ONLINE APPENDIX (NOT FOR PUBLICATION): THE EMPLOYEE COSTS OF CORPORATE DEBARMENT IN PUBLIC PROCUREMENT

Christiane Szerman

A Appendix A – Additional Information from Debarment Data

Table A1: Descriptive Statistics Using CEIS Data

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
	Debarred (Initial Sample)		**Debarred Between 2008 and 2013**		**Debarred Between 2014 and 2016**		**Matched with RAIS data**		**Debarred (Final Sample)**	
	Mean	SD	Mean	SD	Mean	SD	Mean	SD	Mean	SD
Government Level										
Federal	0.62	0.48	0.66	0.47	0.65	0.48	0.62	0.48	0.62	0.49
State	0.31	0.46	0.31	0.46	0.30	0.46	0.32	0.47	0.33	0.47
Municipal	0.06	0.24	0.03	0.16	0.04	0.21	0.05	0.22	0.05	0.23
Government Branch										
Executive	0.73	0.44	0.70	0.46	0.71	0.45	0.75	0.43	0.75	0.43
Judiciary	0.20	0.40	0.22	0.41	0.22	0.41	0.19	0.39	0.19	0.39
Legislative	0.02	0.14	0.02	0.13	0.03	0.17	0.02	0.15	0.02	0.15
Others	0.05	0.21	0.07	0.25	0.04	0.20	0.04	0.19	0.04	0.18
Type of Sanction										
Impediment	0.40	0.49	0.32	0.47	0.43	0.50	0.45	0.50	0.45	0.50
Suspension	0.41	0.49	0.46	0.50	0.41	0.49	0.44	0.50	0.44	0.50
Prohibition	0.08	0.27	0.11	0.31	0.08	0.27	0.06	0.23	0.06	0.23
Others	0.11	0.31	0.10	0.31	0.07	0.26	0.05	0.23	0.05	0.22
Length (# months)	21.76	21.69	29.13	24.83	19.95	19.41	18.17	17.22	18.12	17.19
Location										
Central-West Region	0.32	0.47	0.40	0.49	0.34	0.47	0.33	0.47	0.33	0.47
North Region	0.06	0.23	0.05	0.21	0.05	0.21	0.04	0.20	0.04	0.20
Northeast Region	0.16	0.36	0.14	0.34	0.16	0.36	0.15	0.36	0.15	0.35
South Region	0.13	0.34	0.07	0.26	0.14	0.35	0.16	0.36	0.16	0.37
Southeast Region	0.30	0.46	0.28	0.45	0.32	0.46	0.32	0.47	0.33	0.47
N	19,112		6,268		6,862		3,294		3,179	

Note: This table reports descriptive statistics (mean and standard deviation) for establishments using information from CEIS database and RAIS data. The variables are drawn from the CEIS data. The first two columns refer to a sample of establishments listed in CEIS before being matched with RAIS data. Columns (3) and (4) consider establishments that are included in CEIS between 2008 and 2013, while Columns (5) and (6) consider establishments that are included in CEIS between 2014 and 2016. Columns (7) and (8) further restrict the sample to establishments debarred between 2014 and 2016 that are matched with RAIS data. Columns (9) and (10) describe the sample of establishments debarred between 2014 and 2016 after applying the matching algorithm. Further details on the matching algorithm are found in Section 3.4. The set of variables is the following: indicator variables for whether the establishment is punished by the federal, state or municipal government, indicator variables for which government branch is responsible for the punishment (executive, judiciary, legislative or neither of them), indicator variables for the types of sanctions, encompassing temporary **suspension** in participation in public bids, **impediment** of bidding and contracting with the public administration, **prohibition** of contracting with the public administration and receiving benefits and incentives, and **other categories**, average length of debarment, expressed in months, and indicator variables for whether the debarment occurred in Central-West, North, Northeast, South and Southeast regions. The total number of establishments in each sample restriction is reported in the last row.

Table A2: Descriptive Statistics for All Establishments

	(1)	(2)
	All Establishments	
	Mean	SD
Main Variables		
# Employees	18.27	135.62
Log Employees	1.87	1.11
Monthly Payroll *(in reais)*	38,444.55	446,004.27
Log Monthly Payroll *(in reais)*	8.75	1.61
Average Earnings per Employee	1,526.72	1,271.35
Average Log Earnings per Employee	7.18	0.66
Bid for Procurement Contract	0.01	0.09
Win Procurement Contract	0.01	0.07
Unique Firm	0.85	0.36
Location		
Central-West Region	0.09	0.28
North Region	0.04	0.19
Northeast Region	0.16	0.37
South Region	0.22	0.41
Southeast Region	0.50	0.50
Average Municipality Population	1,662,300.49	3,232,904.87
Sector		
Construction	0.04	0.20
Commerce	0.45	0.50
Transp., Storage & Commun.	0.05	0.22
Transformation Industry	0.11	0.31
Real Estate	0.13	0.34
Other Categories	0.22	0.41
N	4,058,403	

Note: This table reports descriptive statistics for all establishments in the formal sector using information from RAIS data. Summary statistics are computed from RAIS data using the averages between 2011 and 2013, the years before initial debarment in the main analysis. The variables are: average and log number of employees, average and log monthly payroll (expressed in Brazilian *reais*), average and log earnings per worker (also expressed in Brazilian *reais*), indicators for whether the establishment has bid for and won a procurement contract with the federal government between 2013 and 2018, an indicator for whether the establishment is a single establishment from the associated firm, indicator variables for whether the establishment is located in Central-West, North, Northeast, South and Southeast regions, average population of the municipality in which the establishment is located, and indicator variables for economic sector the establishment belongs to (construction, commerce, transportation, storage and communication, transformation industry, real estate, or other sectors).

B Appendix B – Data Appendix

This appendix provides further details on the data sources described in Section 3, including subsections on further data description and sample construction.

B.1 Data Description

The Debarment Data. The CEIS file contains the following variables: sanction identification number, process number, government agency responsible for the process, government agency's state, level of government agency (federal, state, or municipal), type of punished agent (establishment or individual), tax identifier, name, type of punishment, start and end dates of punishment, total amount of fine, status of punishment, cancellation date, reason for cancellation, reactivation date, and reason for reactivation. The CEIS file is available under a confidentiality agreement with CGU (*Controladoria Geral da União*).

The Labor Market Data. The *Relação Anual de Informações Sociais* (RAIS) is main labor market data source. RAIS is linked employer-employee register with worker and establishment tax identifiers collected by the Brazilian Ministry of Economy and is available under a confidentiality agreement with the agency. The raw RAIS data are mostly provided in state-year files and all variables are standardized across years. I use data spanning the years between 2002 and 2018.

The Procurement Data. Information on all online bidders and winners of procurement contracts obtained with the federal government are extracted from *Portal de Transparência* and *Compras Governamentais* websites, updated by the federal government. Due to data availability, the first year of data used in this paper is 2013.

Data on Municipal Population. Information on municipal population are drawn from the Demographic Census in 2010, the most recent Census data available. Although information on estimated annual population are available, they are more sensitive to measurement errors. The Demographic Census, sourced from IBGE (*Brazilian Institute of Geography and Statistics*), provides the most reliable information.

B.2 Sample Selection and Variable Construction

In order to get the main sample of debarred establishments, I make some restrictions to the CEIS dataset. I begin by restricting the analysis to establishments, as the original data also include punished individuals. To avoid duplicate observations, I maintain the earliest sanction each establishment has. I also remove establishments that had cancelled sanctions or invalid tax identification

numbers. Lastly, I delete all sanctions starting before 2014 and after 2016. These restrictions altogether yield a sample of 6,862 establishments to be matched with RAIS data through establishment tax identifiers. When extending the analysis to include establishments that were debarred between 2008 and 2013, I replicate these steps by maintaining the relevant information.

The establishment tax identifier (CNPJ) is unique to a given establishment over time and consists of fourteen digits. The first eight digits correspond to the firm, while the last six digits correspond to an establishment within the firm. Therefore, as a robustness check, I also adopt an alternative sample restriction at the firm level that follows the same steps using the first eight digits of establishment tax identifier instead of all fourteen digits.

