Foreign Direct Investment and Structural Transformation in Africa

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Outline of the talk

- Contribution
- Data
- Identification Strategy and Results
- Mechanisms

Background: FDI and Economic Development

- FDI are a major instrument to support local economic development (Javorick 2018)
- Large literature on the impact of FDI on economic development, and on their effect on firms, but
  - Very little evidence on the implications of FDI on structural transformation (Alviarez et al. 2021; Liu 2022);
  - Only a few works go granular enough to account for the heterogeneous characteristics of FDI and the features of the local (labour) markets (e.g. Toews and Vezina, 2022).

What we do

RQ: We evaluate if the entry of new greenfield FDI projects drive structural transformation at the sub-national level in Africa

- We combine geolocalized information on FDI projects with data on over 40mln individuals and 26k firms in 24 African countries;
- Assess the heterogeneous effects of FDI by activity of foreign firms in the field;
- Explore effects on different models of structural transformation (sectors; skills; informality);
- Try to account how such supply side effects are stimulated by the effect of FDI on demand forces.

What we get

- Locations that receive FDI experience an increase in employment and show evidence on structural transformation:
  - Away from agriculture, towards modern activities;
  - Towards more skilled occupations (though this is not persistent)
- Effects of FDI depend on the activity performed by foreign firms in the local markets:
  - Most of the findings driven by *production* activities;
  - Skilled occupations respond to the entry of hi-va services
  - some evidence on informality raising with entry of extractive activities
- Evidence of domestic firms growth and upgrading in response to horizontal and vertical (backward) linkages with foreign investors in their locations.

Data

Individual level data:

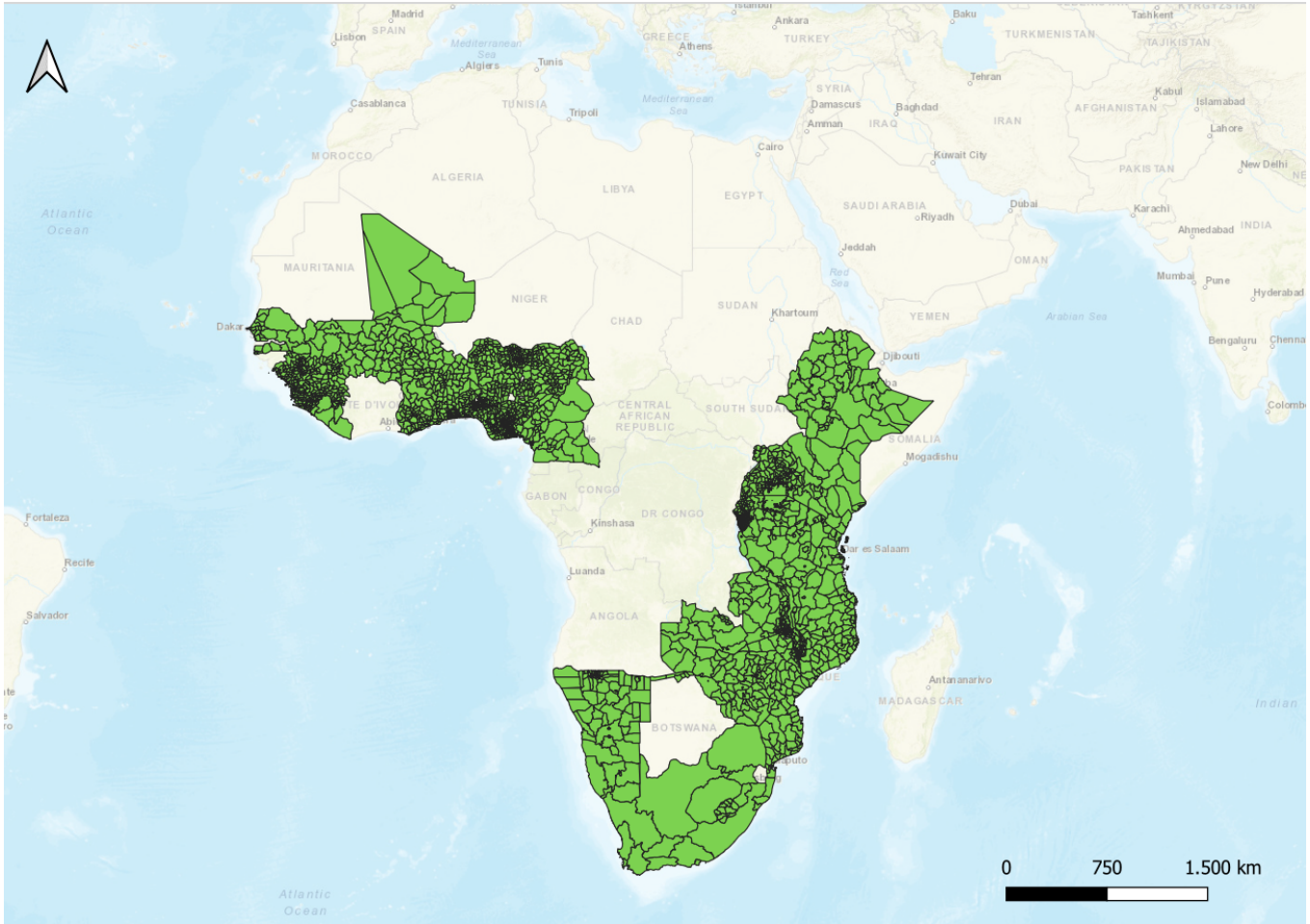
- IPUMS International Census Database
- Demographic Health Survey (DHS) Program Database

Individual Level Data

Our sample includes:

- 21 African countries from IPUMS and DHS data from 24 African countries in the time period 1987 - 2019
- Working age population (15 - 49)
- 40.665.627 individuals from 82 DHS waves and 49 IPUMS waves localized in 2,570 subnational units. Waves
- We harmonize the information provided by these two sources following Bandiera et al. (2022, JEP).
- Outcomes of interest: employed population, employed by skill (high, blue, white collars); employed by sector; self-employed.

Administrative units



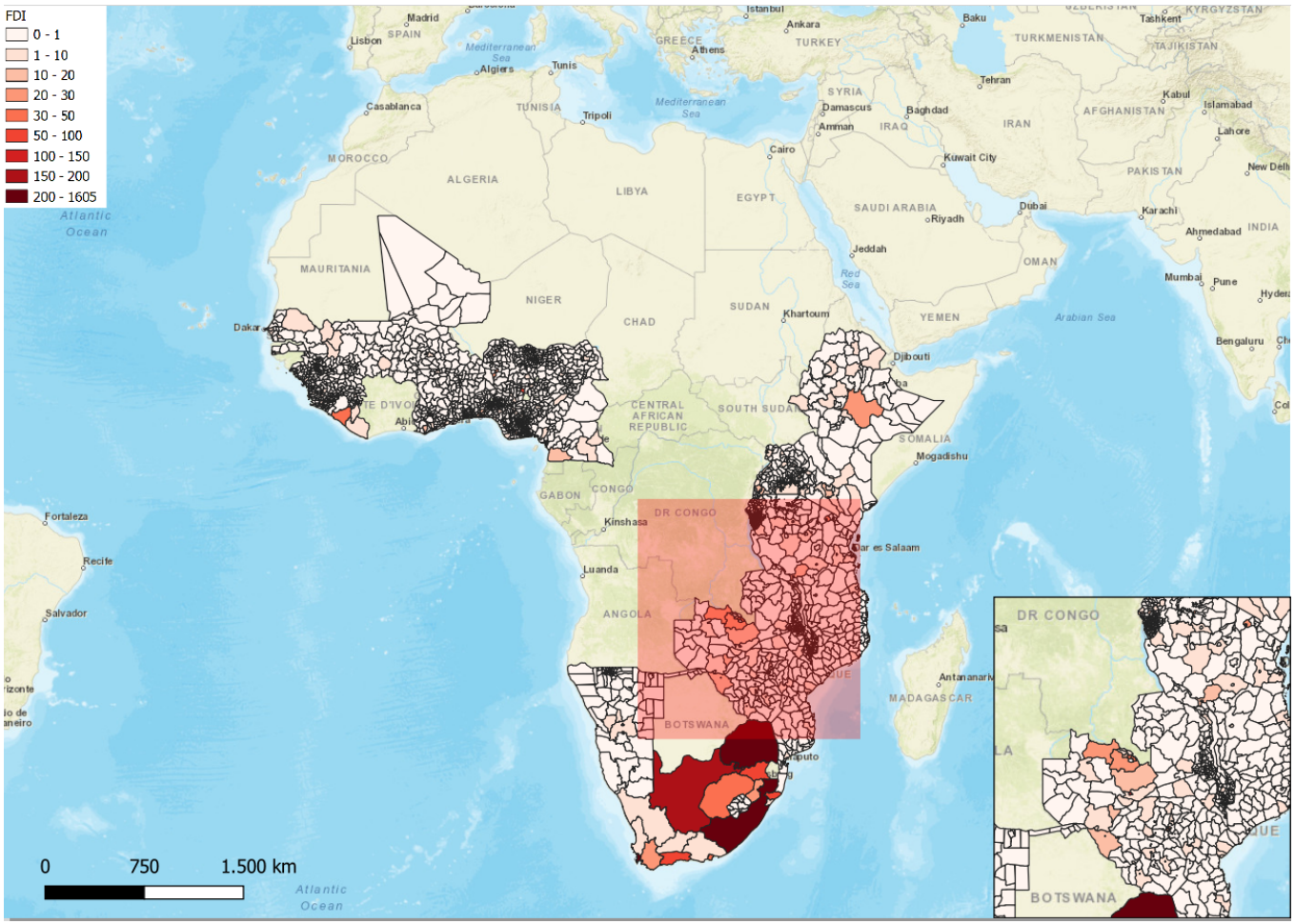
FDI Data

- Financial Times' fDiMarkets database
- Information provided: the location of each projects, its country of origin, the sector and the activity performed by the firm in the host country
- 4.918 greenfield FDI projects in 24 countries from 2003 to 2020

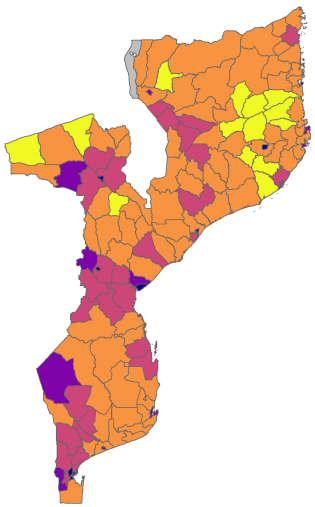
Investors and Recipients | Sectors and Activities | Investors and Recipients (attrition) | Sectors and Activities (attrition) | Geographic distribution of FDI

Combining the data at the geographical level

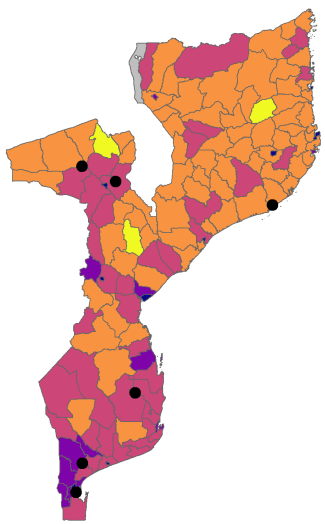
Descriptive Statistics



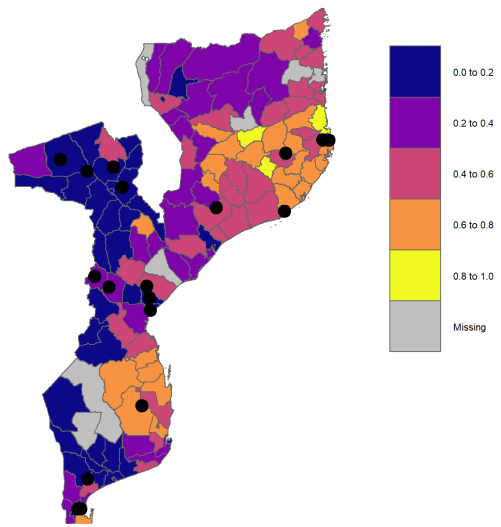
FDI and the share of Agr. workers in Mozambique



(a) 1997



(b) 2007



(c) 2011

Descriptive Analysis

We link the entry of FDI to changes in the local labor markets in recipient destinations:

$$y_{ict} = \beta_0 + \beta_1 FDI_{ict} + \beta_2 X_{ict} + \gamma_i + \theta_{ct} + \epsilon_{ict} \quad (1)$$

where

- y_{ict} is one of the outcomes of interest (share of employment; employment by sectors, occupations, self-empl.);
- FDI_{ict} takes 1 since the first project arrives in location i;
- γ_i and θ_{ct} are location and country-wave fixed effects;
- X_{ict}: average age, share of women, share of urban residents and the share of individuals with secondary education;
- Regressions weighted by total population of the area;
- standard errors are clustered at the province level.

