Technical Appendix
Evaluation of Rwanda's Export Growth Fund: Preliminary Results and Next Steps

Jie Bai
Harvard Kennedy School

Lauren Falcao Bergquist
Yale University and International Growth Centre

Christian Lippitsch
International Growth Centre

Ignacio Marra de Artinano
Université Libre de Bruxelles

Appendix A1. Methodology

Our main analysis relies in the following differences-in-differences estimation strategy:

$$Y_{it} = \sum_{k=-3}^{k=2} \beta_{t+k} EGF_{i,t+k} + \theta_i + \mu_t + \varepsilon_{it}$$

Our database is a panel of firm (*i)* x year (*t*) outcomes between 2013 and 2022 created using administrative databases from the Rwanda Revenue Authority (CIT, PAYE, VAT, customs, registration) matched with the administrative database of the Rwanda Development Bank containing the universe of Export Growth Fund (EGF) loans along with the timing of the loan disbursement.

The main outcome variables (Y_{it}) along with their corresponding sources are business revenues (CIT), number of permanent employees (PAYE), total exports (customs), CIT tax payable (CIT) and PAYE tax payable (PAYE).

The main explanatory variable $EGF_{i,t}$ of interest is a binary variable that takes value 1 if a firm obtains the EGF loan for the first time in the year t. We add 3 leads, 2 lags and the contemporary explanatory variable, so as to track the effects of EGF up to 2 years after disbursement along with potential pre-trends up to 3 years before. Our estimations take as a baseline one year before obtaining EGF, as do our descriptive statistics in Section 2.

We carry out two different sets of estimation, both of which include firm (θ_i) and (μ_t) year fixed effects. The first one is an uncorrected two-way fixed effects regression. Given that in our setting treatment timing varies across units, we also correct for treatment heterogeneity following Sun and Abraham (2021).

We have four different sets of results corresponding to three alternative comparison groups. The first one and our preferred specification is displayed in Figures 4 and 5 of the main document (*Comparison Group I*). In this case our comparison group corresponds to the group of firms with propensity scores above the 10th percentile of the propensity score distribution of the treated firms. The propensity score matching (PSM) includes as relevant variables lagged and first differences of total revenue and exporting status

interacted with sector dummies. In a Lasso regression that aims to predict treatment status, these variables had the highest predictive power. The second group (*Comparison Group II*) restricts the comparison group to firms in manufacturing and agriculture whose size overlaps with the size distribution of EGF recipients. The third group is an unconstrained comparison group, with no restrictions (*Comparison Group III*). Finally, the fourth group (*Comparison Group IV*) employs propensity scores above the 10th percentile of the distribution of treated firms (as in Comparison Group I), but in addition it includes in the matching procedure total purchases and the first difference of total purchases.

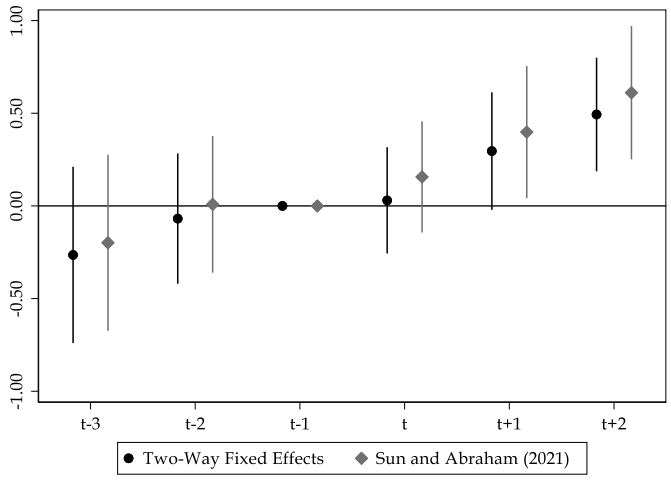
The impact of EGF is measured using the difference in the growth rates between firms that receive EGF and firms that do not receive it. The main identification assumption is that firms that received EGF (treatment) would be growing at a similar rate to what we observe in non-beneficiaries if they had not received it.

Appendix A2. Comparison Group II

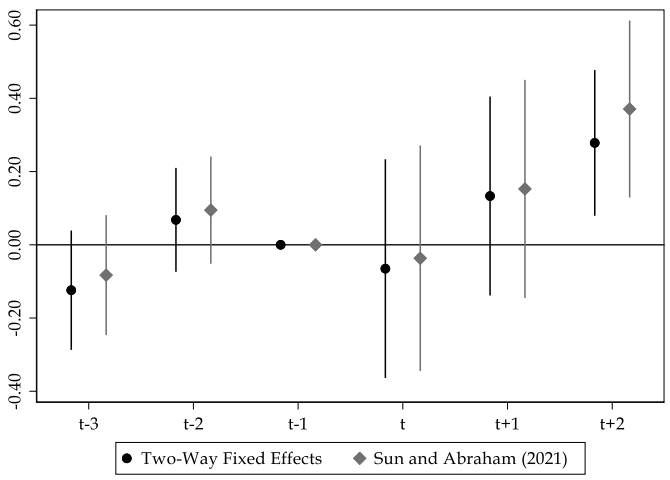
Comparison Group Restricted to Firms Agriculture and Manufacturing with Overlapping Size Distribution

In this section, we carry out the main specifications in Section 3 of the main document with Comparison Group 2, which limits the comparison group to firms in agriculture and manufacturing with an overlapping size distribution to firms receiving EGF. Our results are similar to those found with Comparison Group I. We find significant increases in business revenue (~50%), permanent employment (above 30%), the probability of exporting (10 percentage points), CIT tax payable (80-100%) and PAYE tax payable (40%).