I describe here the steps to prepare the sample to be matched with the debarment data and the **variables** used in the establishment-level analysis. I compute the **total number of employees** and **total average payroll** for all establishments every year based on worker-level files. Payrolls are adjusted to 2018 Brazilian *reais*. Each establishment is assigned its modal legal classification, **municipality** (and, therefore, **state** and **region**), industry code, and establishment size group.[37] I then keep establishments from private sector based using legal classification of each establishment. I also remove units from the Brazilian Central Bank and with invalid industry codes. **Average earnings** are defined as total average payroll divided by number of employees. Considering the universe of all establishments that survived to former sample restrictions, I compute the **deciles of the employment and average earnings** in each of the years. I also generate an indicator variable for whether each establishment a **single establishment** each year.

Using the first two digits of industry code[38], each establishment is assigned to one of the following 17 **economic sectors (or industries)** (defined as sections by IBGE): agriculture, cattle, and forestry (section A); fishing (section B); extractive industries (section C), transformation industries (section D); production and distribution of electricity, gas, and water (section E); construction (section F); wholesale and retail trade; repair of motor vehicles and motorcycles (section G); accommodation and food service activities (section H); transporting, storage, and communication (section I); financial activities (section J); real estate activities (section K); public administration, defence, and social security (section L); education (section M); health and social services (section N); other services activities (section O); domestic services (section P); and international organizations and other extraterritorial institutions (section Q).

Other variables are also created using procurement and municipal population data, such as

[37]Size is recorded as a variable with 10 possible values: zero workers, up to 4 workers, between 5 and 9 workers, between 10 and 19 workers, between 20 and 49 workers, between 50 and 99 workers, between 100 and 249 workers, between 250 and 499 workers, between 500 and 999 workers, more than 1000 workers.

[38]Industry code follows the National Classification of Economic Activities (CNAE), versio 1.0, based on UN ISIC - International Standard Industrial Classification of All Economic Activities.

indicator for whether the establishment bids for procurement contracts with the federal government each year and **population group** for municipality where the establishment is located.[39]

B.3 Matching Procedure

I use the labor market, municipal population and procurement data to construct the matching algorithm for the **establishment sample**. For each establishment debarred in a given year of debarment, I consider a set of non-debarred establishments from the same economic sector and state as possible candidates for the control group. The algorithm uses information extracted from RAIS in all the three years before (years $t-3$, $t-2$ and $t-1$). More precisely, for each pair of economic sector and state, I run a simple linear probability model predicting treatment using the following set of variables as regressors: deciles of total employment in years $t-3$, $t-2$ and $t-1$, deciles of annual earnings in years $t-3$, $t-2$ and $t-1$, indicator variables for whether the establishment won procurement contracts with the federal government in years $t-3$, $t-2$ and $t-1$, indicator variable for whether the establishment bid for procurement contracts with the federal government in any of the three years before debarment, whether it is a single establishment in all of the three years before debarment, and population group representing the size of municipality where the establishment is located. For each treated establishment, I keep one control candidate with the closest propensity score. I also ensure that potential control establishments are not associated to more than one debarred establishment. I consecutively repeat the above steps for all years with debarment events.

As robustness checks, I consider the following changes in the matching algorithm. First, instead of considering the previous regressors from all the three years before debarment, I utilize regressors from year $t-1$ and from years $t-2$ and $t-1$ separately. Second, instead of using a simple linear probability model with the closest propensity score, I implement a more restrictive version of matching: one-to-one coarsened exact matching (Iacus et al. (2012)) with the same set of regressors as before (and, again, within pairs of economic sector and state). Third, instead of allowing only one control establishment with the closest propensity score for each treated establishment, I flexibly allow up to three and five control candidates with the highest propensity scores. I find very similar conclusions. Section 5.4 describes the results in detail.

For the worker-level analysis, I construct a **worker sample** also using a matching algorithm. In

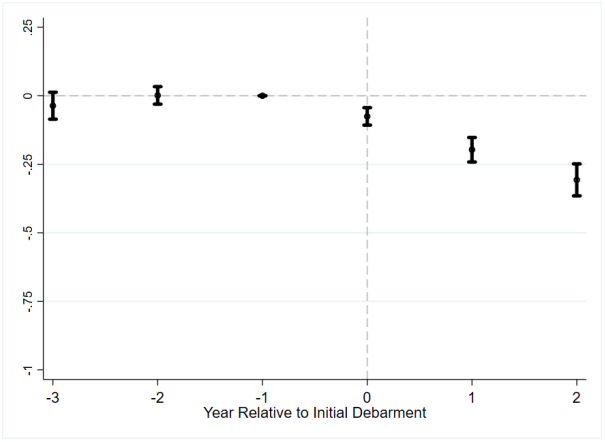
[39] I aggregate population information into seven groups: less than 5,000 inhabitants; equal or more than 5,000 and less than 10,000; equal or more than 10,000 and less than 20,000; equal or more than 20,000 and less than 50,000; equal or more than 50,000 and less than 100,000; equal or more than 100,000 and less than 500,000; and more than 500,000.

particular, from the set of matched debarred establishments (i.e., the final debarred establishment sample after the matching steps outlined above), I recover all individuals who worked in these establishments in all three years before they were debarred (years $t-3$, $t-2$ and $t-1$). I repeat this step for the set of matched control establishments. I then recover the relevant characteristics extracted from RAIS in year $t-1$: age groups (I create 5 years age bins), indicator for male, indicator for disability, indicator for white, educational categories (there are 11 educational categories: illiterate, incomplete primary education, primary education, incomplete lower secondary education, lower secondary education, incomplete upper secondary education, upper secondary education, incomplete tertiary education, tertiary education, Master degree, and PhD degree), occupational categories (more precisely, I use the 2002 Brazilian Classification of Occupations (CBO), which classifies jobs based on their skill and task content to construct four occupation categories: managerial, professional, blue collar, and white collar lower level positions), and economic sector. Thereafter, with the sample of workers from matched treated and control establishments in hand, I estimate a simple linear probability model predicting treatment using the above characteristics. For each worker from treated establishment, I keep one comparison worker from control establishment with the closest propensity score.

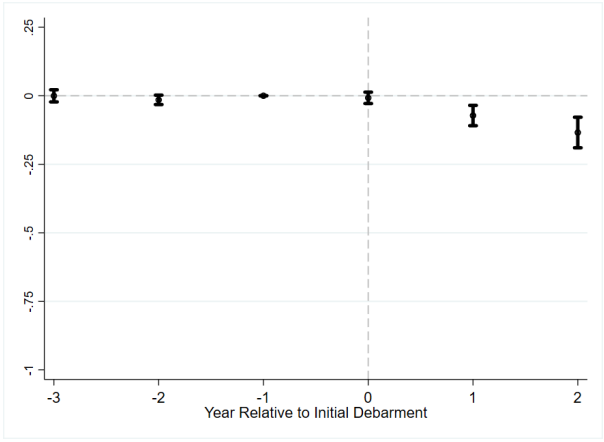
As a last step, the resulting establishment and worker samples are matched to relevant years of RAIS data (years $[t-3,\ t+2]$) to recover the outcomes of interest.