Results–Descriptive Analsys

Table 1: Results of the TWFE model

VARIABLES	(1) Employment	(2) High Skilled	(3) White collar	(4) Blue collar	(5) Agriculture	(6) Non Agriculture	(7) Self Employment
FDI	0.0184**	0.00565**	0.00864*	0.00647	0.00440	0.0143**	0.0205
	(0.00851)	(0.00260)	(0.00503)	(0.00901)	(0.00932)	(0.00710)	(0.0132)
Constant	0.227***	-0.165***	-0.0374	0.508***	0.456***	-0.231***	0.180***
	(0.0411)	(0.0223)	(0.0368)	(0.0510)	(0.0525)	(0.0510)	(0.0567)
Observations	10,725	10,367	10,367	10,367	9,758	9,758	9,959
R-squared	0.790	0.772	0.852	0.836	0.866	0.873	0.817
Controls	Y	Y	Y	Y	Y	Y	Y
ADM FE	Y	Y	Y	Y	Y	Y	Y
Country*wave FE	Y	Y	Y	Y	Y	Y	Y
Mean DV	0.688	0.0393	0.151	0.502	0.377	0.300	0.559

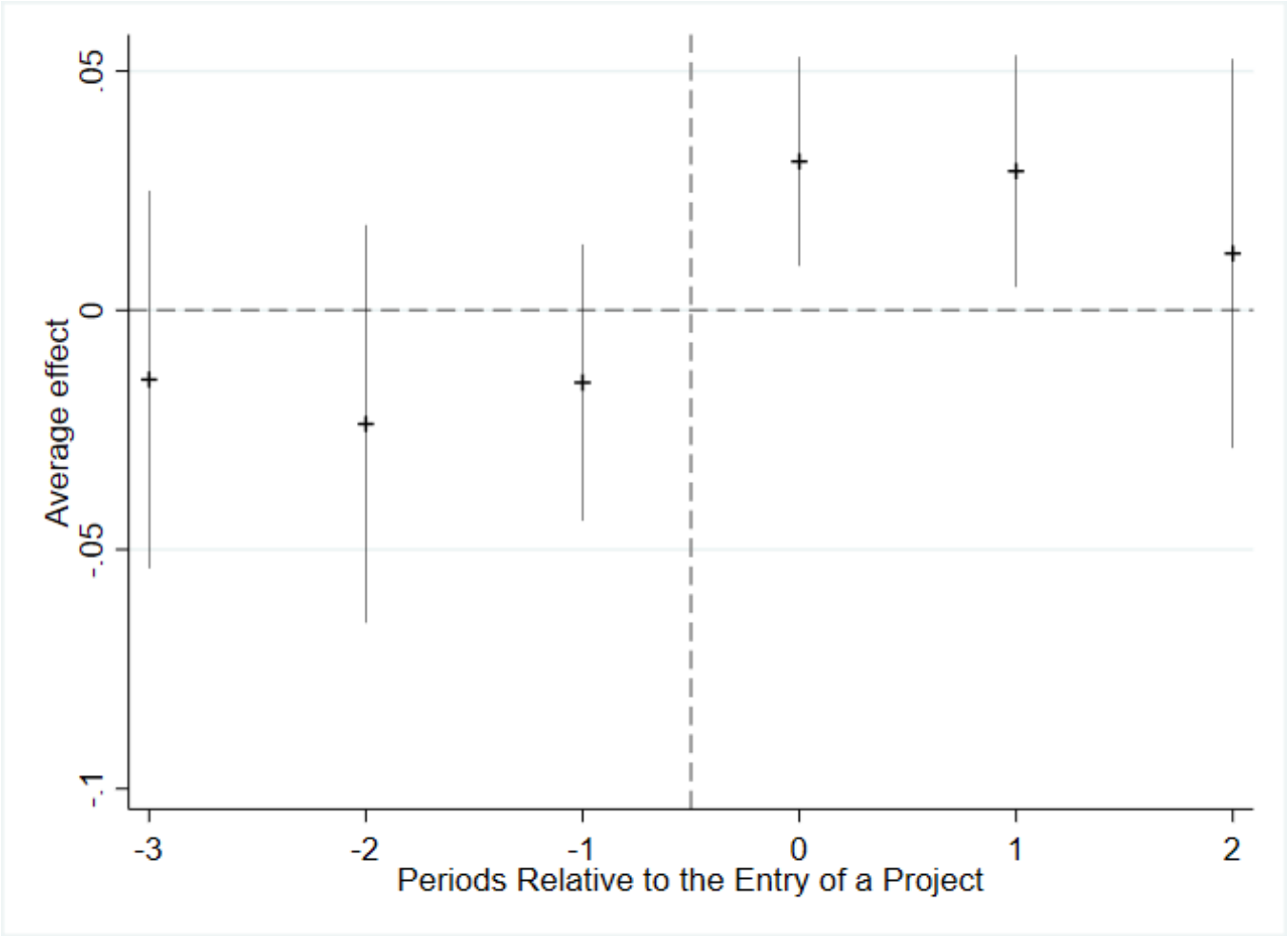
Notes: The unit of observation is the province. The variable *FDI* is a dummy variable equal to 1 if the province has received at least one project by year t. The outcomes of interest are the share of employed population, the share of population in high skill jobs, in white collar jobs and in blue collar jobs, the share of population employed in agriculture and outside agriculture, and the share of population self-employed or working in a family business. Controls variables are the share of female, the share of people who live in the urban areas, the share of individuals with at least secondary education and average age in each province. We include location and country-wave fixed effects and the total population of the area as a weight. Standard errors clustered at the provincial level in parenthesis. *** $p<0.01$, ** $p<0.05$, * $p<0.1$

Identification Strategy & Results

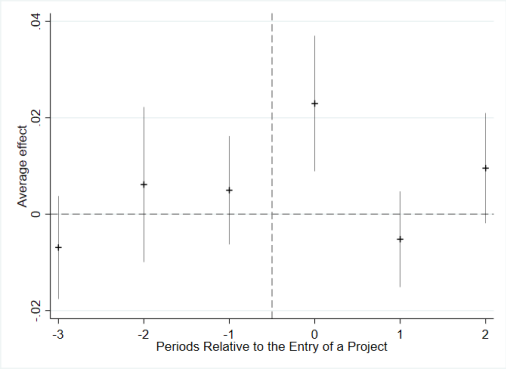
- FDIs location choices are not taken at random
  - Previous estimates assume **parallel trends** Treated vs Controls
  - and no **negative weights** Negative Weights

- We test our relations in an event study setting, following recent advances in the literature:
  - We implement the doubly-robust D-i-D estimator proposed by Callaway and Sant'Anna (2020) and Sant'Anna and Zhao (2020).

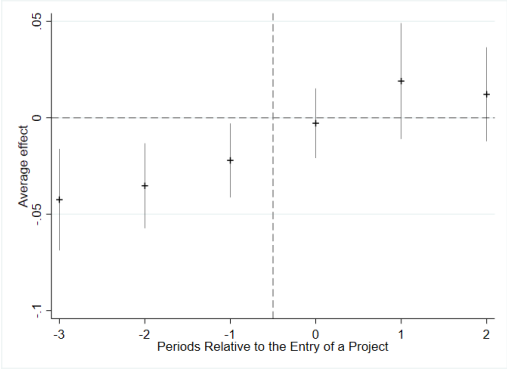
FDI entry and Employment



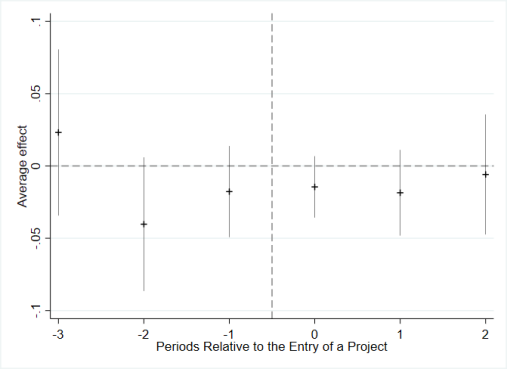
FDI entry and Structural Transformation



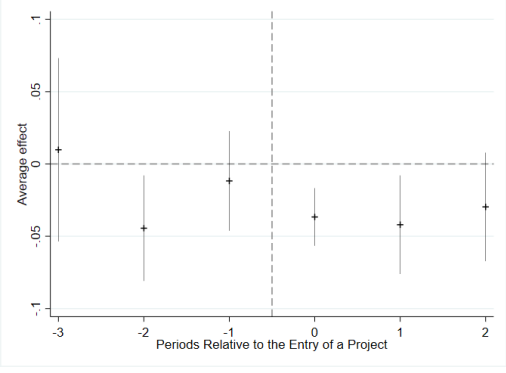
(d) High Skilled



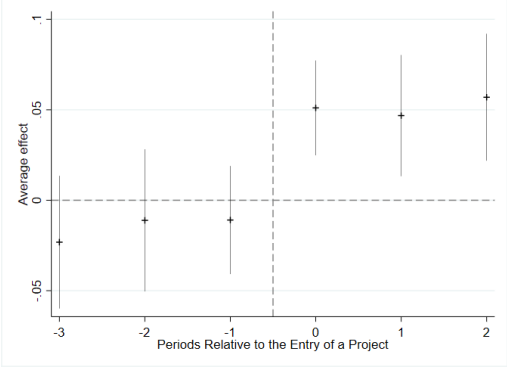
(e) White Collar



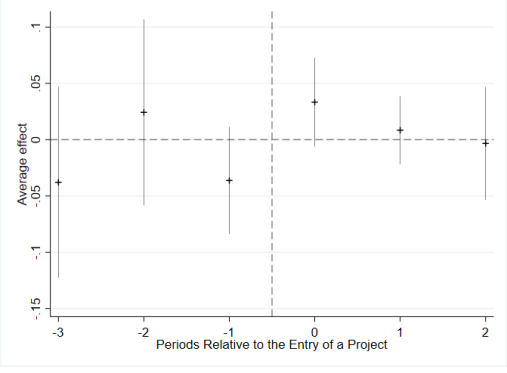
(f) Blue Collar



(g) Agriculture



(h) Non Agriculture



(i) Self-Employment

Heterogeneity

- FDI by business activity Business Activity
  - Production
  - "High-skill" activities
  - Extraction
- FDI from OECD vs. non-OECD countries Source country
- Workers by Gender Women sample
- Migration Migration

Robustness Checks (*in progress*)

- Using alternative estimators: Alternative Estimators
  - De Chaisemartin and d'Haultfoeuille (2020)
  - Borusyak et al.(2021)
  - Wooldridge J. M. (2021) JWDID
- Different cuts to the sample No capital
- Neighbouring administrative areas: Spillover
  - 2270 provinces do not receive projects.
  - 17% of these provinces become treated because they broader provinces that receive at least one project.

Mechanisms: Firm level responses to FDI

- We propose a demand side mechanism:
  - spillover effects from FDI on proximate domestic firms that may impact local labor demand.

- We match FDI project to firm-level data from the World Bank Enterprise Surveys:
  - 26,351 firms from all the 24 countries covered in our main analysis from 2006 to 2020;
  - Link exposure to FDI projects on domestic firms performance using a spatial matching FDI-firms

Identification: Firm level responses to FDI

- We exploit spatial and temporal variation in the distrubution of FDI;
- We compare areas with FDI projects (*Active*) with areas where a project will be located in future (*Inactive*)
- Areas are defined by a buffer (50 km) Buffer

Identification: Firm level responses to FDI

- We estimate the following regression:

$$y_{i(cj)t} = \beta_1 Active_{jrt} + \beta_2 Inactive_{jrt} + \beta_3 X_{it} + \theta_r + \phi_j + \omega_{ct} + \epsilon_{ijrt}$$

- where $y_{i(cj)t}$ is an outcome of interest (an indicator of firm's performance) for firm i, sector j, location r at time t;
- Our coefficient of interest is the difference β_1-β_2

The effects of FDI on domestic firms

VARIABLES	(1) Productivity	(2) Total Sales	(3) Investment	(4) Number of employees	(5) Skilled employees	(6) Labor cost on employment
Active (50 km)	0.190**	0.272***	0.0209	0.0665**	0.0361	0.0337
	(0.0749)	(0.0800)	(0.0215)	(0.0283)	(0.0374)	(0.0795)
Inactive (50 km)	-0.00273	-0.0143	-0.0229	-0.00589	-0.00769	-0.00705
	(0.0628)	(0.0698)	(0.0166)	(0.0224)	(0.0125)	(0.0597)
Constant	13.28***	13.84***	0.226***	0.525***	0.620***	11.43***
	(0.0407)	(0.0440)	(0.00932)	(0.0150)	(0.0101)	(0.0380)
Observations	18,981	19,117	21,008	20,976	7,631	18,211
R-squared	0.677	0.694	0.126	0.804	0.219	0.692
Difference	**0.192**	**0.287**	**0.0438**	**0.0724**	0.0438	0.0407
p-value difference	**0.0335**	**0.00296**	**0.0970**	**0.0395**	0.253	0.664

The unit of observation is a domestic firm. Firms who report foreign ownership in the WBES sample are dropped. The table reports at the bottom the coefficient of interest, the difference between the coefficients Active and Inactive, and its p-value. In this Table, the treatment is defined as the proximity (within a 50km buffer) to at least an FDI in the same sector. All regressions include a dummy for firm size (small, medium, large), the age of the firm, city, industry (2-digit ISIC Rev 3.1) and country-year fixed effects. Standard errors clustered at the city-industry level in parentheses*** $p<0.01$, ** $p<0.05$, * $p<0.1$

Backward Linkages Alternative buffers

Conclusions

Much more to be done, some preliminary thoughts:

- Suggestive evidence on the role of FDI on structural transformation;
- Importance of going granular both at the level of local labour markets and in the definition of the type (quality) of FDI;
- Importance of combining supply and demand forces to better understand the dynamics of spillovers from FDI.

