRAPH 5   IA APPLICATIONS AND UNEMPLOYMENT (2012-2018)
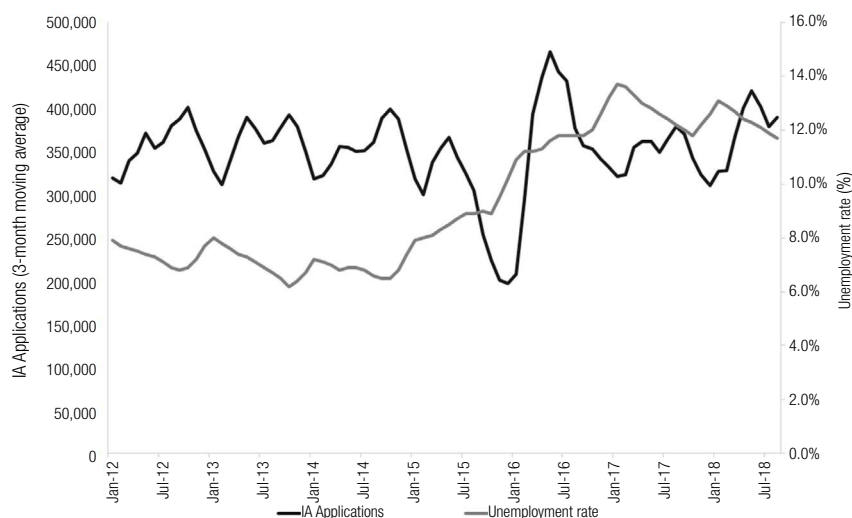
Source: Elaborated by the authors, based on data from Boletim Estatístico da Previdência Social – BEPS (Social Security Statistical Bulletin) and Continuous National Household Sample Survey (PNADC – IBGE).

Additionally, the number of benefit applications does not seem to change before, during, or after the four economic crises that have occurred in Brazil since 2001 (CODACE, 2017). Graph 6 does not show a clear change in the pattern of IA applications before (from -6 to 0), during, or after recessions (from 0 to 38, depending on recession duration).

GRAPH 6   IA APPLICATIONS BEFORE, DURING, OR AFTER RECESSIONS
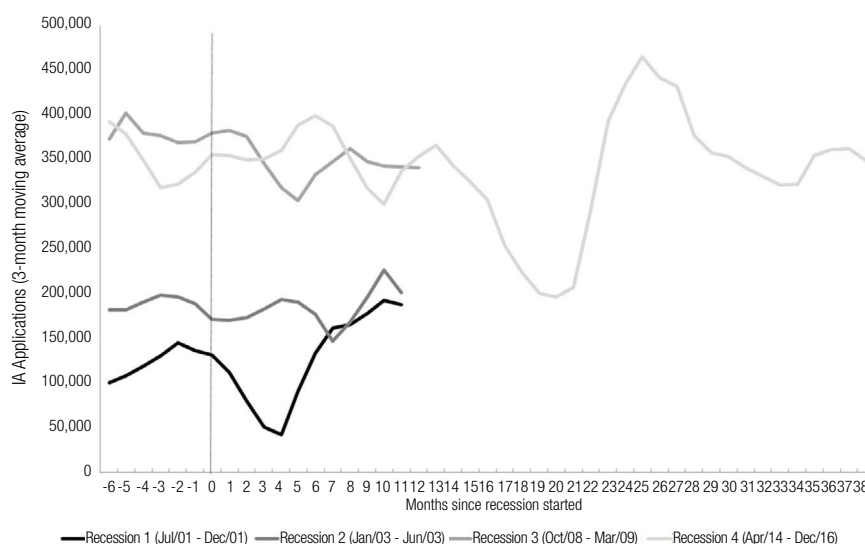
Source: Elaborated by the authors, based on data from Boletim Estatístico da Previdência Social – BEPS (Social Security Statistical Bulletin) and the Brazilian Business Cycle Dating Committee (FGV CODACE).

Furthermore, the number of IA applications (which is the indicator of how the business cycle affects the number of IAs granted), and grants and terminations, oscillate around the same mean since 2005 (Graph 7).