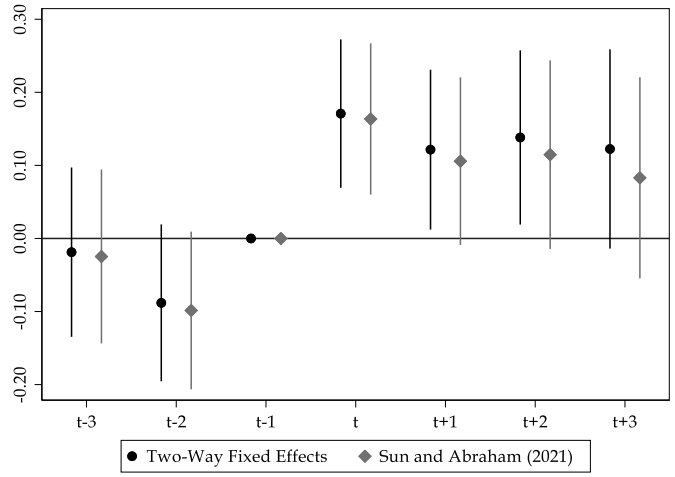
Business Revenue



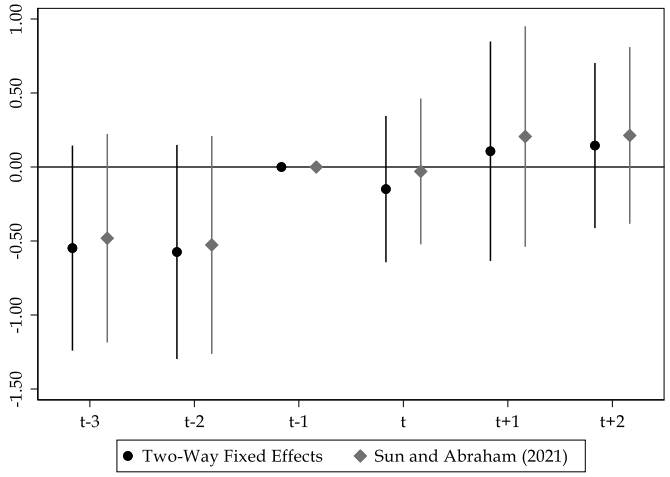
Permanent Employment

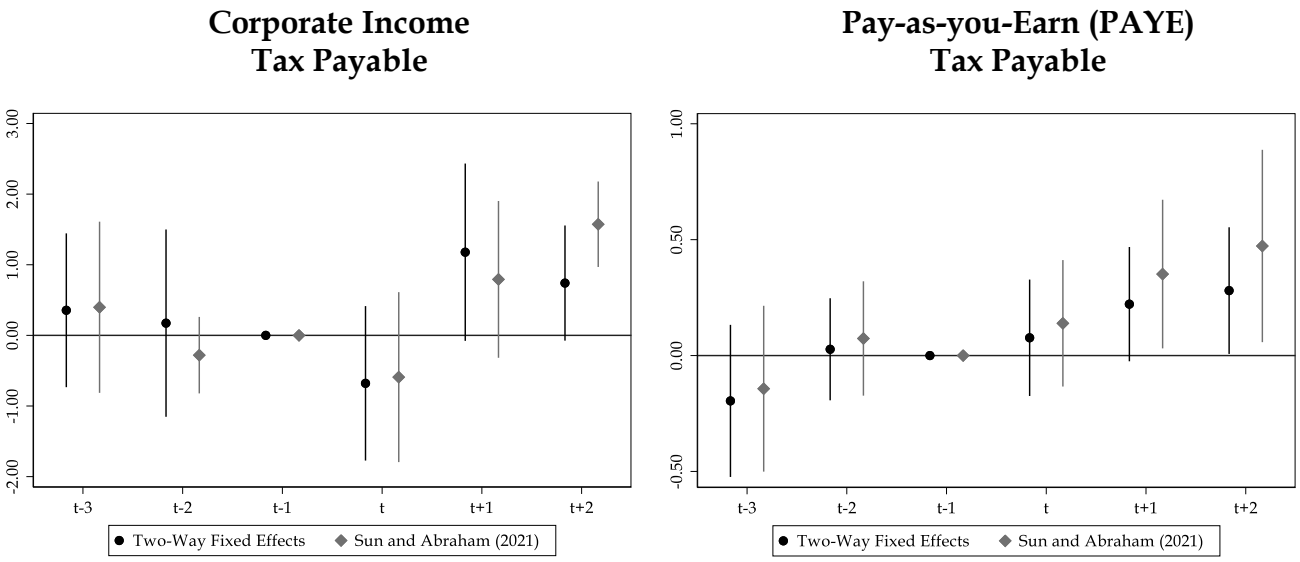


Probability of Exporting



Total Exports – Established Exporters





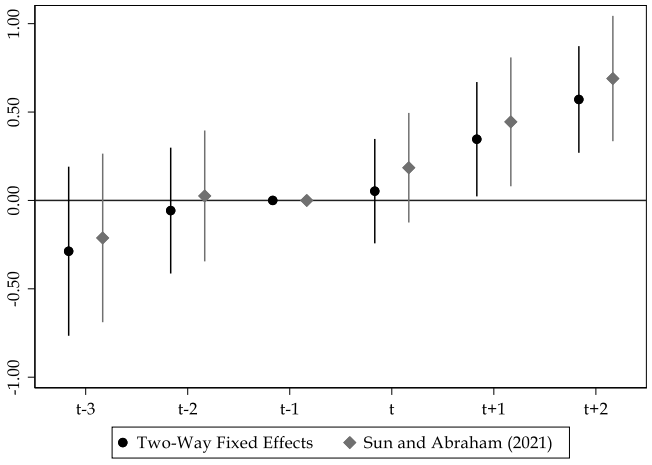
The figures above show the estimated impact of obtaining EGF in percentages (for business revenue, employment, total exports, CIT tax payable and PAYE tax payable) or percentage points (for the probability to start exporting). Time "t" refers to the time when EGF was first obtained. Similarly, the coefficient at time "t+2" refers to the effect of EGF two years after having obtained the subsidized loan. The periods from t-3 to t-1 are "placebo" periods; these are 1-3 years before the loan was disbursed, so there should be zero "treatment effect" in these years (if there were an effect in these years, this would make us worry that the match to the comparison group was not good enough). The coefficients plotted are at the 95% confidence interval. The comparison group is restricted to firms in agriculture and manufacturing whose business revenue distribution overlaps with that of EGF recipients. The effects are estimated using traditional two-way fixed effect regression and following the correction for treatment heterogeneity of Sun and Abraham (2021). For more details on the estimation, see Section A1 of the Technical Appendix. Source: Authors' elaboration with data from the RRA and BRD.

Appendix A3. Comparison Group III

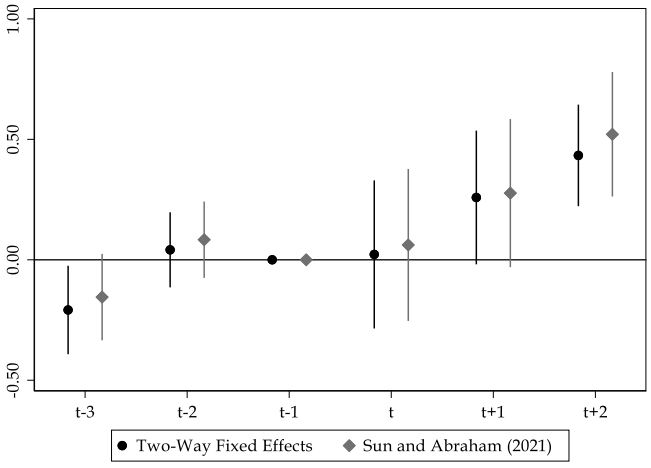
Unrestricted Comparison Group

In this section, we carry out the main specifications in Section 3 of the main document with Comparison Group 3, which is an unrestricted comparison group. Our results are similar to those found with Comparison Group I and Comparison Group II, with somewhat larger estimated impacts. We find significant increases in business revenue (~60%), permanent employment (50%), the probability of exporting (above 10 percentage points), CIT tax payable (above 80%) and PAYE tax payable (50%).

