March 27, 2024 - cascad#313

Execution Report

Title: **Robot Imports and Firm-Level Outcomes**

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Full reference: Bonfiglioli, Alessandra, Crinò, Rosario, Fadinger, Harald & Gancia, Gino "Robot Imports and Firm-Level Outcomes", Working paper, March 26, 2024.

The structure and contents of this execution report provided by **cascad** for the certification are similar to those recommended by the AEA Data Editor.

1. DATA DESCRIPTION

This study uses confidential firm-level data for France over the 1994-2013 period and combines several datasets administered by the French statistical agency (INSEE), covering the universe of French firms (legal entities) that report a complete balance sheet. Those datasets are complemented with information on the occupational structure of employment in each firm from DADS Etablissement, and data on values and quantities of exports and imports from the French customs authority (DOUANE).

The confidential datasets are listed below:

BRN: Bénéfices Réels Normaux, 1994-2009, https://www.casd.eu/en/source/actual-normal-profits/

BTS-Etablissements : Base Tous Salariés : fichier Etablissements, 1994-2013, https://www.casd.eu/en/source/all-employees-databases-establishment-data/

DOU NC8 (DOUANE) : Dédouanement en nomenclature NC8, 1994-2013, https://www.casd.eu/en/source/dedouanement-en-nomenclature-nc8-en/

FARE : Statistique structurelle annuelle d'entreprises issue du dispositif ESANE, 2010-2013, https://www.casd.eu/en/source/annual-structural-statistics-of-companies-from-the-esane-scheme/

Researchers wishing to get access to those four data sources should contact the CASD at https://www.casd.eu/en/contacts-title/ and ask for those datasets. Once they have obtained clearance from the Statistical Confidentiality Committee, they will have to take part in an enrolment session after which they will receive a fingerprint-encrypted chip card and an "SD Box". This will allow them to access the data in a secure environment. Thanks to a partnership with the CASD, cascad reproducibility experts are already enrolled.

For a thorough description of the data, please refer to section 3 of the paper.

2. CODE DESCRIPTION

The verification materials contain the following folders and Stata scripts:

Folders:
Appendix
automation_intensity
CN8-BECrev4
Figure-B1
IFR_data
naf_rev11_rev2_correspondence
routine_intensity
Substitution-Elasticities
Table-B3

Stata scripts:
0_setup.do
cleaning_datasets_brn_douanes_dads_v3.do
constructing_replaceability_v2.do
constructing_routine_intensity_v2.do
data_preparation_annual_panel_v1.do
data_preparation_longdifferences_v1.do
master_v2.do
replication_eventstudies_v1.do
replication_longdifferences_v1.do

master_v2.do is a Masterfile: it will call all the other Stata scripts in order. They extract confidential source files from SAS format and convert them to Stata format), clean them along with the rest of the data contained in each folder, and create analyses datasets which are used to generate the Tables and Figures.

3. VERIFICATION STEPS

On January 30, 2024, one of the authors submitted a certification request on the **cascad** website and provided the code and public data, which we downloaded on the same day. On February 16, we sent to the Statistical Confidentiality Committee a data request form. We received their approval the same day, and the CASD set up the environment on February 19. We encountered no issues during the verification.

Please note that we did not use the current version of DOU NC8, but the one used in the paper instead. To do so, the author wrote for the CASD an authorization to make a copy of the DOU NC8 data from his secure environment into ours, for the purpose of verification checks only. This version dates from before 2016, when the Customs data were not accessible through the CASD and the authors had to import them. There were only 13 variables in this version, named v1 to v13. The current version, available through the CASD, contains 27 variables instead, with descriptive names such as *AN, SIREN, DEPE, PYOD*, etc. Mapping the old variables with the current ones is achievable, but would have been time-consuming, required some modifications in the code and would have likely been a source of errors.