**GRAPH 7   IA APPLICATIONS, GRANTS, AND TERMINATIONS (2001-2017)**
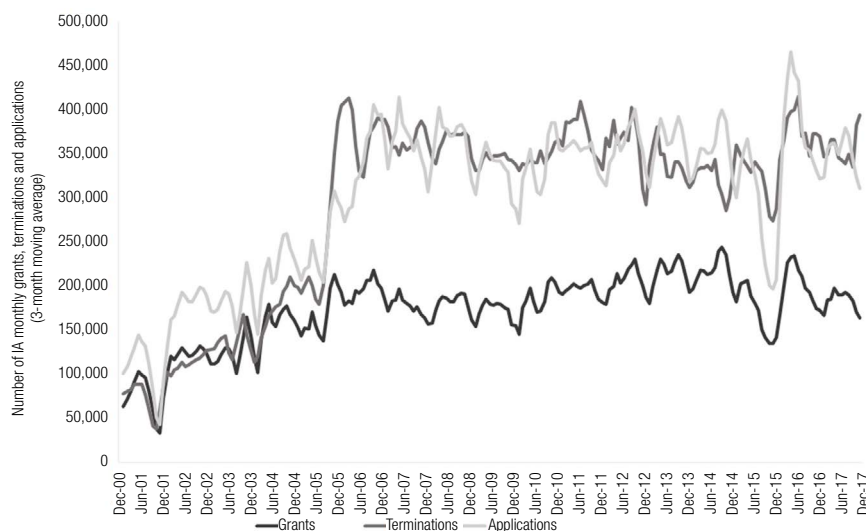
Source: Elaborated by the authors, based on data from Boletim Estatístico da Previdência Social – BEPS (Social Security Statistical Bulletin).

Based on this evidence, it is difficult to explain IA volatility or recent fall based only on the business cycle.

In August 2016, the Brazilian Ministry of Social Development (MDS) identified 563,771 IAs (out of 1,827,225) without a medical examination within two years. They had no termination dates. Therefore, these benefits were granted before August 2014 and had not been evaluated since (Ministério do Desenvolvimento Social, 2018).

We obtained this database from MDS and, after excluding missing, inconsistent, or incomplete data, we found 476,163 benefits (Graph 8). Of them, 99.7% started more than four years before the reference date, and 238,902 were granted by judicial rulings (50.2%). Such numbers drew attention, since average monthly IA grants during the ten years before the reference date (September 2004 to August 2014) was 189,145, and only 2.23% of grants were judicial.

GRAPH 8   DURATION OF ALL 476,163 BENEFITS (YEARS)
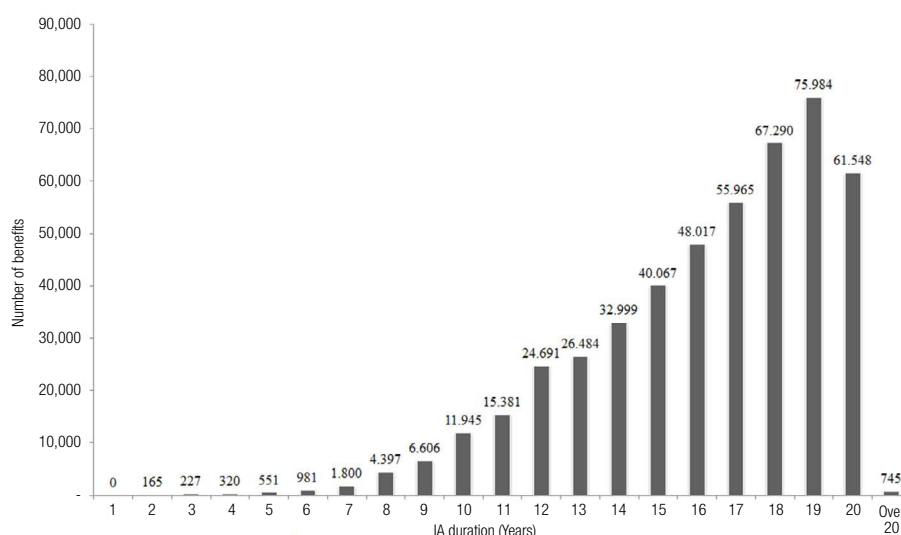
Source: Elaborated by the authors based on data from MDS.

Further investigation revealed the cause of the problem: judicial rulings typically do not specify a duration for IA benefits and, therefore, beneficiaries whose benefits were granted by judicial rulings never requested the INSS medical reevaluation because they could keep their benefits indefinitely without doing so. These workers continued to receive IAs several years after they had recuperated. It is a clear case in which a small problem persisted for a very long time, causing a big distortion many years later.

As a result, there was a group of IA beneficiaries receiving benefits, on average, for less than a year (Ministério do Trabalho e da Previdência Social, 2014), and another group, whose benefits were granted by judicial rulings, receiving benefits indefinitely.

To solve these problems, the program for incapacity benefits assessment (PRBI) was launched in August 2016. The program allowed INSS to pay extra hours for INSS medical experts to evaluate IA benefits that had not been examined for more than two years, a group of 563,771 benefits, which we call the PRBI group. It also determined that new IA benefits granted by judicial rulings without explicit termination dates must be terminated or reevaluated 120 days after being granted.

PRBI started with Provisional Measure 739/2016. Congress did not vote in time, so it expired and had to be reissued in 2017 (Provisional Measure 767/2017). After intense discussions, Congress voted the new Provisional Measure (almost identical to the first one) and converted it into Law 13,457/2017. In the process, Congress made almost no relevant changes to the PRBI design.