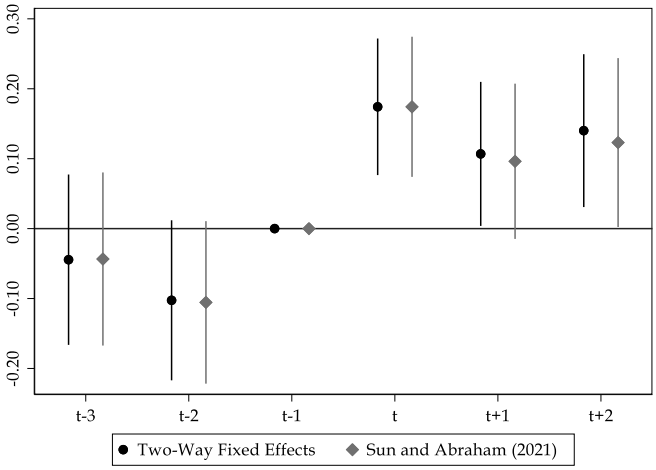
Business Revenue



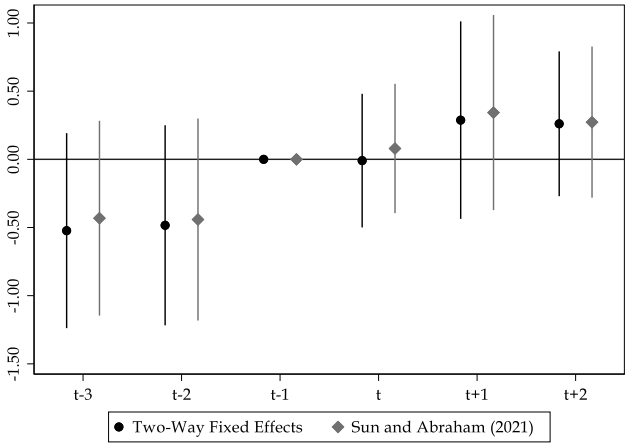
Employment



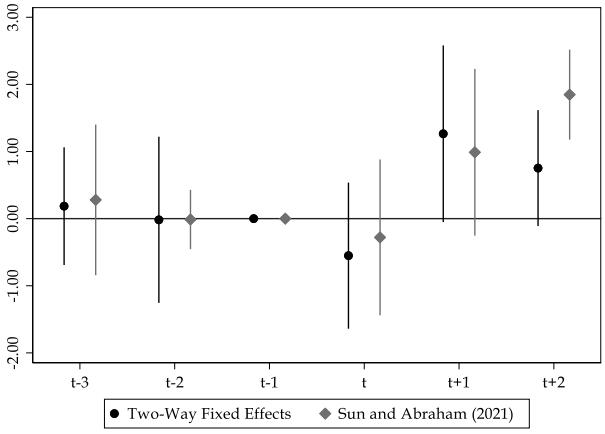
Probability of Exporting



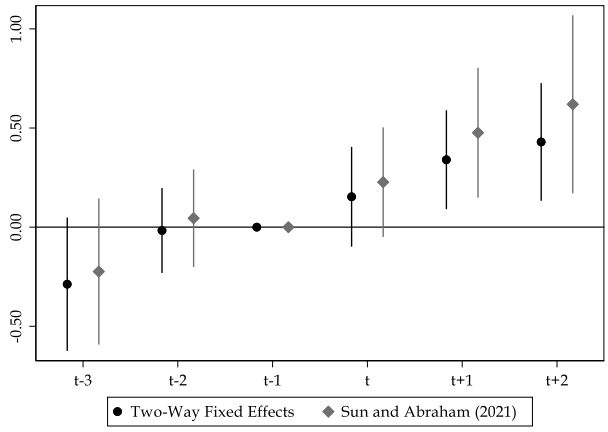
Total Exports – Established Exporters



Corporate Income Tax Payable



Pay-as-you-Earn (PAYE) Tax Payable



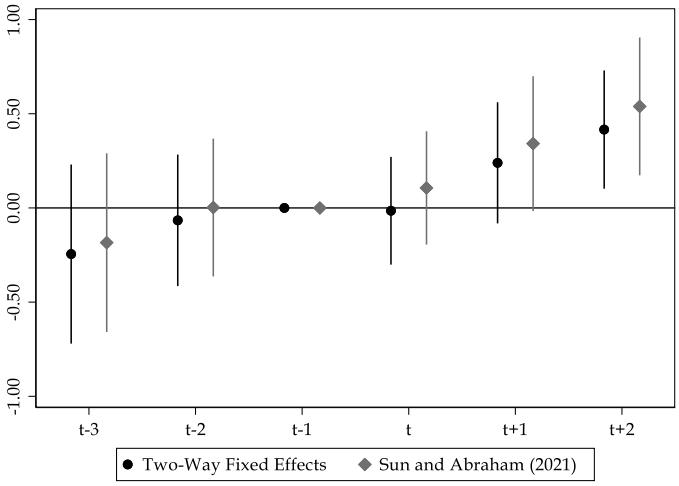
The figures above show the estimated impact of obtaining EGF in percentages (for business revenue, employment, total exports, CIT tax payable and PAYE tax payable) or percentage points (for the probability to start exporting). Time "t" refers to the time when EGF was first obtained. Similarly, the coefficient at time "t+2" refers to the effect of EGF two years after having obtained the subsidized loan. The periods from t-3 to t-1 are "placebo" periods; these are 1-3 years before the loan was disbursed, so there should be zero "treatment effect" in these years (if there were an effect in these years, this would make us worry that the match to the comparison group was not good enough). The coefficients plotted are at the 95% confidence interval. The comparison group includes all formal firms in Rwanda with available information in the RRA datasets. The effects are estimated using traditional two-way fixed effect regression and following the correction for treatment heterogeneity of Sun and Abraham (2021). For more details on the estimation, see Section A1 of the Technical Appendix. Source: Authors' elaboration with data from the RRA and BRD.

Appendix A4. Comparison Group IV

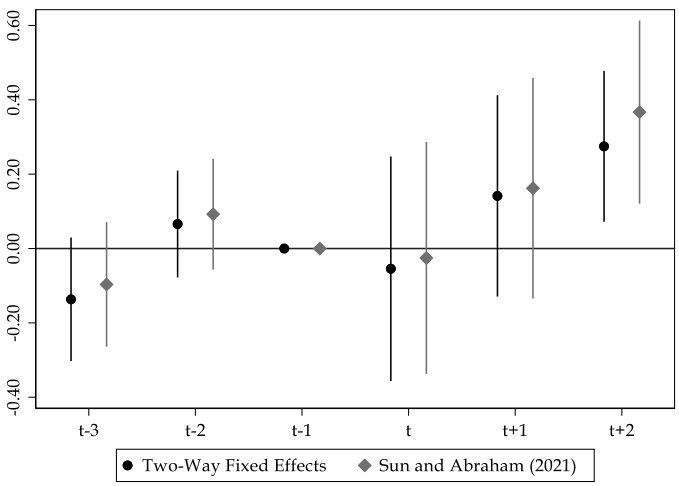
Propensity Score Matching including Firm Purchases

In this section, we carry out the main specifications in Section 3 of the main document with Comparison Group IV. This comparison group corresponds to the group of firms with propensity score above the 10th percentile of the propensity score distribution, based on a propensity score that includes as relevant variables those in Comparison Group I plus total purchases and first difference of total purchases. Our results are similar to those found in our baseline carried out with Comparison Groups I.