C Appendix C – Additional Results

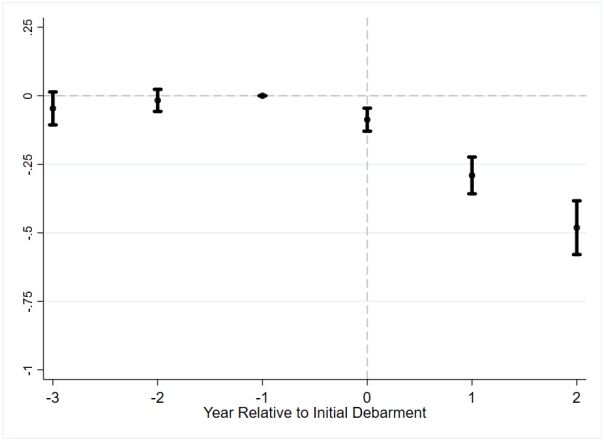
Figure C1: Effects of Debarment on Establishments' Outcomes Using Establishment Stayers



(a) Log Employment



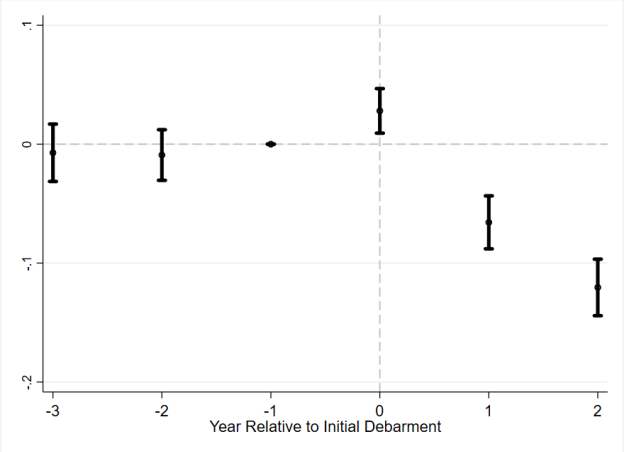
(b) Log Earnings



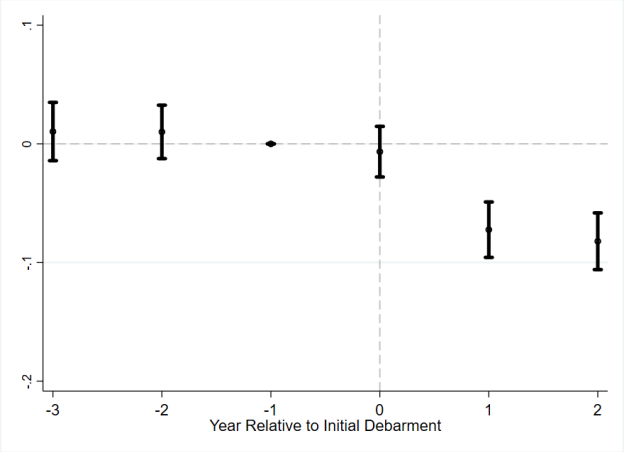
(c) Log Payroll

Note: This figure reports point estimates of the annual effects of debarment on different establishment-level outcomes from RAIS data. The omitted category is the year before debarment. The sample consists of establishment stayers, that is, active establishments that have at least one employee in all years from the window of [-3, 2] years around the debarment event. More details can be found in Table C1.

Figure C2: Effects of Debarment on Procurement Contracts



(a) Bidding Federal Contract



(b) Winning Federal Contract

Note: This figure reports point estimates of the annual effects of debarment on the likelihood of bidding for and winning procurement contracts with the federal government. The omitted category is the year before debarment. More details can be found in Table C6.

Table C1: Effects of Debarment on Establishments' Outcomes for Stayers

	(1) log employment	(2) log earnings (cond.)	(3) log payroll (cond.)
PostDebarment	-0.180***	-0.066***	-0.264***
	(0.024)	(0.016)	(0.034)
Sample Size	27,306	27,306	27,306
Establishment FE	✓	✓	✓
Year FE	✓	✓	✓
# Establishments	4,506	4,506	4,506
# Debarred Establishments	1,902	1,902	1,902
Mean Dep. Var (Control)	3.25	7.45	10.59

Note: ***: significant at 1% level; **: significant at 5% level; *: significant at 10% level. This table reports the aggregate effects of debarment on several establishments' outcomes: log employment, log earnings and log monthly payroll in the formal sector using information from both CEIS database and RAIS data. The sample consists of active establishments that have at least one employee in all years of annual window [-3,2] around debarment between 2014 and 2016. I refer to them as establishment stayers. All columns refer to Equation (1). Number of establishments and establishment-year pairs is reported. Means of dependent variables are computed from pre-event years [-3,-1] of the matched control group. Standard errors are clustered at the firm level.

Table C2: Robustness Checks: Establishments' Outcomes

	(1)	(2)	(3)	(4)	(5)	(6)
	Alternative Measures for Outcome Variables					
	employm. (level)	employm. (arc sin)	earnings (level)	earnings (arc sin)	payroll (level)	payroll (arc sin)
PostDebarment	-62.782***	-0.746***	-262.773***	-1.254***	-128,967.369***	-1.897***
	(10.672)	(0.040)	(24.444)	(0.070)	(24,730.618)	(0.098)
Sample Size	38,148	38,148	38,148	38,148	38,148	38,148
Establishment FE	✓	✓	✓	✓	✓	✓
Year FE	✓	✓	✓	✓	✓	✓
Mean Dep. Var (Control)	113.66	3.73	1,958.27	8.11	247,625.94	11.13

Note: ***: significant at 1% level; **: significant at 5% level; *: significant at 10% level. This table reports several robustness checks at the establishment-level using information from CEIS database and RAIS data. Odd columns refer to number of employees, earnings per worker and total monthly payroll as the dependent variables. Even columns consider the inverse hyperbolic sine transformation of these variables as the dependent variables. Number of establishment-year pairs is reported. Means of dependent variables are computed from pre-event years $[-3, -1]$ of the matched control group. Standard errors are clustered at the firm level.

Table C3: Additional Robustness Checks: Establishments' Outcomes

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
	Municipality-Specific Trends				**Industry-Specific Trends**			
	log employm.	exit	log earnings (uncond.)	log payroll (uncond.)	log employm.	exit	log earnings (uncond.)	log payroll (uncond.)
PostDebarment	-0.652***	0.154***	-1.155***	-1.800***	-0.648***	0.149***	-1.138***	-1.782***
	(0.033)	(0.008)	(0.060)	(0.086)	(0.031)	(0.008)	(0.059)	(0.083)
Sample Size	38,148	38,148	38,148	38,148	38,148	38,148	38,148	38,148
Establishment FE	✓	✓	✓	✓	✓	✓	✓	✓
Year FE	✓	✓	✓	✓	✓	✓	✓	✓
Municipality-Specific Trends	✓	✓	✓	✓	×	×	×	×
Industry-Specific Trends	×	×	×	×	✓	✓	✓	✓
Mean Dep. Var (Control)	3.14	0	7.42	10.44	3.14	0	7.42	10.44

Note: ***: significant at 1% level; **: significant at 5% level; *: significant at 10% level. This table reports several robustness checks using establishment-level sample extracted from CEIS and RAIS data. Columns (1)–(4) refer to the same set of outcome variables from Table 3 after including municipality-specific trends in the set of controls of Equation (1). Columns (5)–(8) add 2-digit industry-specific trends. Means of dependent variables are computed from pre-event years [-3,-1] of the matched control group. Standard errors are clustered at the firm level.

Table C4: Heterogeneous Effects by Economic Sector

	(1) log employment	(2) exit	(3) log earnings (uncond.)	(4) log payroll (uncond.)
Panel A: Construction (N = 5,976)				
PostDebarment	-0.679***	0.135***	-1.095***	-1.783***
	(0.089)	(0.022)	(0.161)	(0.232)
Panel B: Commerce (N = 15,648)				
PostDebarment	-0.374***	0.150***	-1.104***	-1.455***
	(0.032)	(0.012)	(0.089)	(0.111)
Panel C: Transp., Storage & Commun. (N = 1,824)				
PostDebarment	-0.722***	0.160***	-1.146***	-1.845***
	(0.156)	(0.038)	(0.282)	(0.406)
Panel D: Transf. Industry (N = 5,064)				
PostDebarment	-0.373***	0.084***	-0.639***	-1.014***
	(0.067)	(0.018)	(0.137)	(0.191)
Panel E: Real Estate (N = 8,124)				
PostDebarment	-1.307***	0.213***	-1.606***	-2.921***
	(0.096)	(0.018)	(0.131)	(0.215)
Panel F: Other Sectors (N = 1,512)				
PostDebarment	-0.673***	0.108**	-1.025***	-1.739***
	(0.159)	(0.043)	(0.305)	(0.430)
Establishment FE	✓	✓	✓	✓
Year FE	✓	✓	✓	✓

Note: ***: significant at 1% level; **: significant at 5% level; *: significant at 10% level. This table reports heterogeneous effects of debarment on establishments' outcomes by economic sector using establishment-level sample extracted from CEIS and RAIS data. All columns refer to Equation (1) restricted to one of the following sectors: construction, commerce, transportation, storage and communication, transformation industry, real estate or other sectors. Standard errors are clustered at the firm level.