Nevertheless, PRBI faced resistance in INSS. INSS administrative staff required extra payment for the extra hours they worked (without success), and medical staff needed to be motivated to do the evaluations since they could choose not to do them (the payment for extra hours were an important incentive, as well as the engagement from the National Association of INSS Medical Experts).

As Liebman (2015) points out, the United States tried a similar program, but it was discontinued because benefit terminations were perceived as unfair. From this perspective, one of the core elements for PRBI success was communication: monthly reports to the press about PRBI results and public disclosure on the most striking findings, such as people receiving IAs for over ten years for risky pregnancies, IAs for allegedly blind people who were found to be informally working as drivers, IAs for allegedly paraplegic beneficiaries who were professional runners (Ministério do Desenvolvimento Social, 2018). Communication was essential for PRBI sustained political support.

Despite the resistance, between August 2016 and October 2018, 91.7% of the PRBI group had been evaluated (436,642 benefits), and 74.8% of evaluated benefits were terminated (Table 1).

TABLE 1   PRBI RESULTS

	IA benefits
PRBI benefits (database obtained from MDS)	**476,163**
Evaluated	**436,642**
Terminated	326,786
Not terminated	109,856

Source: Elaborated by the authors based on data from MDS.

3. METHODOLOGY

To evaluate PRBI impacts on IA, this section extends the model from Liebman (2015).

3.1 Model

Number of IA beneficiaries in time $t(B(t))$ are a function of new IA granted ($C(t)$) and terminations ($T(t)$), as in equation (1).

$$B(t) = B(t-1) + C(t) - T(t) \tag{1}$$

Liebman (2015) assumes termination numbers depend on fixed death and recovery rates ($D(t)$), as in equation (2).

$$T(t) = D_T B(t-1) \tag{2}$$

However, to understand the effects of nonlinear benefit duration changes on benefits, it is not possible to use equation (2). It is necessary to generalize the Liebman (2015) model considering nonlinear benefit termination structures.

Where $p(i)$ is the probability of a benefit being terminated, i is the number of months after it was granted and $P(i)$ is the cumulative distribution of $p(i)$, we assume n is the smallest number for which $P(i) = 1$, for every i ≥ n. Therefore, the number of terminated benefits in time t is expressed by equation (3) and the number of active benefits by equation (4). Average benefit duration (D) is expressed by equation (5).

$$T(t) = \sum_{i=1}^{n} C(t-i)\, p(i) \tag{3}$$

$$B(t) = C(t) + \sum_{i=1}^{n} C(t-i)\, (1 - P(i)) \tag{4}$$

$$D = n - \sum_{i=1}^{n-1} P(i) \tag{5}$$

Liebman (2015) original model is a particular case of equations (3), (4), and (5) in which equations (2) and (6) hold.

$$D_T = \frac{1}{D} \tag{6}$$

Applying the expectation operator ($E[\blacksquare]$) on equations (1), (4), and (5), it is possible to write the expected number of IA benefits (B) as equation (7).

$$B = DC \tag{7}$$

3.2 PRBI economic impacts

After PRBI was implemented, the cumulative probability distribution of benefit termination for new benefits changed from to $P(i)$ to $P'(i)$. This change implies new benefits follow another trend ($B'(t)$) and have another duration (D'). In this case, equations (1), (4), and (5) lead to equation (8). The first term of equation (8) is the long-term impact of this change assuming that all benefits were instantly affected. The second term represents the transition cost of having active benefits granted according to previous regulation.

$$E[B(t) - B'(t)] = C(D - D') - C\sum_{i = t - k+1}^{n} (P'(i) - P(i)) \tag{8}$$

To estimate the impact of medical reexaminations, it is necessary to compare medical evaluation costs (α) with the expected cash flow of terminated benefits, considering their probability of natural termination ($P(i)$). It is noteworthy that medical exams can increase expenditures if they only cease benefits with a high probability of natural termination.

The probability ($L_{t,j}$) a benefit conceded on date c_j is still active on date t, considering it is active when the medical examination occurs (d_j), is expressed in equation (9).

$$L_{t,j} = 1 - \frac{P(t-c_j)-P(d_j-c_j)}{1-P(d_j-c_j)} \tag{9}$$

Defining $V(t)$ as the average value of IA benefits in time t, r as the real interest rate, and k as the moment PRBI was implemented, equation (10) measures the net present value of the overall PRBI economic impact on the social security budget.

$$J(k) = V(k)\left[\sum_{j\in PRBI}\sum_{t=d_j}^{\infty}\left[\left(\frac{1}{(1+r)^{t-k}}\right)\left(1 - \frac{P(t-c_j)-P(d_j-c_j)}{1-P(d_j-c_j)}\right)\right] + C\left[\frac{(D-D')}{r} - \right.\right.$$

$$\left.\left.\sum_{t=k+1}^{\infty}\frac{\sum_{j=t-k+1}^{n}\left(P'(j)-P(j)\right)}{(1+r)^{t-k}}\right]\right] - \alpha \tag{10}$$