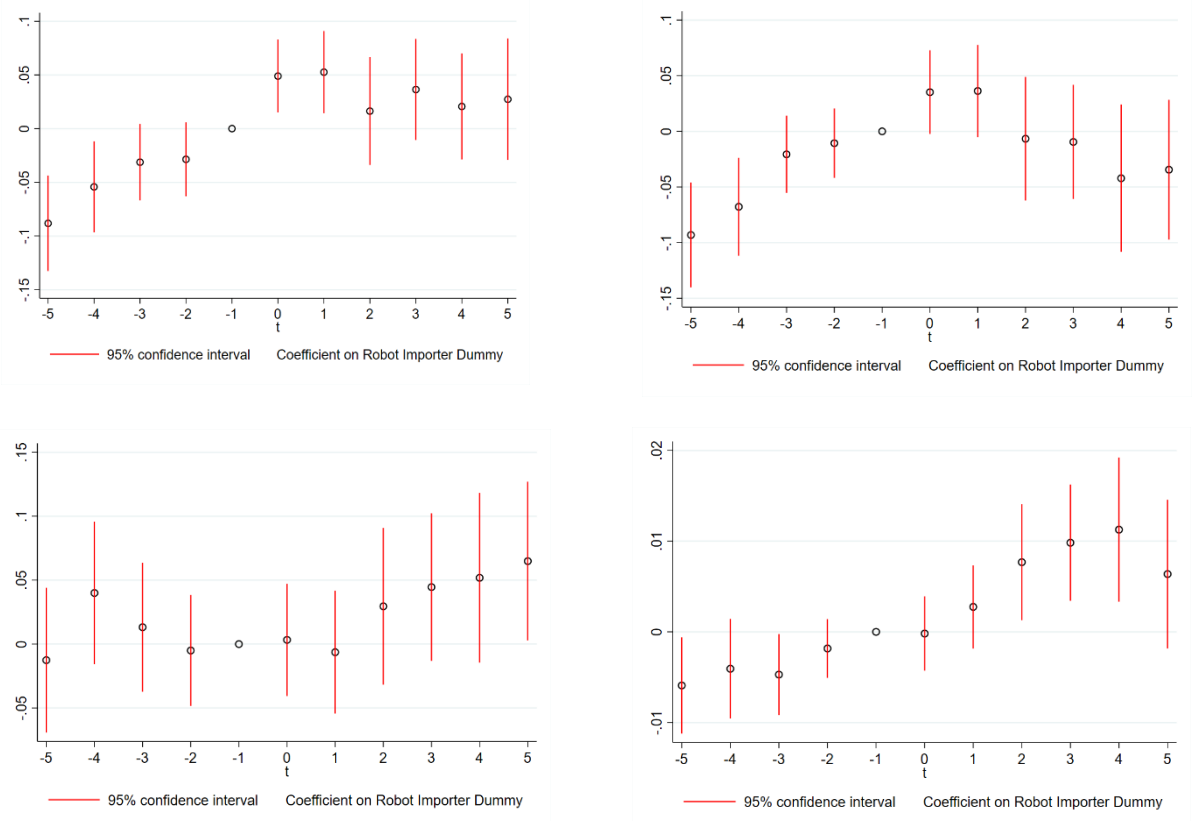
4. FINDINGS

We reproduced Tables 1-4, B1-B8 as well as Figures 1 and B1-B2 with accuracy.

4.1 TABLE 1: FIRM-LEVEL OUTCOMES AND ROBOT ADOPTION

VARIABLES	(1) lsalesw i+e+sales	(2) lsizew i+e+sales	(3) lvawokw i+e+sales	(4) sCS3Tw i+e+sales
robot_adopter	0.230*** [10.458]	0.106*** [5.763]	0.057*** [3.630]	0.003 [1.030]
Observations	596,166	597,282	585,886	597,282
R-squared	0.949	0.871	0.850	0.698
Number firms	56319	56355	55714	56355