Coverage of IPUMS and DHS data by countries and years

Back

Country	DHS Waves	IPUMS Waves
Benin	1996, 2001, 2012, 2017	1992, 2002, 2013
Burkina Faso	1993, 1999, 2003, 2010	1996, 2006
Burundi	2010, 2016	NA
Cameroon	1991, 2004, 2011, 2018	1987, 2005
Ethiopia	2000, 2005, 2010, 2016	1994, 2007
Ghana	1993, 1998, 2003, 2008, 2014	2000, 2010
Guinea	1999, 2005, 2012, 2018	1996, 2014
Kenya	2003, 2008 2014	1989, 1999, 2009
Lesotho	2004, 2009, 2014	1996, 2006
Liberia	2007, 2013, 2019	2008
Malawi	2000, 2004, 2010, 2015	1998, 2008
Mali	1996, 2001, 2006, 2012, 2018	1987, 1998, 2009
Mozambique	2011	1997, 2007
Namibia	2000, 2006, 2013	NA
Nigeria	2003, 2008, 2013, 2018	NA
Rwanda	2005, 2010, 2014, 2019	1991, 2002, 2012
Senegal	1993, 1997, 2005, 2010, 2019	1988, 2002, 2013
Sierra Leone	2008, 2013, 2019	2004, 2015
South Africa	2017	2001, 2007, 2011, 2016
Tanzania	1999, 2010, 2015	1988, 2002, 2012
Togo	1998, 2013	2010
Uganda	2000, 2006, 2011, 2016	1991, 2002, 2014
Zambia	2007, 2013, 2018	1990, 2000, 2010
Zimbabwe	1999, 2005, 2010, 2015	2012

Notes: For DHS, we adopt the year of data collection from the survey documentation given that some datapoints might have been collected in the previous or in the following year. This is not the case for IPUMS which collects data during a single year.

Top 10 FDI source and recipient countries

Back

Investors	Freq.	Recipients	Freq.
United States	14.46%	South Africa	34.30%
United Kingdom	13.89%	Kenya	12.67%
South Africa	6.28%	Nigeria	11.64%
Germany	5.98%	Ghana	7.63%
France	4.98%	Mozambique	5.06%
China	4.55%	Tanzania	4.21%
India	3.84%	Ethiopia	3.50%
Switzerland	3.58%	Uganda	3.29%
Japan	2.83%	Zambia	3.27%
UAE	2.83%	Rwanda	2.40%

Main sectors and business activities of FDI

Sectors	Freq.	Activities	Freq.
Financial services	17.14%	Business Services	26.01%
Business services	10.94%	Sales, Marketing &Support	24.26%
Software & IT services	8.70%	Manufacturing	19.38%
Communications	7.77%	Logistics, Distribution & Transportation	4.53%
Food & Beverages	6.73%	Electricity	3.97%
Transportation & Warehousing	5.31%	Extraction	3.13%
Metals	4.94%	Construction	3.05%
Industrial equipment	4.45%	Headquarters	2.91%
Renewable energy	3.92%	Research & Development	2.70%
Coal, oil & gas	3.54%	ICT & Internet Infrastructure	2.50%
Real estate	2.95%	Retail	2.09%
Chemicals	2.89%	Education & Training	2.03%
Automotive OEM	2.52%	Maintenance & Servicing	1.79%
Hotels & tourism	2.05%	Customer Contact Centre	0.98%
Building materials	1.93%	Technical Support Centre	0.35%
Electronic components	1.77%	Recycling	0.24%
Textiles	1.53%	Shared Services Centre	0.08%

Back

Top 10 FDI source and recipient countries–Not geolocated projects

Investors	Freq	Recipients	Freq
United States	11.08%	South Africa	20.01%
United Kingdom	9.52%	Nigeria	11.66%
India	9.31%	Kenya	10.38%
China	7.98%	Ghana	9.63%
South Africa	7.28%	Tanzania	6.58%
UAE	3.64%	Ethiopia	5.78%
Kenya	3.53%	Uganda	4.92%
France	3.42%	Zambia	4.49%
Canada	3.26%	Mozambique	4.01%
Japan	3.21%	Senegal	2.73%

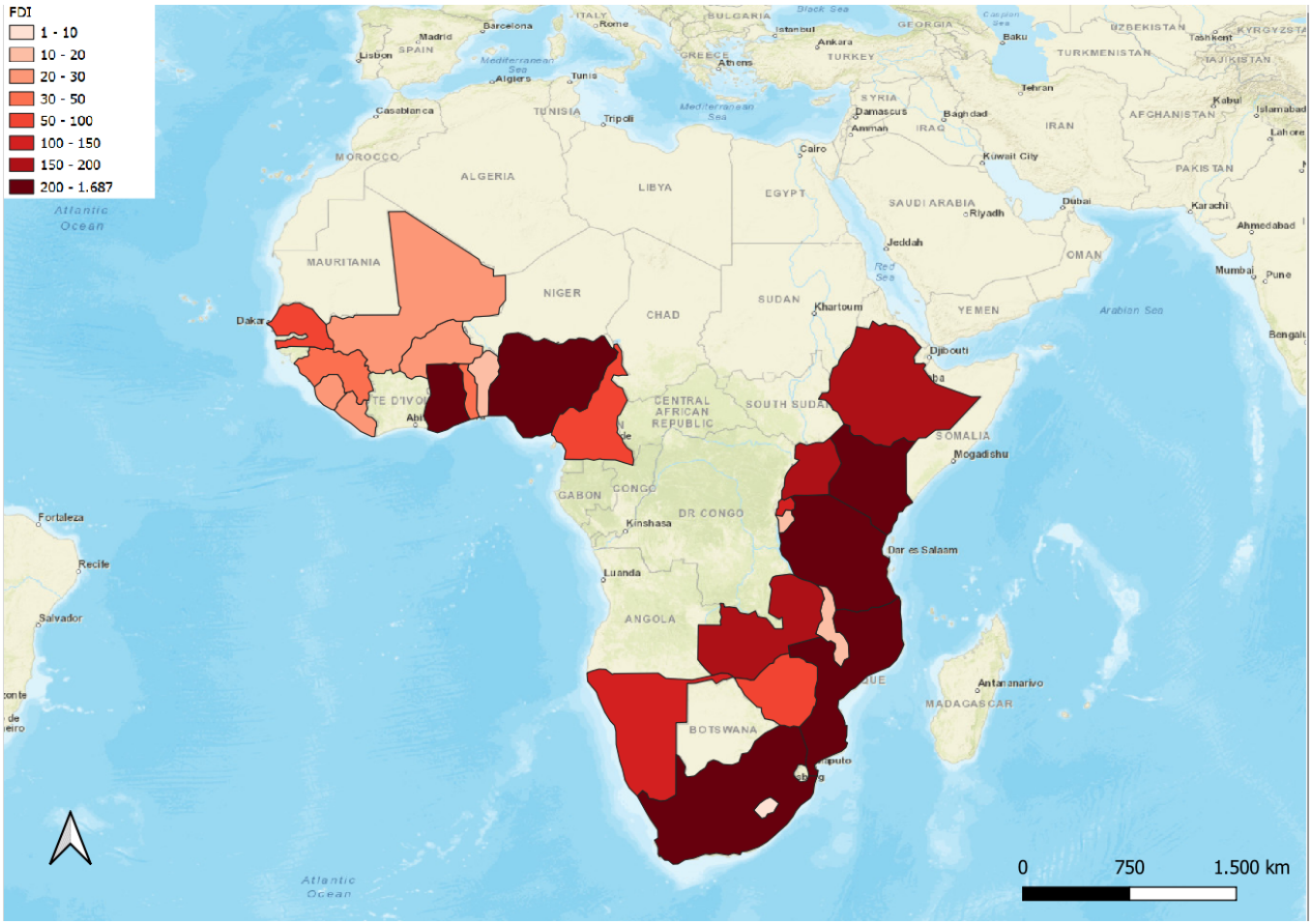
Back

Main sectors and business activities of FDI–Not geolocated projects

Sectors	Freq.	Activities	Freq.
Financial services	13.06%	Manufacturing	26.32%
Communications	11.82%	Sales, Marketing &Support	22.26%
Metals	8.08%	Business Services	18.30%
Business Services	7.28%	Extraction	8.08%
Food & Beverages	7.28%	ICT & Internet Infrastructure	6.58%
Software & IT Services	6.15%	Logistics, Distribution & Transportation	3.75%
Coal, oil & gas	5.62%	Electricity	3.48%
Automotive OEM	4.12%	Retail	2.68%
Chemicals	3.37%	Construction	2.30%
Transportation & Warehousing	3.32%	Research & Development	1.71%
Industrial Equipment	3.21%	Education & Training	1.39%
Renewable Energy	3.00%	Headquarters	0.96%
Consumer Products	2.41%	Customer Contact Centre	0.80%
Electronic components	2.19%	Maintenance & Servicing	0.70%
Building materials	2.03%	Recycling	0.97%
Textiles	1.93%	Technical Support Centre	0.32%

Back

Appendix



Geographic Distribution of FDIs across Africa

Back

Descriptive Statistics

Back

	Mean	SD	Median	Num. of Obs.
Female	0.544	0.073	0.537	11206
Urban	0.249	0.343	0.070	10886
Age	28.543	1.616	28.293	11206
Secondary Educ. +	0.261	0.272	0.149	11176
Employment	0.688	0.165	0.704	11140
Self Employment	0.559	0.222	0.574	10516
Employee	0.091	0.099	0.059	10516
Agriculture	0.376	0.252	0.371	10035
Non Agriculture	0.299	0.2	0.262	10035
High skilled	0.039	0.051	0.023	10751
White collar	0.150	0.137	0.107	10751
Blue collar	0.501	0.223	0.499	10751

Treated vs control areas

Variable	Treated (at t-1)	Controls
Employed	62.45%	69.06%
High skilled	4.87%	3.77%
White collar	14.82%	14.77%
Blue collar	41.78%	50.86%
Agriculture	28.79%	38.69%
Non Agriculture	32.18%	29.17%
Self Employment	41.99%	56.68%
Age	28.26	28.54
Female	52.72%	54.52%
Urban	43.8%	23.27%
Secondary School	30.63%	25.02%