3.3 Model Calibration

To simulate the model, equation (10) parameters must be calibrated. To do so, we use the database of PRBI benefits. Unless explicitly stated, all estimates are based on the 238,902 benefits marked as being granted by judicial rulings. Where $A(i,t)$ is the number of benefits conceded on date $t - i$ still active on date t, and $\underline{t}$ is the date PRBI was launched, from an extraction of $A(i,\underline{t})$ and $C(t)$ it is possible to calculate the proportion of effectively terminated benefits granted i months ago, $\mu(i)$, using equation (11).

$$\mu(i) = \frac{C(\underline{t}-i)-A(i,\underline{t})}{C(\underline{t}-i)} \tag{11}$$

Since $P(i)$ is a cumulative probability distribution, it is necessary to filter the data in order to have a function in which $P(i) \leq P(i + 1)$. Graph 9 shows the data has a linear pattern, so we will filter $\mu(i)$ by estimating the linear trend (12) by ordinary least squares, in which $u(i)$ is a random term.

$$\mu(i) = a + bi + u(i) \tag{12}$$

The estimation results are shown in Table 2. As expected, the estimated value for is greater than zero, implying $E[\mu(i)] \leq E[\mu(i + 1)]$. Estimates suggest the cumulative benefit termination probability increases by 0.3 percentage points every month.

Since $P(i)$ must also follow the inequality $P(i) \leq 1$ and $P(n) = 1$, we suppose $P(i)$ follows a linear trend between the largest i for which $P(i) < 1$ and n. Where j is the greatest parameter for which $E[\mu(j)] \leq 1$, such assumption means $P(i)$ follows equation (13).

$$P(i) = min \left(E[\mu(i)], 1 - \frac{n-i}{n-j}(1 - E[\mu(j)]), 1 \right) \tag{13}$$

Our data indicates $j = 195$. There are only 104 judicial benefits with i > 195. Since n is the highest possible duration of benefits, the whole dataset of 476,163 benefits will be used to calibrate it: $n = 463$. Graph 9 shows $\mu(i)$ and $P(i)$ for $i < j$.

GRAPH 9 $\mu(i)$ **E** $P(i)$ **PARA** $i < j$

Number of months since IA was granted (i)

♦ $\mu(i)$ —$P(i)$
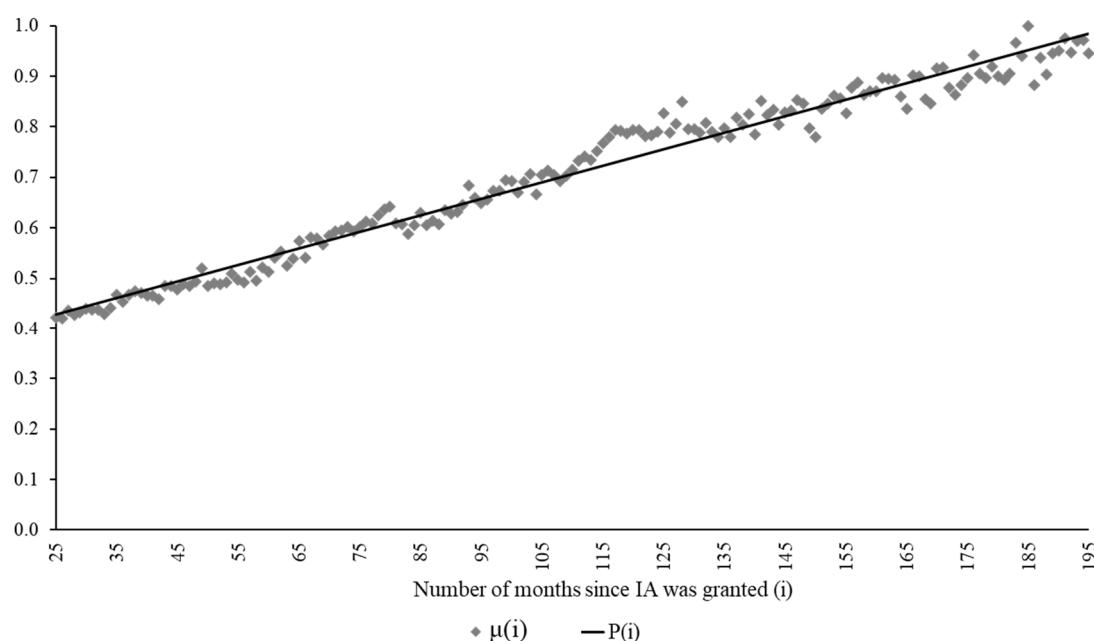
Source: Elaborated by the authors, based on data from MDS.