Table C5: Heterogeneous Effects by Establishment Size

	(1) log employment	(2) exit	(3) log earnings (uncond.)	(4) log payroll (uncond.)
Panel A: 0-9 Employees (N = 17,430)				
PostDebarment	-0.289***	0.144***	-1.059***	-1.317***
	(0.030)	(0.013)	(0.092)	(0.113)
Panel B: 10-49 Employees (N = 12,444)				
PostDebarment	-0.606***	0.120***	-0.965***	-1.591***
	(0.051)	(0.013)	(0.097)	(0.142)
Panel C: 50-99 Employees (N = 2,922)				
PostDebarment	-0.999***	0.171***	-1.356***	-2.373***
	(0.137)	(0.026)	(0.198)	(0.324)
Panel D: 100+ Employees (N = 5,352)				
PostDebarment	-1.606***	0.198***	-1.481***	-3.109***
	(0.134)	(0.020)	(0.150)	(0.277)
Establishment FE	✓	✓	✓	✓
Year FE	✓	✓	✓	✓

Note: ***: significant at 1% level; **: significant at 5% level; *: significant at 10% level. This table reports heterogeneous effects of debarment on establishments' outcomes by establishment size using establishment-level sample extracted from CEIS and RAIS data. All columns refer to Equation (1) restricted to one of the following sizes: 0-9 employees, 10-49 employees, 50-99 employees, and equal or more than 100 employees. Standard errors are clustered at the firm level.

Table C6: Effects of Debarment on Procurement Contracts

	(1) bidding contract	(2) bidding contract	(3) winning contract	(4) winning contract
PostDebarment	-0.047***	0.012	-0.061***	-0.007
	(0.008)	(0.010)	(0.008)	(0.010)
Sample Size	38,148	27,036	38,148	27,036
Establishment FE	✓	✓	✓	✓
Year FE	✓	✓	✓	✓
Sample	All	Stayers	All	Stayers
Mean Dep. Var (Control)	0.36	0.38	0.29	0.31

Note: ***: significant at 1% level; **: significant at 5% level; *: significant at 10% level. This table reports the aggregate effects of debarment on the probability of bidding for and winning procurement contracts with the federal government using CEIS, procurement and RAIS data. In the first column, the sample consists of all establishments from the matching procedure described in Section 3.4 considering the period for which procurement data is available. In the second column, the sample is further restricted to establishments that have at least one employee in all years of annual window [-3,2] around debarment, the establishment stayers. All columns refer to Equation (1). Means of dependent variables are computed from pre-event years of the matched control group. Standard errors are clustered at the firm level.

Table C7: Heterogeneous Effects by Intensity of Connection with the Government

	(1) log employment	(2) exit	(3) log earnings (uncond.)	(4) log payroll (uncond.)
Panel A: Sectors Less Connected with Government (N = 3,456)				
PostDebarment	-0.703***	0.129***	-1.031***	-1.733***
	(0.119)	(0.026)	(0.194)	(0.292)
Panel B: Sectors More Connected with Government (N = 34,692)				
PostDebarment	-0.645***	0.153***	-1.156***	-1.797***
	(0.034)	(0.008)	(0.062)	(0.088)
Panel C: Lower Dependence on Federal Contracts (N = 28,008)				
PostDebarment	-0.637***	0.135***	-1.040***	-1.677***
	(0.039)	(0.009)	(0.070)	(0.101)
Panel D: Higher Dependence on Federal Contracts (N = 10,140)				
PostDebarment	-0.681***	0.194***	-1.441***	-2.102***
	(0.055)	(0.015)	(0.108)	(0.148)
Establishment FE	✓	✓	✓	✓
Year FE	✓	✓	✓	✓

Note: ***: significant at 1% level; **: significant at 5% level; *: significant at 10% level. This table reports heterogeneous effects of debarment by size on establishments' outcomes by intensity of connection with the government using establishment-level sample extracted from CEIS and RAIS data. All columns refer to Equation (1). I use two measures of government dependence. First, considering the universe of federal government contracts awarded in 2013, I create the distribution of total value of contracts by 2-digit industry and divide these sectors into medians. Panels A and B show the results after restricting the sample to sectors below and above the median to represent weaker and stronger connections with the government. Second, I compute the ratio of total revenues obtained from federal government contracts and the annual payroll for each establishment. Panels C and D report the estimates after restricting the sample to establishments with lower and higher dependence on these contracts measured as having less than and at least 25 percent of payroll expenses covered by revenues from federal contracts, respectively. Standard errors are clustered at the firm level.

Table C8: Robustness Check – Workers' Outcomes

	(1)	(2)	(3)	(4)	(5)
	Other Earnings Measures		**Occupation-Specific Trends**		
	(uncond.) earnings (sin transf.)	(cond.) earnings (sin transf.)	employment	log earnings (uncond.)	log earnings (cond.)
PostDebarment	-0.271**	-0.000	-0.034**	-0.247**	-0.000
	(0.106)	(0.011)	(0.014)	(0.097)	(0.011)
Sample Size	975,996	883,131	975,996	975,996	883,131
Worker FE	✓	✓	✓	✓	✓
Year FE	✓	✓	✓	✓	✓
Occupation-Specific Trends	×	×	✓	✓	✓
Mean Dep. Var (Control)	8.03	8.03	1	7.35	7.35

Note: ***: significant at 1% level; **: significant at 5% level; *: significant at 10% level. This table reports several robustness checks at the worker-level using information from CEIS and RAIS data. Columns (1) and (2) apply the inverse hyperbolic sine transformation on earnings. Columns (3)–(5) include 2-digit occupation-specific trends in the set of controls. Numbers of workers, is reported. Means of dependent variables are computed from pre-event years [-3,-1] of the matched control group. Standard errors are two-way clustered at the worker and pre-event firm level.

Table C9: Heterogeneous Effects by Workers' Characteristics

	(1) employment	(2) log earnings (uncond.)	(3) log earnings (cond.)
Panel A: Gender			
PostDebarment ×**1**(male)	-0.024	-0.137	-0.008
	(0.019)	(0.135)	(0.018)
Panel B: Disability			
PostDebarment ×**1**(with disability)	-0.003	-0.124	-0.078*
	(0.027)	(0.186)	(0.046)
Panel C: Race			
PostDebarment ×**1**(white)	-0.008	-0.128	-0.027*
	(0.021)	(0.140)	(0.016)
Panel D: Education			
PostDebarment ×**1**(High School)	0.004	0.047	0.007
	(0.012)	(0.084)	(0.016)
PostDebarment ×**1**(College)	-0.022	-0.201	-0.013
	(0.022)	(0.159)	(0.027)
Panel E: Age Group			
PostDebarment ×**1**(age $<$ 25)	0.017	0.137	0.062***
	(0.016)	(0.110)	(0.016)
PostDebarment ×**1**($26 \leq age < 36$)	0.013	0.118	0.082***
	(0.014)	(0.093)	(0.013)
PostDebarment ×**1**($36 \leq age < 46$)	0.012	0.110	0.084***
	(0.011)	(0.076)	(0.012)
Panel F: Occupation			
PostDebarment ×**1**(Managerial)	-0.068*	-0.520*	-0.024
	(0.040)	(0.270)	(0.027)
PostDebarment ×**1**(Professional)	-0.053	-0.378*	0.012
	(0.035)	(0.226)	(0.023)
PostDebarment ×**1**(Blue Collar)	-0.031	-0.178	0.015
	(0.037)	(0.229)	(0.018)
Panel G: Tenure			
PostDebarment ×**1**(4 years)	0.021	0.166	-0.003
	(0.035)	(0.233)	(0.018)
PostDebarment ×**1**(5 years)	0.005	0.078	0.020
	(0.018)	(0.124)	(0.021)
PostDebarment ×**1**(6+ years)	-0.036**	-0.235**	0.007
	(0.017)	(0.119)	(0.019)
Panel I: Wage Distribution			
PostDebarment ×**1**(Quintile 2)	-0.043	-0.306	0.054*
	(0.030)	(0.236)	(0.029)
PostDebarment ×**1**(Quintile 3)	-0.022	-0.166	0.053*
	(0.030)	(0.242)	(0.030)
PostDebarment ×**1**(Quintile 4)	-0.036	-0.264	0.067
	(0.030)	(0.242)	(0.030)
PostDebarment ×**1**(Quintile 5)	-0.057*	-0.511**	0.016
	(0.031)	(0.253)	(0.032)
Sample Size	975,996	975,996	883,131
Worker FE	✓	✓	✓
Year FE	✓	✓	✓

