

# Strategic Formal Layoffs: Unemployment Insurance and Informal Labor Markets

Bernardus Van Doornik

David Schoenherr

Janis Skrastins

Online Appendix

# Appendix A. Additional Tables and Figures

Table A.1: Variable Definitions - Dependent Variables

	Variable Definition	Main Sample	Sample Period
$Layoff_{it}$	Dummy variable: 1 if worker $i$ is laid off in month $t$ , 0 otherwise	Formally employed workers with tenure of 0 to 11 months (RAIS)	March 2014 to February 2016
$Quit_{it}$	Dummy variable: 1 if worker $i$ separates from her employer in month $t$ other than through layoff, 0 otherwise	Formally employed workers with tenure of 0 to 11 months (RAIS)	March 2014 to February 2016
$\hat{B}/N_{6+}^{pre}$	Excess layoffs (bunching) for workers with 6 to 11 (17) month tenure scaled by the number of affected workers with tenure from 6 to 11 (17) between March 2014 and February 2015.	Formally employed workers with tenure of 0 to 11 months (RAIS)	March 2014 to February 2016
$\hat{M}/N_{6+}^{pre}$	Missing mass of layoffs for workers with up to five months of tenure scaled by the number of affected workers with tenure from 6 to 11 (17) between March 2014 and February 2015.	Formally employed workers with tenure of 0 to 11 months (RAIS)	March 2014 to February 2016
$(\hat{B} - \hat{M})/N_{6+}^{pre}$	Extensive margin of excess layoffs for workers with 6 to 11 (17) month tenure scaled by the number of affected workers with tenure from 6 to 11 (17) between March 2014 and February 2015.	Formally employed workers with tenure of 0 to 11 months (RAIS)	March 2014 to February 2016
$ExcessLayoff$	The triple-difference between changes in layoff rates for workers in the six to eleven months tenure range compared with the zero to five tenure range around the reform for affected relative to unaffected workers in a given industry or municipality.	Formally employed workers with tenure of 0 to 11 months (RAIS)	March 2014 to February 2016
$Informal_{it}$	Dummy variable: 1 if worker $i$ reports to be informally employed in month $t + 1$ after being formally employed in month $t$ , 0 if worker $i$ reports to be unemployed in month $t + 1$ after being formally employed in month $t$	Workers with tenure of 4 to 11 months in last month of formal employment (PME)	May 2014 to November 2015
$Formal_{it}$	Dummy variable: 1 if worker $i$ is formally employed by a different firm upon formal layoff in month $t$ , 0 if worker $i$ is not formally employed elsewhere upon formal layoff in month $t$	Workers with tenure of 0 to 11 months at layoff (RAIS)	March 2014 to February 2016
$Recall_{it}^{4-10}$	Dummy variable: 1 if worker $i$ is recalled by the same firm 4 to 10 months after layoff in month $t$ , 0 otherwise	Workers with tenure of 0 to 11 months at layoff (RAIS)	March 2014 to February 2016
$Replace_{i,t+1}$	Dummy variable: 1 if a firm hires a worker within one month of laying off worker $i$ in month $t$ , 0 otherwise	Workers with tenure of 0 to 11 months at layoff (RAIS)	March 2014 to February 2016
$\log(salary)_{it}$	Log of worker $i$ 's salary in month $t$	Formally employed workers (RAIS)	January 2013 to December 2015

This table lists all dependent variables and their definitions, and describes the main sample, data source, and sample period for each variable.

Table A.2: Variable Definitions - Independent Variables

	Variable Definition	Notes
$6Months_{it}$	Dummy variable: 1 if worker $i$ 's current tenure is 6 months or higher, 0 if worker $i$ 's current tenure is below 6 months	For tests that are conditional on formal layoff, the variable is defined based on worker $i$ 's tenure at layoff
$Reform_t$	Dummy variable: 1 for the post-reform period between March 2015 and February 2016, 0 for the pre-reform period between March 2014 and February 2015	For salary tests, the post-reform period starts after the announcement of the reform in January 2015, and the pre-reform period ends in the month of the announcement of the reform in December 2014
$Affected_i$	Dummy variable: 1 for workers affected by the reform (less than two prior UI benefits spells), 0 for workers unaffected by the reform (two or more prior UI benefits spells)	
$Informal$	Share of informally employed workers in total employment in a given industry or municipality	Based on the 2010 Brazilian Census
$\widehat{Informal}$	The predicted level of informality at the municipality level based on its industry composition	Based on the 2010 Brazilian Census
$Strategic_i$	Dummy variable: 1 if worker $i$ is laid off with a tenure of 6 to 17 months in 2013 or 2014, 0 otherwise	

This table lists all independent variables and their definitions.