TABLE 2   ESTIMATES

Dependent Variable:	$\mu(i)$
Constant	0.347***
	(0.0050)
Trend	0.003***
	(0.0000)
Observations	171
R-squared	0.974

Source: Elaborated by the authors.
p-values in parentheses. *** significant at 1%.

Table 3 shows the values for the other parameters of equation (10).

TABLE 3   MODEL CALIBRATION

Parameter	Value	Reference
$V(k)$	R$ 1,303.83/month	Average IA benefit (2016)
C	8,654 benefits/month	Monthly average of judicial grants (2016 and 2017)
r	5.8% o.y.	Public debt interest rates (NTN-B 2050) in September 2018.
α	R$ 71.8 million	Overall medical evaluation costs, according to MDS (Ministério do Desenvolvimento Social, 2018)

Source: Elaborated by the authors.

4. RESULTS

$P(i)$ values and equation (5) suggest that the average duration of benefits granted judicially is 67.83 months. Therefore, the probability of an IA benefit lasting for ten years is significant. The average monthly judicial granted IAs, from September 2004 to August 2014 (exactly two years before the PRBI date), was 4,226. Therefore, equation (7) suggests that the PRBI group should have around 286,650 judicial benefits. Since there were 238,902 judicially granted benefits in the PRBI database, it seems the model is replicating real data well.

Equation (7) suggests the rise in monthly judicial granted IAs (from 4,226 in the period from September 2004 to August 2014 to 8,654, between 2016 and 2017) would cause the number of

overall judicial IA benefits to rise to 586,963. Such a trend is in line with growing IA beneficiaries during 2016.

Moreover, from 2011 to 2016, overall monthly IA grants were 200,766, and the number of overall benefits varied from 1,374,454 to 1,827,225. Therefore, equation (7) suggests the overall benefit duration varied between 6.8 and 9.1 months. As a result, the average duration of benefits granted judicially is eight times longer than the average duration of overall benefits.

In the most extreme case, PRBI reduced the duration of judicial benefits to exactly four months (120 days). In this case, equation (10) suggests PRBI reduced social security expenditures by R$ 124.2 billion, and equation (7) suggests PRBI reduced the number of benefits by 552,348 in the long run.

However, there may be cases in which judicial benefits granted under the PRBI law are extended after medical reexaminations, bringing their duration close to that of all benefits. Graph 10 evaluates the robustness of the results and shows the estimated impact of PRBI on social security budgets when benefit duration is between four and twenty months. Impacts range from R$ 87.9 billion to R$ 124.2, concluding that PRBI can save more than R$ 85 billion of the social security budgets.