Back

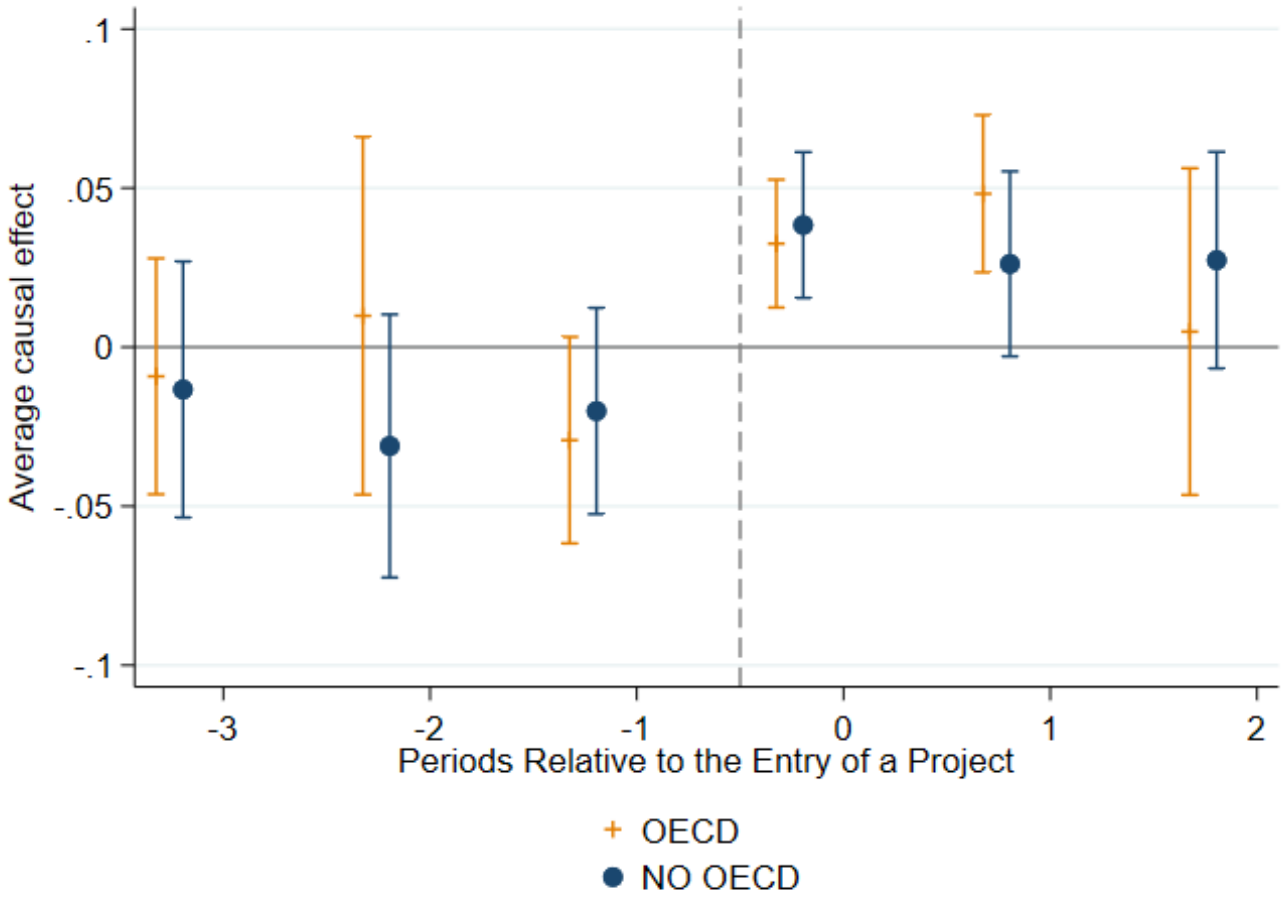
Negative Weights

	Positive	Negative	Sum Negative	$\lvert E[\hat{\beta}_{twfe}]\rvert / SD_w$
Employment	587	52	-0.007	0.0183
High Skilled	537	53	-0.01	0.0097
White collar	537	53	-0.01	0.0051
Blue collar	537	53	-0.01	0.0094
Agriculture	519	51	-0.01	0.0039
Non agriculture	519	51	-0.01	0.0267
Self Employment	531	48	-0.01	0.0105

Back

Event study by country of origin

Back



Event study by country of origin

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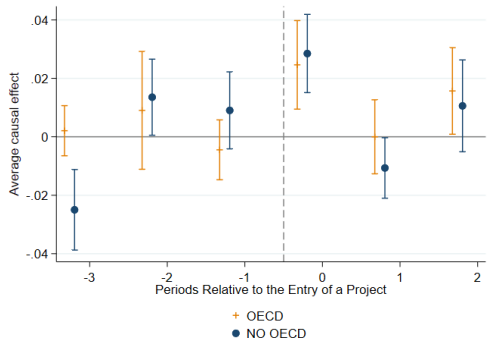
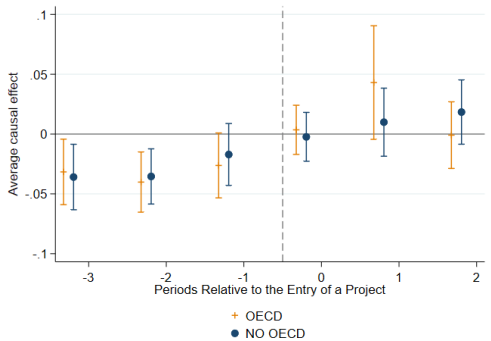
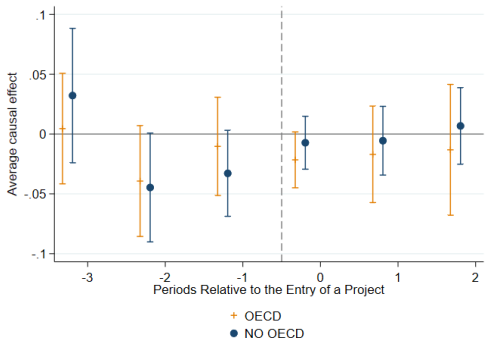


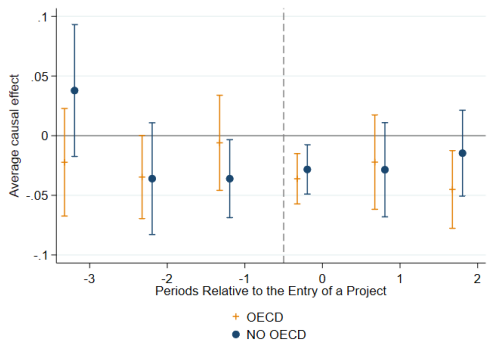
(j) High Skilled



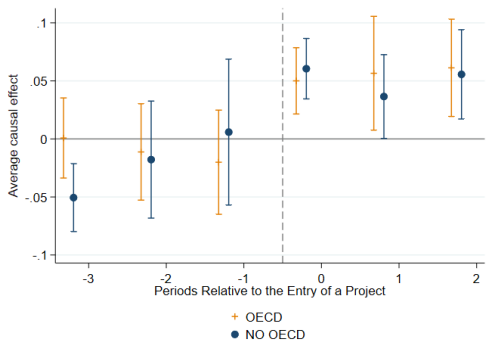
(k) White Collar



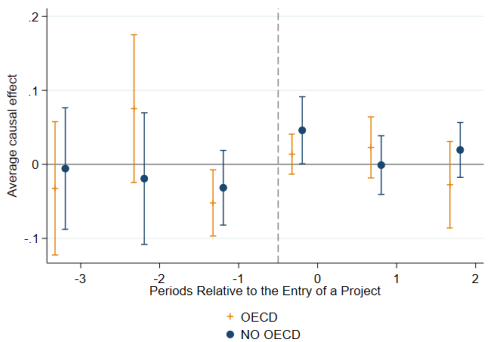
(l) Blue Collar



(m) Agriculture



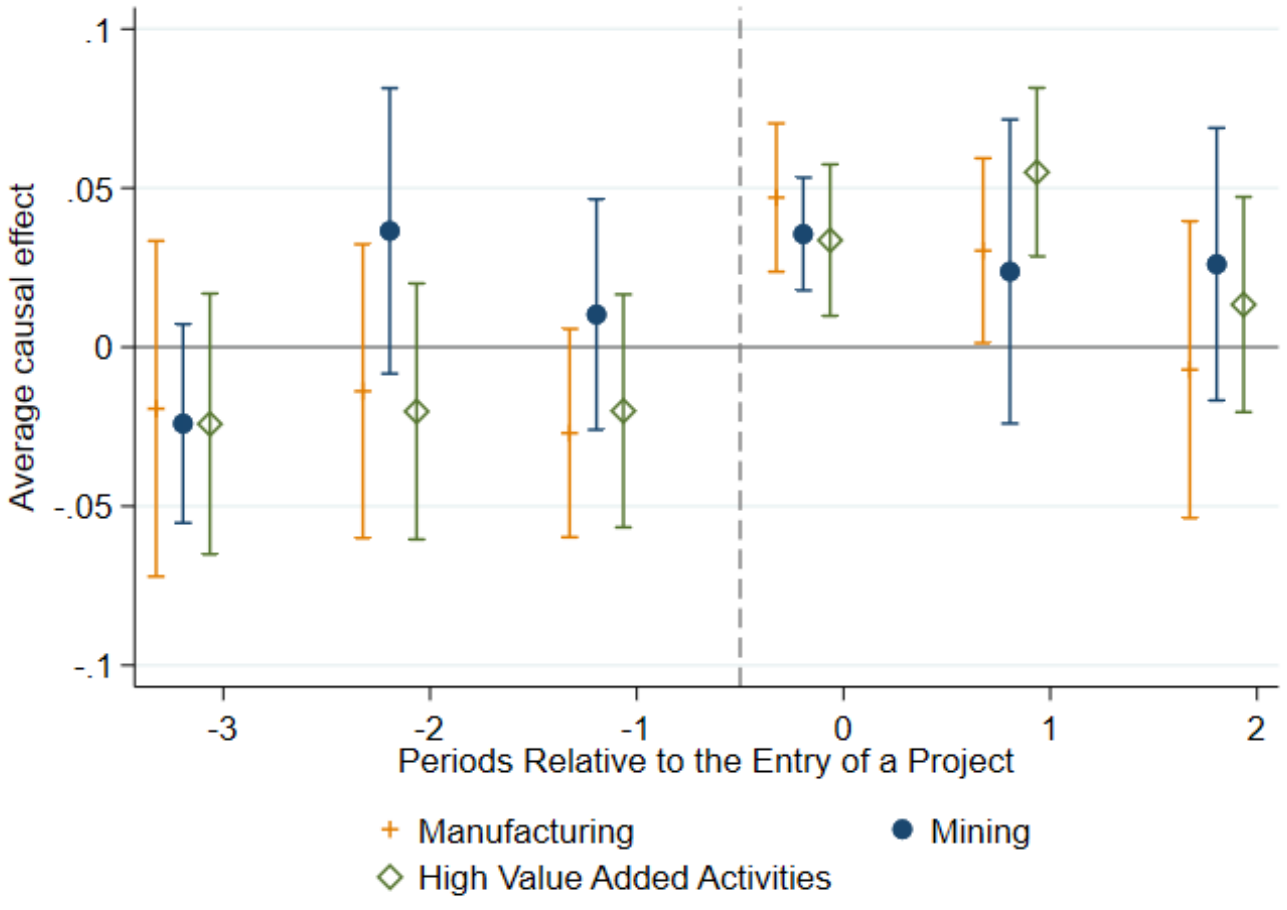
(n) Non Agriculture



(o) Self-Employment

Event study by business activity

Back



Event study by business activity

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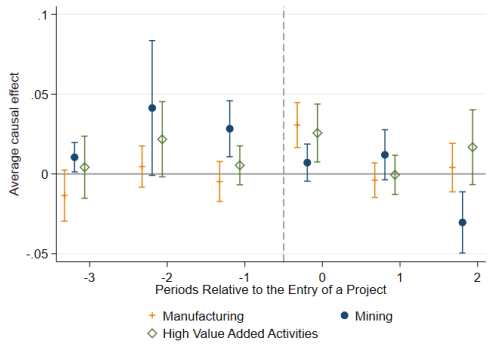
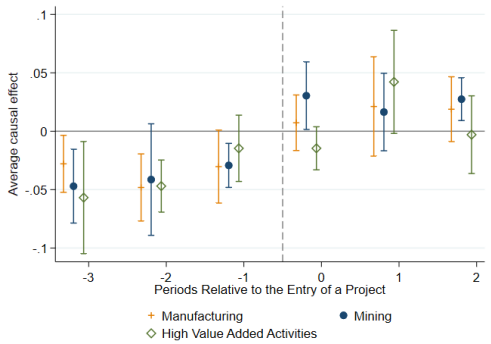


(p) High Skilled



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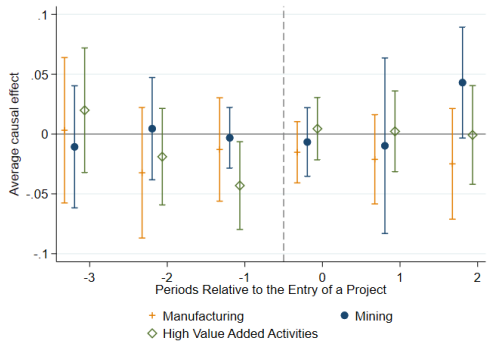

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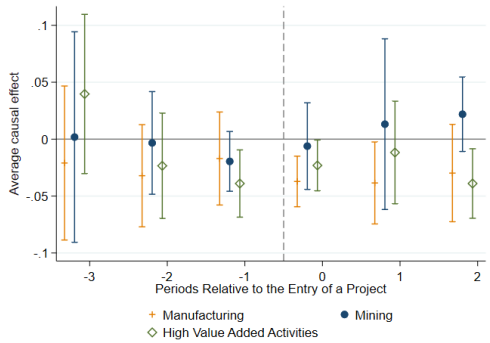

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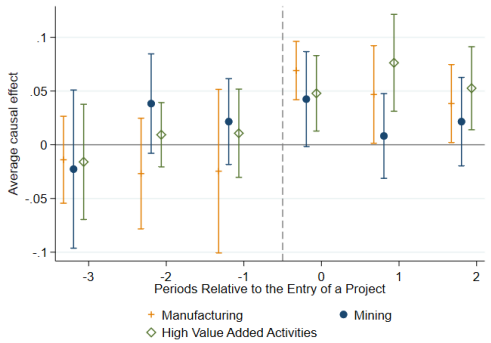

