

Crowding-in or crowding-out? Analysis of innovation government support for firms located in Canada

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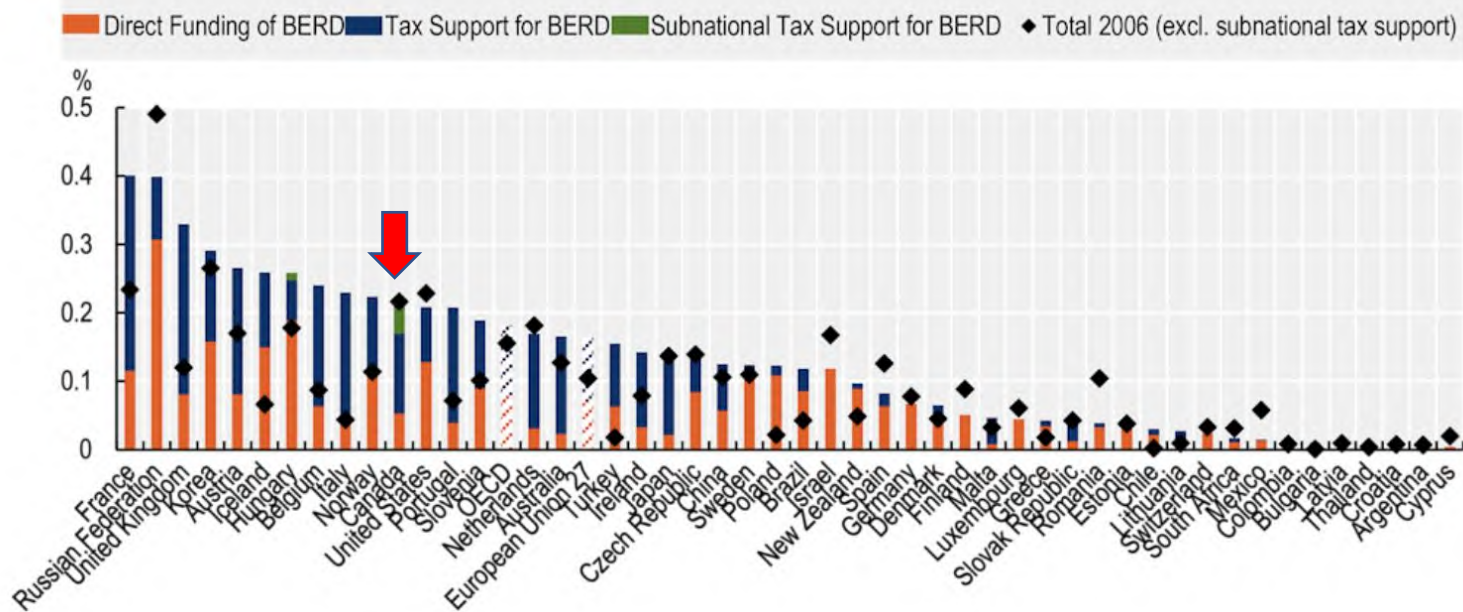
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Context

Direct government funding and government tax support for business R&D, 2018 As a percentage of GDP



Source: OECD R&D Tax Incentives Database, <http://oe.cd/rdtax>, December 2020.