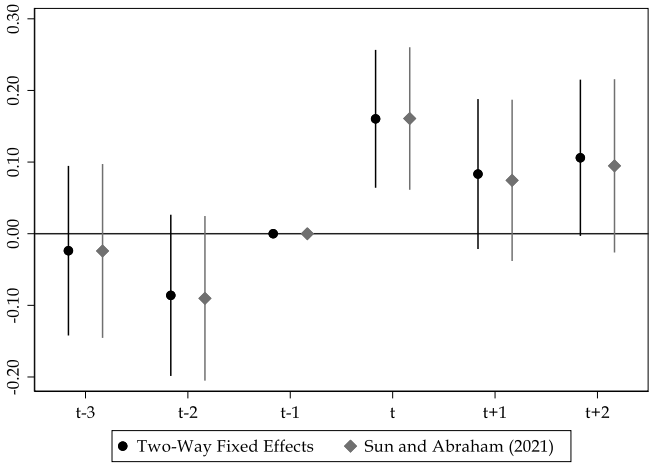
Business Revenue



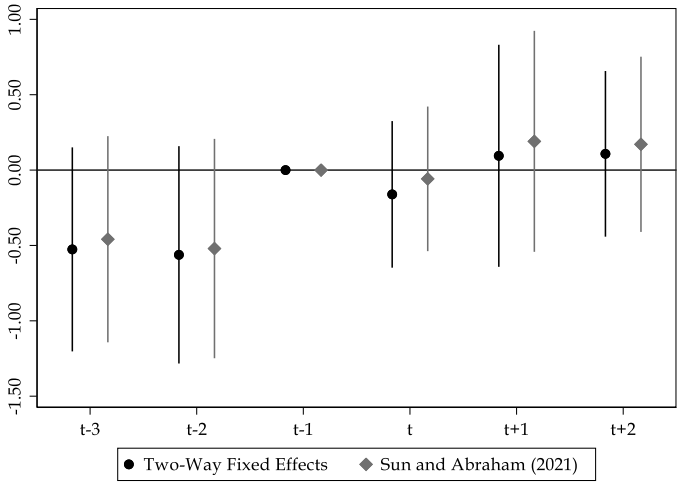
Employment

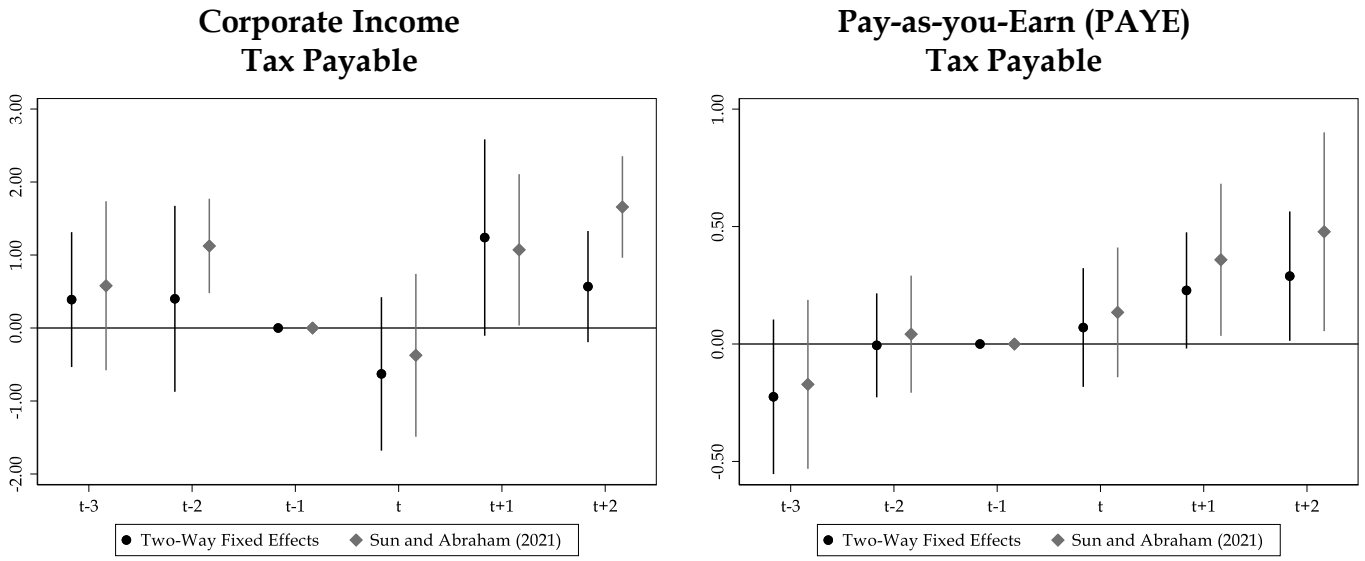


Probability of Exporting



Total Exports – Established Exporters





The figures above show the estimated impact of obtaining EGF in percentages (for business revenue, employment, total exports, CIT tax payable and PAYE tax payable) or percentage points (for the probability to start exporting). Time "t" refers to the time when EGF was first obtained. Similarly, the coefficient at time "t+2" refers to the effect of EGF two years after having obtained the subsidized loan. The periods from t-3 to t-1 are "placebo" periods; these are 1-3 years before the loan was disbursed, so there should be zero "treatment effect" in these years (if there were an effect in these years, this would make us worry that the match to the comparison group was not good enough). The coefficients plotted are at the 95% confidence interval. The comparison group includes all formal firms in Rwanda with available information in the RRA datasets. The effects are estimated using traditional two-way fixed effect regression and following the correction for treatment heterogeneity of Sun and Abraham (2021). For more details on the estimation, see Section A1 of the Technical Appendix. Source: Authors' elaboration with data from the RRA and BRD.

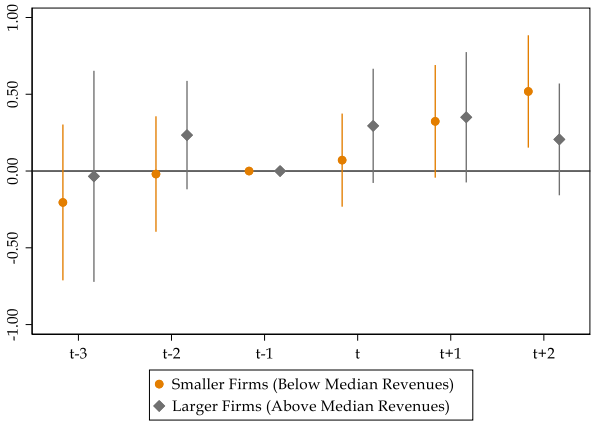
Appendix A5. Heterogeneity by Size

In this section, we divide our EGF recipients into two categories: one with revenues above the median (larger firms) and one with revenues below the median (smaller firms). The objective is to analyze the impact of receiving the subsidized loan by size category. We find larger effects in the group of smaller firms for both business revenues and employment, although the effects seem to take longer to materialize in this group. In addition, the effect on the probability of exporting is only present in smaller firms.