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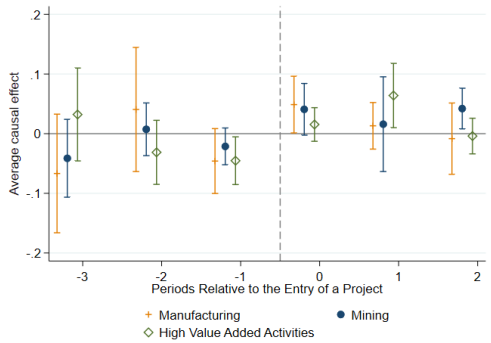
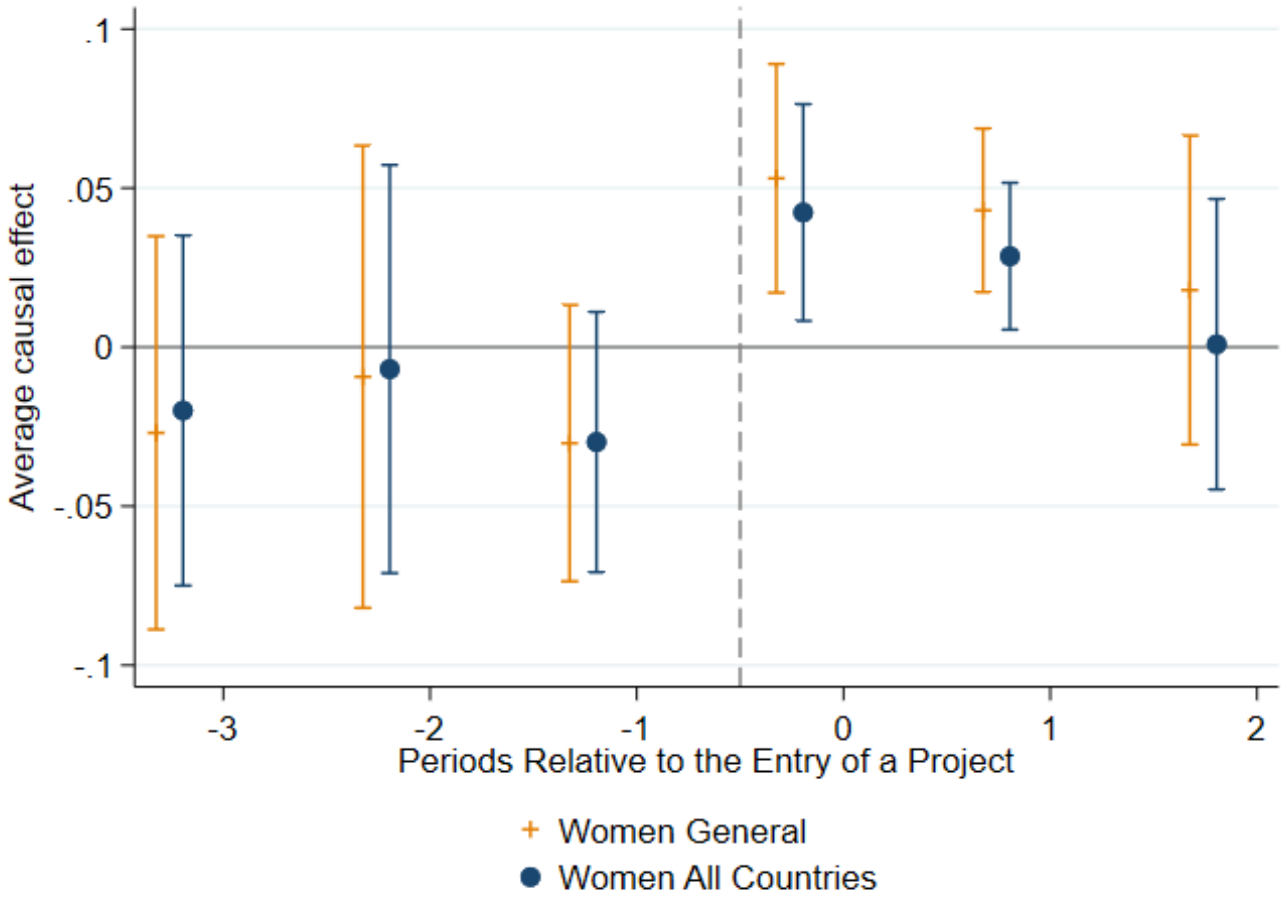


(u) Self-Employment

Event Study by activity of investors

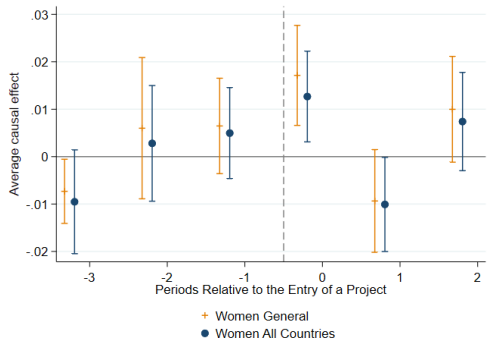
Event study - Women sample

Back



Event study - Women sample

Back



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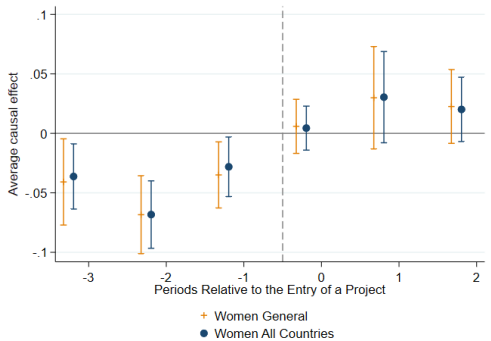

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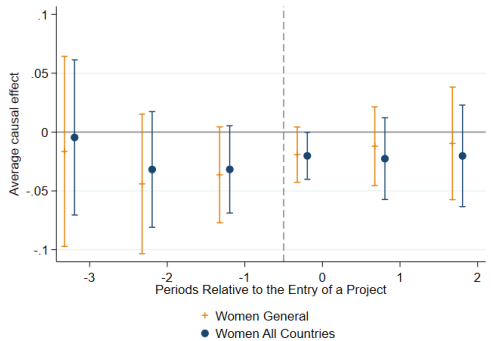

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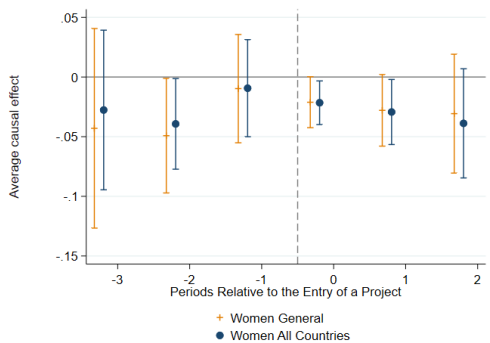

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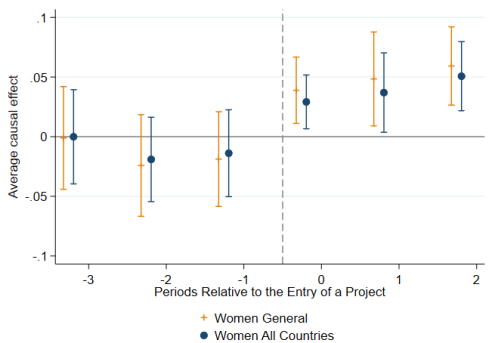

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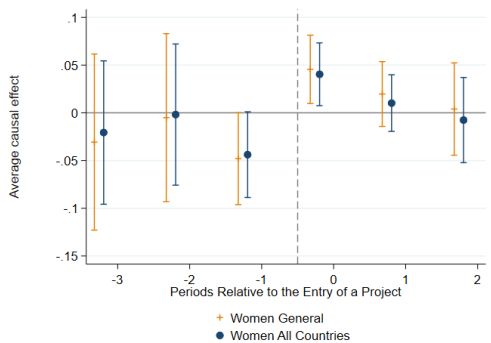
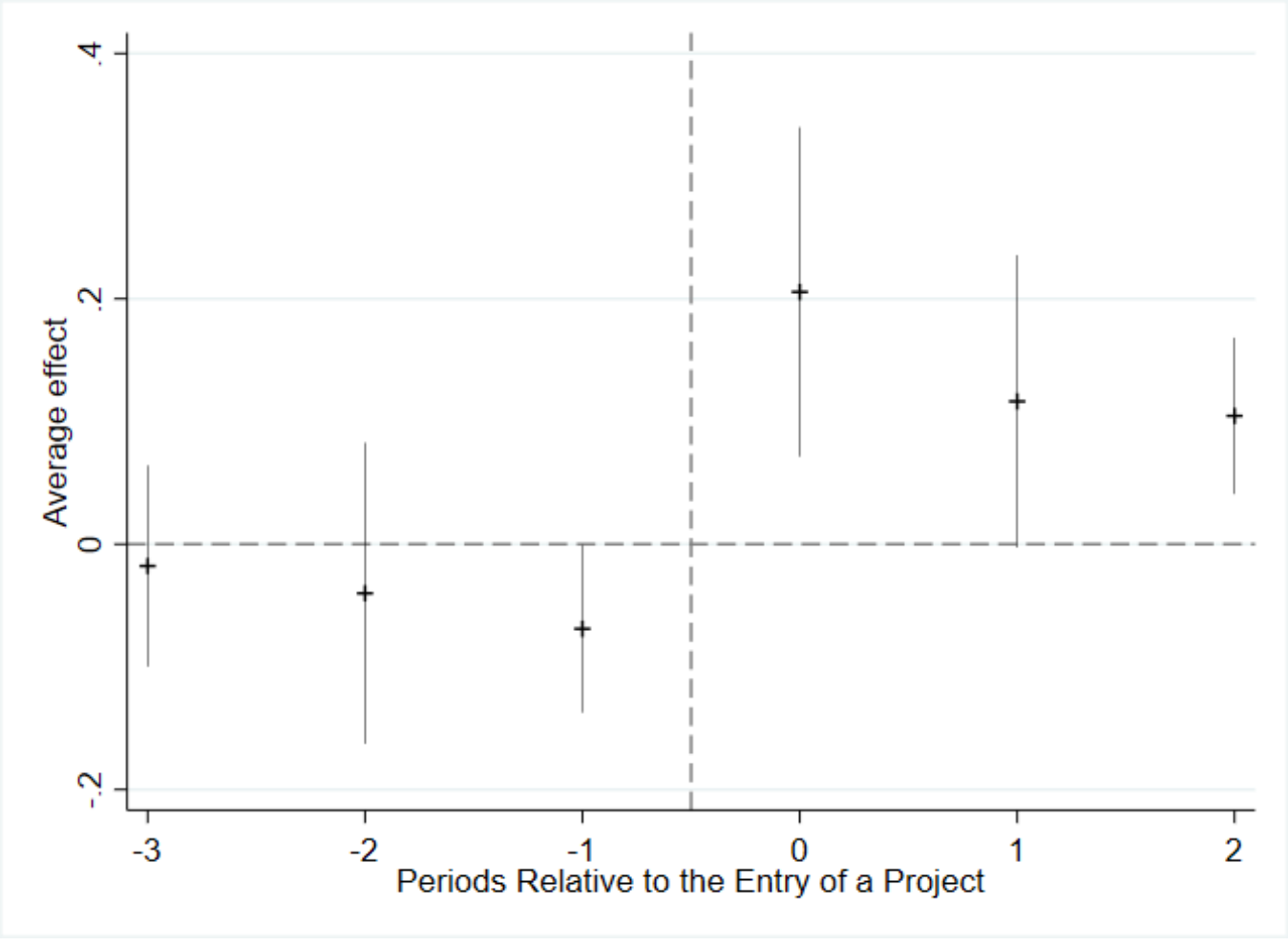