Note: This table reports the effects of debarment on several workers' outcomes based on workers' characteristics in the year before the debarment event using information from CEIS and RAIS data. All columns refer to Equation (4). Only the estimates for β_4 are displayed. The dependent variables and sample are the same as in Table 2. I consider the following characteristics: indicator variable for male workers; indicator variable for disabled workers; indicator variables for educational levels (basic education is the omitted category); indicator variables for age groups (aged above 46 is the omitted category); indicator variables for occupational categories (white collar lower level position is the omitted category); indicator variables for tenure lengths (three years or less of tenure is the omitted category); and indicator variables for wage distributions (first quintile is the omitted category).

Table C10: The Information Shock Channel by Year of Separation

	(1) employment	(2) employment	(3) log earnings	(4) log earnings
Panel A (Separated One Year Before) (N = 176,112)				
PostDebarment	0.005	0.007	-0.009	0.005
	(0.024)	(0.023)	(0.174)	(0.176)
Mean Dep. Var (Control)	0.78	0.78	5.84	5.84
Panel B (Separated Two Years Before) (N = 226,818)				
PostDebarment	-0.026*	-0.025*	-0.241**	-0.233**
	(0.015)	(0.013)	(0.111)	(0.105)
Mean Dep. Var (Control)	0.70	0.70	5.31	5.31
Panel C (Separated Three Years Before) (N = 183,978)				
PostDebarment	-0.014	-0.012	-0.095	-0.081
	(0.012)	(0.011)	(0.093)	(0.088)
Mean Dep. Var (Control)	0.67	0.67	5.13	5.13
Worker FE	✓	✓	✓	✓
Year FE	✓	✓	✓	✓
Worker Controls	×	✓	×	✓

Note: ***: significant at 1% level; **: significant at 5% level; *: significant at 10% level. This table tests the information shock channel by estimating the aggregate effects of debarment on employment and log unconditional earnings in the formal sector. I use information from CEIS and RAIS data. The estimation sample consists of annual window [-3,2] around debarment. All columns refer to Equation (1). In Columns (2) and (4), I add time-varying controls, such age and age squared. In Panel A, the sample consists of workers that have been displaced one year before the event. Similarly, Panels B and C consist of workers that have been displaced two and three years before the event, respectively. Further details on how the sample is constructed can be found in Section 5.3. Total number of worker-year pairs is reported. Means of dependent variables are computed from pre-event years [-3,-1] of the matched control group. Standard errors are two-way clustered at the worker and pre-event firm levels.

D Appendix D – Robustness Checks

In Appendix D, I provide a set of robustness tests for the main results in Section 5.

D.1 Debarment Prior to the Anti-Corruption Law in 2014

Table D1: Effects of Debarment on Establishments' Outcomes Prior to 2014

	(1) log employment	(2) exit	(3) log earnings (uncond.)	(4) log payroll (uncond.)
PostDebarment	-0.725***	0.132***	-0.952***	-1.685***
	(0.044)	(0.010)	(0.071)	(0.107)
Sample Size	32,136	32,136	32,136	32,136
Establishment FE	✓	✓	✓	✓
Year FE	✓	✓	✓	✓
Mean Dep. Var (Control)	3.10	0	7.26	10.24

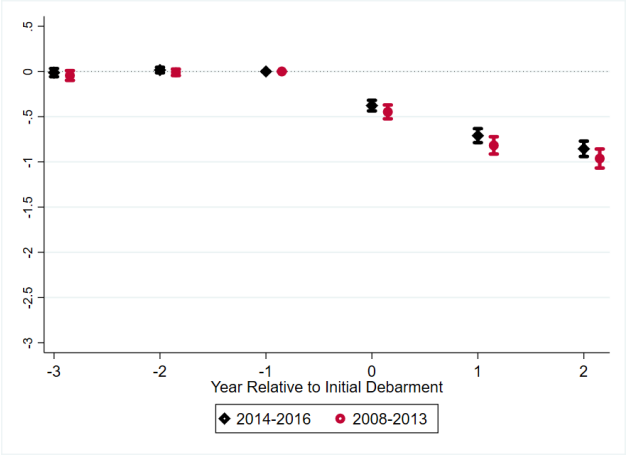
Note: ***: significant at 1% level; **: significant at 5% level; *: significant at 10% level. This table reports the aggregate effects of debarment on several establishments' outcomes restricted to the formal sector: log employment, likelihood of exiting the formal sector, log (unconditional) earnings and log (unconditional) monthly payroll using information from both CEIS and RAIS data. The estimation sample consists of annual window $[-3, 2]$ around debarment between 2008 and 2013. All columns refer to Equation (1). Means of dependent variables are computed from pre-event years $[-3, -1]$ of the matched control group. Standard errors are clustered at the firm level.

Table D2: Effects of Debarment on Workers' Outcomes Prior to 2014

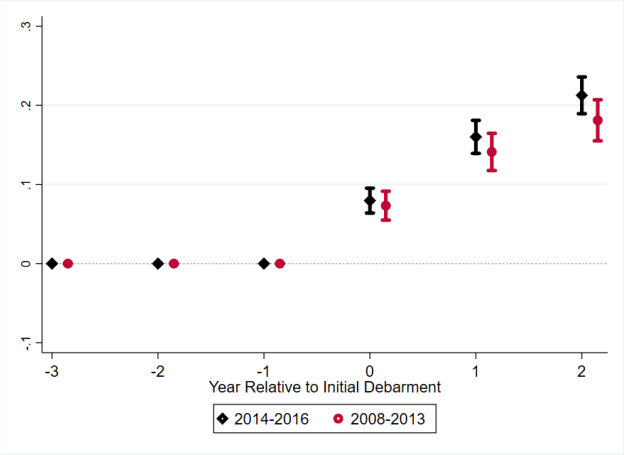
	(1) employment	(2) log earnings (uncond.)	(3) log earnings (cond.)
PostDebarment	-0.044***	-0.280***	0.014
	(0.009)	(0.063)	(0.012)
Sample Size	474,156	474,156	436,559
Worker FE	✓	✓	✓
Year FE	✓	✓	✓
Mean Dep. Var (Control)	1	7.19	7.19

Note: ***: significant at 1% level; **: significant at 5% level; *: significant at 10% level. This table reports the aggregate effects of debarment on workers' outcomes in the formal sector: indicator for employment, log unconditional earnings and log conditional earnings using information from both CEIS database and RAIS data. The estimation sample consists of annual window [-3,2] around debarment between 2008 and 2013. All columns refer to Equation (2). Number of workers, treated workers and worker-year pairs is reported. Means of dependent variables are computed from pre-event years [-3,-1] of the matched control group. Standard errors are two-way clustered at the worker and pre-event firm levels.