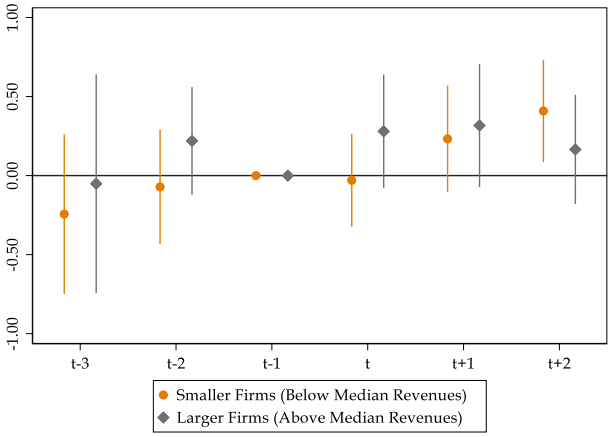
Comparison Group I: Using Propensity Score Matching

Business Revenues

Sun and Abraham (2021)

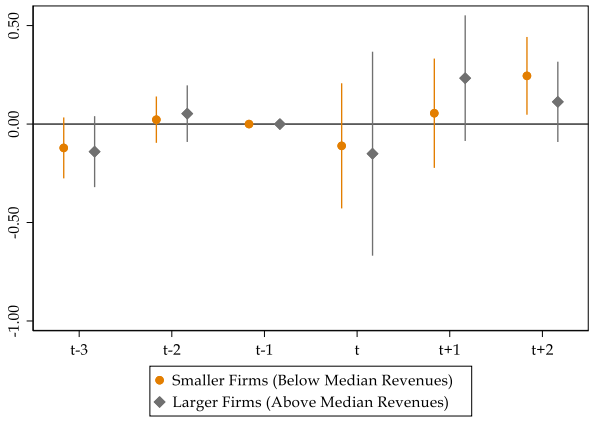


TWFE

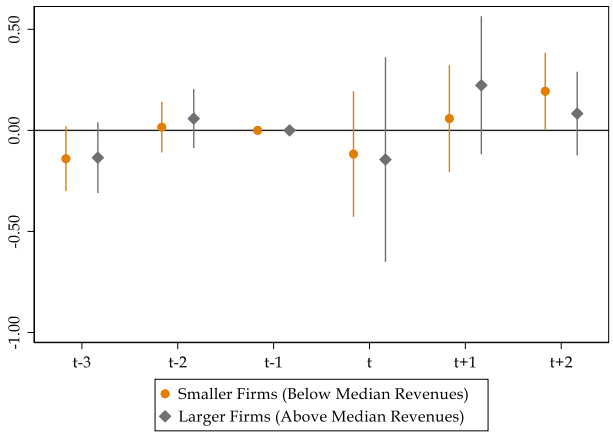


Employment

Sun and Abraham (2021)

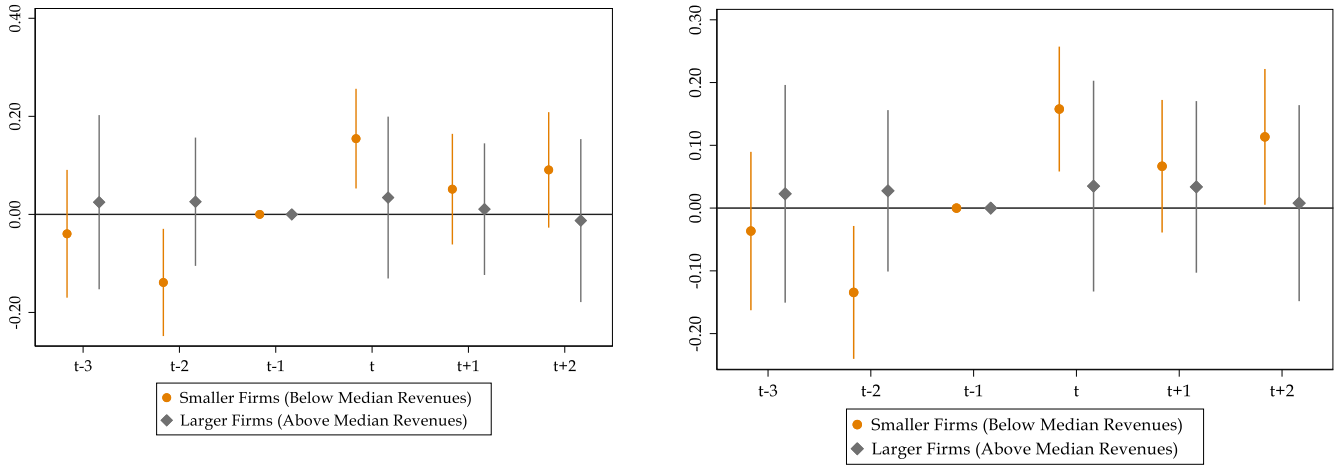


TWFE



Probability of Exporting

Sun and Abraham (2021) *TWFE*



The figures above show the estimated impact of obtaining EGF in percentages (for business revenue, employment, total exports, CIT tax payable and PAYE tax payable) or percentage points (for the probability to start exporting). Smaller firms are those with business revenues below the median of the EGF recipients in the year before obtaining the subsidized loan; larger firms are those above such median. Time "t" refers to the time when EGF was first obtained. Similarly, the coefficient at time "t+2" refers to the effect of EGF two years after having obtained the subsidized loan. The periods from t-3 to t-1 are "placebo" periods; these are 1-3 years before the loan was disbursed, so there should be zero "treatment effect" in these years (if there were an effect in these years, this would make us worry that the match to the comparison group was not good enough).The coefficients plotted are at the 95% confidence interval. The comparison group I is restricted to firms with propensity scores above P10 of the treatment distribution. The comparison group II is restricted to firms in agriculture and manufacturing whose business revenue distribution overlaps with that of EGF recipients. The effects are estimated using traditional two-way fixed effect regression and following the correction for treatment heterogeneity of Sun and Abraham (2021). For more details on the estimation, see Section A1 of the Technical Appendix. Source: Authors' elaboration with data from the RRA and BRD.

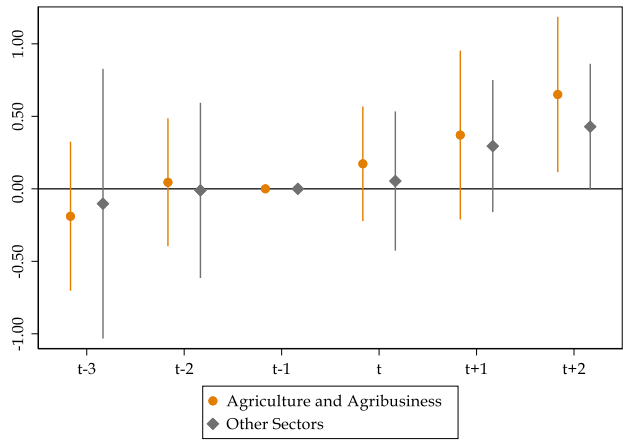
Appendix A6. Heterogeneity by Sector: Agriculture and Agrobusiness vs Other Sectors

In this section, we divide our EGF recipients into two categories: firms in agriculture and agrobusiness and firms operating in other sectors. The objective is to analyze if the impact of receiving the subsidized loan differs between both categories. Overall, we find no significant different between the effect of loans to firms in agriculture/agrobusiness or other sectors in terms of the impact on business revenues or the probability of exporting. There seems to be, however, a larger effect of EGF on employment for firms in agriculture/agrobusiness.