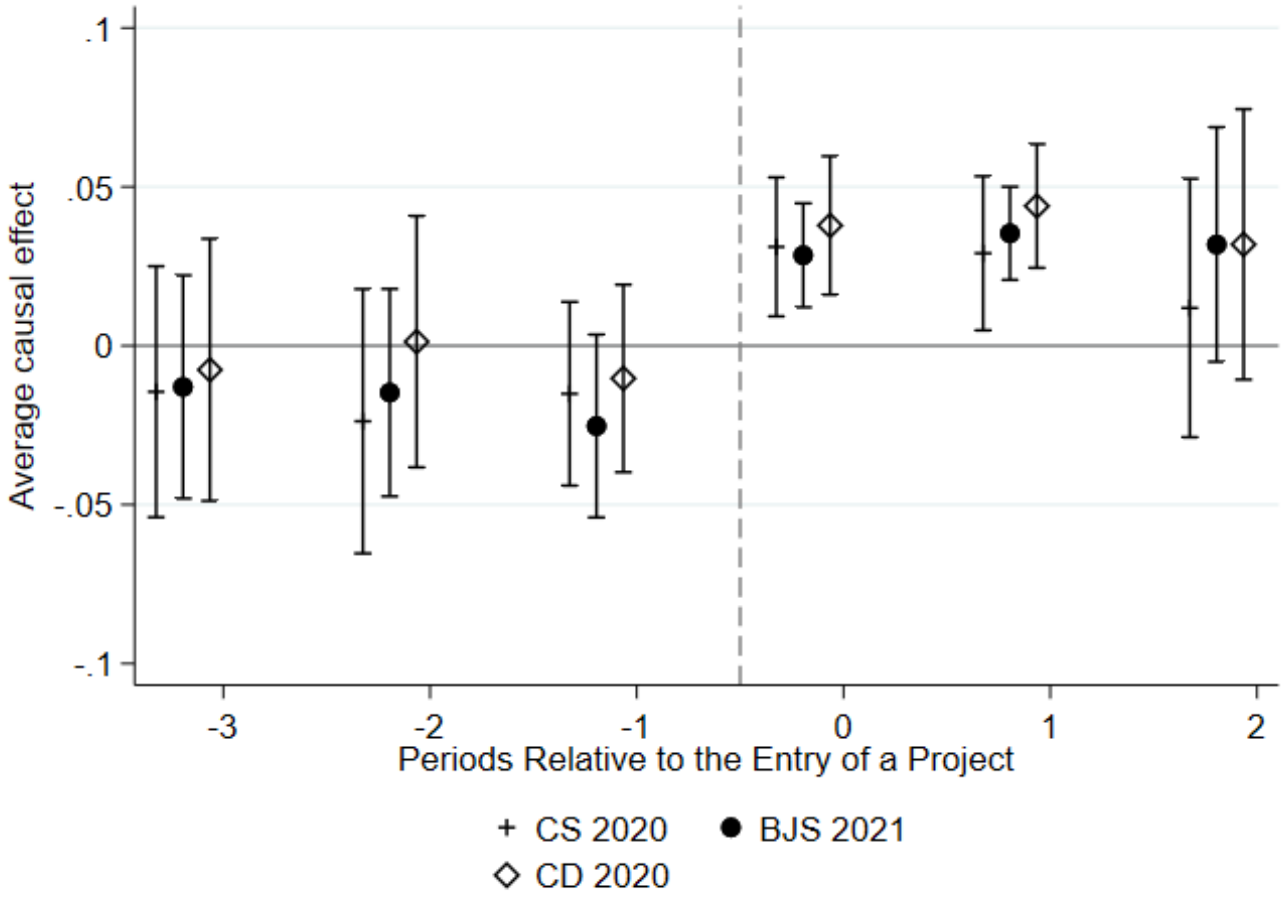
() Self-Employment

Event study - Overall Migration

Back



Event Study - Alternative estimators



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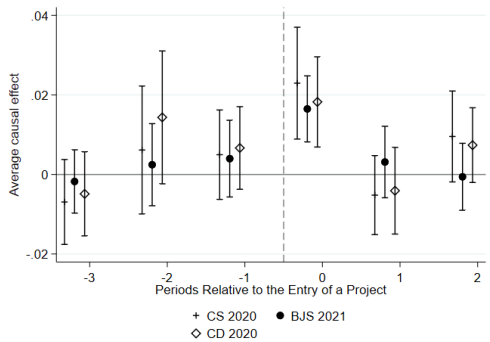
Event Study - Alternative estimators



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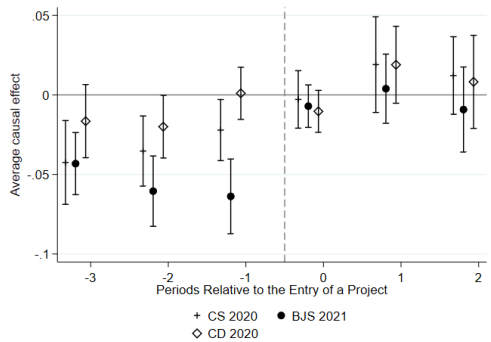

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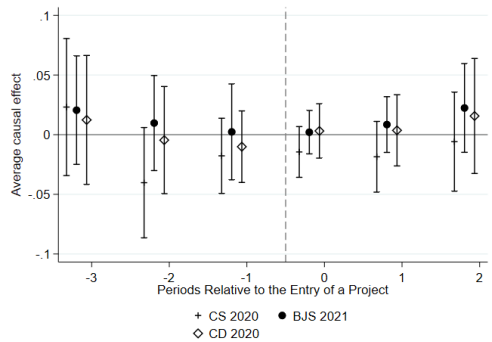

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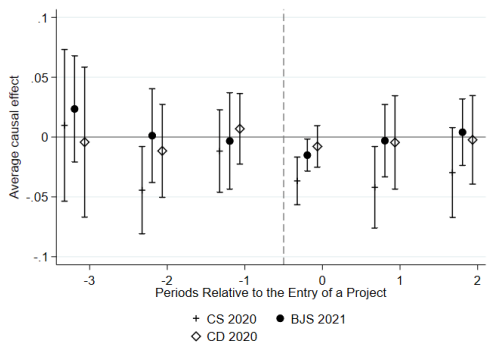

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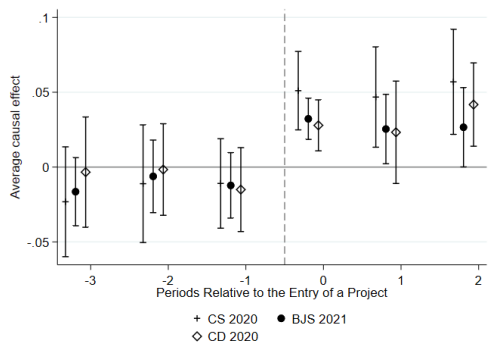

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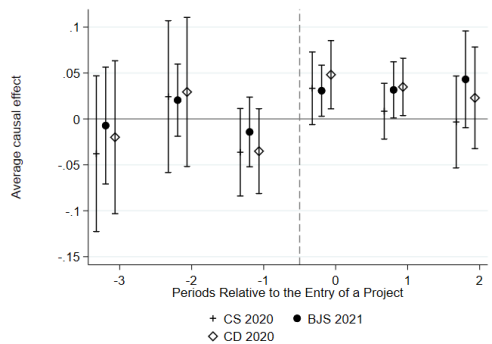
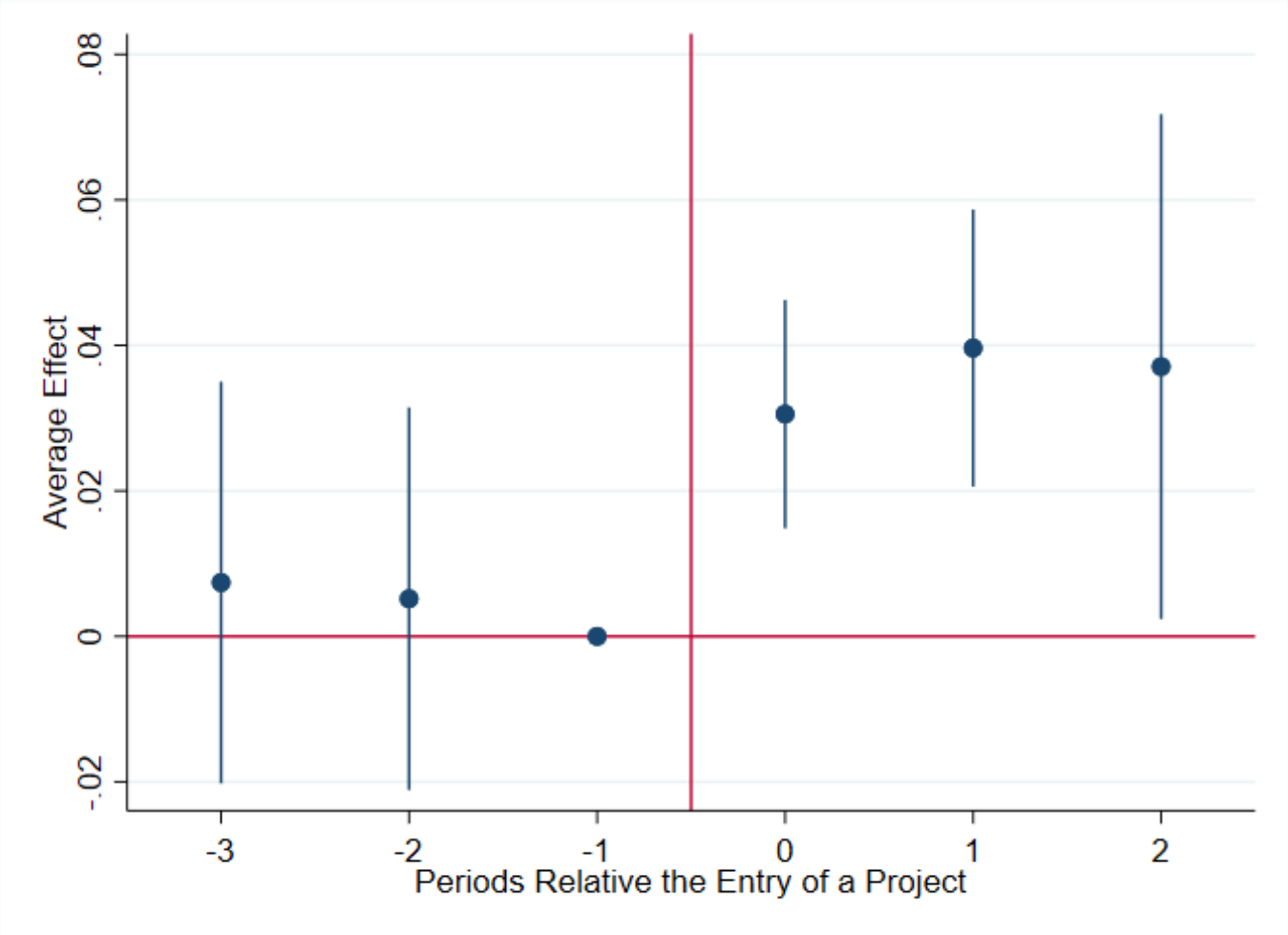


() Self-Employment

Back

Event Study - Wooldridge Estimator



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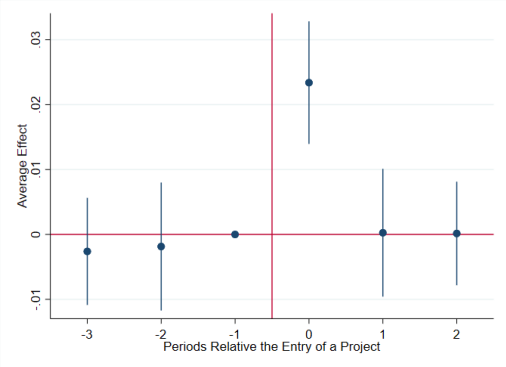
Event Study - Wooldridge Estimator



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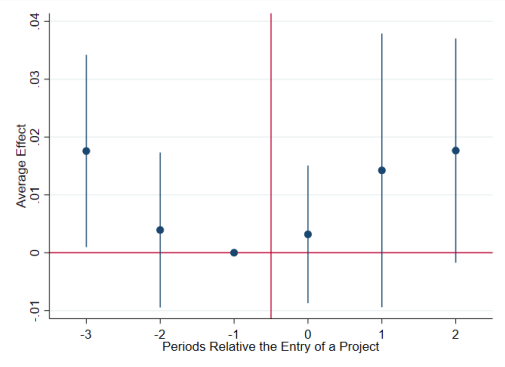

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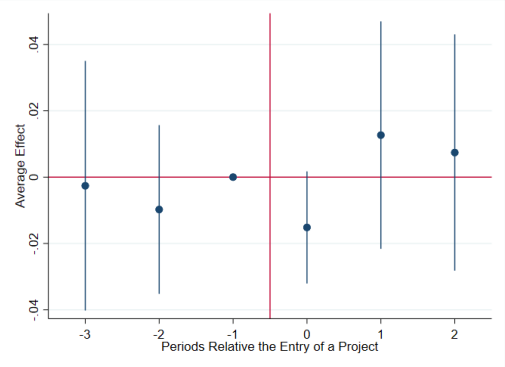

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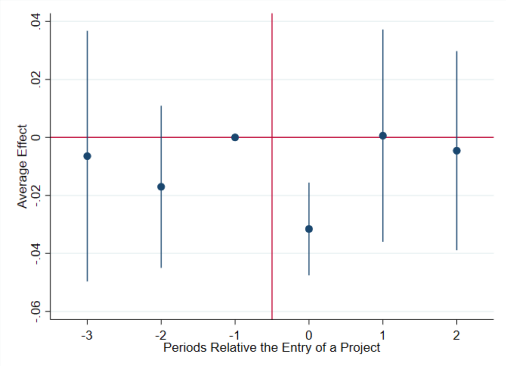

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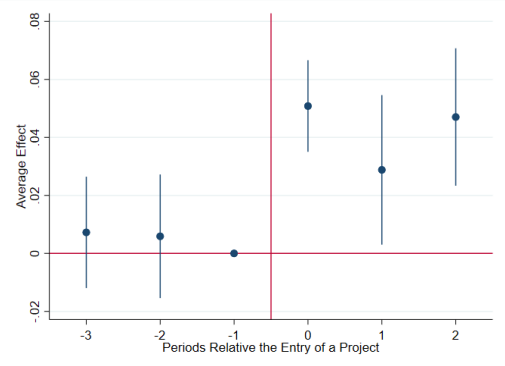