4.2. FIGURE 1: DIFFERENCE-IN-DIFFERENCES EVENT STUDIES



4.3. TABLE 2: FIRM-LEVEL OUTCOMES AND ROBOT EXPOSURE, MAIN RESULTS AND ROBUSTNESS

	-1	-2	-3	-4	-5
VARIABLES	longd_lsalesw	longd_lsizew	longd_lvawokw	longd_sCS3Tw	longd_robot_adopter
	0.148	-0.094**	0.302***	0.006	0.174***
RobExp	[1.343]	[-2.095]	[2.702]	[1.106]	[2.893]
Obs.	36,301	36,584	35,180	36,584	36,584
R2	0.099	0.040	0.065	0.040	0.052
RobExp	0.142	-0.108**	0.310***	0.008	0.224***
	[1.192]	[-2.230]	[2.629]	[1.396]	[2.666]
Obs.	36,301	36,584	35,180	36,584	36,584
R2	0.098	0.044	0.062	0.047	0.069
RobExp	0.148	-0.095**	0.303***	0.005	0.171***
	[1.329]	[-2.101]	[2.695]	[0.837]	[2.847]
Obs.	35,759	36,040	34,647	36,040	36,040
R2	0.100	0.040	0.065	0.040	0.052
RobExp	0.120	-0.044	0.191*	0.011**	0.208
	[1.234]	[-0.946]	[1.788]	[2.282]	[1.454]
Obs.	36,301	36,584	35,180	36,584	36,584
R2	0.099	0.040	0.065	0.040	0.112
RobExp	-0.160	-0.203**	-0.061	0.001	0.065
	[-0.737]	[-2.020]	[-0.270]	[0.111]	[0.414]
RobExp x Elast	0.069*	0.023	0.076*	0.002	0.023
	[1.963]	[1.405]	[1.955]	[0.774]	[0.838]
Obs.	32,427	32,679	31,365	32,679	32,679
R2	0.106	0.041	0.070	0.042	0.053
RobExp	3.331***	0.248	3.537***	0.070**	0.625***
	[9.669]	[1.043]	[11.543]	[2.537]	[3.469]
Obs.	36,301	36,584	35,180	36,584	36,584
R2	0.103	0.040	0.068	0.039	0.052

4.4. TABLE 3: THREATS TO IDENTIFICATION: ADDITIONAL CONTROLS AND ALTERNATIVE SAMPLES

VARIABLES	longd_lsalesw	longd_lsizew	longd_lvawokw	longd_sCS3Tw	longd_robot_adopter
RobExp	0.124	-0.092**	0.263**	0.004	0.184***
	[1.186]	[-2.015]	[2.505]	[0.494]	[2.939]
Obs.	35,747	36,023	34,663	36,023	36,023
R2	0.103	0.043	0.073	0.067	0.052
RobExp	0.033	-0.142***	0.252**	0.008	0.148**
	[0.376]	[-2.610]	[2.529]	[1.235]	[2.128]
Obs.	28,539	28,761	27,534	28,761	28,761
R2	0.241	0.189	0.197	0.173	0.169
RobExp	0.148	-0.095**	0.303***	0.006	0.164***
	[1.349]	[-2.104]	[2.707]	[1.106]	[3.575]
Obs.	36,301	36,584	35,180	36,584	36,584
R2	0.100	0.041	0.065	0.040	0.788
RobExp	0.153	-0.094**	0.310***	0.008	
	[1.366]	[-2.034]	[2.752]	[1.246]	
Obs.	35,729	36,008	34,633	36,008	
R2	0.099	0.041	0.065	0.038	
RobExp	0.146	-0.095**	0.306***	0.007	
	[1.319]	[-2.101]	[2.734]	[1.162]	
RobExp x Adopter	-0.184	-0.131	-0.243	-0.015	
	[-1.176]	[-0.893]	[-1.472]	[-0.883]	
Obs.	36,301	36,584	35,180	36,584	
R2	0.100	0.041	0.065	0.040	