Table A.3: **Excess Layoff Bunching Estimates and Informality**

	I	II	III
Dep. Var.:	Excess Layoff in Municipality		
	Bunching	Missing	Total Effect
	$\hat{B}/N_{6+}^{pre}$	$\hat{M}/N_{6+}^{pre}$	$(\hat{B} - \hat{M})/N_{6+}^{pre}$
<i>Informal</i>	0.0267*** (0.0038)	-0.0008 (0.0034)	0.0285*** (0.0056)
$\widehat{Informal}$	0.0896*** (0.0090)	-0.0229** (0.0092)	0.1137*** (0.0137)
Observations	5,286	5,134	5,134
$R^2$	0.191	0.006	0.129

This table reports bunching ( $\hat{B}/N_{6+}^{pre}$ ) and missing mass ( $\hat{M}/N_{6+}^{pre}$ ) of layoff rates above and below the six month threshold, respectively. The empirical distribution is estimated based on affected workers from March 2014 to February 2015. The counterfactual distribution is based on affected workers from March 2015 to February 2016, and adjusted based on the difference in pre-reform and post-reform layoffs of unaffected workers. The variable *Informal* is the share of informal employment in a given municipality. The variable  $\widehat{Informal}$  is the predicted level of informality at the municipality level based on its industry composition. Robust standard errors are reported in parentheses. \*\*\* denotes statistical significance at the 1% level.

## Appendix B. Summary of Labor Laws

In this section, we summarize the changes in the labor law that define a worker's eligibility for unemployment benefits. Eligibility is defined in Article 3 of the original labor law 7998, which was enacted on January 11, 1990. It was updated by the Provisional Measure 665, which was first announced on December 29, 2014 and came into effect on March 1, 2015.<sup>1</sup> Finally, the provisional measure was transformed into Law 13 135 on June 16, 2015 and has been in effect since July 1, 2015. In what follows next, we provide the relevant part of each law defining a worker's eligibility for UI benefits, the source of the law, the wording of the law in Portuguese, and the English translation.

### **Law 7998, in effect from January 11, 1990 until March 1, 2015**

Source: [http://www.planalto.gov.br/ccivil\\_03/LEIS/L7998.htm](http://www.planalto.gov.br/ccivil_03/LEIS/L7998.htm)

Portuguese [definition of eligibility]:

*Art. 3<sup>o</sup> Terá direito à percepção do seguro-desemprego o trabalhador dispensado sem justa causa que comprove:*

*I - ter recebido salários de pessoa jurídica ou pessoa física a ela equiparada, relativos a cada um dos 6 (seis) meses imediatamente anteriores à data da dispensa;*

English [definition of eligibility]:

*Art. 3 A worker dismissed without just cause shall have the right to claim unemployment insurance if the following is satisfied:*

*I – The worker has received salaries from a firm or an individual equivalent to it for each of the six (6) months immediately preceding the date of the dismissal;*

### **Provisional Measure MPV 665; Announced December 29, 2014. In effect between March 1, 2015 and July 1, 2015**

Source: [http://www.planalto.gov.br/ccivil\\_03/\\_Ato2011-2014/2014/Mpv/mpv665.htm](http://www.planalto.gov.br/ccivil_03/_Ato2011-2014/2014/Mpv/mpv665.htm)

Portuguese [definition of eligibility]:

*Art. 3<sup>o</sup> Terá direito à percepção do seguro-desemprego o trabalhador dispensado sem justa causa que comprove:*

*I - ter recebido salários de pessoa jurídica ou pessoa física a ela equiparada, relativos:*

- a) a pelo menos dezoito meses nos últimos vinte e quatro meses imediatamente anteriores à data da dispensa, quando da primeira solicitação;*
- b) a pelo menos doze meses nos últimos dezesseis meses imediatamente anteriores à data da dispensa, quando da segunda solicitação; e*
- c) a cada um dos seis meses imediatamente anteriores à data da dispensa quando das demais solicitações;*

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<sup>1</sup>The reform was officially published by the Federal Government on December 30, 2014, while the newspapers started to discuss it on December 29, 2014.

English [definition of eligibility]:

*Art. 3 A worker dismissed without just cause shall have the right to claim unemployment insurance if the following is satisfied:*

*I – The worker has received salaries from a firm or an individual equivalent to it:*

- a) for at least eighteen months in the last twenty-four months immediately preceding the date of dismissal at the time of the first request;*
- b) for at least twelve months in the last sixteen months immediately preceding the date of dismissal at the time of the second request; and*
- c) for each one of the six months immediately preceding the date of the dismissal at the time of the third or higher request;*

**Law 13 134; Enacted June 16, 2015. In effect from July 1, 2015**

Source: [http://www.planalto.gov.br/ccivil\\_03/\\_Ato2015-2018/2015/Lei/L13134.htm](http://www.planalto.gov.br/ccivil_03/_Ato2015-2018/2015/Lei/L13134.htm)

Portuguese [definition of eligibility]:

*Art. 3º Terá direito à percepção do seguro-desemprego o trabalhador dispensado sem justa causa que comprove:*

*I - ter recebido salários de pessoa jurídica ou de pessoa física a ela equiparada, relativos a:*

