Kosovo Credit Guarantee Fund

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DIME/World Bank

June, 2022

According to Tax Registry, 70% of firms have up to 9 employees, but under-reporting might be a problem:

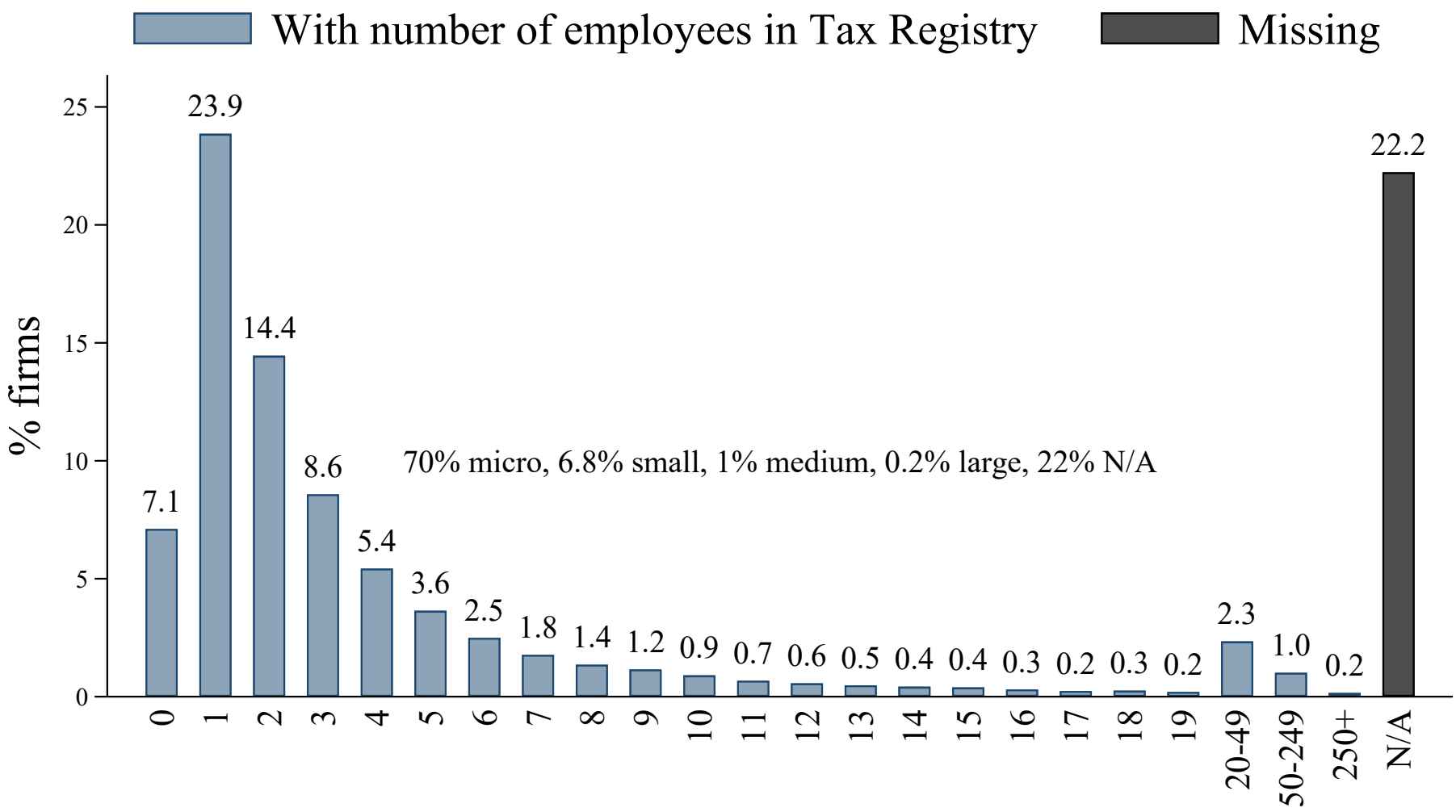


Figure 1: % firms by number of employees, 2017-2018

The % of firms with loans increases significantly with firms' size:

More than half of firms with more than 10 employees have loans.