4.5. TABLE 4: THREATS TO IDENTIFICATION: ADDITIONAL INTERACTIONS

VARIABLES	(1) longd_lsalesw	(2) longd_lsizew	(3) longd_lvawokw	(4) longd_sCS3Tw	(5) longd_robot_adopter
RobExp	0.151	-0.090**	0.297***	0.006	0.181***
	[1.385]	[-1.994]	[2.676]	[1.005]	[3.055]
RobExp x Routine	-2.934	4.864	9.589	1.193***	2.545
	[-0.129]	[0.829]	[0.433]	[2.781]	[0.355]
Obs.	36,301	36,584	35,180	36,584	36,584
R2	0.099	0.040	0.065	0.040	0.052
RobExp	0.147	-0.094**	0.301***	0.006	0.172***
	[1.335]	[-2.093]	[2.695]	[1.098]	[2.876]
Obs.	36,301	36,584	35,180	36,584	36,584
R2	0.099	0.040	0.065	0.040	0.052
RobExp	0.190*	-0.096**	0.348***	0.007	0.186***
	[1.697]	[-2.117]	[3.080]	[1.140]	[2.966]
Obs.	36,301	36,584	35,180	36,584	36,584
R2	0.101	0.040	0.066	0.040	0.052
RobExp	0.176	-0.136***	0.402***	0.012*	0.155***
	[1.608]	[-2.752]	[4.023]	[1.808]	[2.616]
Obs.	36,254	36,537	35,134	36,537	36,537
R2	0.101	0.041	0.066	0.041	0.052
RobExp	0.398***	-0.118**	0.633***	0.017**	0.235***
	[3.025]	[-2.233]	[5.811]	[2.338]	[3.465]
Obs.	36,301	36,584	35,180	36,584	36,584
R2	0.101	0.041	0.067	0.041	0.052