- a) pelo menos 12 (doze) meses nos últimos 18 (dezoito) meses imediatamente anteriores à data de dispensa, quando da primeira solicitação;*
- b) pelo menos 9 (nove) meses nos últimos 12 (doze) meses imediatamente anteriores à data de dispensa, quando da segunda solicitação; e*
- c) cada um dos 6 (seis) meses imediatamente anteriores à data de dispensa, quando das demais solicitações;*

English [definition of eligibility]:

*Art. 3 A worker dismissed without just cause shall have the right to claim unemployment insurance if the following is satisfied:*

*I – The worker has received salaries from a firm or an individual equivalent to it:*

- a) for at least 12 (twelve) months in the last 18 (eighteen) months immediately preceding the date of the dismissal at the time of the first request;*
- b) for at least 9 (nine) months in the last 12 (twelve) months immediately preceding the date of the dismissal at the time of the second request; and*
- c) for each of the six (6) months immediately preceding the date of the dismissal at the time of the third or higher request;*

## Appendix C. Bunching Estimates

Measuring excess layoff rate and missing mass around the eligibility threshold requires an accurate estimate of a counterfactual layoff distribution. While the existing literature has developed standard approaches for estimating this type of counterfactual from a single cross-section of data, those approaches require the assumption that the counterfactual distribution is smooth around the threshold (??). Since we have a group of affected and unaffected workers before and after the reform, we do not need to make this assumption. Our counterfactual distribution leverages both the time-series dimension and the fact that some workers were unaffected by the reform. We construct the pre-reform counterfactual layoff distribution for affected workers by adjusting the post-period layoff distribution of affected workers based on observed changes to the distribution in the layoff distribution of unaffected workers. Below we describe in detail how we obtain the counterfactual distribution.

**Counterfactual Layoff Distribution** We first estimate the counterfactual number of layoffs that would have occurred in each tenure bin  $d$  in the pre-reform period. We construct the counterfactual pre-reform layoff distribution from the observed post-reform layoff distribution of affected workers plus an adjustment that is based on the observed changes in the layoff distribution of unaffected workers around the reform. We scale the observed number of layoffs by the respective total employment ( $N$ ) in each tenure bin. This provides us with layoff rates (e.g.  $n_{ad}^{pre}/N_{ad}^{pre}$  and  $n_{ad}^{post}/N_{ad}^{post}$ ), which are directly comparable across tenure levels for affected and unaffected workers both before and after the reform. Thus, our counterfactual distribution is given by:

$$\hat{n}_{ad}^{pre} = \left( \frac{n_{ad}^{post}}{N_{ad}^{post}} + \left( \frac{n_{ud}^{pre}}{N_{ud}^{pre}} - \frac{n_{ud}^{post}}{N_{ud}^{post}} \right) \right) \cdot N_{ad}^{pre}, \quad (C1)$$

where  $n_{ad}^{post}/N_{ad}^{post}$  denotes the post-reform period layoff rate for the affected workers for each tenure-bin,  $(n_{ud}^{pre}/N_{ud}^{pre} - n_{ud}^{post}/N_{ud}^{post})$  estimates the change in the layoff rate of unaffected workers before and after the reform for each tenure-bin, and  $N_{ad}^{pre}$  denotes the number of affected workers within each tenure bin before the reform.

**Bunching, Missing Mass, and the Effect of UI on Layoff Rates** Based on this counterfactual, we measure the effects of eligibility for UI benefits on excess layoff rates above the eligibility threshold (bunching) as well as the missing mass below the eligibility threshold by comparing the empirical pre-reform layoff distribution of affected workers to the counterfactual distribution. We define the bunching mass as the sum of the difference between the empirical and counterfactual distributions over the region  $[6, \bar{d}]$  for which eligibility for UI benefits varies around the reform for affected workers:

$$\hat{B} = \left| \sum_{d=6}^{\bar{d}} (\hat{n}_{ad}^{pre} - n_{ad}^{pre}) \right|. \quad (C2)$$

Similarly, we define the missing mass below the threshold as

$$\hat{M} = \sum_{d=0}^5 (\hat{n}_{ad}^{pre} - n_{ad}^{pre}). \quad (\text{C3})$$

To facilitate the interpretation of the results, we report them as layoff rates, i.e. relative to the total number of affected workers in the respective tenure range. Specifically, we report the bunching estimate as  $\hat{B}/N_{6+}^{pre}$ , and the missing mass as  $\hat{M}/N_{6+}^{pre}$ , where  $N_{6+}^{pre}$  is the sum of all affected workers in the pre-reform affected tenure range  $[6, \bar{d}]$ . This allows us to directly compare the estimates to our benchmark estimates based on equation ???. We calculate standard errors for all estimated parameters by bootstrapping from the observed sample of layoffs, drawing 100 random samples with replacement and re-estimating the parameters at each iteration.

Finally, for our main analysis, we set  $\bar{d} = 11$ . This is motivated by the fact that this is the highest tenure threshold at which all affected workers are affected by the UI reform. In addition, we replicate the estimation results for  $\bar{d} = 17$ , which is the highest tenure range for which some of the affected workers are affected by the reform.