GRAPH 10   PRBI IMPACT ON SOCIAL SECURITY BUDGETS (R$ BILLION)
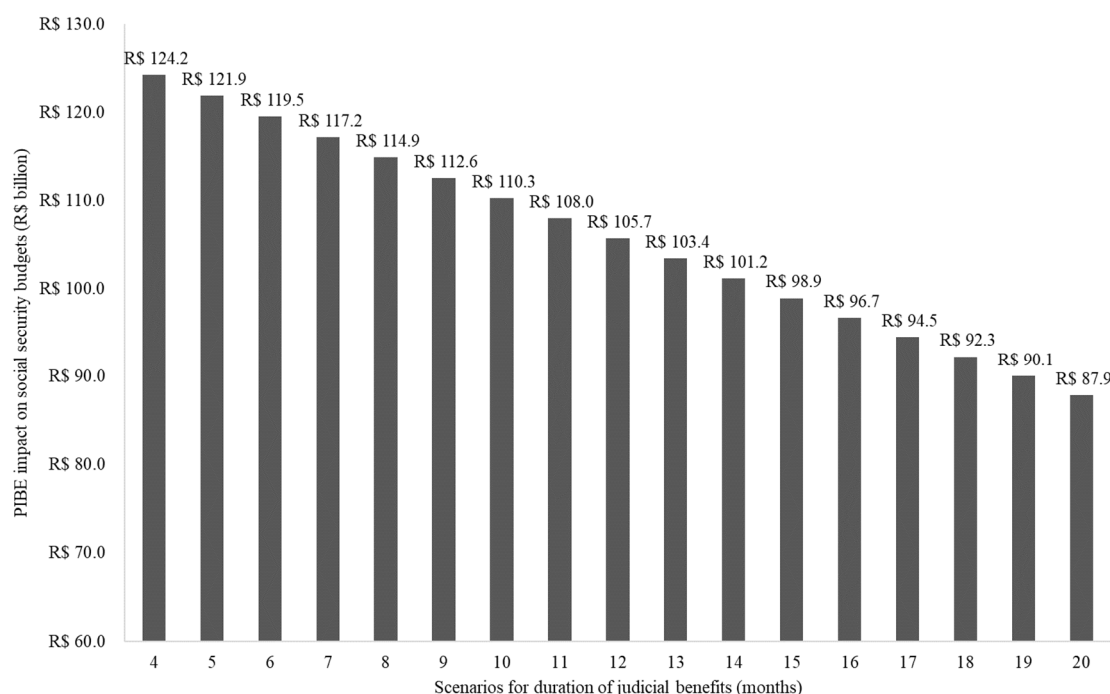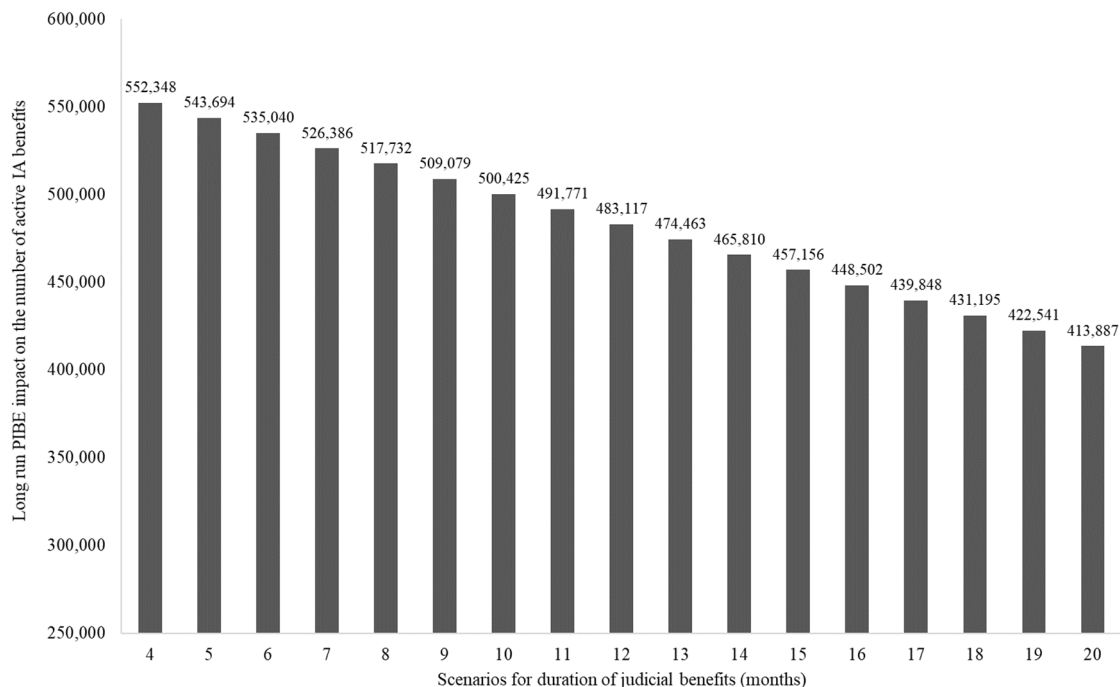

Source: Elaborated by the authors.

Equation (7) suggests that the reduction in judicial benefits duration from 68.73 months to between 4 and 20 months caused the number of active IAs to fall by between 413,887 and 552,348, in all scenarios (Graph 11). So, the number of judicial granted IAs, in the long run, falls from 586,963 to between 34,615 and 173,076.

These results are comparable to the actual overall fall in IA, considering the reduction of 723,050 benefits between 2016 and 2019. The results also reinforce the link between our simulations and real data, and the fact that the impact is permanent.

GRAPH 11   PRBI IMPACT ON THE NUMBER OF IAS (LONG RUN)

Source: Elaborated by the authors.

Equation (10) allows decomposition of the PRBI impact into three elements: a) long-term effect ($LR(k)$), measuring the long-term impact of changing the duration rules; b) transition costs ($TC(k)$), which adjust to the fact PRBI rules apply only to new benefits; and c) medical examinations ($ME(k)$), which reduce transition costs by reevaluating old benefits. The decomposition is explained in equations (14) to (17).

$$J(k) = ME(k) + LR(k) + TC(k) \tag{14}$$

$$ME(k) = V(k) \sum_{j \in PRBI} \sum_{t=d_j}^{\infty} \left[\left(\frac{1}{(1+r)^{t-k}} \right) \left(1 - \frac{P(t-c_j)-P(d_j-c_j)}{1-P(d_j-c_j)} \right) \right] - \alpha \tag{15}$$

$$LR(k) = V(k)C \frac{(D-D')}{r} \tag{16}$$

$$TC(k) = -V(k)C \sum_{t=k+1}^{\infty} \frac{\sum_{j=t-k+1}^{n}\left(P'(j)-P(j)\right)}{(1+r)^{t-k}} \tag{17}$$

Medical examinations account for R$ 13.9 billion of overall savings, while the long-term effect ranges between R$ 114.6 and R$ 152.9 billion, and transition costs are between R$ 40.6 and R$ 42.6 billion (Graph 12). Therefore, medical examinations reduced transition costs by approximately one-third and were responsible for 11% to 16% of the overall financial impact.