Comparison Group I: Using Propensity Score Matching

Business Revenues

Sun and Abraham (2021)



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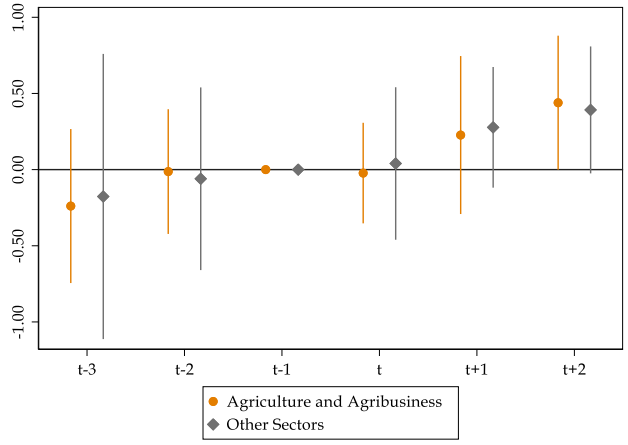
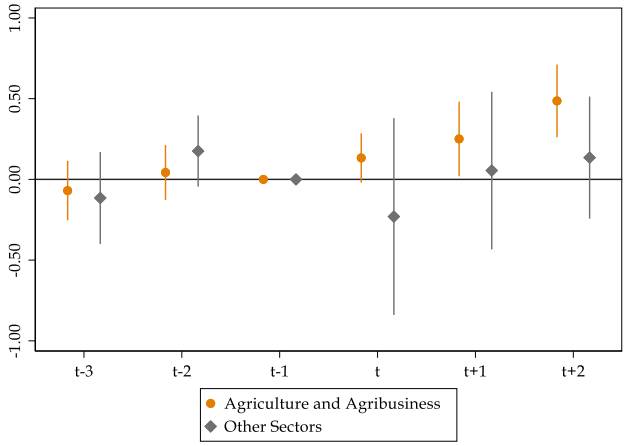


Employment

Sun and Abraham (2021)



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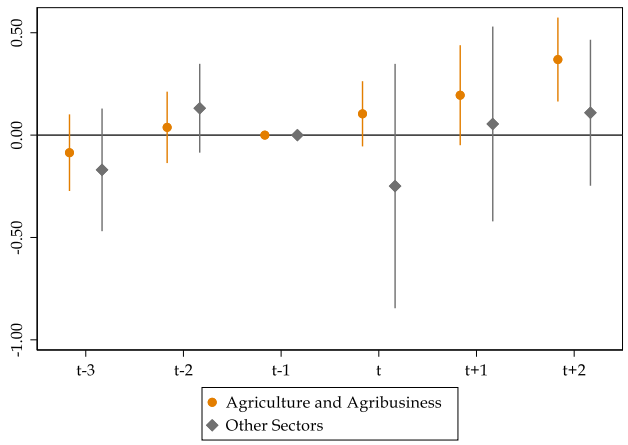
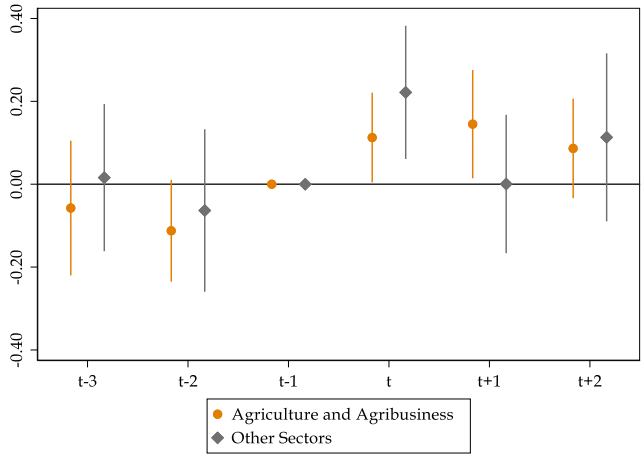
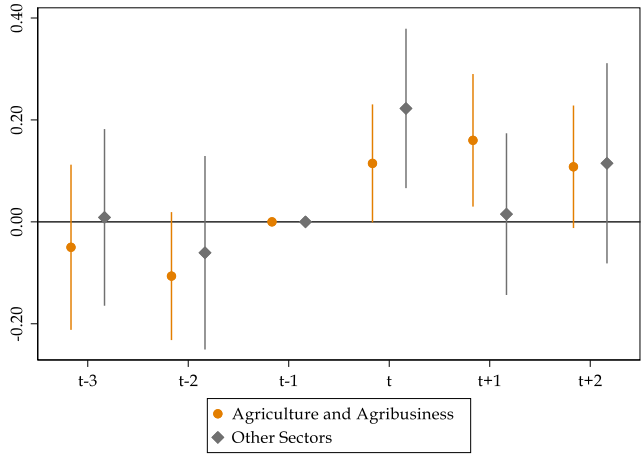


Probability of Exporting

Sun and Abraham (2021)



TWFE



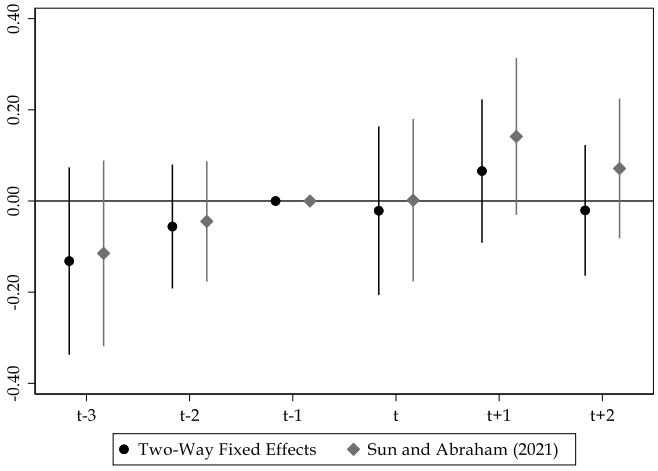
The figures above show the estimated impact of obtaining EGF in percentages (for business revenue, employment, total exports, CIT tax payable and PAYE tax payable) or percentage points (for the probability to start exporting). Time "t" refers to the time when EGF was first obtained. Similarly, the coefficient at time "t+2" refers to the effect of EGF two years after having obtained the subsidized loan. The periods from t-3 to t-1 are "placebo" periods; these are 1-3 years before the loan was disbursed, so there should be zero "treatment effect" in these years (if there were an effect in these years, this would make us worry that the match to the comparison group was not good enough).The coefficients plotted are at the 95% confidence interval. The comparison group I is restricted to firms with propensity scores above P10 of the treatment distribution. The comparison group II is restricted to firms in agriculture and manufacturing whose business revenue distribution overlaps with that of EGF recipients. The effects are estimated using traditional two-way fixed effect regression and following the correction for treatment heterogeneity of Sun and Abraham (2021). For more details on the estimation, see Section A1 of the Technical Appendix. Source: Authors' elaboration with data from the RRA and BRD.