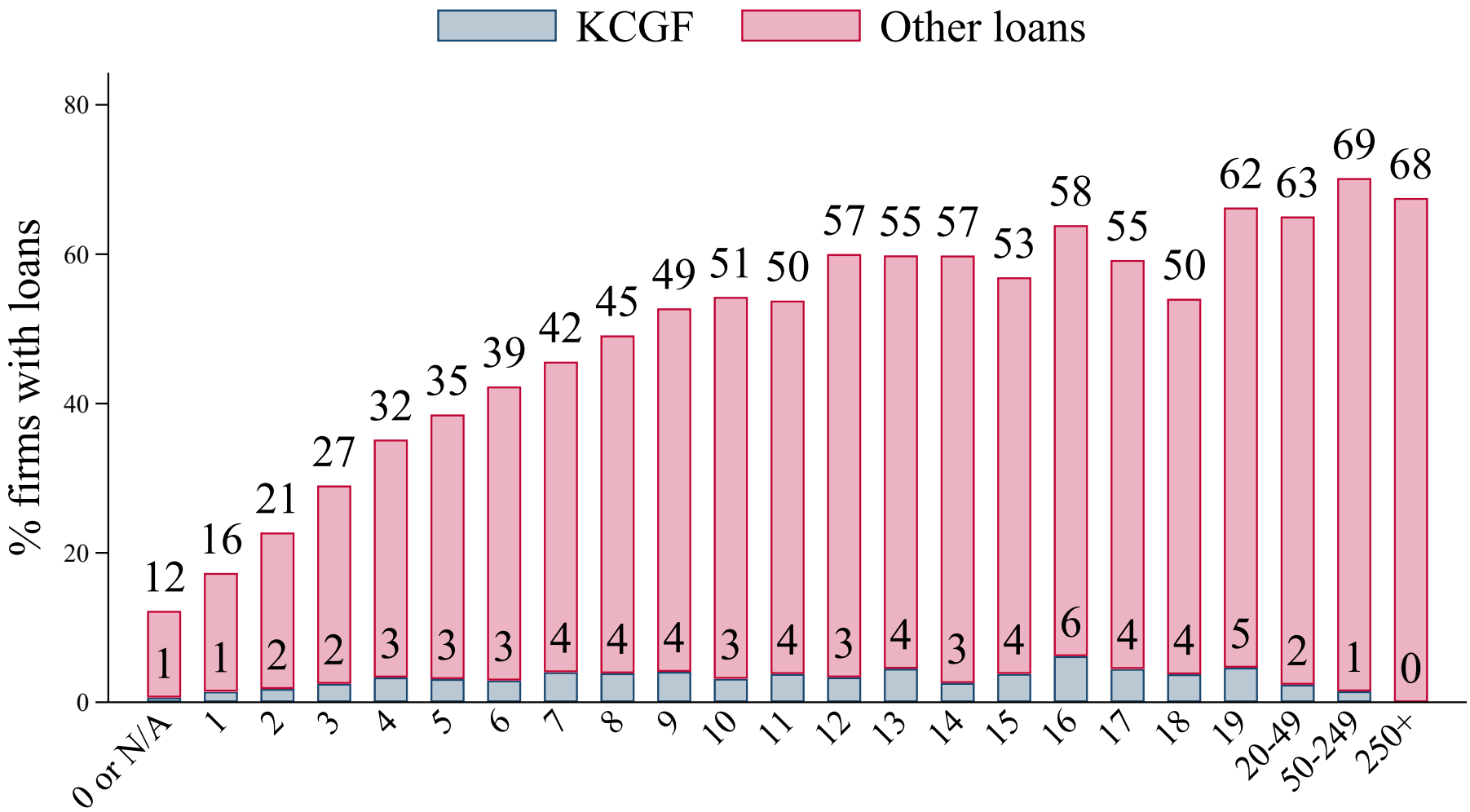


Figure 2: % loans by number of employees, 2017-2018

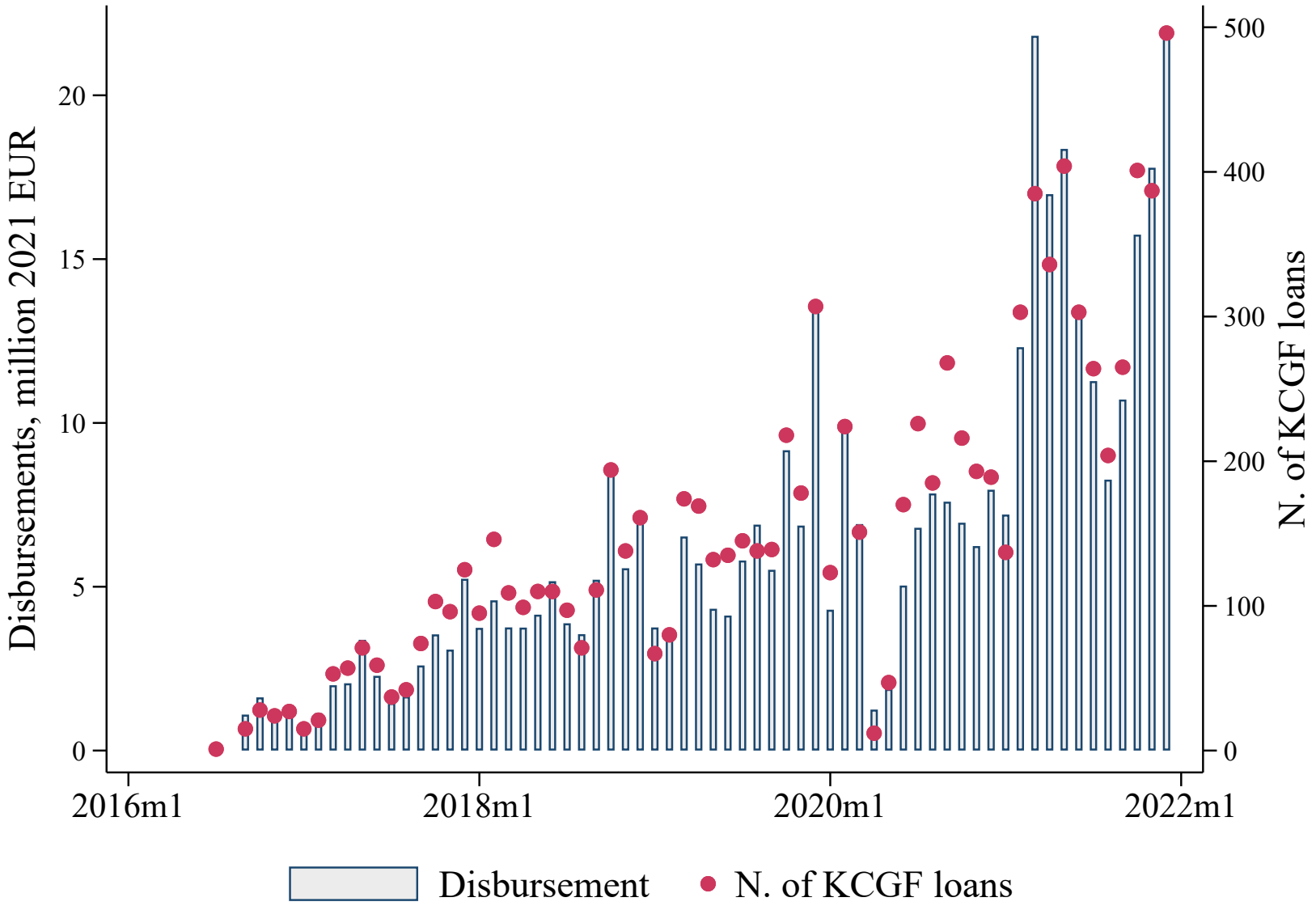
The KCGF loans total more than 400 million EUR*:

KCGF , MSMEs			
	N. loans	Median loan in 2021 EUR	Total amount in 2021 million EUR
2016	95	38,167	5.4
2017	752	32,235	29.2
2018	1,441	31,900	59.6
2019	1,881	31,067	75.9
2020	2,004	25,838	73.0
2021	3,884	30,000	176.2
Total	**10,057**	**31,534**	**419.3**
Other loans , MSMEs			
	N. firms	Median loan in 2021 EUR	Total amount in million EUR
2016	9,378	5,452	467
2017	8,899	9,045	454.6
2018	8,679	10,633	452.3
2019	6,957	10,356	312.3

Table 1: Total loan amount and number of firms with loans, MSMEs

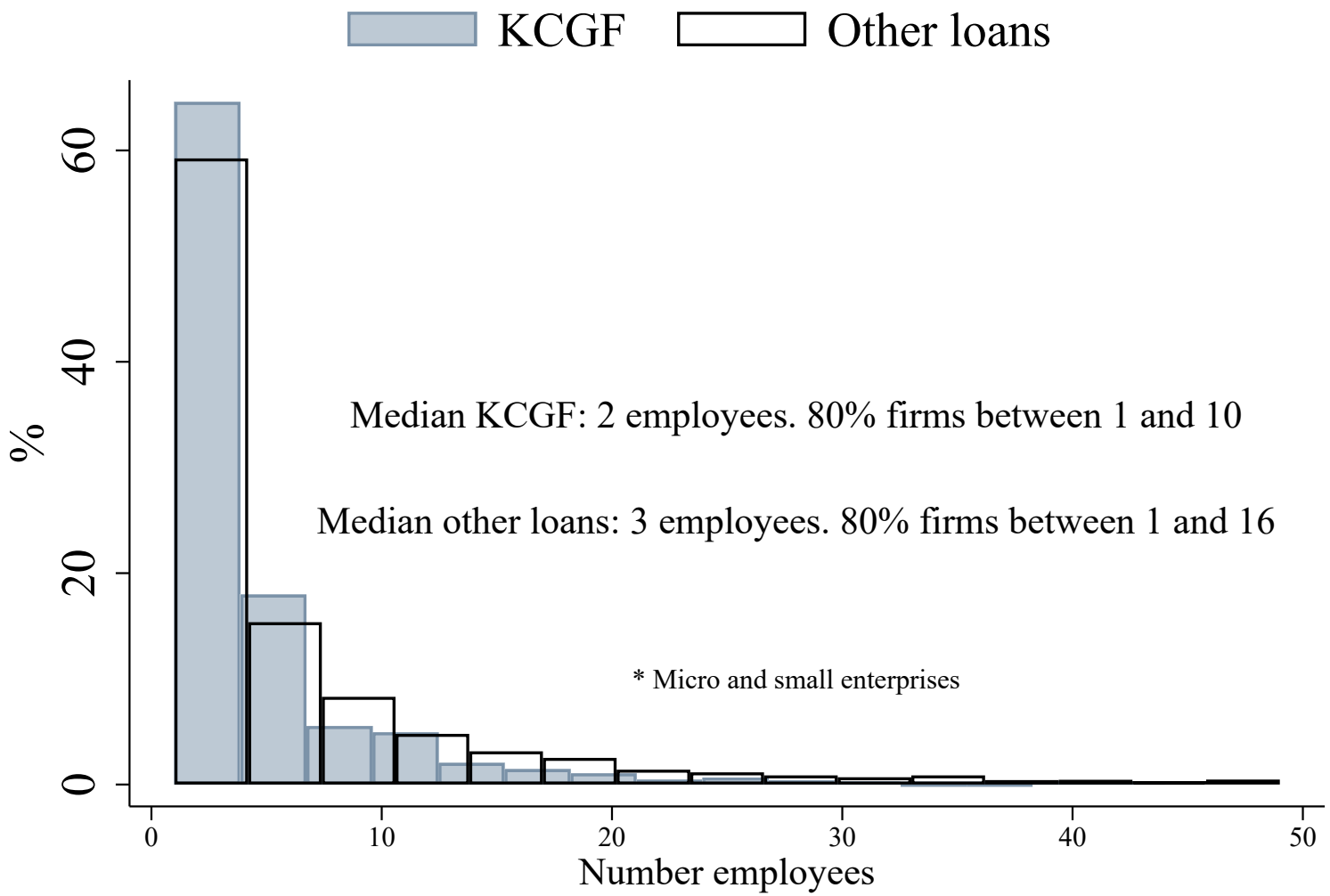
60% of KCGF disbursements in 2020 or 2021:

Figure 3: KCGF disbursement and contracts, (2016-2021)



Among firms with access to credit, KCGF firms are slightly smaller in terms of the number of employees:

Figure 4: Distribution of the number of employees (MSEs), 2016-2018



The median KCGF loan is 31.9k EUR, while the non-covered loans are 9.8k EUR:

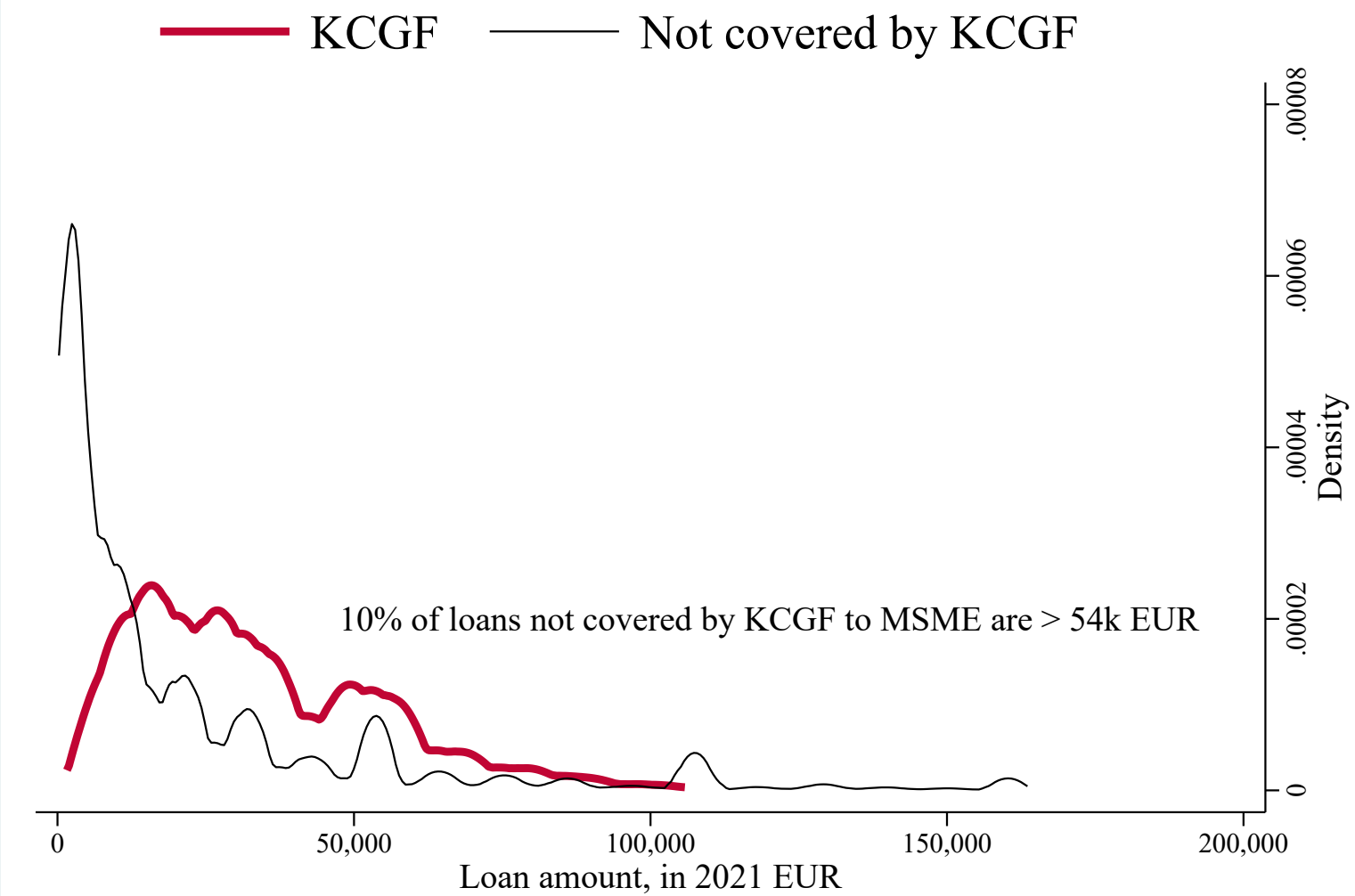


Figure 5: Distribution of the loan amounts for MSMEs (2016-2018)