GRAPH 12   DECOMPOSITION OF PRBI IMPACT ON SOCIAL SECURITY BUDGETS (R$ BILLION)
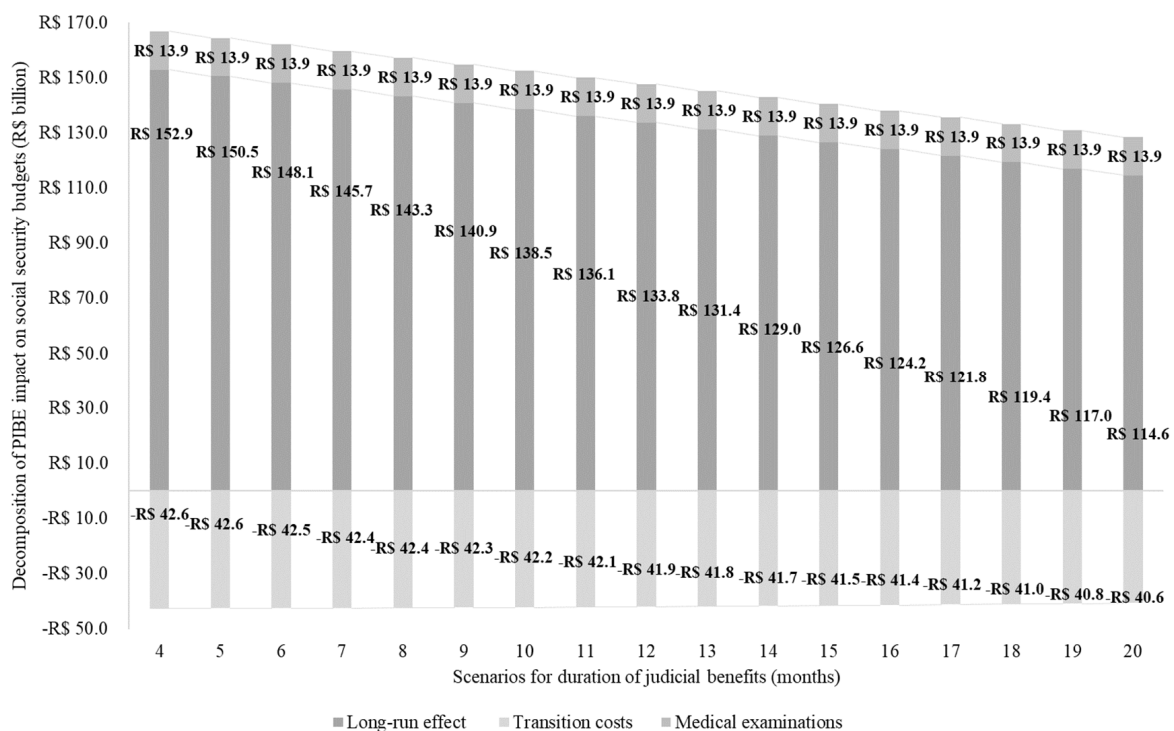
Source: Elaborated by the authors.

These results show that the program promoted equality by providing similar termination rules to those who apply under administrative protocols and those who require the benefit judicially. Reducing benefit distortions can improve social security benefits rationality and reduce inequalities.

5. CONCLUSION

While the number of main Brazilian Social Security benefits is steadily increasing over time, IAs have been steadily falling since 2016. The number of IAs in December 2019 was the lowest since October 2003. From 2016 to 2019, the number of IA benefits reduced by 723,050. Understanding such dynamics is important to analyze whether benefit volatility is natural or caused by distortions in benefit rules.

The evolution of IAs over time is very volatile. Our analysis suggests such volatility cannot be explained by business cycles but by changes in benefit generosity. After expanding a canonical model for IA benefits, it was possible to measure the impact of PRBI on the social security budget. It lies between R$ 87.9 and R$ 124.2 billion, with an impact on the number of benefits between 413,887 and 552,348.

Such evidence suggests that a great proportion of the reduction in IA benefits since 2016 can be explained by PRBI, a program that combined the reassessment of old incapacity benefits with a change in IA rules that equalized the termination criteria for new benefits granted judicially or by the administrative protocol. The high rate of termination of the benefit after medical examination suggests that many IA should have been terminated several years before the program started. Therefore, PRBI not only saves social security a significant amount of resources, but it also seems to increase justice in the system.

REFERENCES

Autor, D., Duggan, M., Greenberg, K., & Lyle, D. (2015). *The Impact of Disability Benefits on Labor Supply: Evidence from the VA's Disability Compensation Program* (NBER Working Paper Series, 21144). Stanford, CA: Stanford Institute for Economic Policy Research.