4.6. TABLE B1: DESCRIPTIVE STATISTICS, WHOLE SAMPLE

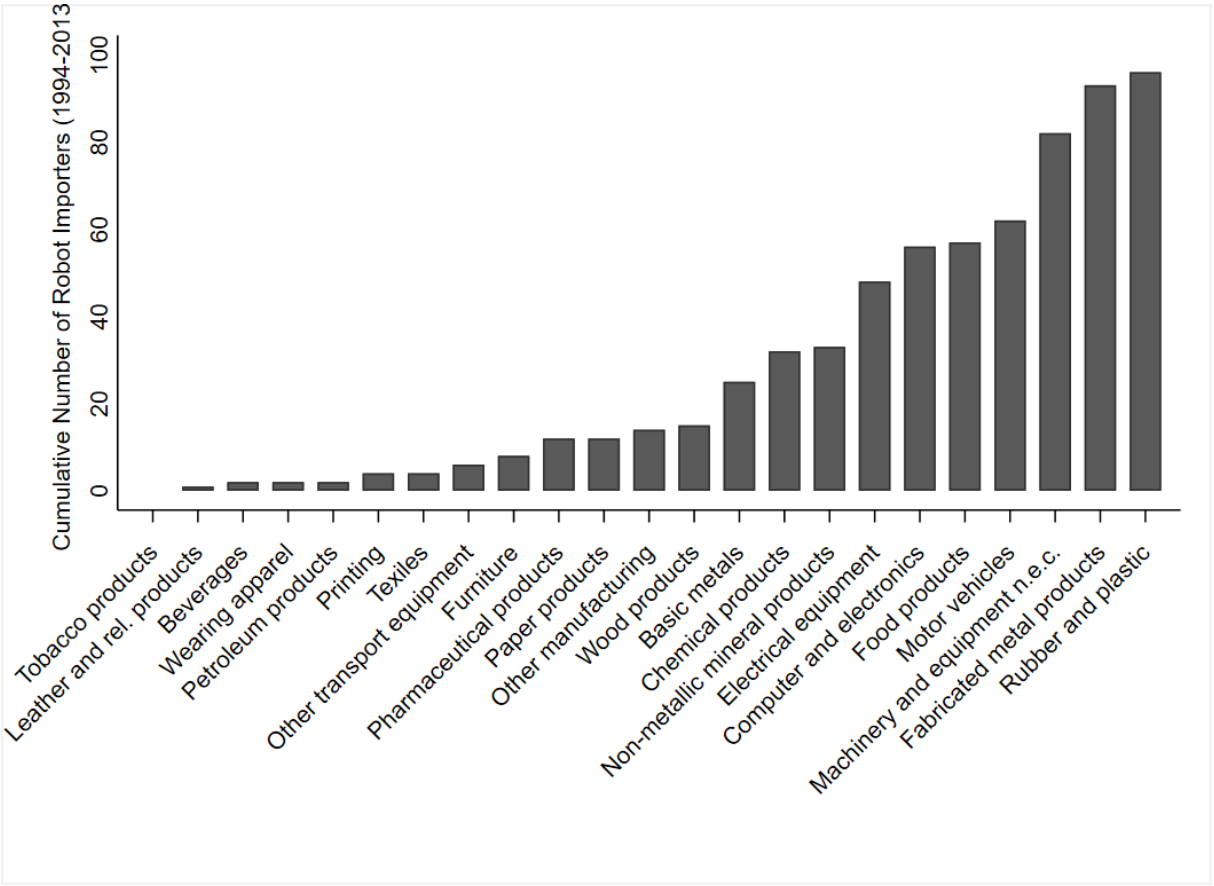
Variable	N	Mean	p50	SD
robot_adop~r	6879	1	1	0
size	6879	874.4655	191	3068.814
sCS3T	6879	.1539796	.1093609	.1422331
total_sales	6879	796657.8	47632	6652943
vawok	6704	190.2437	65.92062	2647.292
size	6879	874.4655	191	3068.814
importer	6879	.972089	1	.1647299
exporter	6879	.9486844	1	.2206567

Variable	N	Mean	p50	SD
robot_adop~r	590403	0	0	0
size	590403	78.03136	27	313.4937
sCS3T	590403	.0801442	.0555556	.1048919
total_sales	590400	54694.34	7598	685260.8
vawok	579621	189.6096	70.29678	1984.256
size	590403	78.03136	27	313.4937
importer	590403	.5700174	1	.4950737
exporter	590403	.5628715	1	.4960318