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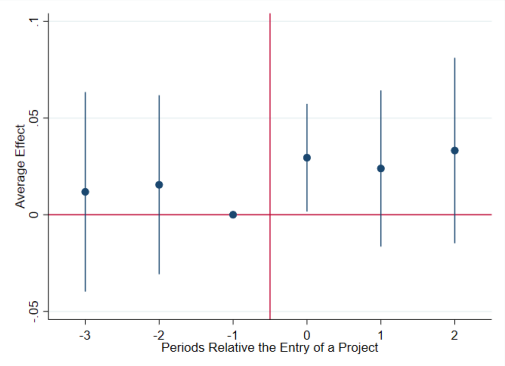
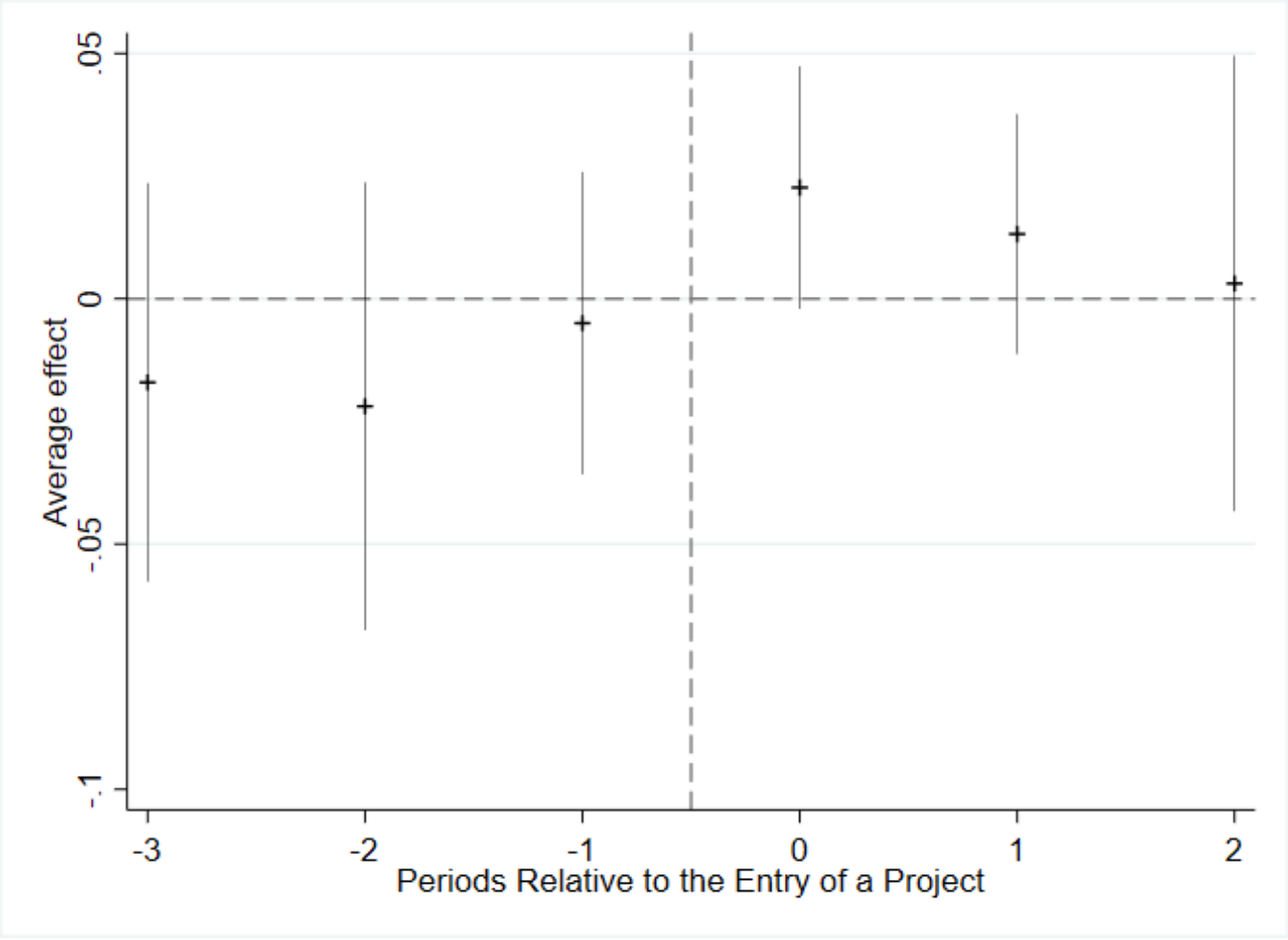


() Self-Employment

Back

No capital

Back



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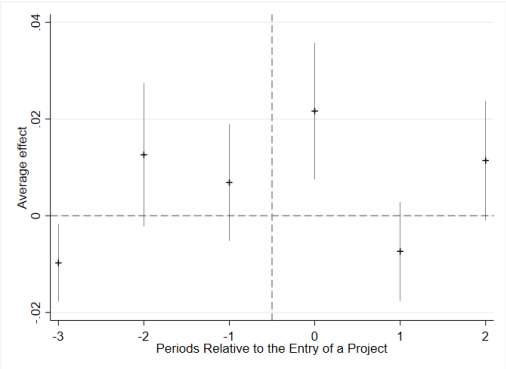

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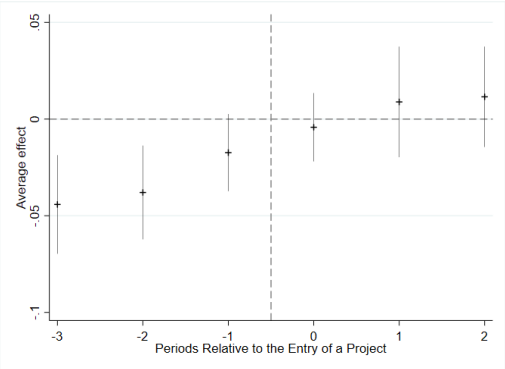

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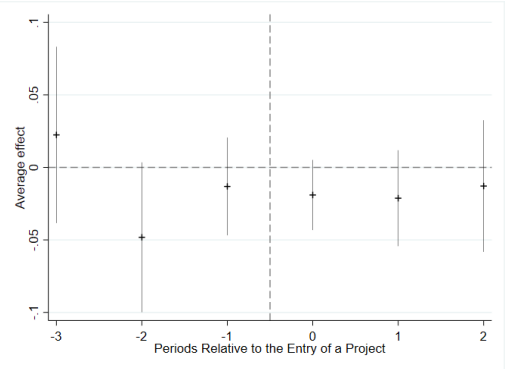

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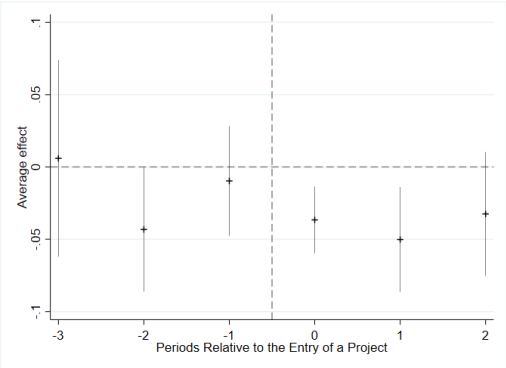

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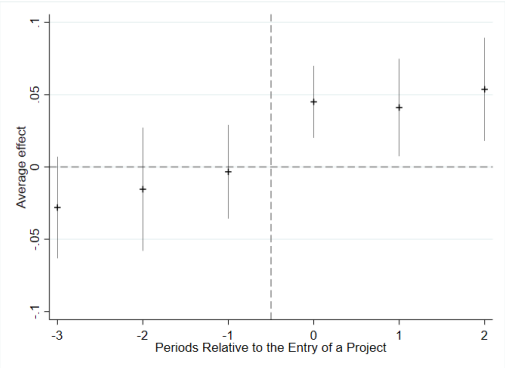

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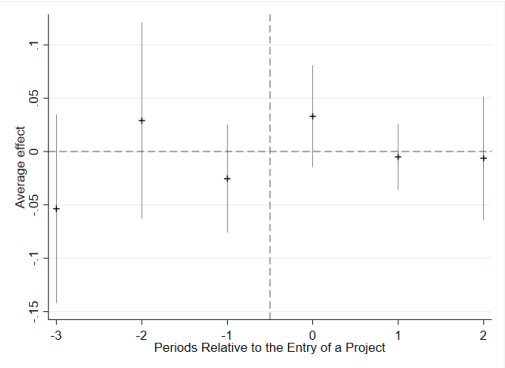

() Self-Employment

Neighbouring Administrative Areas

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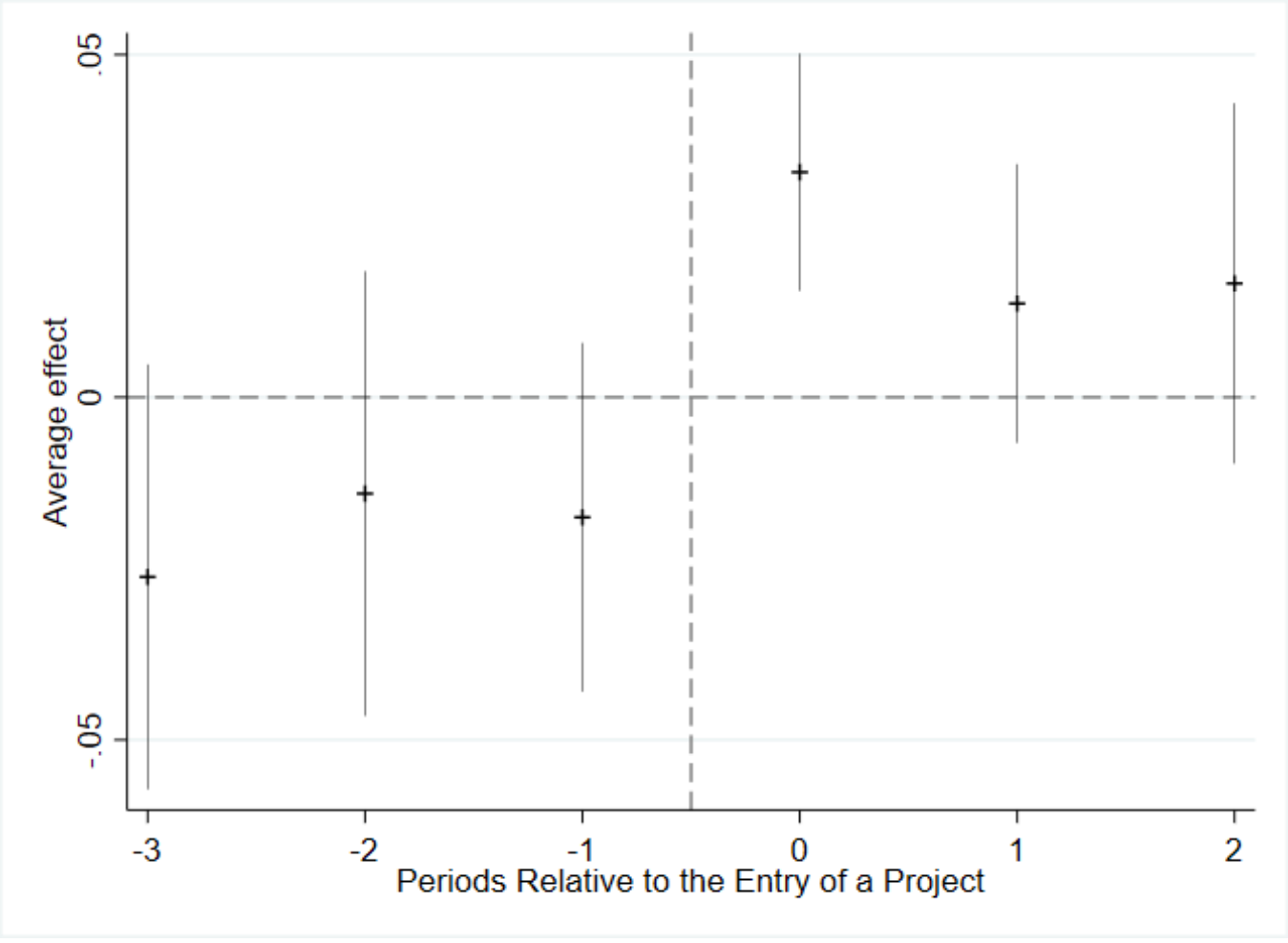

Neighbouring Administrative Areas

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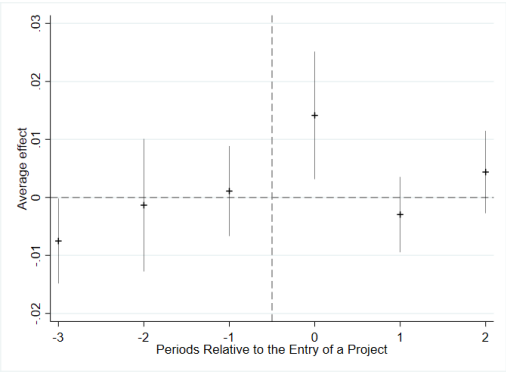