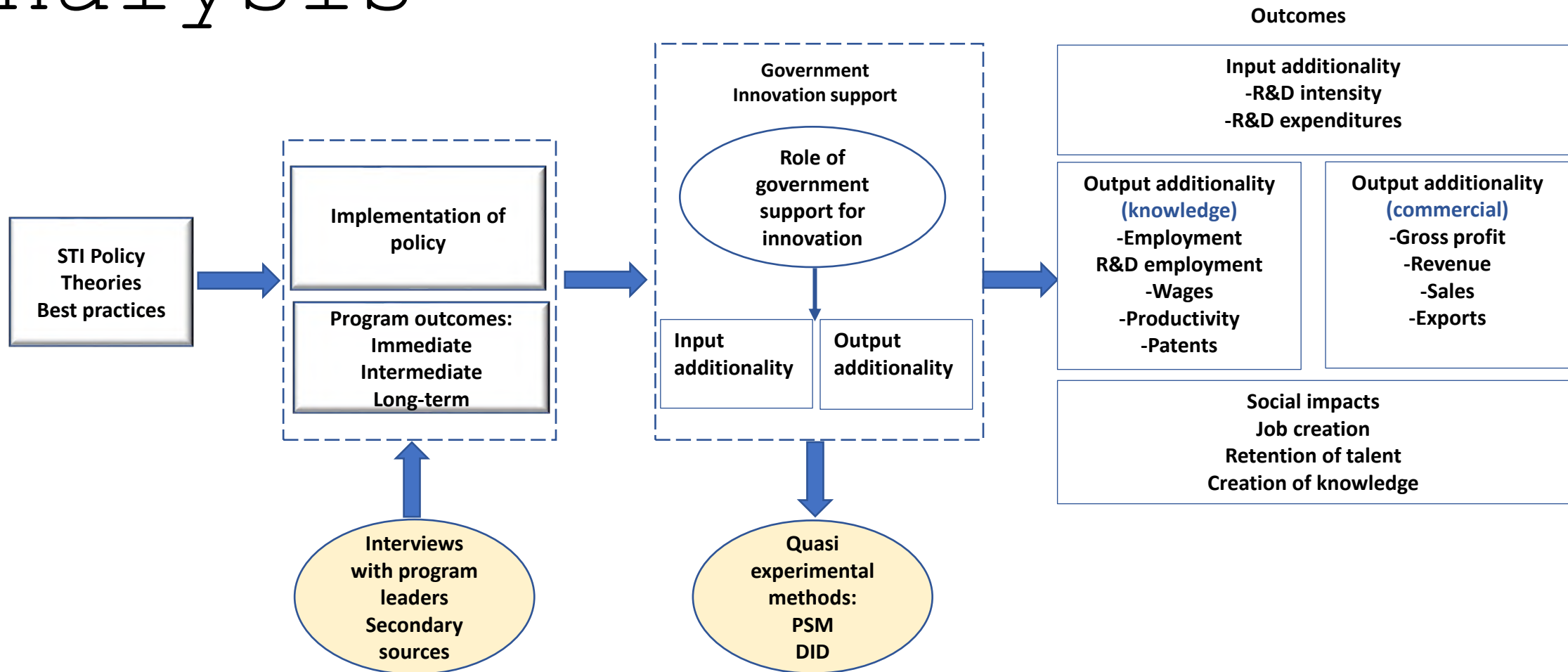
Innovation plays a major role in the creation of products and processes that aim to address social needs and tackle pressing social demands.

The major performers of R&D include businesses, governments, and universities.

Businesses in OECD countries perform on average 70% of total R&D.

This study is one of the pioneer studies with access to data from a novel initiative between TBS and StatsCan to analyze the impact assessment of innovation policy at the firm level.

Framework of analysis



Policy implications

Findings from the research contribute to the discussion of 'picking the winner' strategy identified by several scholars around the world.

The reception of advisory services, without financial support in place, does not have a positive effect on input or output additionality. With better data collection, and indicating the intensity of advisory services, it is possible to understand the specificities of the effect on groups of firms with specific characteristics (e.g., small and low-tech).

Firms that have a higher set of initial capabilities and have a better financial stand use the government support with better outcomes for the creation of additional knowledge and additional jobs.

Results also indicate the relevance of providing continuous government support, thus allowing small firms to continue to sustain the building of technological capabilities and innovation capabilities.

Government support to innovation has played a pivotal and patient role that is necessary to spur innovation at the firm level. Specific outcomes show positive results immediately, while some others require that firms engage in those activities relevant to the innovation process and production before we can observe positive results.

Finally, the research results suggest that complementarity between programs is important, and it is necessary to consider the outcome under analysis.

It is important to identify the optimal amount of subsidy (threshold) and this is program specific.

Limitations of the study

Some program streams use scores to evaluate the projects. Access to the scores can open the opportunity to implement more robust analysis.

The specifications of the equations considered the outcomes for each program stream under analysis. Sometimes the variables or proxy variables are not available.

Specific to IRAP-NRC, quantitative data on advisory services can contribute to the implementation of better specifications in the analysis when comparing the effect of advisory services and financial support.

Specific to programs that support universities and colleges, access to relevant data for the specification of the models is important.

Potential to link regional data to our dataset was not an option.

Stringent vetting requests affect the potential to publish in high quality journals (sensitivity macros, square terms, means, etc.).

RQ1

Do public subsidies stimulate additional private investment in innovation for firms in Canada?