Appendix A7. Impact over Other Variables

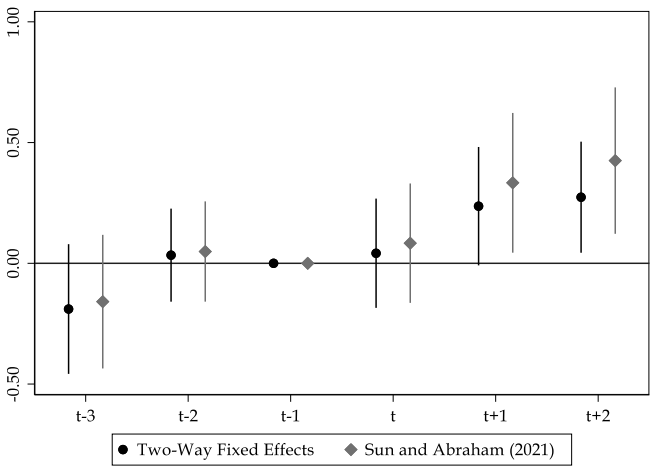
In this section, we explore the impact of EGF over other firm performance outcomes, using as a reference our main comparison group (*Comparison Group I*). Firstly, we explore the effects on wages. We find a significant increase in the total wage bill, mostly driven by increases in permanent employment. The effects over imports follow a similar dynamic to those we find over exports: we do not observe an effect over total imports for established importers but there is a significant increase in the probability of importing. We find some hints of a potential conversion of casual to permanent employment, albeit there are clear pre-trends. We don't find a clear impact over other dimensions of exporting, including number of products, number of destinations and number of transactions, although, as with total exports, this may be due to limited sample size in the sample of established exporters. Finally, we find hints of a potential increase in VAT payable, but our estimates are very noisy.