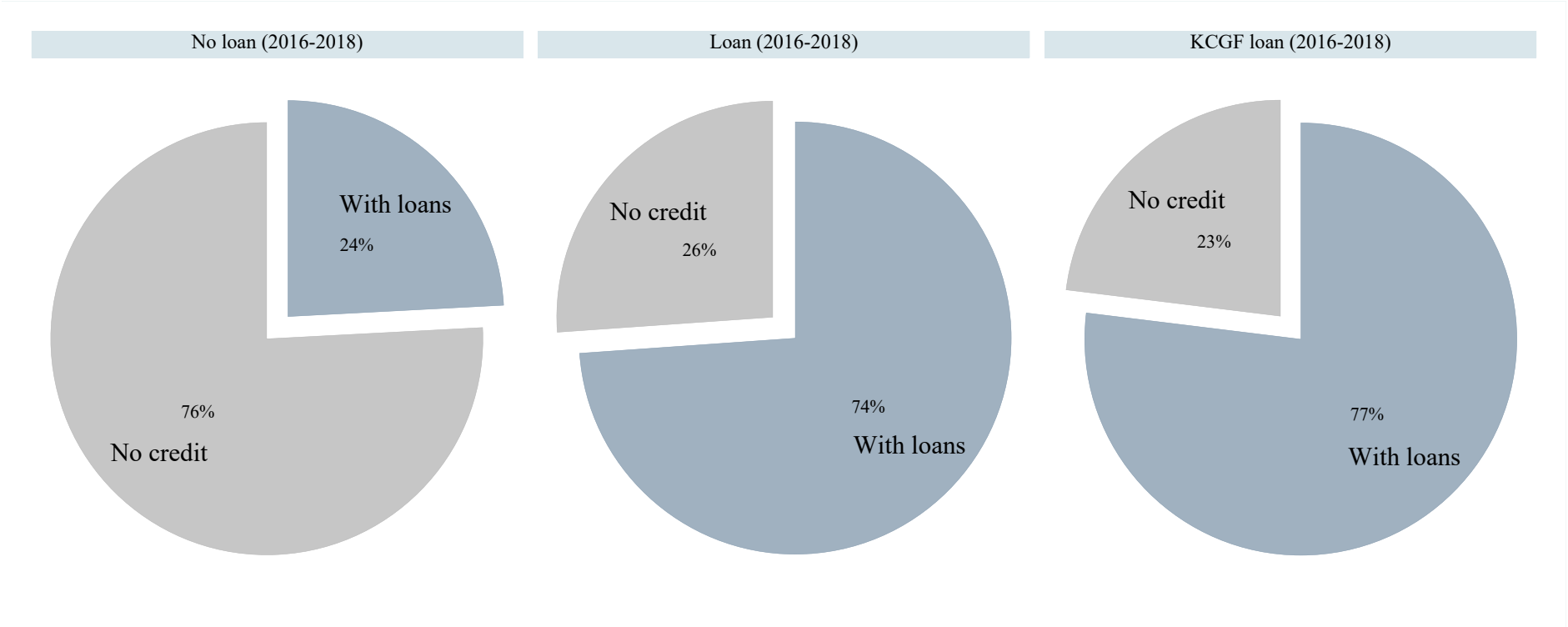
In 2015, micro firms later selected for KCGF were already more productive and registered higher sales:

	No loan, no KCGF 2016-2018		Loan without KCGF 2016-2018		Loan with KCGF 2016-2018	
	N	Mean/SE	N	Mean/SE	N	Mean/SE
Firms' age	24,226	6.52	11,892	6.69	911	6.20
		[0.03]		[0.04]		[0.15]
Employees	16,614	2.52	10,014	5.11	810	4.23
		[0.03]		[0.07]		[0.16]
% micro enterprises	24,226	0.98	11,892	0.88	911	0.92
		[0.00]		[0.00]		[0.01]
Sales, micro	**18,578**	**21,843**	**8,255**	**44,995**	**665**	**60,136**
		[290.34]		[673.18]		[2,771.10]
Sales, small	451	643,862	1,244	951,596	71	809,186
		[36,407.16]		[26,424.95]		[92,812.82]
Productivity, micro	**9,775**	**13,008**	**5,723**	**16,626**	**487**	**18,456**
		[119.33]		[182.97]		[682.78]
Productivity, small	396	34,826	1,148	46,950	65	45,449
		[1,679.89]		[1,046.11]		[4,289.21]
Average wage	11,450	2,168	7,703	2,503	627	2,470
		[7.16]		[11.19]		[32.21]
Firm imports	24,226	0.20	11,892	0.49	911	0.56
		[0.00]		[0.00]		[0.02]

Table 2: Firms' characteristics, MSEs 2015

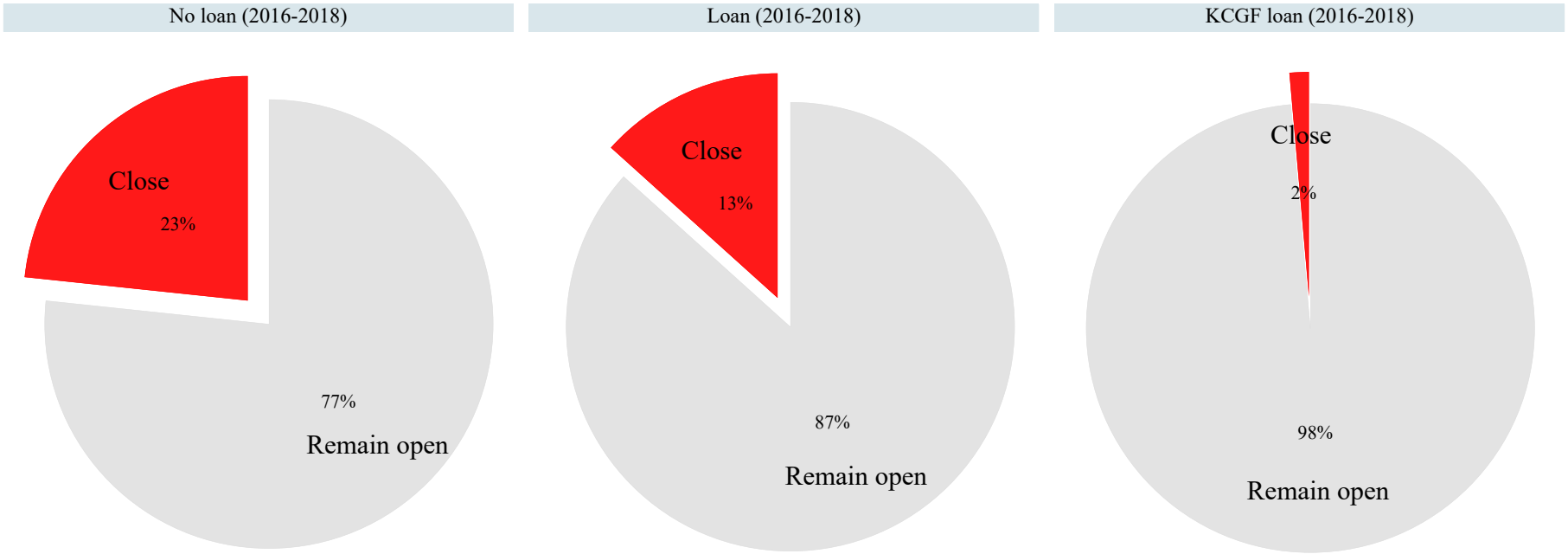
Also prior to KCGF, firms that would later be included in the intervention were more likely to have loans:

Figure 6: % of firms with access to loans before KCGF in 2016, MSMEs



In addition to that, firms with KCGF are less likely to stop their operations:

Figure 7: % of active firms in 2015 that stopped operations by 2018, MSMEs



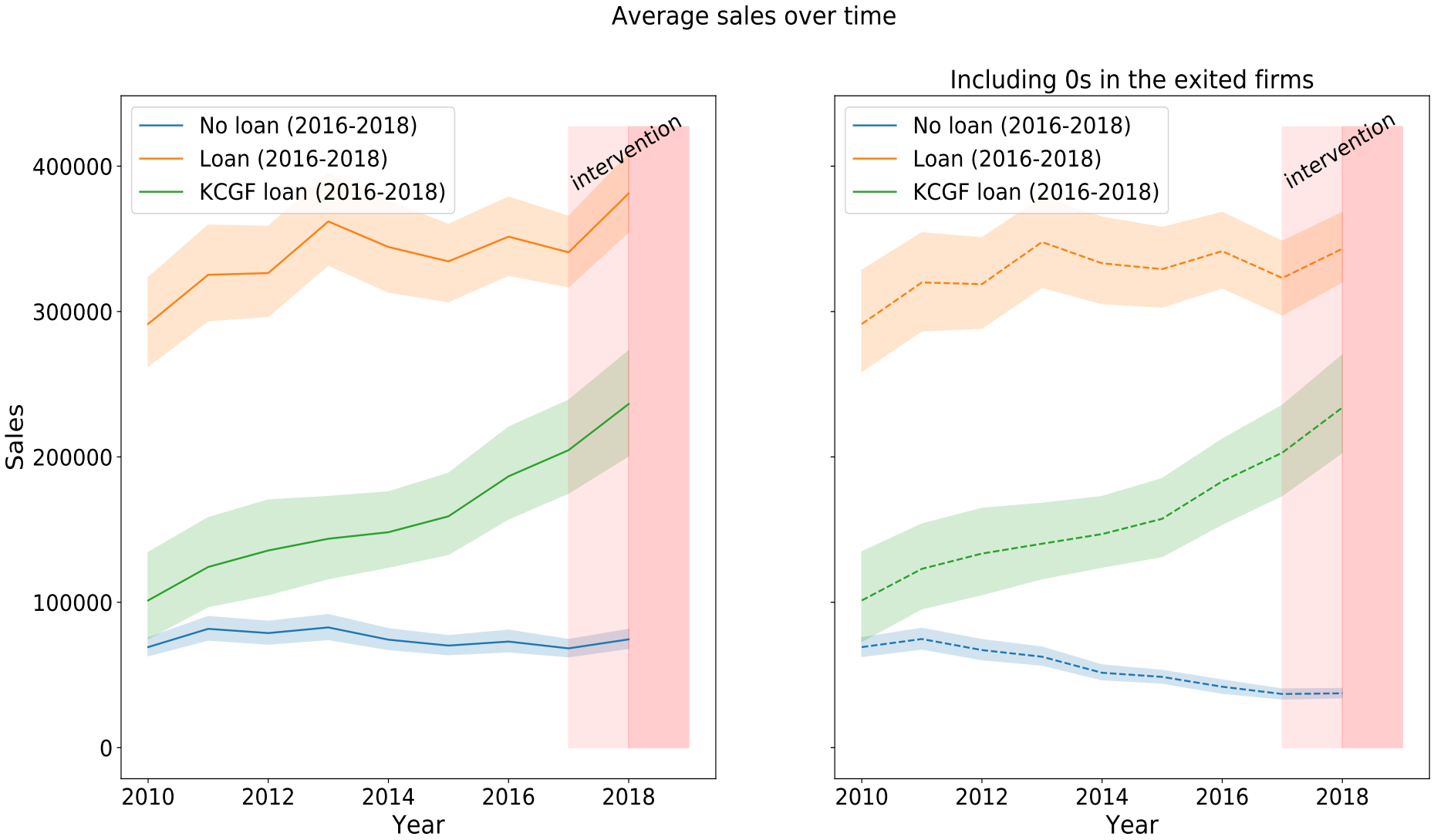
While **23%** of the firms that never got loans ended up stopping their operations, the percentage is **2%** for firms that got the KCGF.

KCGF firms have loans with significant higher maturity:

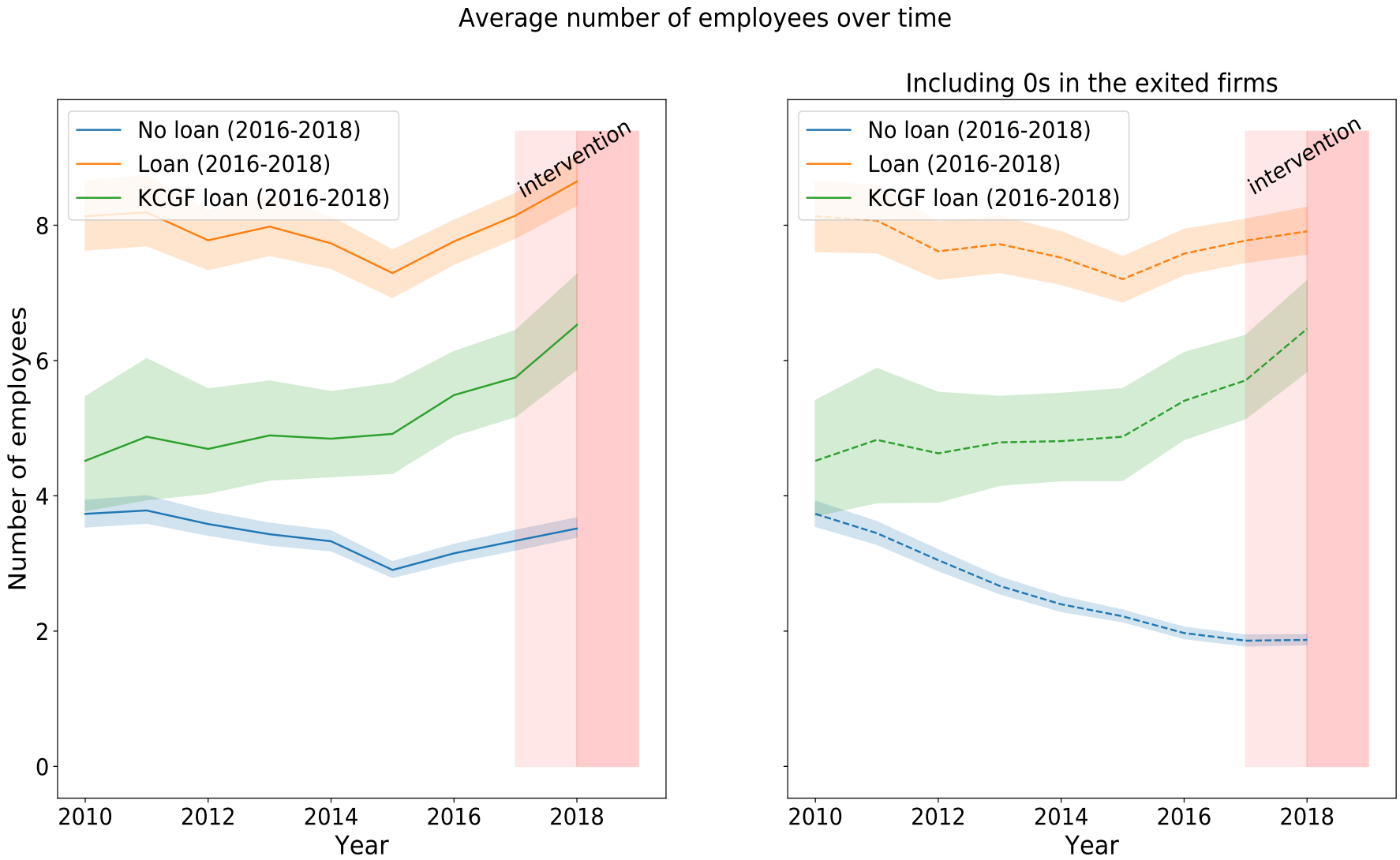
Nominal Interest Rates

	KCGF 2016-2018	KCGF 2020-2021	Economic Recovery Package	Other loans
Median	8.9%	8.5%	7.0%	8.0%
Up to 25% firms	7.5%	7.4%	6.4%	6.5%
Up to 75% of firms	10.0%	10.0%	8.5%	11.0%
Maturity, in months				
Median	36	36	36	12
Up to 25% firms	24	20	24	11
Up to 75% of firms	49	48	48	36