Banks, J., Blundell, R., & Emmerson, C. (2015). Disability Benefit Receipt and Reform: Reconciling Trends in the United Kingdom. *Journal of Economic Perspectives*, *29*(2) 173-190.

Coe, N., Haverstick, K., Munnell, A., & Webb, A. (2011). *What Expains State Variation in SSDI Application Rates?* (CRR WP 2011-23). Newton, MA: Center for Retirement Research at Boston College.

Coile, C., Milligan, K., & Wise, D. (2014). *Social Security Programs and Retirement Around the World: Disability Insurance Programs and Retirement – Introduction and Summary* (NBER Working Paper Series, n. 20120). Cambridge, MA: National Bureau of Economic Research.

Duggan, M., & Imberman, S. (2009). Why are the Disability Rolls Skyrocketing? The Contribution of Population Characteristics, Economic Conditions, and Program Generosity. In: D. Cutler, & D. Wise (Ed.), *Health at Older Ages: The Causes and Consequences of Declining Disability among the Elderly*. Chicago, IL: University of Chicago Press.

Economic Cycles Dating Committee. (2017). *Economic Cycles Dating Report*. Rio de Janeiro, RJ: Author.

Instituto Nacional do Seguro Social. (2002). *Normative Ruling No. 78, of July 16, 2002*. Union Official Journal, Brasília, DF, July 18, 2002.

Liebman, J. (2015). Understanding the Increase in Disability Insurance Benefit Receipts in the United States. *Journal of Economic Perspectives*, *29*(2) 123-150.

Maestas, N., Mullen, K., & Strand, A. (2015). Disability Insurance and the Great Recession. *American Economic Review: Papers & Proceedings*, *105*(5) 177-182.

Marasciulo, A. C. (2004). *Performance assessment of the program of incapacity benefits of the Instituto Nacional do Seguro Social /INSS, management branch of Florianópolis, SC, 2000-2002* (Doctoral Dissertation). Faculdade de Medicina, Universidade de São Paulo, São Paulo, SP.

Marinho, H., Resende, M., Filho, & Lucas, V. M. (2017). Análise do impacto da alteração normativa na aposentadoria por invalidez no Brasil. *Nova Economia*, *27*(3) 551-576.

Meziat Filho, Ney and Silva, Gulnar. (2011). Invalidez por dor nas costas entre segurados da Previdência Social do Brasil. *Revista de Saúde Pública*, *45*(3) 494-502.

Ministério da Fazenda. (2016). *Anuário Estatístico da Previdência Social*. Brasília, DF.

Ministério da Previdência Social. (2014). *2° Boletim Quadrimestral sobre Benefícios por Incapacidade*. Brasília, DF.

Ministério do Desenvolvimento Social. (2018). *PRBI, o maior programa de revisão de benefícios por incapacidade da história do INSS* (Caderno de Estudos, 33). Brasília, DF: Author.

Ministério do Trabalho e da Previdência Social. (2014). *Anuário Estatístico da Previdência Social Suplemento Histórico*. Brasília, DF: Author.

Muellen, K., & Stefan, S. (2016). *Disability Benefit Generosity and Labor Force Withdrawal* (NBER Working Paper Series n. 22419). Cambridge, MA: National Bureau of Economic Research.

Mueller, A., Rothstein, J., & Watcher, T. (2016). Unemployment Insurance and Disability Insurance in the Great Recession. *Journal of Labor Economics*, *34*(S1) S445-S475.

Okpaku, S., Sibulkin, A. E., & Christoph, S. (1994). Disability determinations for adults with mental disorders: Social Security Administration vs independent judgments. *American Journal of Public Health*, *84*(11) 1791-1795.

Von Watcher, T., Song, J., & Manchester, J. (2011). Trends in Employment and Earnings of Allowed and Rejected Applicants to the Social Security Disability Insurance Program. *American Economic Review*, *101*, 3308-3329.

Vinícius Botelho

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iD https://orcid.org/0000-0002-9627-1846
Associated researcher at the Brazilian Institute of Economics (IBRE) of Fundação Getulio Vargas.
E-mail: viniciusobotelho@hotmail.com

Raquel Maria Soares Freitas

iD https://orcid.org/0000-0001-8148-231X
Degree in economic sciences from the Pontifical Catholic University of Rio de Janeiro (PUC-Rio); Coordinator of indicators production at the Department of Monitoring of the Secretary of Information Evaluation and Management of the Brazilian Ministério da Cidadania (DM/SAGI/MC). E-mail: freitas.smr@gmail.com

Alberto Beltrame

iD https://orcid.org/0000-0001-7275-6120
Physician; Former Minister of Social Development of Brazil. E-mail: albertobeltrame1@gmail.com