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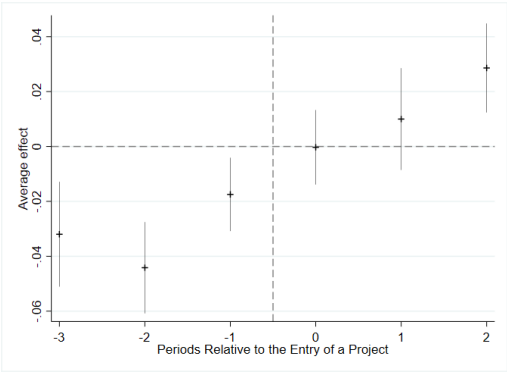

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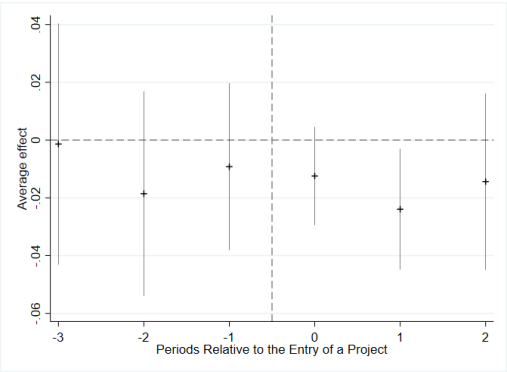

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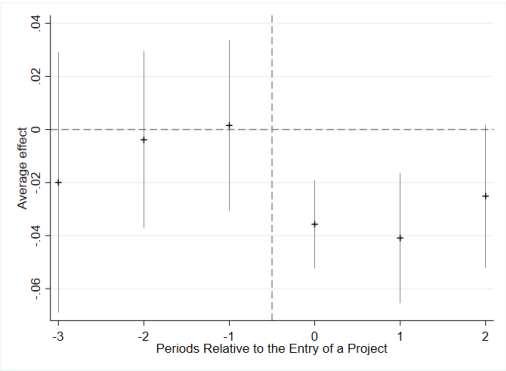

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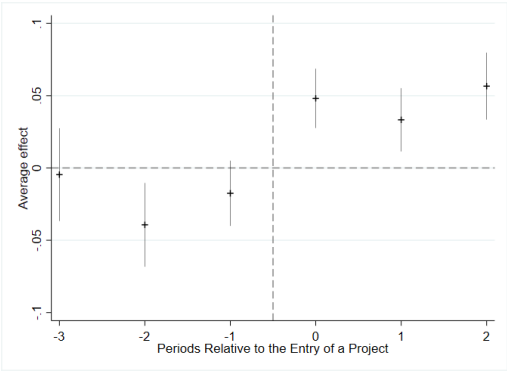

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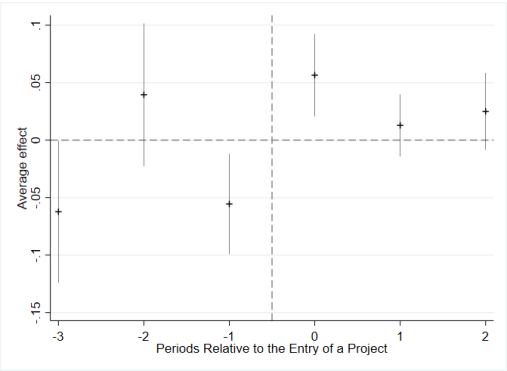


() Self-Employment

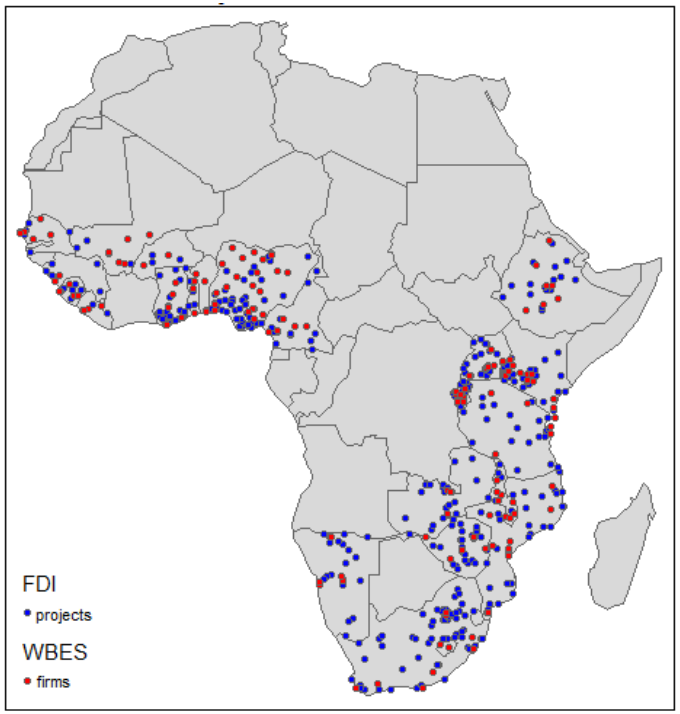
Spillover Effects

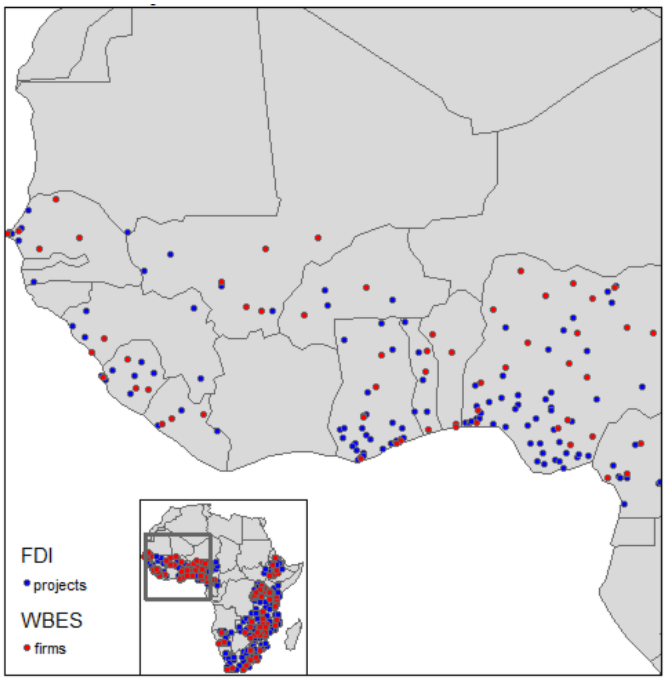
Appendix

Table 2: WBES firms and FDI projects

Country	Waves of WBES	WBES firms	FDI Projects
Benin	2009, 2016	300	12
Burkina Faso	2009	394	28
Burundi	2006, 2014	427	12
Cameroon	2009, 2016	724	89
Ethiopia	2011, 2015	1492	174
Ghana	2007, 2013	1214	375
Guinea	2006, 2016	373	34
Kenya	2007, 2013, 2018	2439	624
Lesotho	2009, 2016	301	6
Liberia	2009, 2017	301	27
Malawi	2009, 2014	673	10
Mali	2007, 2010, 2016	1035	23
Mozambique	2007, 2018	1080	249
Namibia	2006, 2014	909	105
Nigeria	2007, 2014	4567	561
Rwanda	2006, 2011, 2019	813	119
Senegal	2007, 2014	1107	99
Sierra Leone	2009, 2017	302	21
South Africa	2007, 2020	2034	1731
Tanzania	2006, 2013	1232	207
Togo	2009, 2016	305	31
Tunisia	2013, 2020	1207	155
Uganda	2006, 2013	1325	162
Zambia	2007, 2013, 2019	1805	161
Zimbabwe	2011, 2016	1199	93

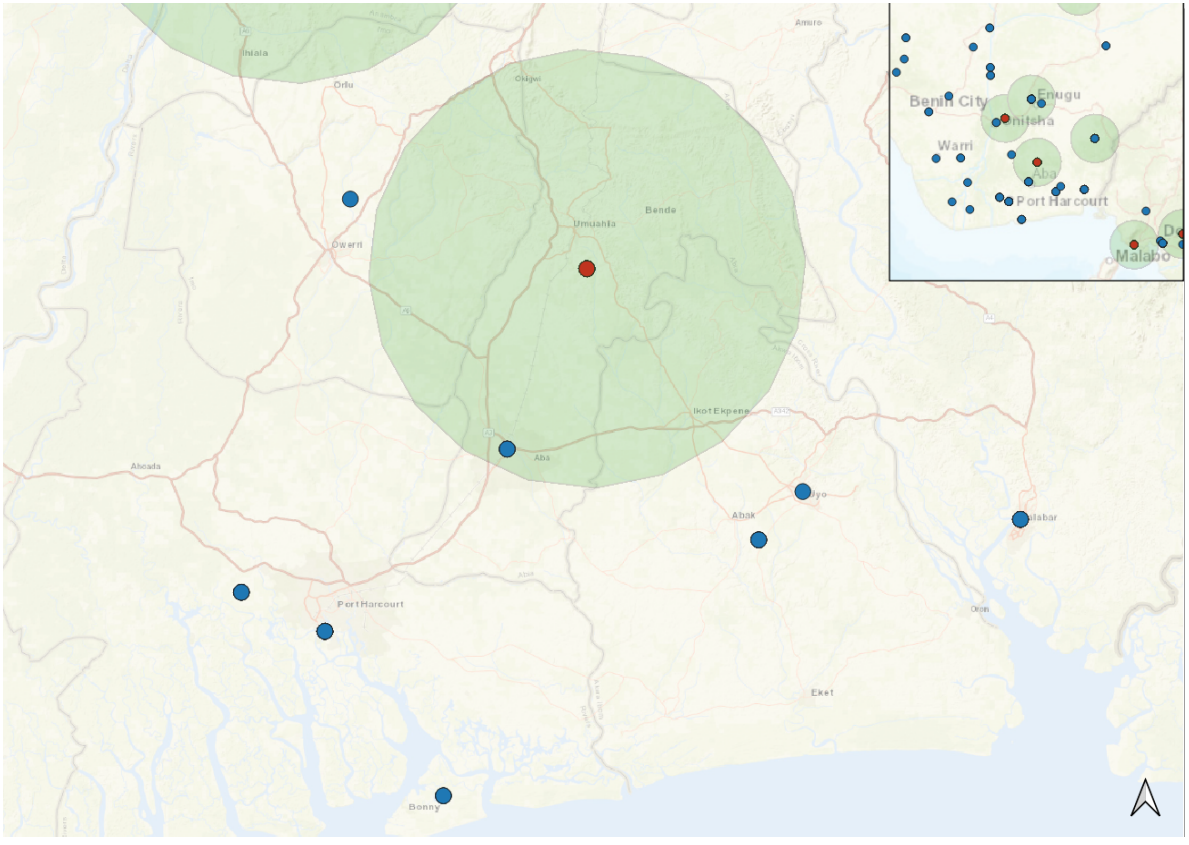
Geographic location of WBES firms and FDI projects





Back

Example of the buffer around Umuahia in Nigeria



Back

FDI and firms: Backward Linkages

VARIABLES	(1) Productivity	(2) Total Sales	(3) Investment	(4) Number of employees	(5) Skilled employees	(6) Labor cost on employment
active_back_50	0.408**	0.343*	0.0265	-0.0981*	0.0743	0.616***
	(0.165)	(0.187)	(0.0372)	(0.0542)	(0.0900)	(0.178)
inactive_back_50	-0.152	-0.186	-0.0492	-0.00659	0.0924	0.239***
	(0.109)	(0.116)	(0.0304)	(0.0344)	(0.152)	(0.0906)
Constant	13.23***	13.78***	0.258***	0.528***	0.551***	11.23***
	(0.0762)	(0.0827)	(0.0188)	(0.0252)	(0.0921)	(0.0673)
Observations	10,525	10,579	11,334	11,339	2,654	10,082
R-squared	0.643	0.654	0.157	0.792	0.279	0.655
Difference	0.560	0.528	0.0758	-0.0915	-0.0181	0.377
p-value difference	0.000805	0.00501	0.0441	0.0590	0.891	0.0213

Standard errors clustered at the city-industry level in parentheses. *** $p<0.01$, ** $p<0.05$, * $p<0.1$

Back

Alternative buffers

VARIABLES	(1) Productivity	(2) Total Sales	(3) Investment	(4) Number of employees	(5) Skilled employees	(6) Labor cost on employment
Panel A: 25 km buffer						
Difference	0.194	0.279	0.0356	0.0598	0.0498	0.0440
p-value difference	0.0389	0.00605	0.177	0.135	0.243	0.651
Panel B: 50 km buffer						
Difference	0.192	0.287	0.0438	0.0724	0.0438	0.0407
p-value difference	0.0335	0.00296	0.0970	0.0395	0.253	0.664
Panel C: 100 km buffer						
Difference	0.118	0.186	0.0495	0.0599	0.0533	0.0162
p-value difference	0.166	0.0430	0.0465	0.0551	0.111	0.852
Panel D: 200 km buffer						
Difference	0.0939	0.119	0.0181	0.0264	0.0294	0.0331
p-value difference	0.256	0.192	0.407	0.373	0.369	0.690

Standard errors clustered at the city-industry level in parentheses. *** $p<0.01$, ** $p<0.05$, * $p<0.1$

Back