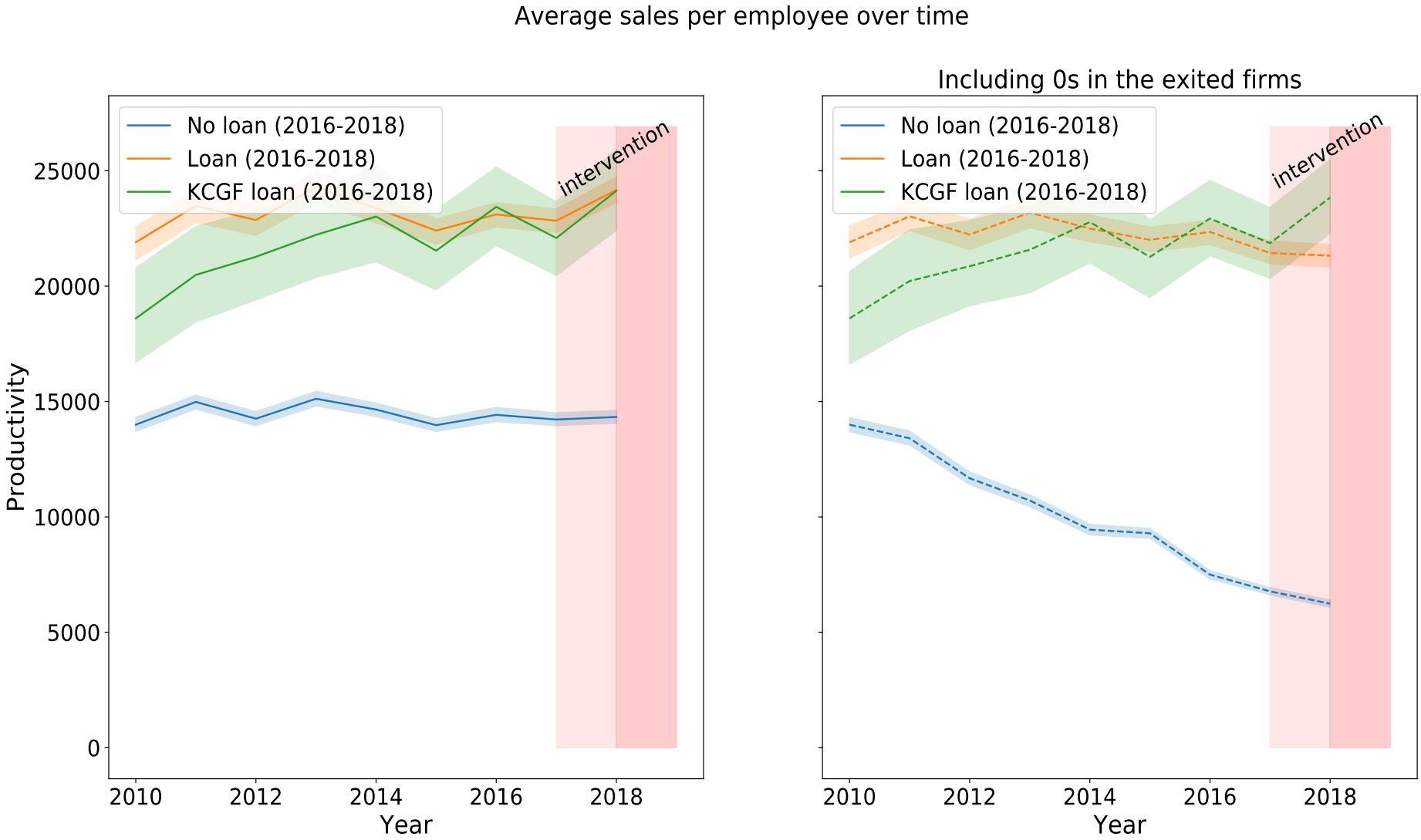
The average sales have increased at a higher pace in KCGF firms:



.. as well as the number of employees:



Compared to firms without access to credit, KCGF firms are significantly more productive:



Assessing the Impact of KCGF

First, we perform machine learning models to select the best predictors of KCGF participation:

- We aim to answer: what firm's characteristics increase the probability of a firm being included in the fund?
- We compare firms that got KCGF loans (treatment group) with two comparison groups:
  - **Firms that got loans without KCGF**
  - **Firms that never got loans.**
- For active firms in 2015, we run the following regression:

$$\Pi_i[KCGF = 1/X] = \alpha_0 + \alpha_1 X_i' + \upsilon_i \quad (1)$$

- $KCGF$ is equal to 1 for firms that got a loan covered by the fund in 2017 or 2018, and 0 otherwise.
- X_i' is a vector of covariates at the firm level and includes sales per employee, wage per employee, number of loans, number of employees; economic sector of activity, age, municipality, and whether the firms export or imports, lagged, and square values of these variables.

Less than 20% of the probability of getting a KCGF loan is explained by the observable firm's characteristics:

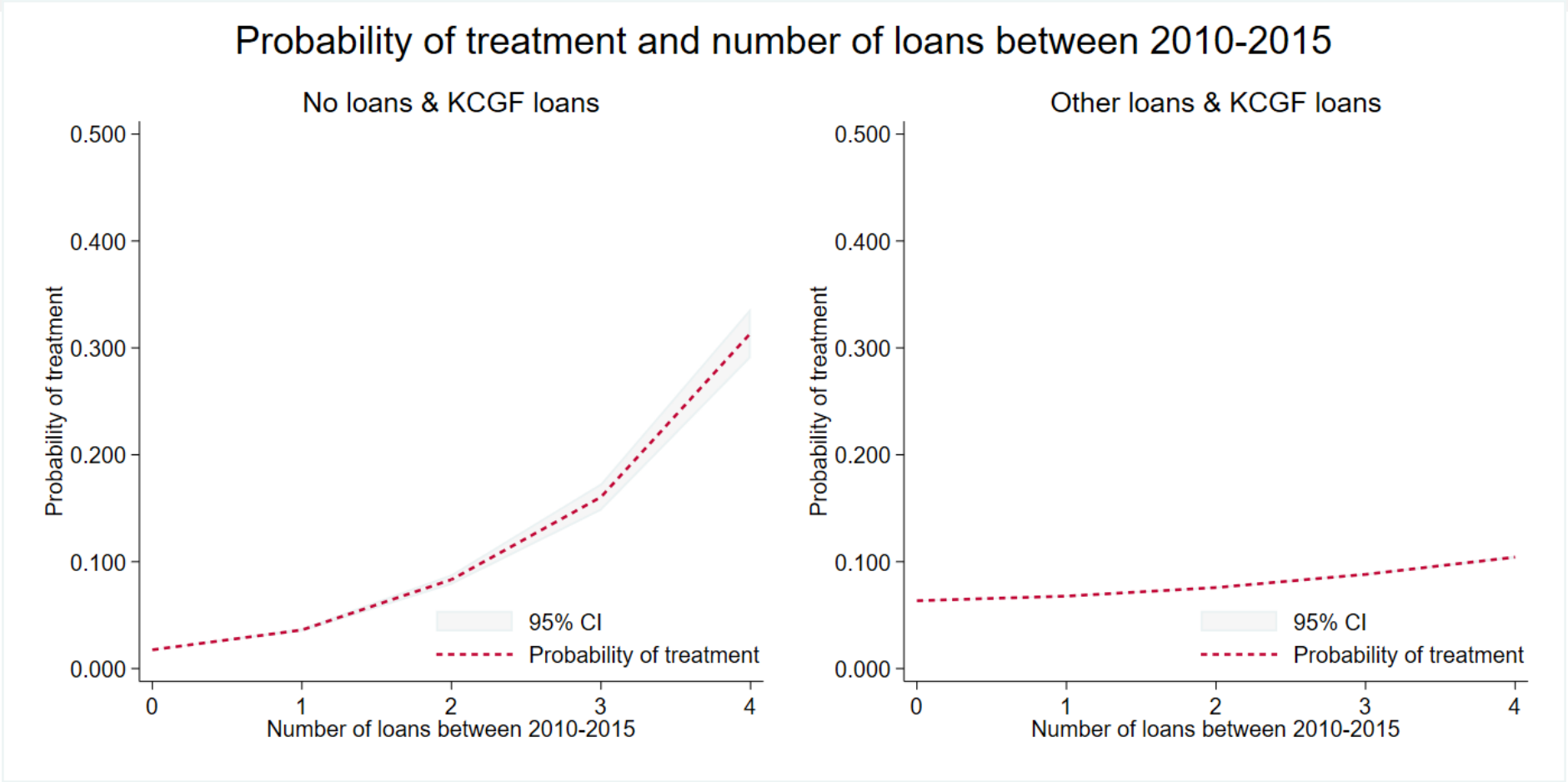
Firms with no loans versus firms with KCGF

- Best predictors of getting a loan:
  - Whether the firm had access to credit before 2016.
  - Firm's productivity (sales per employee).
  - Number of employees.
  - Wage per employee.
  - Firms' age.
  - If the firm exports.

Firms with loans without KCGF versus firms with KCGF

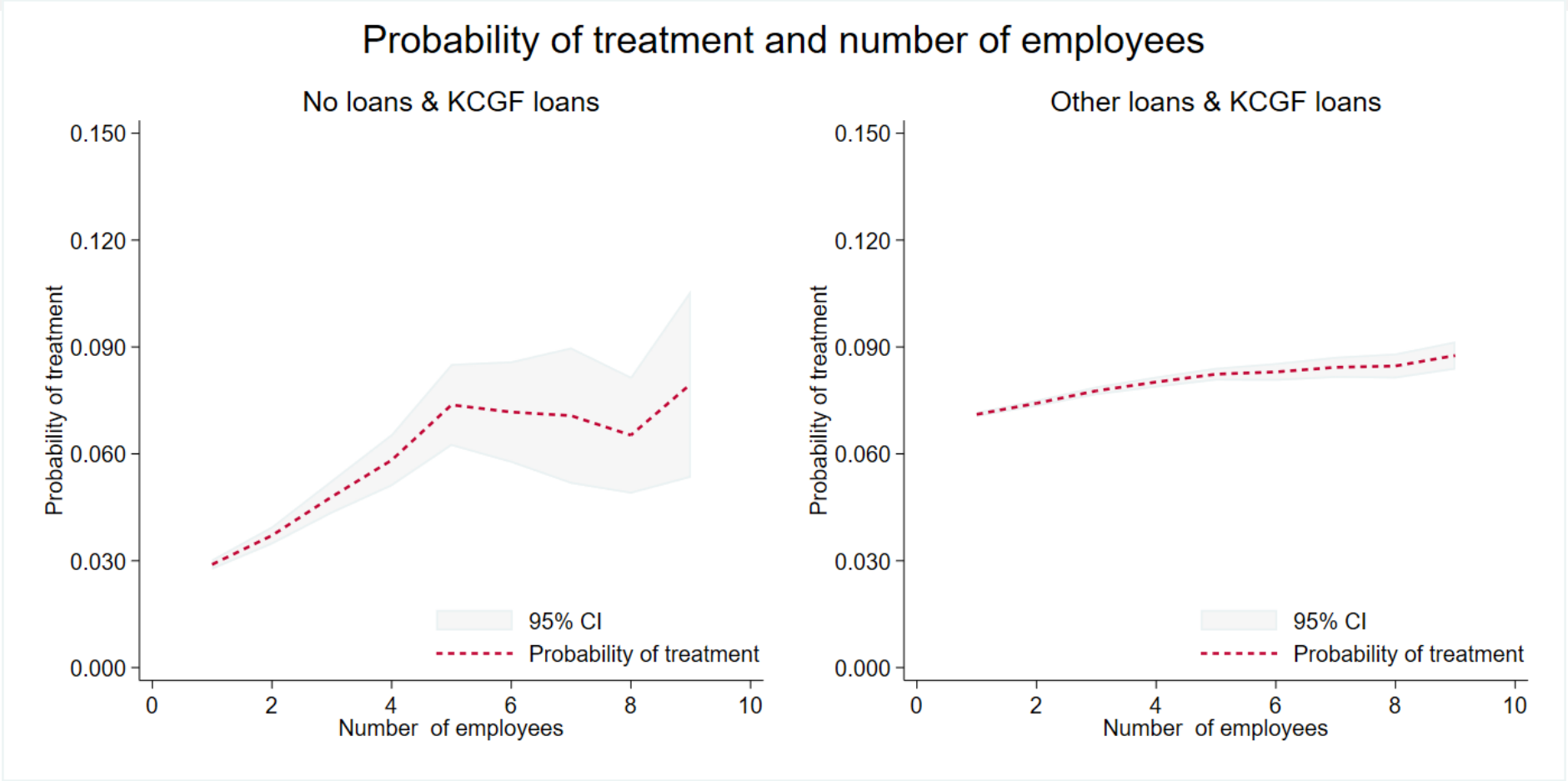
- None of the firms' characteristics are good predictors of the probability of getting a loan covered by KCGF versus obtaining a loan not covered by the fund.
- The data indicates that the banks base their decision on whether or not to cover the loan with KCGF considering firms' characteristics that we do not observe.