Input additionality
regional programs
ACOA-BDP & CanNor-
SINED

Input additionality
Does Innovation Advisory
Services Matter?
NRC-IRAP

Additionality focus on
non-for profit and for
profit
ACOA-BDP

Higher education
NSERC-CRD
NSERC-IEG

RQ2

What are the impacts of financial resources and competencies on the distribution innovation subsidies?

Innovation and firm
performance
ACOA-BDP

RQ3

What are the effects of government support instruments at different stages – innovation intensity, employment, highly qualified employees, etc.?

Output additionality
ACOA-BDP
CANNOR-SINED

Output additionality
Does Innovation Advisory
Services Matter?
NRC-IRAP

Output additionality and
policy complementarity
ACOA-BDP & NRC-IRAP
NRC-IRAP & GAC

Output Higher education
NSERC-CRD
NSERC-IEG



Results

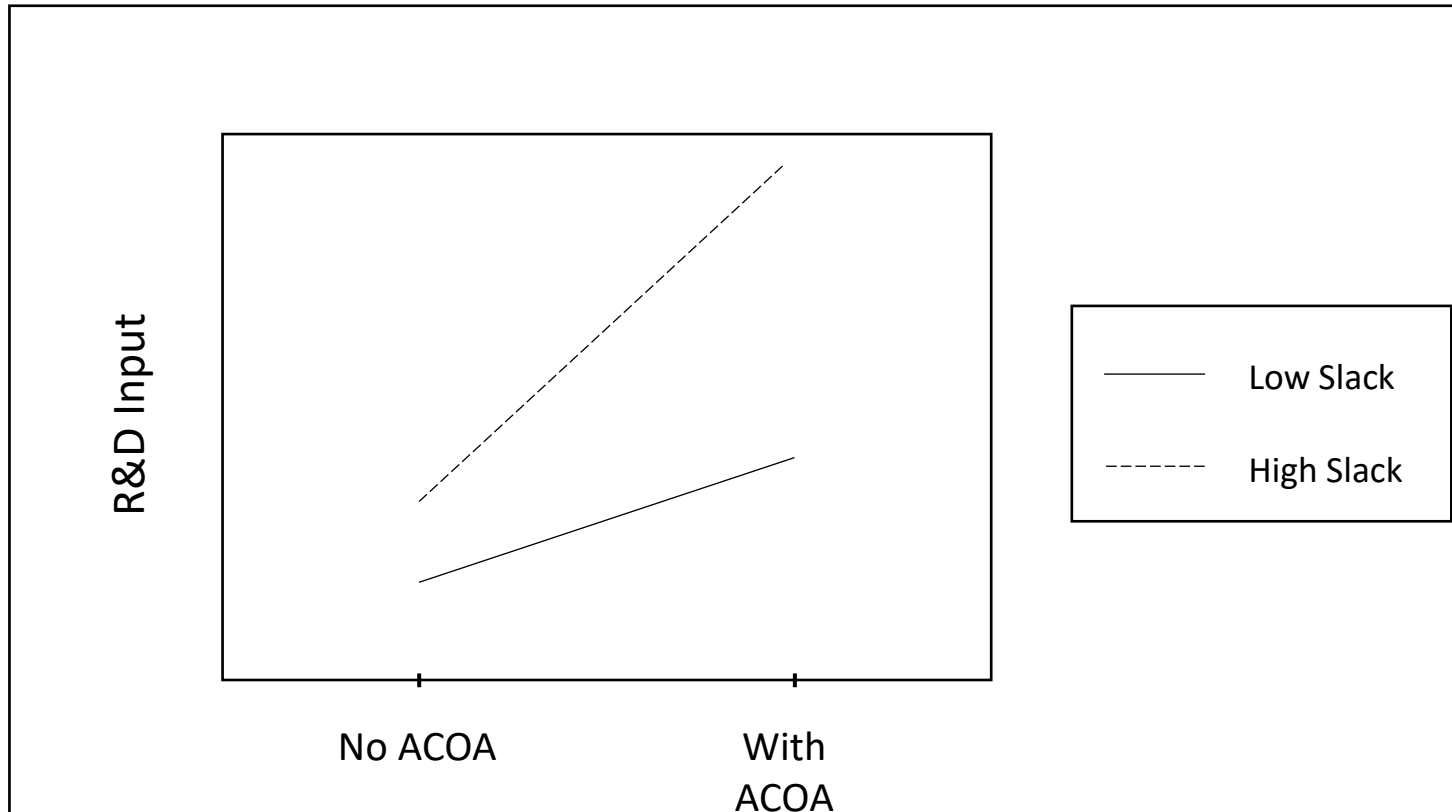


Results. ACOA – BDP

	R&D investment in millions	R&D Intensity	R&D employee	R&D employee percent	R&D wage	R&D wage percent
ACOA	0.007*	0.013	-0.023	-0.004	0.004	-0.003