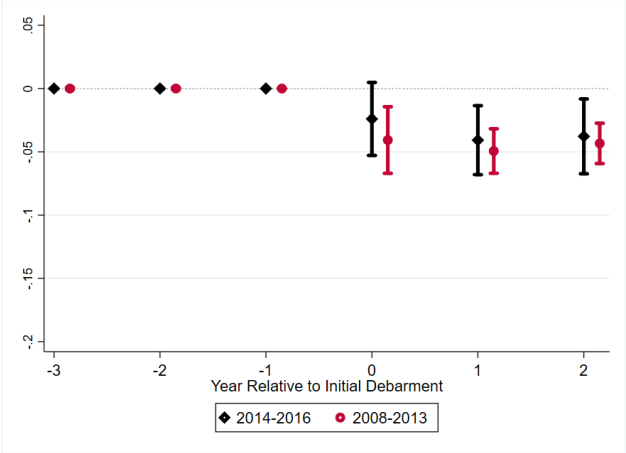
Figure D1: Robustness Check: Debarment Prior to 2014



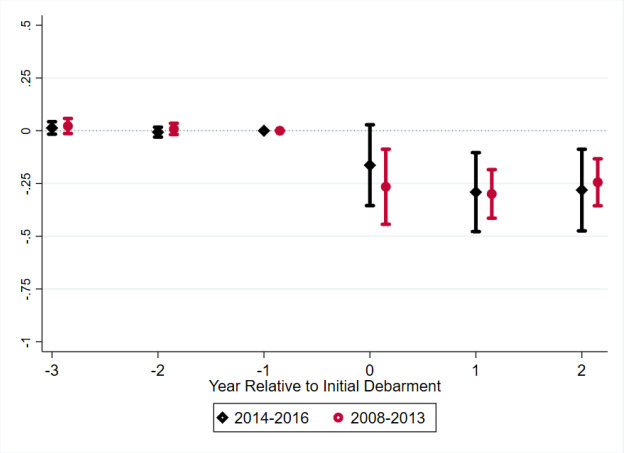
(a) Log Employment - Establishment



(b) Exit - Establishment



(c) Employment - Worker



(d) Log (Uncond.) Earnings - Worker

Note: This figure reports point estimates of the annual effects of debarment on selected outcomes considering establishments that have been debarred between 2014 and 2016 (in black) and between 2008 and 2013 (in red) separately. The omitted category is the year before debarment. More details can be found in Tables 3, 4, D1, and D2.

D.2 "No Employee" Restriction

Table D3: Effects of Debarment on Establishments' Outcomes: No "Employee" Restriction

	(1) log employment	(2) exit	(3) log earnings (uncond.)	(4) log payroll (uncond.)
PostDebarment	-0.507***	0.125***	-0.941***	-1.439***
	(0.030)	(0.008)	(0.062)	(0.085)
Sample Size	55,788	55,788	55,788	55,788
Establishment FE	✓	✓	✓	✓
Year FE	✓	✓	✓	✓
# Establishments	9,298	9,298	9,298	9,298
# Debarred Establishments	4,649	4,649	4,649	4,649
Mean Dep. Var (Control)	2.50	0.13	6.40	8.76

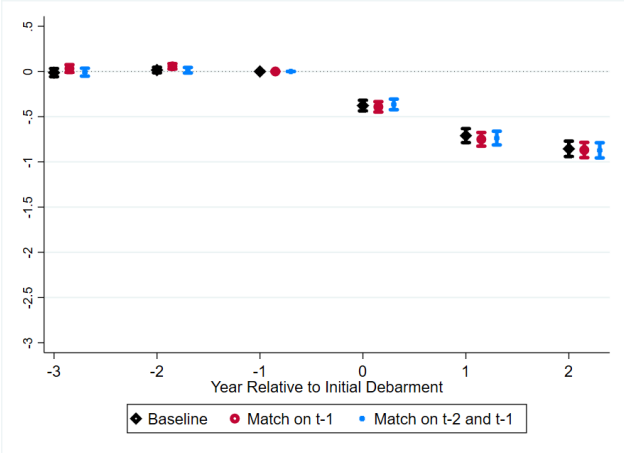
Note: ***: significant at 1% level; **: significant at 5% level; *: significant at 10% level. This table reports the aggregate effects of debarment on workers' outcomes in the formal sector: indicator for employment, log unconditional earnings and log conditional earnings using information from both CEIS database and RAIS data. I relax the tenure restriction described in Section 3.4 by allowing establishments to not have any employee in any of the three years prior to debarment. Further details on how the sample is constructed can be found in Section 5.4. The estimation sample consists of annual window [-3,2] around debarment between 2014 and 2016. All columns refer to Equation (2). Number of workers, treated workers and worker-year pairs is reported. Means of dependent variables are computed from pre-event years [-3,-1] of the matched control group. Standard errors are two-way clustered at the worker and pre-event firm levels.

D.3 Alternative Matching Algorithms

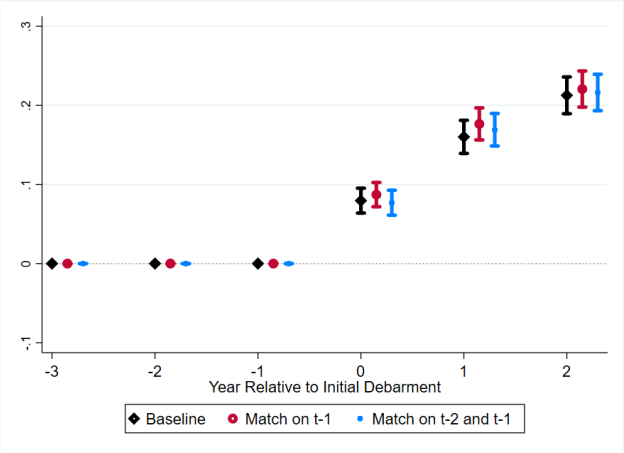
D.3.1 Matching on the Level

Instead of matching on three years before official debarment ($[t-3; t-1]$), I alternatively implement matching on the level $(t-1)$, considering the

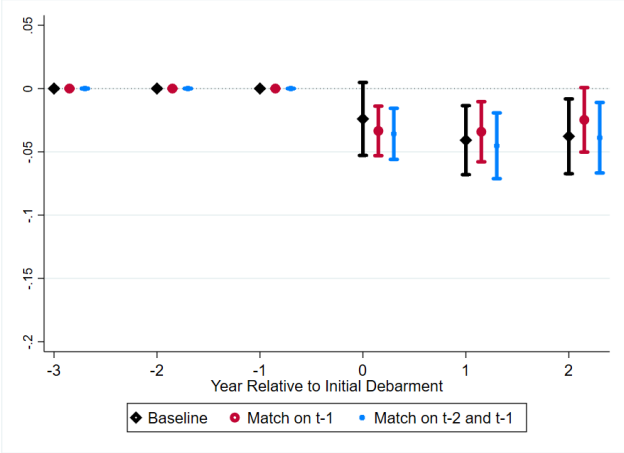
Figure D2: Robustness Check: Matching on Levels