Comparison Group I: Using Propensity Score Matching

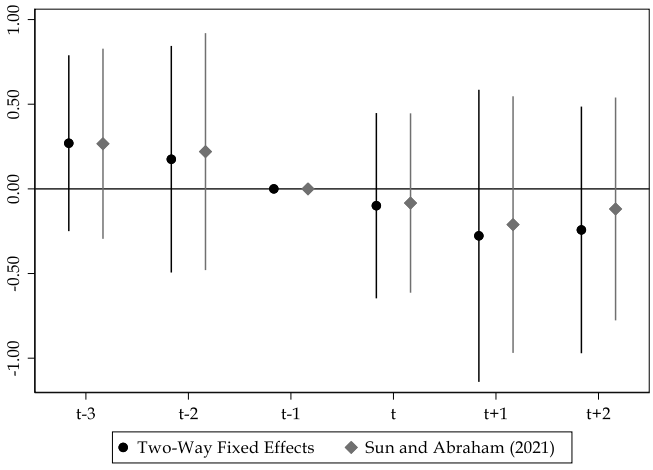
Average Wages



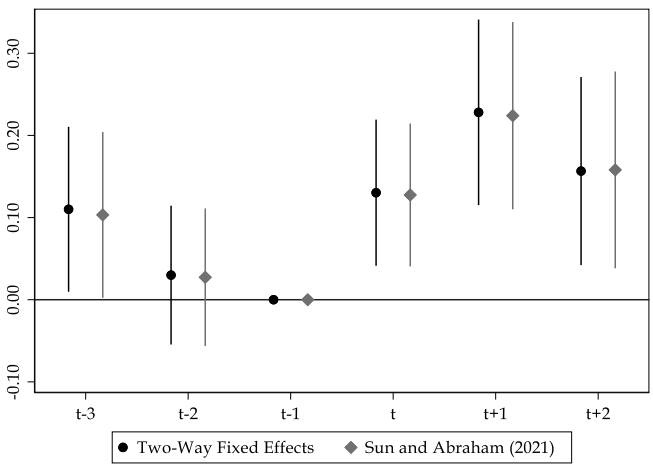
Total Wage Bill



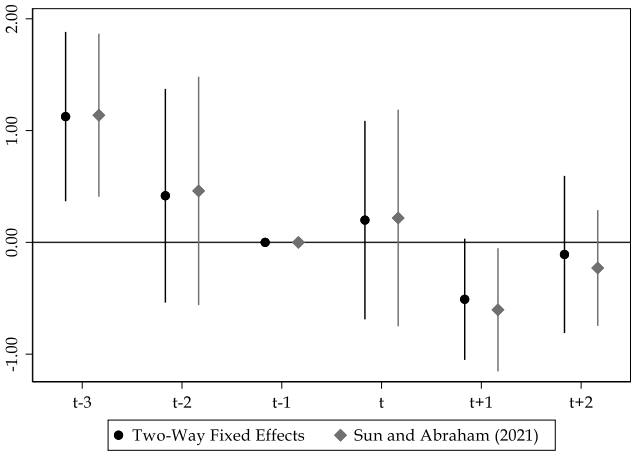
Total Imports – Established Importers



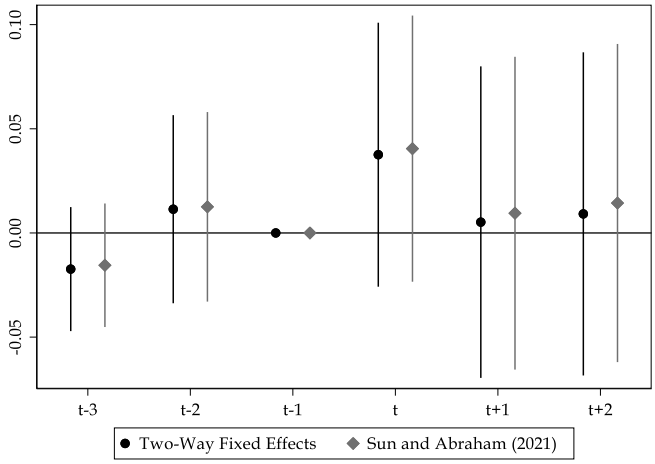
Probability of Importing



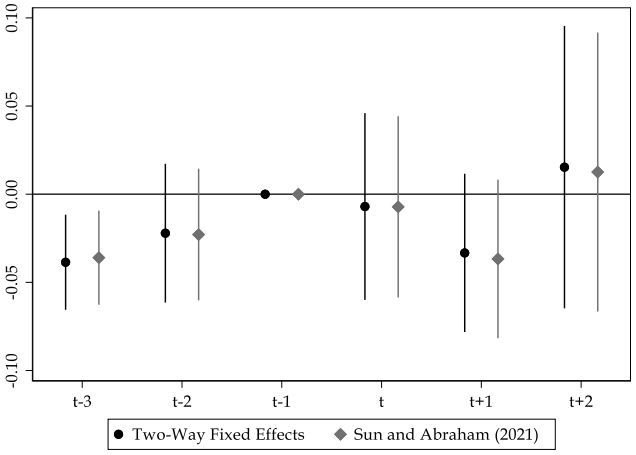
Casual Employment



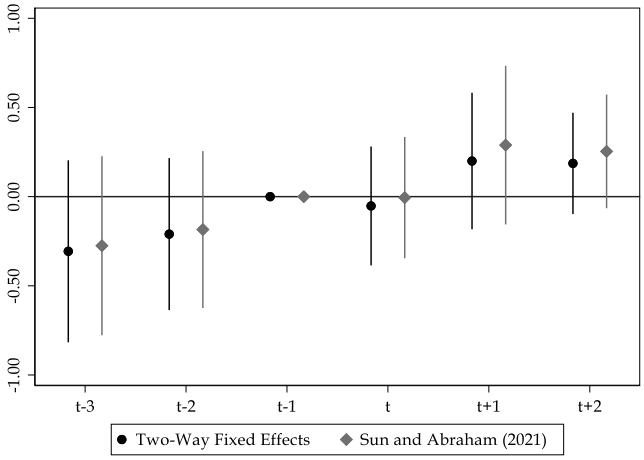
Reports Investment Expenditures



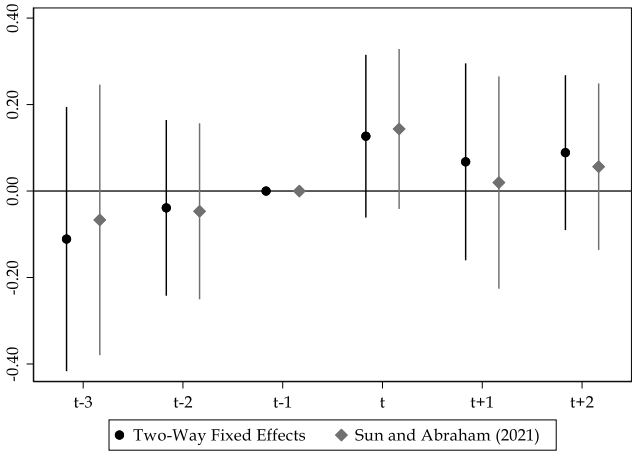
Reports Training Expenditures



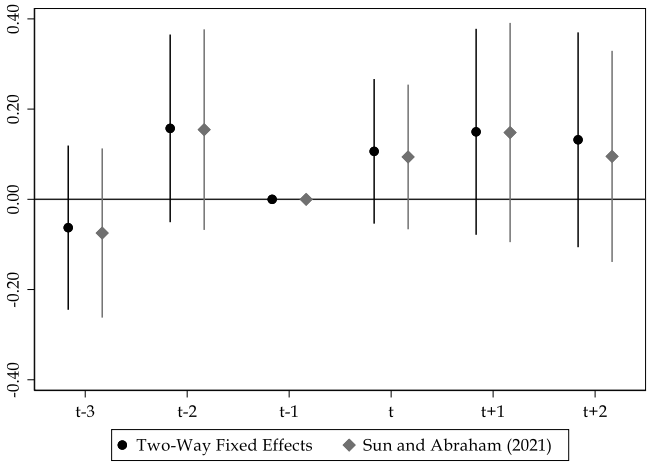
Number of Export Transactions



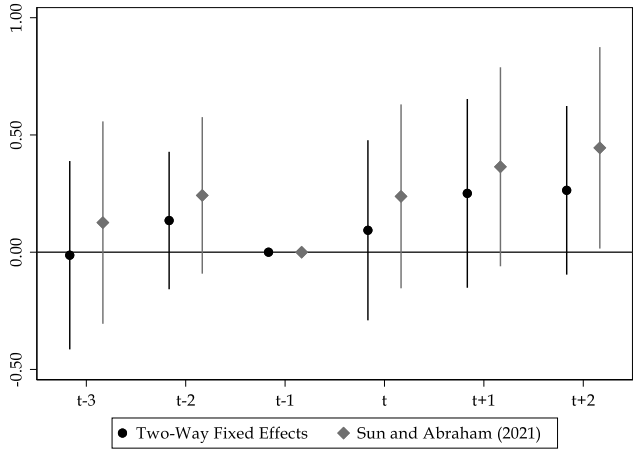
Number of Export Destinations



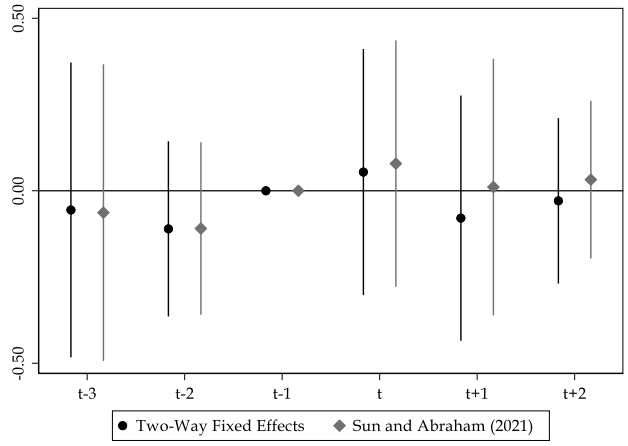
Number of Export Products



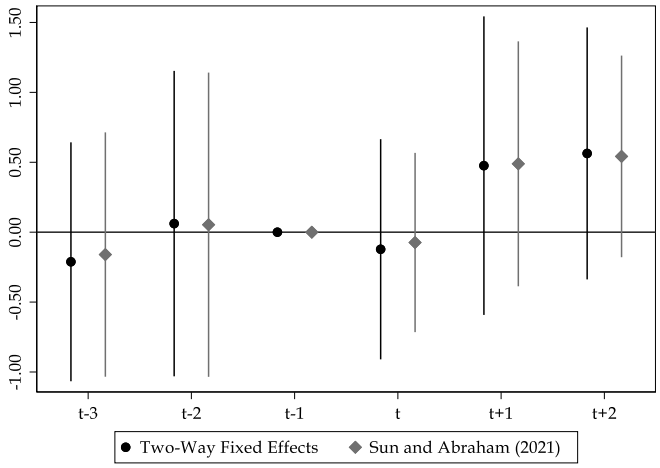
Total Purchases



Business Revenue per Worker



Value Added Taxes Payable



The figures above show the estimated impact of obtaining EGF in percentages (for average wages, total wage bill, total imports, casual employment, number of export transactions, number of export destinations, number of export products and VAT tax payables) or percentage points (for the probability to start importing, the reporting of investment expenditures and the reporting of training expenses). Time "t" refers to the time when EGF was first obtained. Similarly, the coefficient at time "t+2" refers to the effect of EGF two years after having obtained the subsidized loan. The periods from t-3 to t-1 are "placebo" periods; these are 1-3 years before the loan was disbursed, so there should be zero "treatment effect" in these years (if there were an effect in these years, this would make us worry that the match to the comparison group was not good enough).The coefficients plotted are at the 95% confidence interval. The comparison group is restricted to firms with propensity scores above P10 of the treatment distribution. The effects are estimated using traditional two-way fixed effect regression and following the correction for treatment heterogeneity of Sun and Abraham (2021). For more details on the estimation, see Section A1 of the Technical Appendix. Source: Authors' elaboration with data from the RRA and BRD.

Appendix A8. Distribution of Firms by Sector and Size

	All Firms		Smaller Firms		Larger Firms	
	Number of Firms	*Share of Total*	*Number of Firms*	*Share of Total*	*Number of Firms*	*Share of Total*
Coffee	14	19%	9	17%	5	23%
Not Coffee	60	81%	43	83%	17	77%
Coffee and Tea	19	26%	12	23%	7	32%
Not Coffee or Tea	55	78%	40	77%	15	68%
Agriculture and Agribusiness	37	50%	27	52%	10	45%
Not Agriculture or Agribusiness	37	50%	25	48%	12	55%

This table divides firms according to their sector (coffee vs. not coffee; coffee and tea vs. not coffee and tea; and agriculture and agribusiness vs other sectors) and size (smaller firms being those below the median of revenues and larger firms being those above the median of revenues). Note that firms that cannot be classified into smaller/larger firms due to missing information, that is, because they do not report business revenues in previous years, are classified as smaller firms.