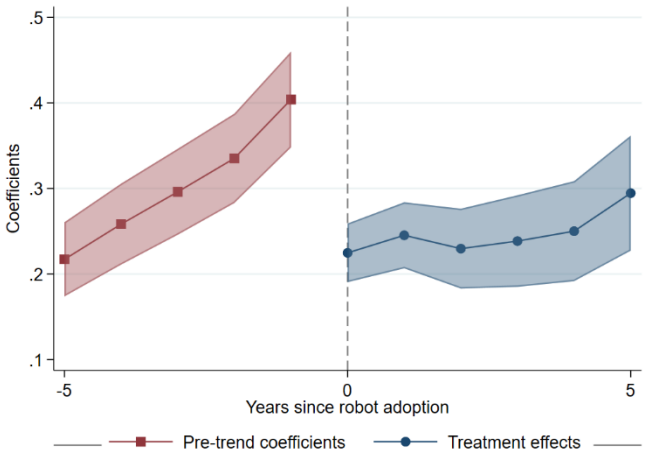
4.7. TABLE B2: DIFFERENCE-IN-DIFFERENCES EVENT STUDIES

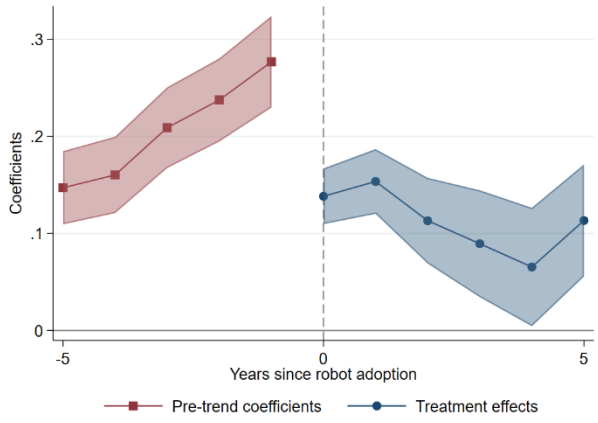
VARIABLES	(1) lsize	(2) lsales	(3) lvawok	(4) sCS3T
robot_firststart_minus5	-0.093***	-0.088***	-0.013	-0.006**
	[-3.882]	[-3.886]	[-0.435]	[-2.184]
robot_firststart_minus4	-0.068***	-0.054**	0.040	-0.004
	[-3.018]	[-2.512]	[1.404]	[-1.450]
robot_firststart_minus3	-0.021	-0.031*	0.013	-0.005**
	[-1.167]	[-1.724]	[0.511]	[-2.071]
robot_firststart_minus2	-0.011	-0.029	-0.005	-0.002
	[-0.670]	[-1.620]	[-0.227]	[-1.111]
robot_firststart	0.035*	0.049***	0.003	-0.000
	[1.835]	[2.830]	[0.147]	[-0.089]
robot_firststart_plus1	0.036*	0.053***	-0.006	0.003
	[1.718]	[2.689]	[-0.260]	[1.177]
robot_firststart_plus2	-0.007	0.016	0.030	0.008**
	[-0.235]	[0.638]	[0.945]	[2.358]
robot_firststart_plus3	-0.010	0.036	0.045	0.010***
	[-0.364]	[1.517]	[1.514]	[3.006]
robot_firststart_plus4	-0.042	0.021	0.052	0.011***
	[-1.248]	[0.821]	[1.531]	[2.783]
robot_firststart_plus5	-0.034	0.027	0.065**	0.006
	[-1.076]	[0.947]	[2.047]	[1.525]
Observations	593,404	592,023	581,807	593,404
R-squared	0.877	0.949	0.816	0.673

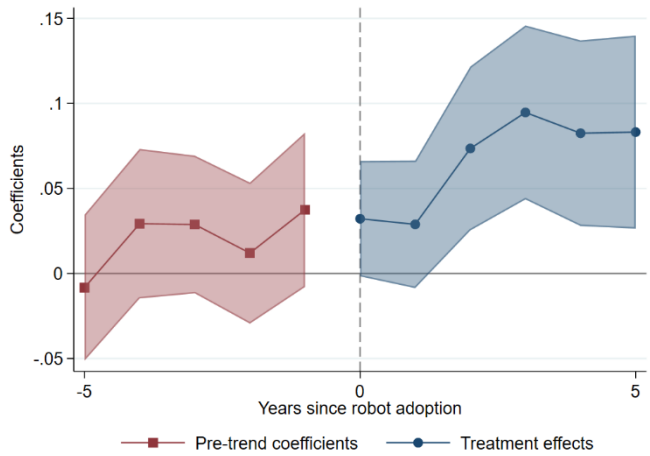
4.8. FIGURE B1: CUMULATIVE NUMBER OF FRENCH ROBOT IMPORTERS BY SECTOR (1994-2013)