Financial Slack*ACOA-BDP	0.048***	3.651	0.139	0.019*	0.019**	0.018*
Leverage *ACOA-BDP	0.007***	0.925***	0.018	0.003*	0.003**	0.009***
Absorptive Capacity*ACOA-BDP	0.035***	1.686***	0.205***	0.004+	0.019***	0.015***
ACOA-BDP*High tech industry dummy	0.084***	3.328***	0.550***	0.007	0.057***	0.022**

Note: *: p<0.05; **: p<0.01; ***: p<0.001.

Moderation Effect Illustration – Slack

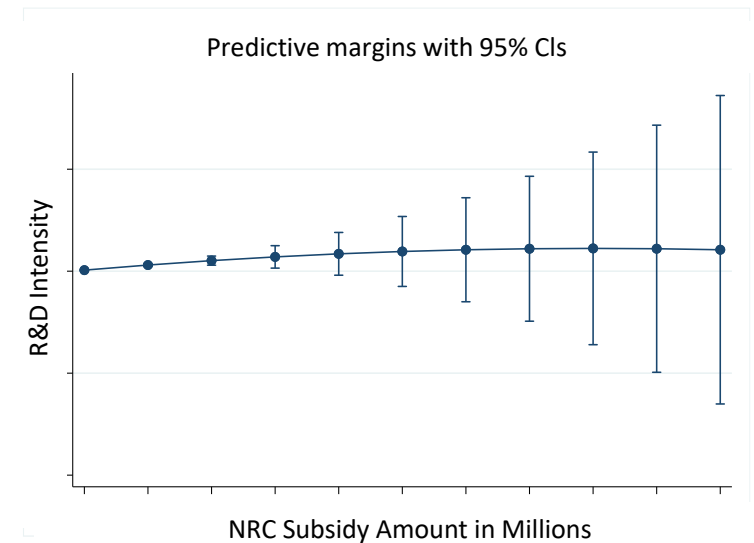
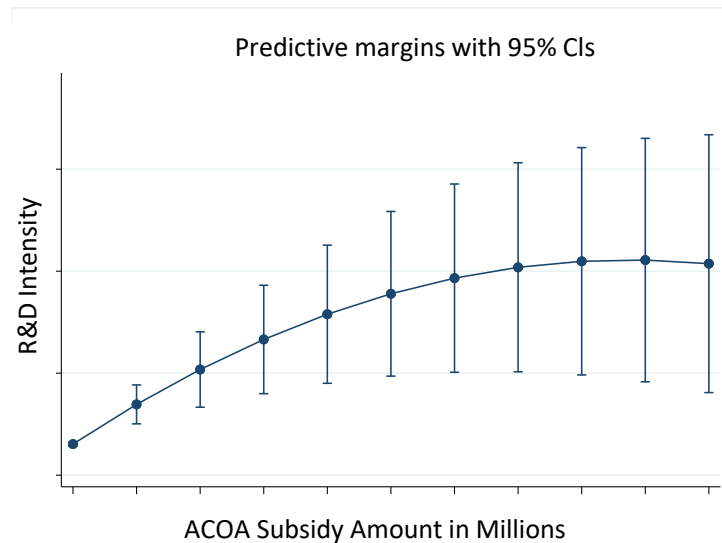
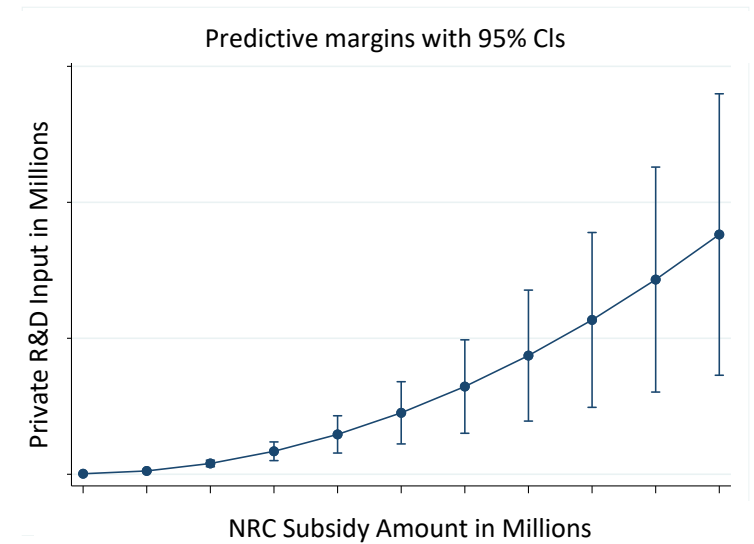
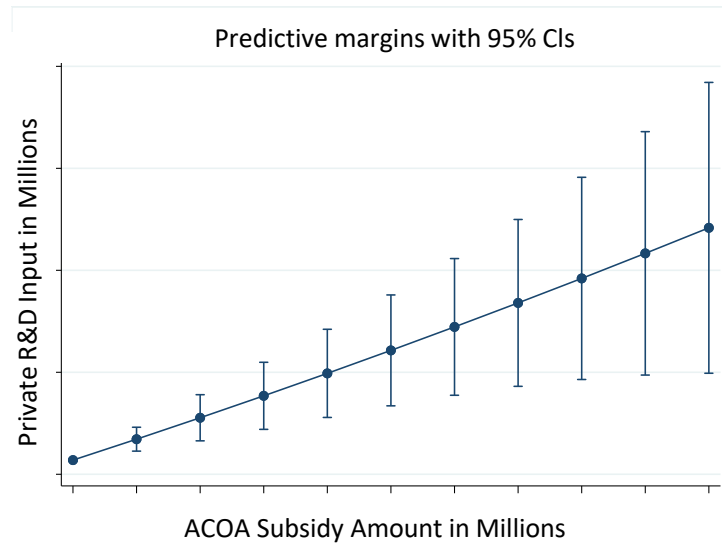