For firms with no loans versus KCGF firms → probability of KCGF is highly correlated w/ previous access to credit:



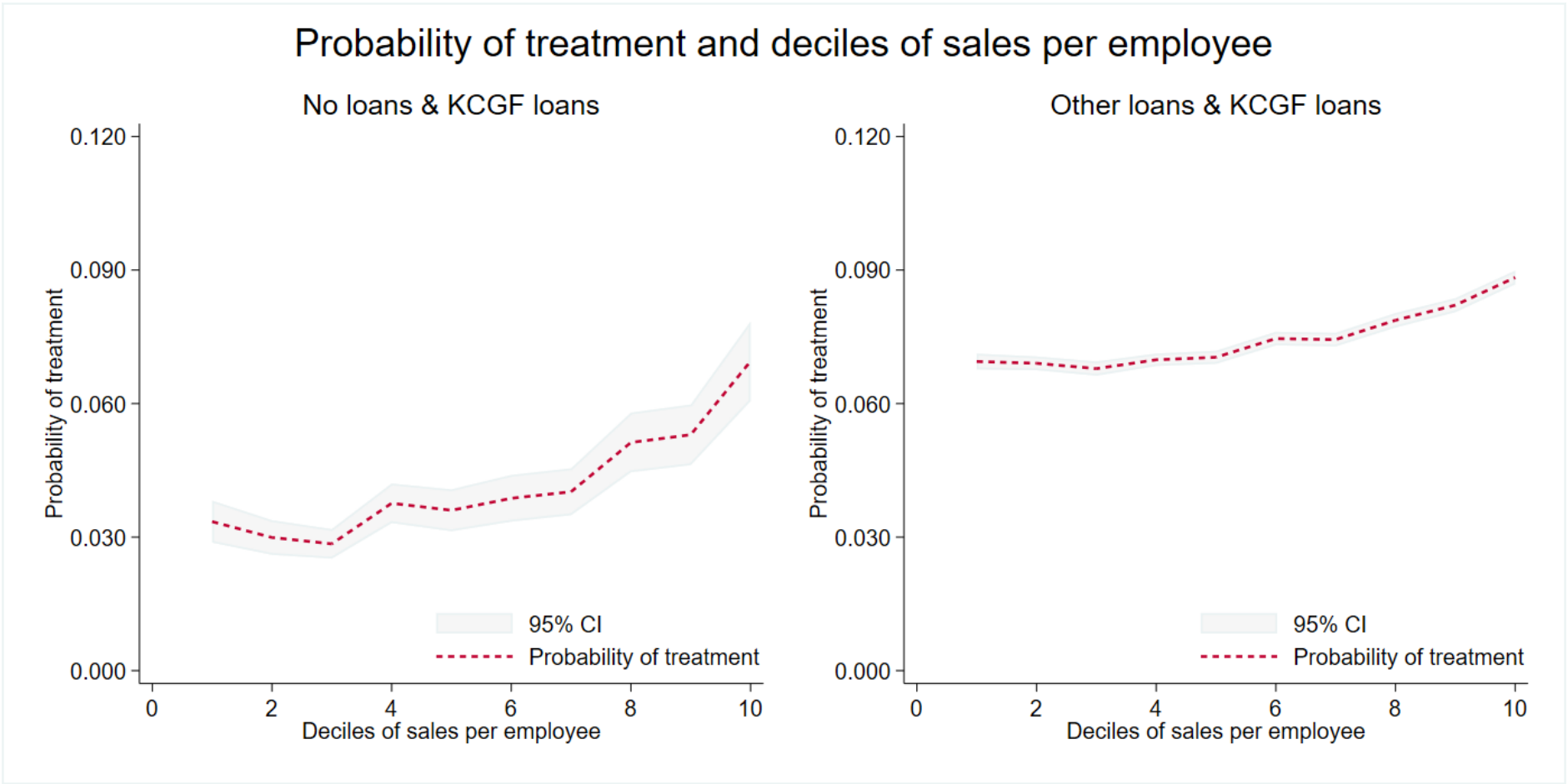
For KCGF firms versus firms with other loans: the previous access to credit does not seem to be associated with the probability of getting the fund.

For firms with no loans versus KCGF firms → the ↑ the number of employees, the ↑ the probability of participating in the fund:



On the other hand, we do not observe the same when comparing KCGF firms and firms with other loans.

For firms with no loans versus KCGF firms → more productivity firms are also more likely of participating in the fund:



To have comparable groups of firms, we match KCGF firms with the ones without access to the fund:

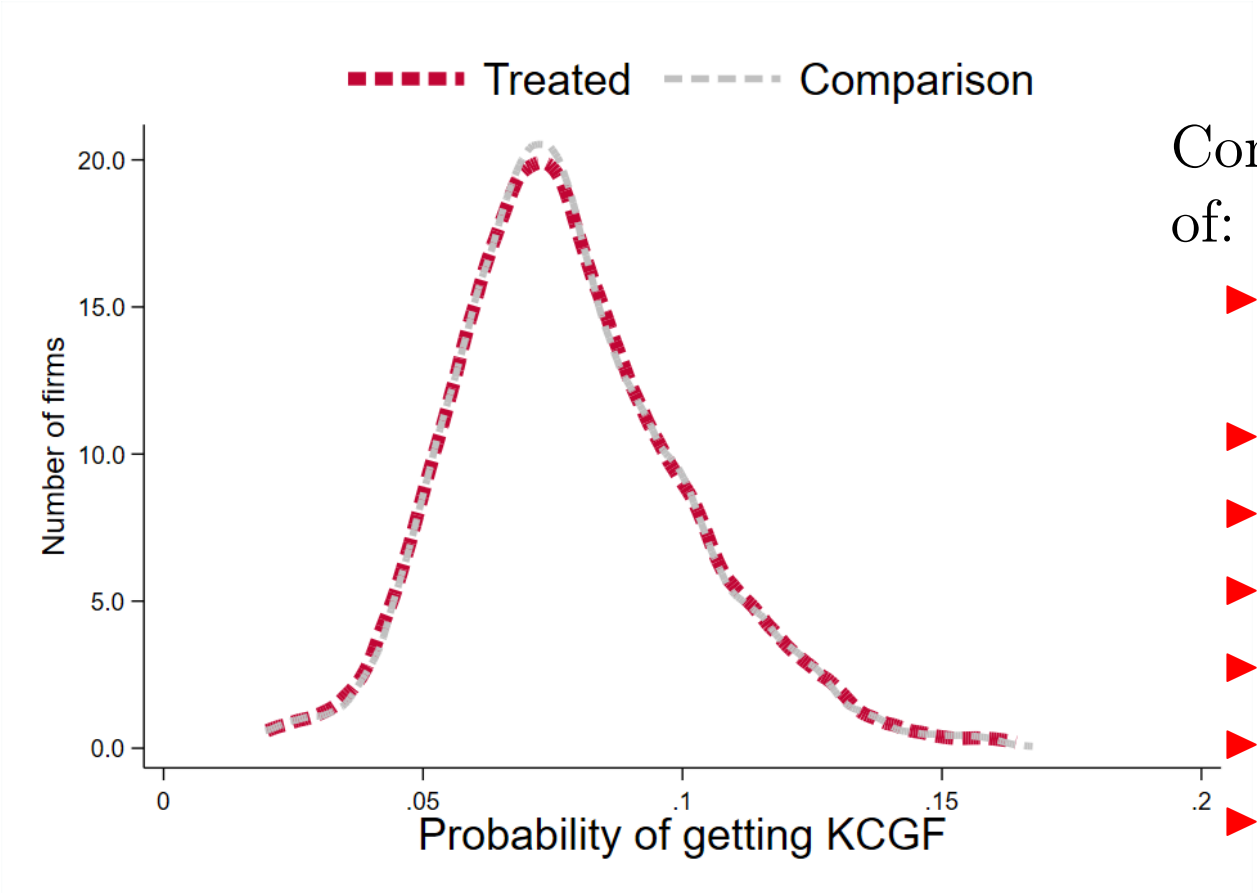
Firms with no loans versus firms with KCGF

- We match firms using the variables selected by the machine learning models.
- Even considering the matched sample, firms without loans are still significantly different than firms included in the fund.
- The number of employees and total sales increased at a higher pace in KCGF firms even prior to the intervention.
- Therefore, firms with no loans do not provide a good comparison group to firms included in the fund.