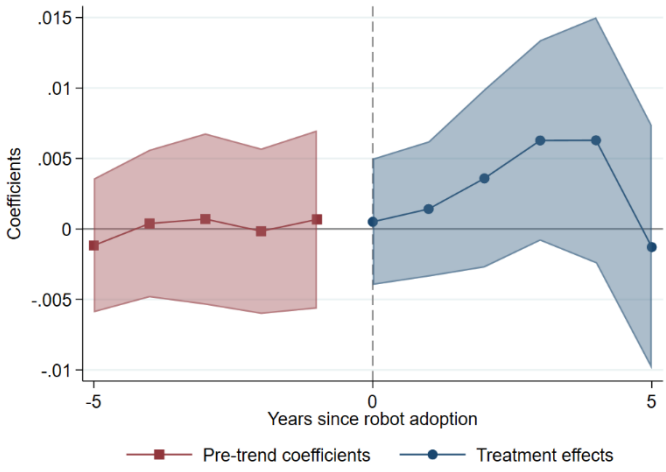


4.9. FIGURE B2: DIFFERENCE-IN-DIFFERENCES EVENT STUDIES, STAGGERED ADOPTION









4.10. TABLE B3: REPLACEABILITY OF FRENCH OCCUPATIONS

pcs2003_name	replac~e
Agriculteurs (salariés de leur exploitation)	0
Artisans (salariés de leur entreprise)	.0714286
Commerçants et assimilés (salariés de leur entreprise)	0
Chefs d'entreprise de 10 salariés ou plus (salariés de leur entreprise)	0
Professions libérales (exercées sous statut de salarié)	0
Cadres de la fonction publique	0
Professeurs, professions scientifiques	0
Professions de l'information, des arts et des spectacles	0
Cadres administratifs et commerciaux d'entreprises	0
Ingénieurs et cadres techniques d'entreprises	0
Professeurs des écoles, instituteurs et professions assimilées	0
Professions intermédiaires de la santé et du travail social	0
Clergé, religieux	0
Professions intermédiaires administratives de la fonction publique	.1
Prof. intermédiaires administratives et commerciales des entreprises	0
Techniciens (sauf techniciens tertiaires)	0
Contremaîtres, agents de maîtrise (maîtrise administrative exclue)	0
Employés civils et agents de service de la fonction publique	.
Agents de surveillance	0
Employés administratifs d'entreprise	0
Employés de commerce	0
Personnels des services directs aux particuliers	.1
Ouvriers qualifiés de type industriel	.375
Ouvriers qualifiés de type artisanal	.25
Chauffeurs	0
Ouvriers qualifiés de la manutention, du magasinage et du transport	0
Ouvriers non qualifiés de type industriel	.7045454
Ouvriers non qualifiés de type artisanal	.2333333
Ouvriers agricoles et assimilés	0

4.11. TABLE B4: DESCRIPTIVE STATISTICS, SAMPLE USED FOR SPECIFICATIONS IN LONG DIFFERENCES

Variable	N	Mean	p50	SD
longd_lsizew	497	-.008868	.0025925	.0768009
longd_sCS3Tw	497	.0054221	.003288	.0093558
longd_lsal~w	493	-.0928293	-.081153	.0927381
longd_lvaw~w	470	-.095739	-.0935787	.0952496
longd_labo~5	497	.0014386	-.0005103	.0185636
longd_robo~l	481	.0036614	.0004502	.0161128
lt_mean_ro~e	497	4.911373	4.764827	1.590997
ini_lsales	497	11.77845	11.64375	1.768422
ini_sCS3T	497	.1027565	.0704225	.104632
ini_lcapint	491	-12.60313	-12.74754	1.144896
ini_importer	497	.9235412	1	.2659985
ini_exporter	497	.889336	1	.3140317
automation~t	497	.3780992	.4157379	.182525
ini_autom_~e	497	-5.87203	-5.329588	3.729545

Variable	N	Mean	p50	SD
longd_lsizew	36087	-.0330583	-.0123365	.0953701
longd_sCS3Tw	36087	.0033997	.0008971	.0114846
longd_lsal~w	35808	-.1318003	-.1077752	.130798
longd_lvaw~w	34710	-.1043306	-.1006267	.1405108
longd_labo~5	36087	.0028631	.0005651	.031494
longd_robo~l	34229	.0000103	0	.0007135
lt_mean_ro~e	36087	.0104318	0	.2337988
ini_lsales	36087	9.881673	9.685891	1.376326
ini_sCS3T	36087	.0635946	.0458015	.0816999
ini_lcapint	35532	-11.81924	-11.90814	1.157149
ini_importer	36087	.5500042	1	.4975002
ini_exporter	36087	.519356	1	.4996321
automation~t	36087	.357809	.3600713	.1900116
ini_autom_~e	36087	-6.681026	-5.94626	4.300488