Note: This figure is NOT based on actual data.

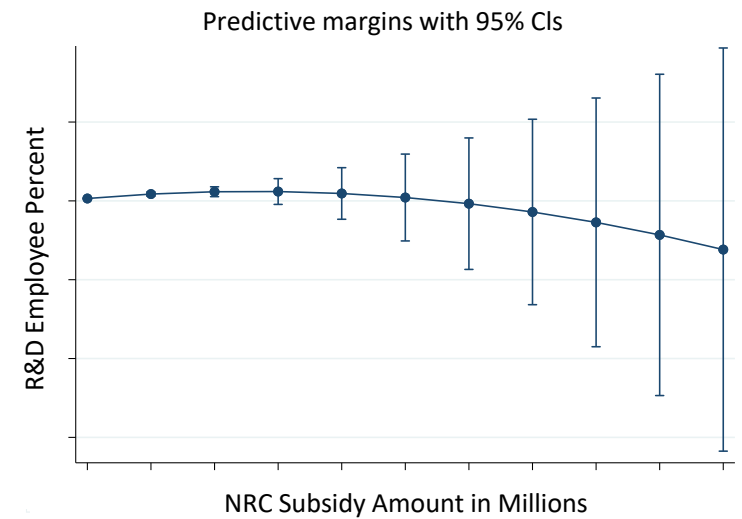
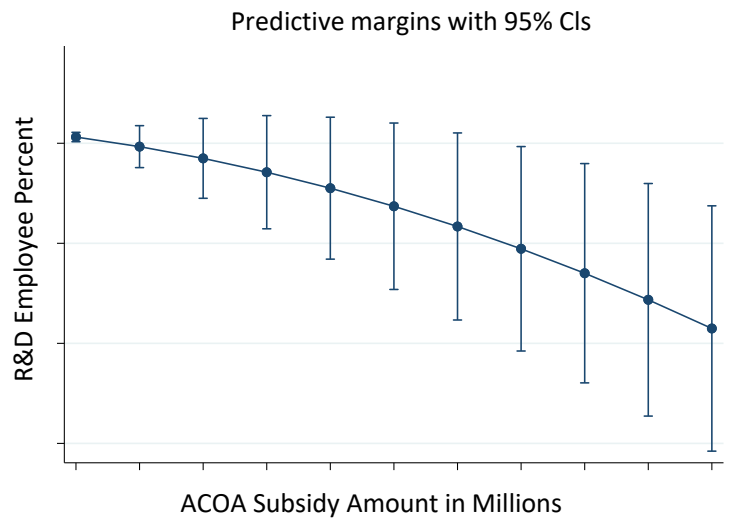
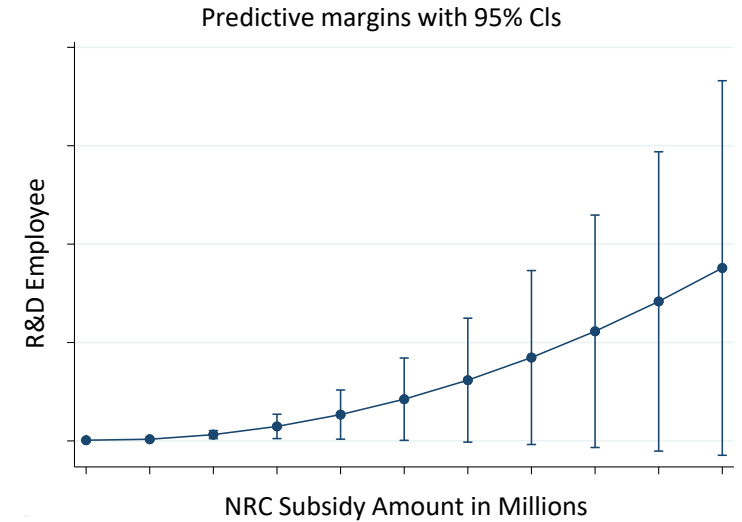
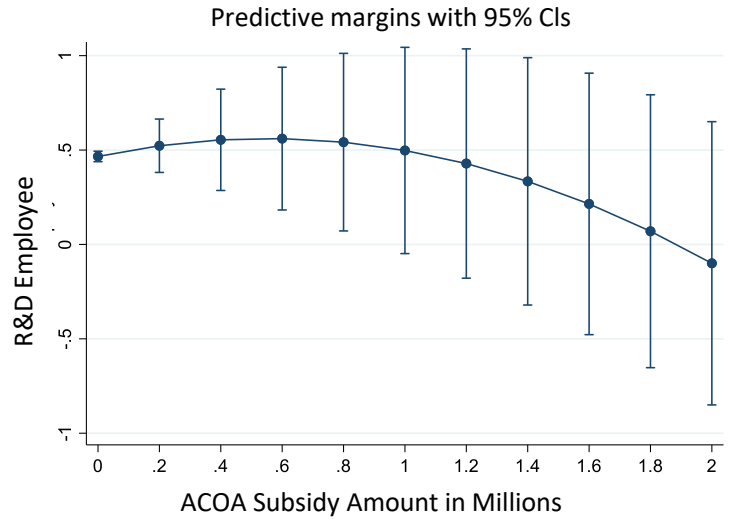
It serves as a visual aid to illustrate the moderation effect.

The actual data is unavailable due to privacy regulations of Statistics Canada.