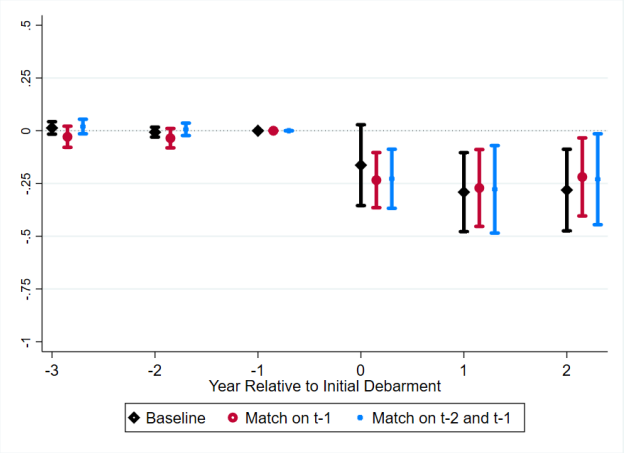
(a) Log Employment - Establishment



(b) Exit - Establishment



(c) Employment - Worker

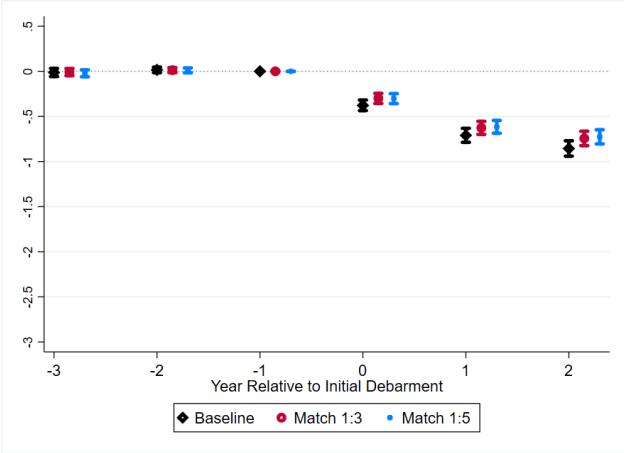


(d) Log (Uncond.) Earnings - Worker

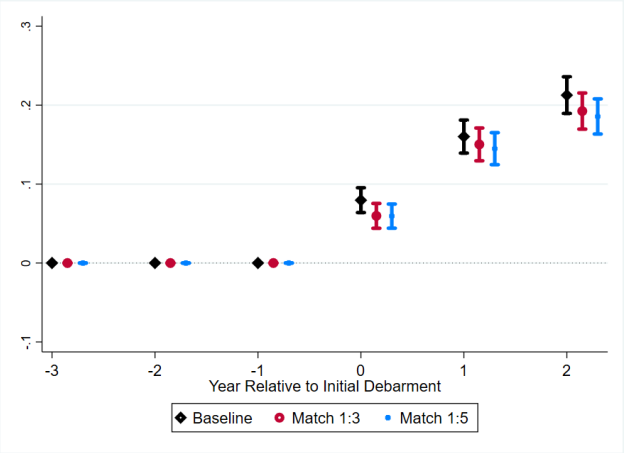
Note: This figure reports point estimates of the annual effects of debarment on selected outcomes considering three different matching algorithms: matching on three years before debarment (in black), matching on the year before debarment (in red), and matching on the two years before debarment (in blue). More details can be found in Section 5.4 and in Tables 3, 4, and D4.

D.3.2 Multiple Candidates

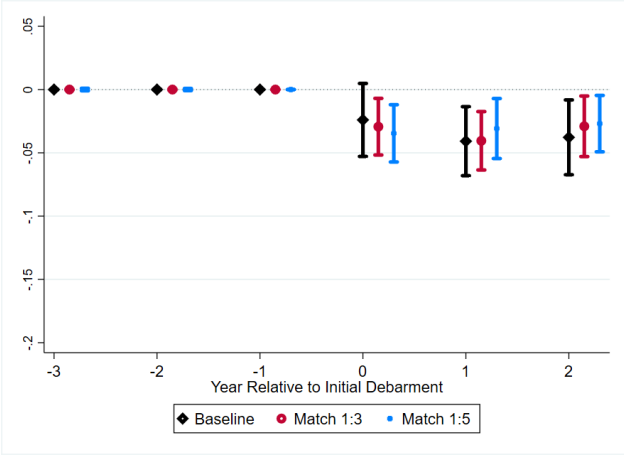
Figure D3: Robustness Check: Multiple Candidates



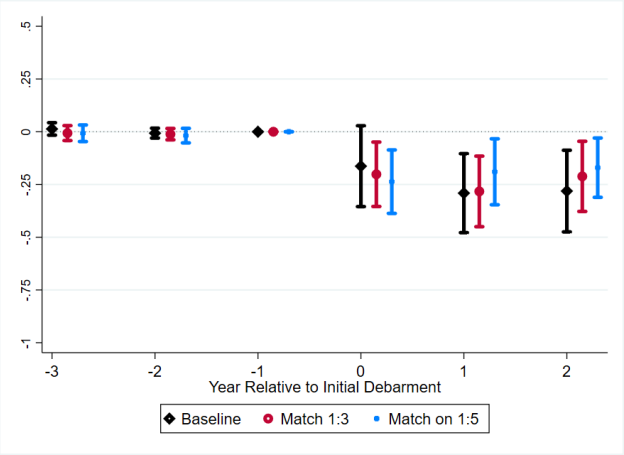
(a) Log Employment - Establishment



(b) Exit - Establishment



(c) Employment - Worker

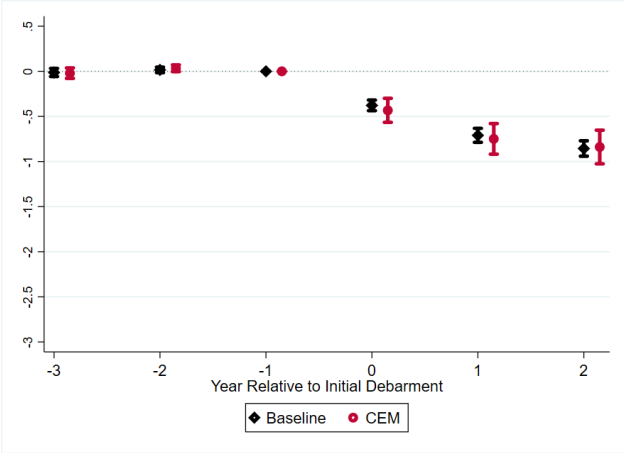


(d) Log (Uncond.) Earnings - Worker

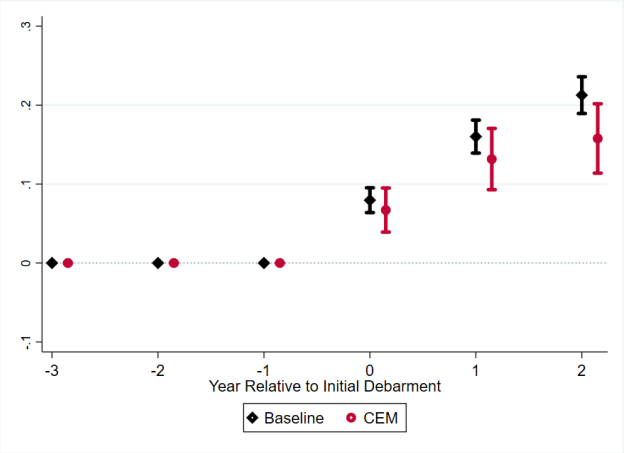
Note: This figure reports point estimates of the annual effects of debarment on selected outcomes considering three different matching algorithms: one-to-one matching (in black), one-to-three matching (in red), and one-to-five matching (in blue). More details can be found in Section 5.4 and in Tables 3, 4, and D4.

D.3.3 Coarsened Exact Matching

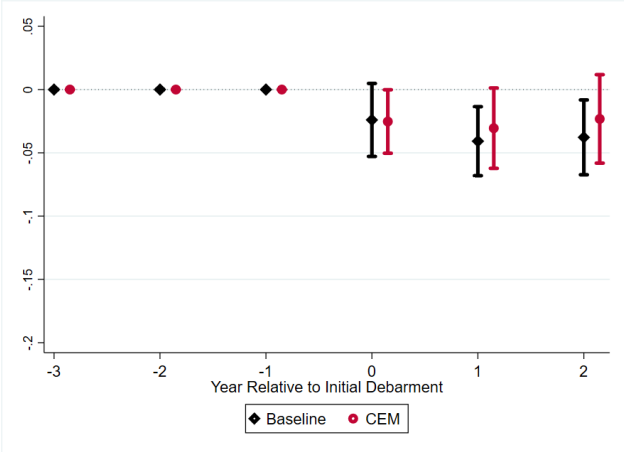
Figure D4: Robustness Check: Coarsened Exact Matching



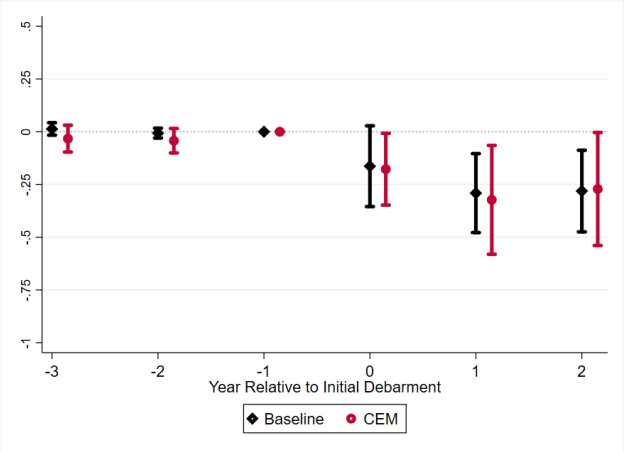
(a) Log Employment - Establishment



(b) Exit - Establishment



(c) Employment - Worker



(d) Log (Uncond.) Earnings - Worker

Note: This figure reports point estimates of the annual effects of debarment on selected outcomes considering two different matching algorithms: the baseline matching described in Section 3.4 (in black) and one-to-one coarsened exact matching (in red). More details can be found in Section 5.4 and in Tables 3, 4, and D4.