4.12. TABLE B5: DESCRIPTIVE STATISTICS ON INITIAL FIRM CHARACTERISTICS BY LEVEL OF REPLACEABILITY

Variable	N	Mean	p50	SD
automation~t	18292	.1947234	.2029809	.1022139
ini_lsales	18292	9.789814	9.543593	1.4505
ini_sCS3T	18292	.079806	.0571429	.1008619
ini_lcapint	18046	-11.71452	-11.78356	1.1814
ini_importer	18292	.5105511	1	.4999023
ini_exporter	18292	.4911983	0	.4999362

Variable	N	Mean	p50	SD
automation~t	18292	.5214459	.5232759	.0912131
ini_lsales	18292	10.02507	9.857836	1.336708
ini_sCS3T	18292	.0484472	.0390625	.0533094
ini_lcapint	17977	-11.94578	-12.05525	1.127412
ini_importer	18292	.5996064	1	.4899915
ini_exporter	18292	.5575661	1	.4966887

4.13. TABLE B6: FIRM-LEVEL OUTCOMES AND ROBOT ADOPTION, LONG DIFFERENCES

	(1)	(2)	(3)	(4)
VARIABLES	longd_lsalesw	longd_lsizew	longd_lvawokw	longd_sCS3Tw
longd_robot_adopter	4.438***	2.434***	1.517***	0.007
	[11.032]	[7.775]	[3.609]	[0.155]
Observations	36,301	36,584	35,180	36,584
R-squared	0.099	0.039	0.064	0.037

4.14. TABLE B7: FIRM-LEVEL OUTCOMES AND ROBOT EXPOSURE, BASELINE REGRESSIONS

VARIABLES	(1) longd_lsalesw	(2) longd_lsizew	(3) longd_lvawokw	(4) longd_sCS3Tw	(5) longd_robot_adopter
ini_autom_ltrobstockcapape	0.148	-0.094**	0.302***	0.006	0.174***
	[1.343]	[-2.095]	[2.702]	[1.106]	[2.893]
(sum) automation_int	0.193	-3.798***	4.595**	-0.139	3.379***
	[0.092]	[-4.698]	[2.246]	[-1.230]	[2.660]
ini_lttotrobotstockcapapemi1	0.974	-65.304***	23.771	16.035***	5.147
	[0.016]	[-5.018]	[0.352]	[11.205]	[0.362]
ini_lsales	-1.271***	-0.015	-1.199***	0.072***	1.349***
	[-10.145]	[-0.268]	[-9.353]	[10.298]	[7.275]
ini_importer	1.073***	0.040	1.087***	0.049**	-0.076
	[4.720]	[0.297]	[5.496]	[2.395]	[-0.477]
ini_exporter	0.436**	-0.403***	0.746***	0.059***	0.014
	[2.214]	[-2.963]	[3.658]	[3.206]	[0.118]
Observations	36,301	36,584	35,180	36,584	36,584
R-squared	0.099	0.040	0.065	0.040	0.052

4.15. TABLE B8: ADDITIONAL FIRM-LEVEL OUTCOMES AND ROBOT EXPOSURE

VARIABLES	(1)	(2)	(3)	(4)	(5)	(6)
ini_autom_ltrobstockcapape	0.009	0.097**	0.008	0.074**	0.008	0.100**
	[1.148]	[2.197]	[0.906]	[2.098]	[1.027]	[2.213]
Observations	36,584	481	36,584	481	36,040	475
R-squared	0.024	0.134	0.026	0.115	0.025	0.135