Firms with loans without KCGF versus firms with KCGF

- We match the two groups of firms considering several of their characteristics available in Tax Registry and Credit Registry..
- On the matched sample, KCGF firms are not significantly different than firms with loans not covered by the fund.

We restrict the sample of analysis to firms that have similar probability of being included in KCGF:



Comparable firms in terms of:

- Access to credit between 2010-2015 (prior to KCGF).
- Sales per employee.
- Number of employees.
- Firms' age.
- Economic sector of activity.
- If the firm exports.
- Average wage per employee

Figure 8: Distribution of the probability of being included in KCGF

No significant differences between the matched sample of KCGF firms and firms with loans not covered:

	Loan without KCGF 2016-2018		**Loan with KCGF 2016-2018**		t-test Difference
	N	**Mean/SE**	**N**	**Mean/SE**	(1)-(2)
Firms' age	1,703	7.73	410	7.30	0.43**
		[0.10]		[0.20]	
Employees	1,696	2.84	408	2.90	-0.06
		[0.05]		[0.09]	
% micro enterprises	1,703	1.00	410	1.00	N/A
		[0.00]		[0.00]	
Sales	1,361	55,028	341	58,122	-3,093.61
		[1,715.25]		[3,408.53]	
Productivity	1,235	16,872	307	17,632	-760.79
		[385.75]		[844.83]	
Wage per employee	1,571	2,378	366	2,403	-24.73
		[14.39]		[30.53]	
Firm exports	1,703	0.05	410	0.06	-0.00
		[0.01]		[0.01]	
Firm imports	1,703	0.50	410	0.50	-0.01
		[0.01]		[0.02]	
Num. loans 2010-2015	1,703	1.87	410	1.88	-0.01
		[0.03]		[0.07]	
Firm access to credit 2010-2015	1,703	0.81	410	0.81	-0.00
		[0.01]		[0.02]	

Also, the groups do not have significant differences in the average growth of the number of employees and total sales:

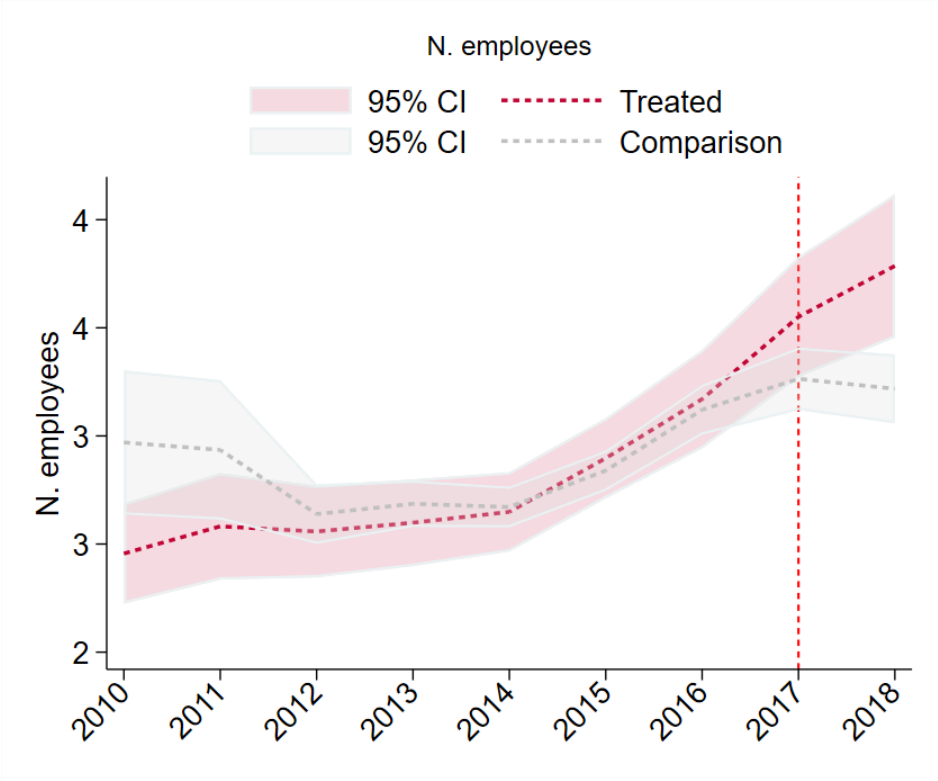


Figure 9: Number of employees, matched firms

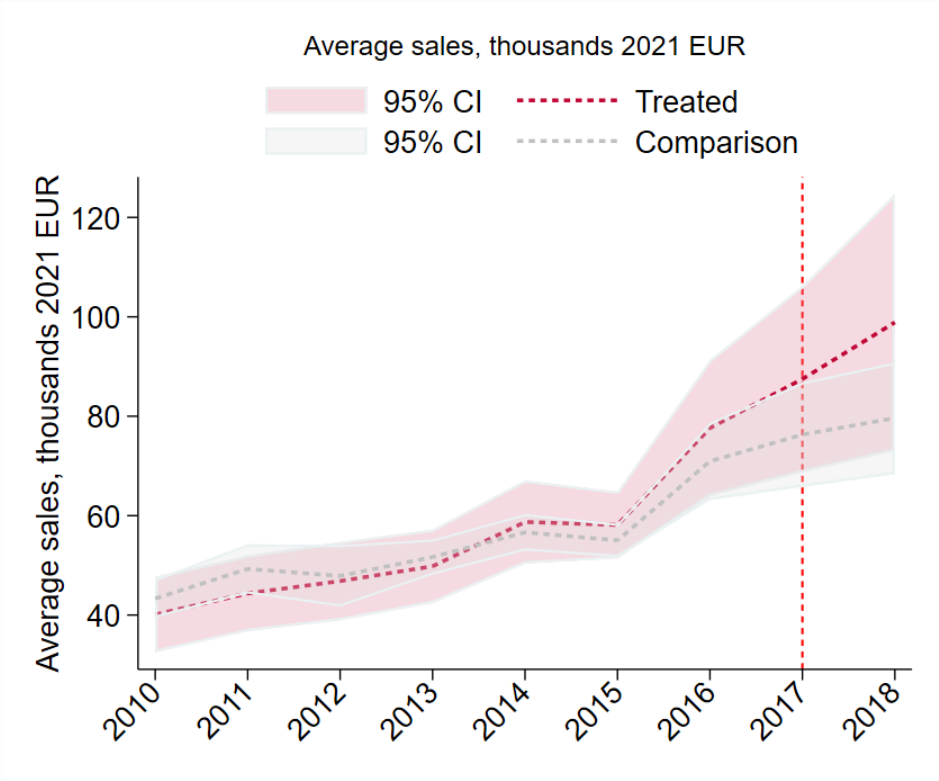


Figure 10: Sales in 2021 EUR, matched firms

To assess the impact of KCGF, we employ a difference-in-differences specification:

We run a DiD on the matched sample:

$$y_{it} = \alpha_0 + \alpha_2 D_i + \gamma D_i Post_t + \tau Post_t + \upsilon_{it} \tag{2}$$

in which:

- y_{it} is the outcome of interest for firm i, in year t (sales per employee, total sales, number of employees and if the firm stops its operation).
- D_i is a dummy equal to 1 if the firm i belongs to the treatment group (KCGF), and 0 otherwise.
- $Post_t$ is equal to 1 for the years after 2016, and 0 otherwise.
- υ_{it} is the idiosyncratic error.
- **We test 4 vectors of covariates to match treatment and comparison groups (according to the results of the machine learning models).**

The results indicate that productivity increased a higher pace in KCGF firms:

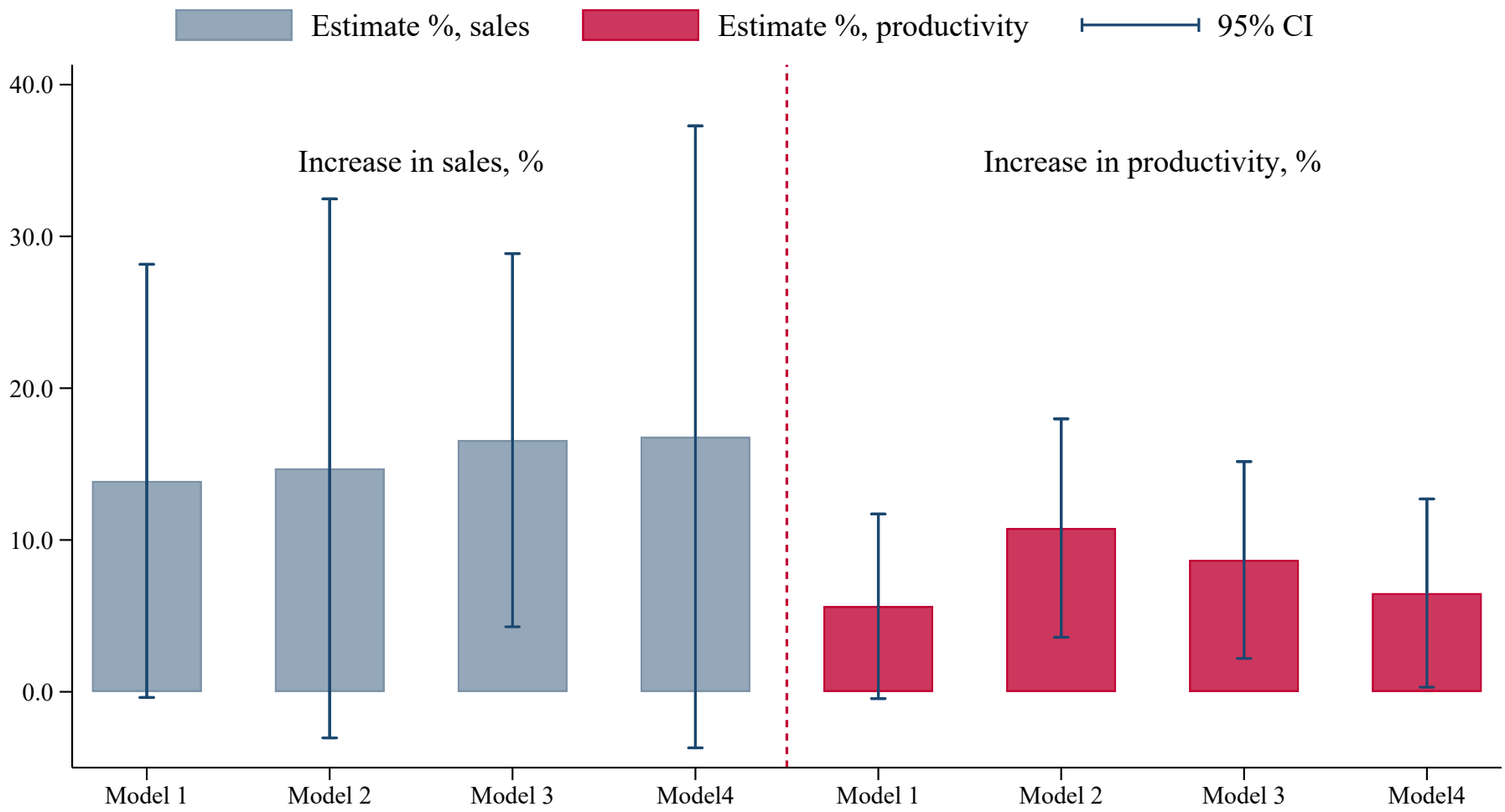


Figure 11: Estimate for sales and productivity

We find evidence that KCGF firms registered ↑ in n. employees and were less likely to stop their operations:

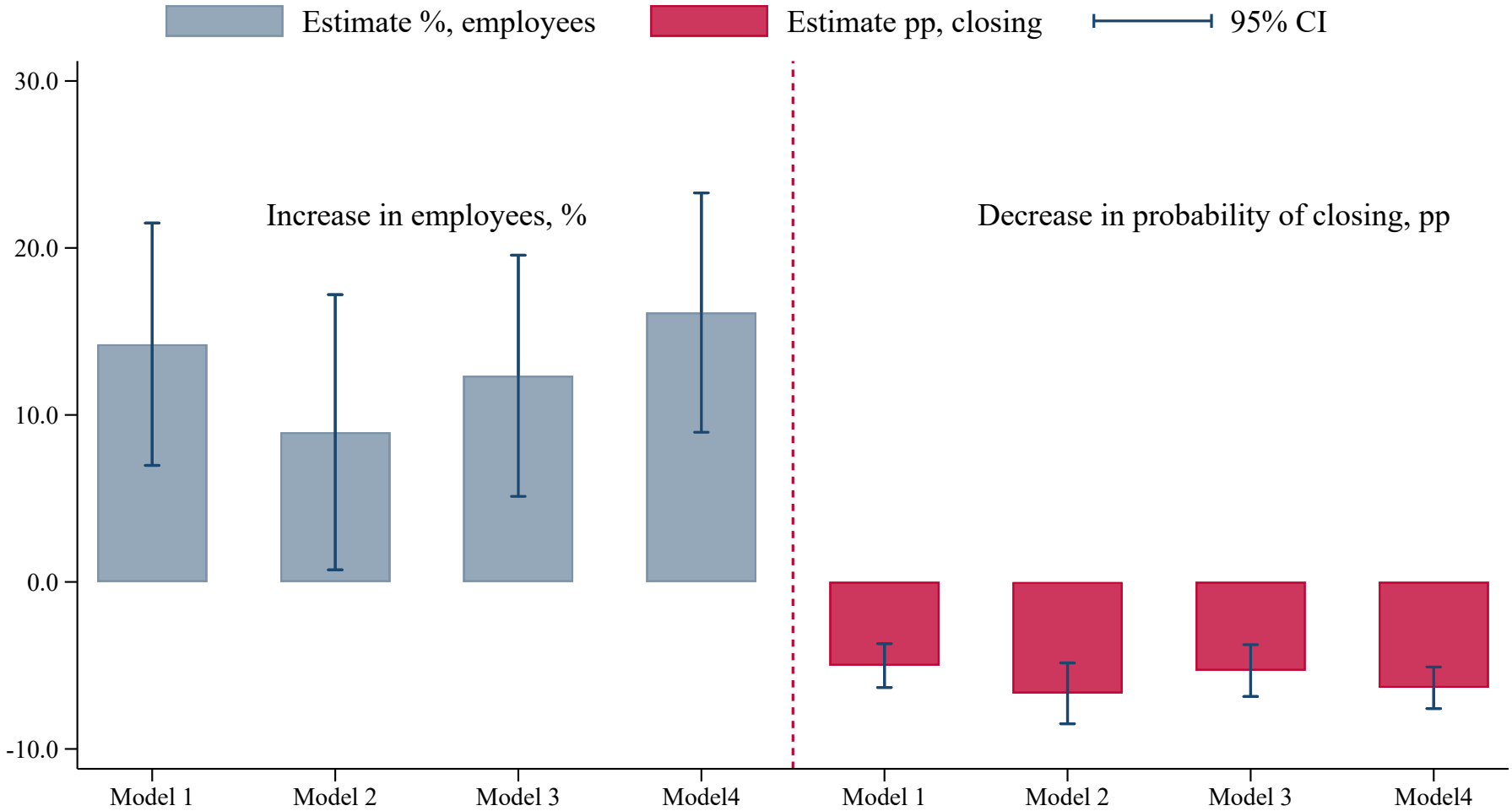


Figure 12: Estimate for n. employees and probability to close

Machine Learning Models

Table 3: KCGF funded loans vs no loans

	OLS	LASSO	RIDGE	Random Forest	XGBoost
R2 out-of-sample[1]	0.17	0.17	0.17	0.18	0.19
Important predictors	Number of Loans & Squared term lags 0-2 Turnover & Squared term Imported Amount	Number of Loans & Squared term lags 0-1 Squared Import Dummy Productivity Number of Employees Legalform ID missing	Number of Loans & Squared terms lags 0-1 Turnover & Squared term Number of Loans lag 2 & Squared Number of Loans lag 3 Imported amount	Number of Loans & Squared terms lags 0-1 Imported amount Turnover & Squared term Productivity & Squared term	Lag 4 squared Size, Number of Loans & Lag 2 squared Number of Loans SectionID_16, MunicipalityID_31 Legalformid_4, Import dummy Lag 4 squared employee's wages

Number of observations: 24795 firms with no loans, 955 with KCGF funded loans.

Table 4: KCGF funded loans vs other loans

	OLS	LASSO	RIDGE	Random Forest	XGBoost
R2 out-of-sample[1]	0.00	0.00	0.00	0.00	-0.02
Important predictors	-	-	-	-	-

Number of observations: 12774 firms with loans not funded by KCGF, 955 with KCGF funded loans.

[1] Trained with 80%, evaluated with the other 20% of the data. Assignment to train/test set randomized.

Table 5: Variables with p-value < 0.05 in OLS models

OLS & Ridge		**LASSO**	
variable	**p-val**	**variable**	**p-val**
num_loans	0.000	num_loans	0.000
num_loans_squared	0.000	num_loans_squared	0.000
lag1_num_loans	0.000	lag1_num_loans	0.000
lag1_num_loans_squared	0.000	legalformid_nan	0.000
turnover_r	0.000	lag1_num_loans_squared	0.000
lag2_num_loans	0.000	productivity_r	0.000
turnover_r_squared	0.000	import_tx_squared	0.000
imports_amount_r	0.000	employees	0.000
lag3_num_loans_squared	0.000	lag2_num_loans	0.000
number_loans_up2015	0.000	turnover_r	0.000
firms_age	0.000	firms_age	0.000
employees	0.000	sectionid_16.0	0.000
firms_age_squared	0.001	firms_age_squared	0.001
number_loans_up2015_squared	0.001	employees_squared	0.001
exports_amount_r	0.001	lag3_num_loans_squared	0.001
lag2_num_loans_squared	0.002	wages_employee_r	0.001
import_tx_squared	0.003	exports_amount_r	0.002
import_tx	0.003	number_loans_up2015_squared	0.002
employees_squared	0.005	lag1_import_tx	0.003
lag4_productivity_r_squared	0.008	number_loans_up2015	0.004
municipalityid_28.0	0.008	lag4_turnover_r	0.006
lag3_num_loans	0.010	lag1_productivity_r	0.012
lag1_import_tx	0.010	lag5_productivity_r	0.029
lag1_import_tx_squared	0.010		
lag4_turnover_r	0.014		
municipalityid_13.0	0.015		
lag5_employees_squared	0.020		
lag4_productivity_r	0.022		
lag4_turnover_r_squared	0.049		