Table D4: Robustness Checks

	(1) log employment	(2) exit	(3) employment	(3) log earnings (uncond.)
		Panel A: Baseline		
PostDebarment	-0.649***	0.151***	-0.034**	-0.247**
	(0.035)	(0.009)	(0.014)	(0.096)
		Panel B: Match on t-1		
PostDebarment	-0.700***	0.161***	-0.031***	-0.220***
	(0.034)	(0.008)	(0.011)	(0.080)
		Panel C: Match on t-2 & t-1		
PostDebarment	-0.660***	0.154***	-0.040***	-0.254***
	(0.035)	(0.009)	(0.012)	(0.092)
		Panel D: 1:3 Matching		
PostDebarment	-0.557***	0.134***	-0.033***	-0.226***
	(0.033)	(0.009)	(0.011)	(0.079)
		Panel E: 1:5 Matching		
PostDebarment	-0.542***	0.129***	-0.031***	-0.190***
	(0.033)	(0.008)	(0.011)	(0.071)
		Panel F: Coarsened Exact Matching		
PostDebarment	-0.678***	0.119***	-0.026*	-0.232**
	(0.078)	(0.016)	(0.015)	(0.108)
Establishment FE	✓	✓	×	×
Worker FE	×	×	✓	✓
Year FE	✓	✓	✓	✓
Unit	Establishment	Establishment	Worker	Worker

Note: ***: significant at 1% level; **: significant at 5% level; *: significant at 10% level. This table reports the aggregate effects of debarment on selected establishments' and workers' outcomes: log employment, exit, indicator for employment, and log unconditional earnings. Columns (1) and (2) refer to Equation (1), while Columns (3) and (4) refer to Equation (3). Panel A considers the baseline results after implementing a one-to-one matching on all three years prior to debarment. Panels B and C report estimates after one-to-one matching on the year and on two years prior to debarment. Panels D and E refer to one-to-three and one-to-five matching. Panel F implements a one-to-one coarsened exact matching. Further details can be found in Section 5.4. Standard errors are clustered at the firm level.

D.4 Intensity

Table D5: Treatment Intensity: Establishment-Level Analysis

	(1) log employment	(2) exit	(3) log earnings (uncond.)	(4) log payroll (uncond.)
Panel A: Less Intense Treatment (N = 20,496)				
PostDebarment	-0.374***	0.104***	-0.793***	-1.154***
	(0.042)	(0.011)	(0.083)	(0.115)
Panel B: More Intense Intense Treatment (N = 16,704)				
PostDebarment	-0.986***	0.208***	-1.585***	-2.575***
	(0.059)	(0.014)	(0.101)	(0.148)
Establishment FE	✓	✓	✓	✓
Year FE	✓	✓	✓	✓

Note: ***: significant at 1% level; **: significant at 5% level; *: significant at 10% level. This table reports the heterogeneous effects of debarment on establishments' outcomes by treatment intensity using information from both CEIS and RAIS data. Panels A and B show the results after restricting the sample to establishments with debarment length below and above the median (12 months) to represent less and more intense treatments, respectively. The estimation sample consists of annual window $[-3, 2]$ around debarment. All columns refer to Equation (1). Standard errors are clustered at the firm level.

Table D6: Treatment Intensity: Worker-Level Analysis

	(1) employment	(2) log earnings (uncond.)	(3) log earnings (cond.)
Panel A: Less Intense Treatment			
PostDebarment	-0.016	-0.142	-0.005
	(0.022)	(0.149)	(0.016)
Sample Size	561,372	561,372	510,693
Panel B: More Intense Treatment			
PostDebarment	-0.058***	-0.391***	0.006
	(0.011)	(0.078)	(0.014)
Sample Size	402,636	402,636	361,960
Worker FE	✓	✓	✓
Year FE	✓	✓	✓

Note: ***: significant at 1% level; **: significant at 5% level; *: significant at 10% level. This table reports the heterogeneous effects of debarment on workers' outcomes by treatment intensity using information from both CEIS database and RAIS data. The estimation sample consists of annual window [-3,2] around debarment. Panels A and B show the results after restricting the sample to establishments with debarment length below and above the median (12 months) to represent less and more intense treatments, respectively. All columns refer to Equation (2). Standard errors are two-way clustered at the worker and pre-event firm levels.

Table D7: Treatment Intensity: The Information Shock Channel

	(1) employment	(2) employment	(3) log earnings	(4) log earnings
Panel A: Less Intense Treatment (N = 288,252)				
PostDebarment	-0.008	-0.008	-0.109	-0.110
	(0.015)	(0.013)	(0.109)	(0.100)
Panel B: More Intense Treatment (N = 290,280)				
PostDebarment	-0.023*	-0.021**	-0.181**	-0.170**
	(0.012)	(0.011)	(0.090)	(0.085)
Establishment FE	✓	✓	✓	✓
Year FE	✓	✓	✓	✓
Worker Controls	×	✓	×	✓

Note: ***: significant at 1% level; **: significant at 5% level; *: significant at 10% level. This table tests the information shock channel by estimating the heterogeneous effects of debarment on employment and log unconditional earnings in the formal sector by treatment intensity using information from both CEIS database and RAIS data. The estimation sample consists of annual window [-3,2] around debarment. Panels A and B show the results after restricting the sample to establishments with debarment length below and above the median (12 months) to represent less and more intense treatments, respectively. All columns refer to Equation (2). In Columns (2) and (4), I add time-varying controls, such age and age squared. Standard errors are two-way clustered at the worker and pre-event firm levels.

D.5 Firm-Level Results

Table D8: Effects of Debarment on Firms' Outcomes Using Firm-Level Sample

	(1) log employment	(2) exit	(3) log earnings (uncond.)	(4) log payroll (uncond.)
PostDebarment	-0.635***	0.143***	-1.096***	-1.732***
	(0.035)	(0.009)	(0.064)	(0.091)
Sample Size	38,484	38,484	38,484	38,484
Firm FE	✓	✓	✓	✓
Year FE	✓	✓	✓	✓
Mean Dep. Var (Control)	3.21	0	7.13	10.22

Note: ***: significant at 1% level; **: significant at 5% level; *: significant at 10% level. This table reports the aggregate effects of debarment on several firms' outcomes restricted to the formal sector: log employment, likelihood of exiting the formal sector, log (unconditional) earnings and log (unconditional) monthly payroll using information from both CEIS and RAIS data. The firm-level estimation sample consists of annual window $[-3, 2]$ around debarment. Means of dependent variables are computed from pre-event years $[-3, -1]$ of the matched control group. Standard errors are clustered at the firm level.

Table D9: Effects of Debarment on Workers' Outcomes Using Firm-Level Sample

	(1) employment	(2) log earnings (uncond.)	(3) log earnings (cond.)
PostDebarment	-0.029***	-0.214***	-0.008
	(0.011)	(0.073)	(0.011)
Sample Size	1,274,652	1,274,652	1,158,547
Worker FE	✓	✓	✓
Year FE	✓	✓	✓
Mean Dep. Var (Control)	1	7.33	7.33

Note: ***: significant at 1% level; **: significant at 5% level; *: significant at 10% level. This table reports the aggregate effects of debarment on workers' outcomes in the formal sector: indicator for employment, log unconditional earnings and log conditional earnings using information from both CEIS database and RAIS data. The firm-level estimation sample consists of annual window [-3,2] around debarment. Means of dependent variables are computed from pre-event years [-3,-1] of the matched control group. Standard errors are two-way clustered at the worker and pre-event firm levels.