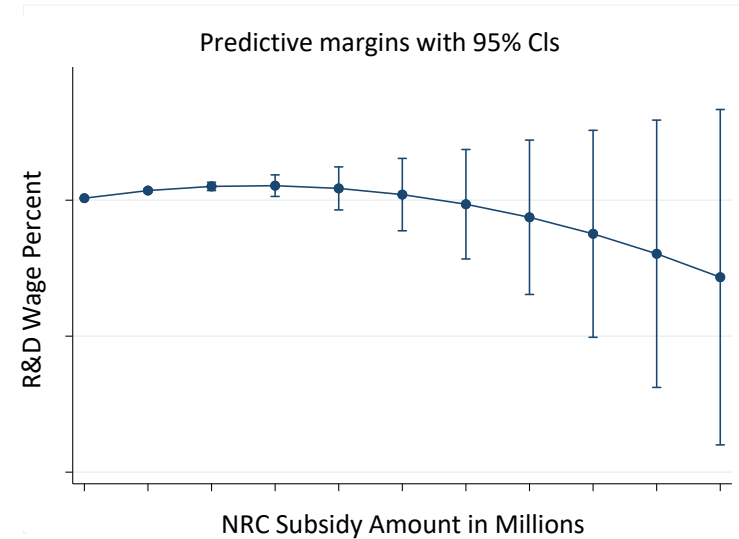
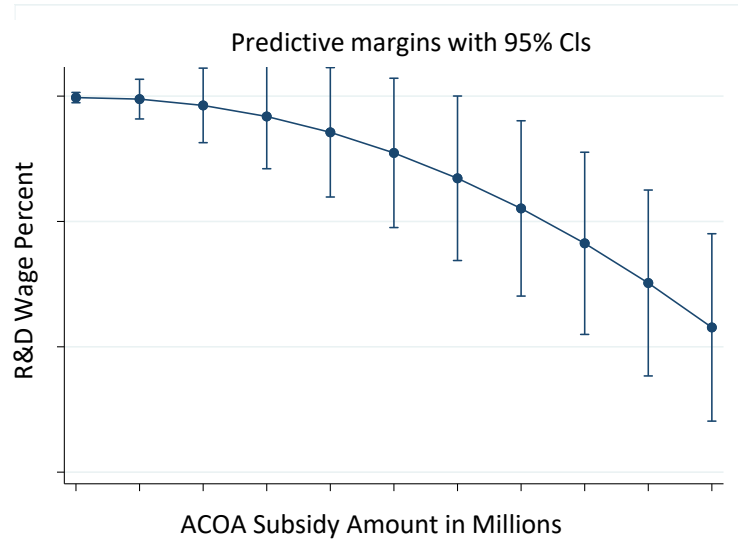
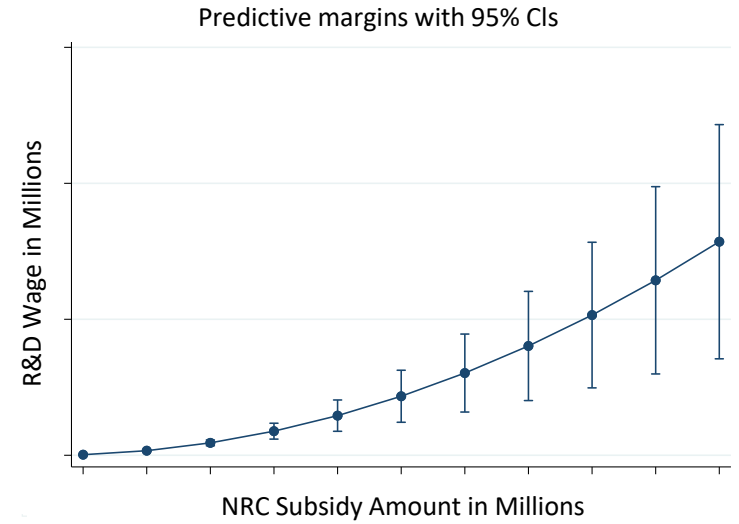
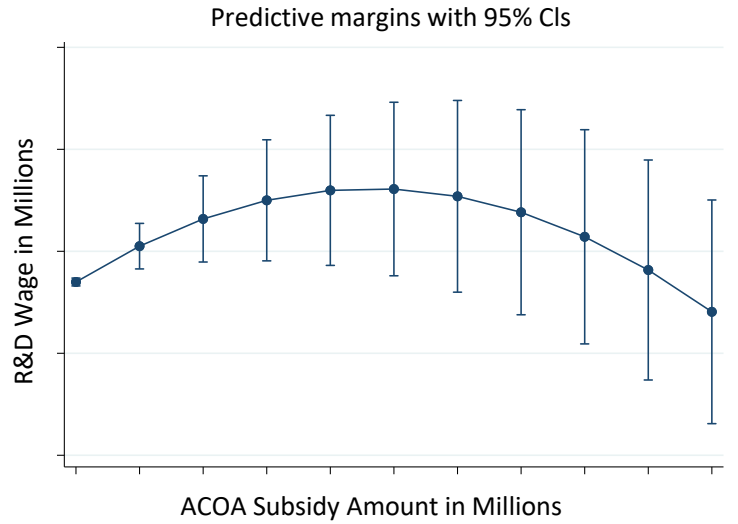
ACOA-BDP vs. NRC- IRAP: R&D Input



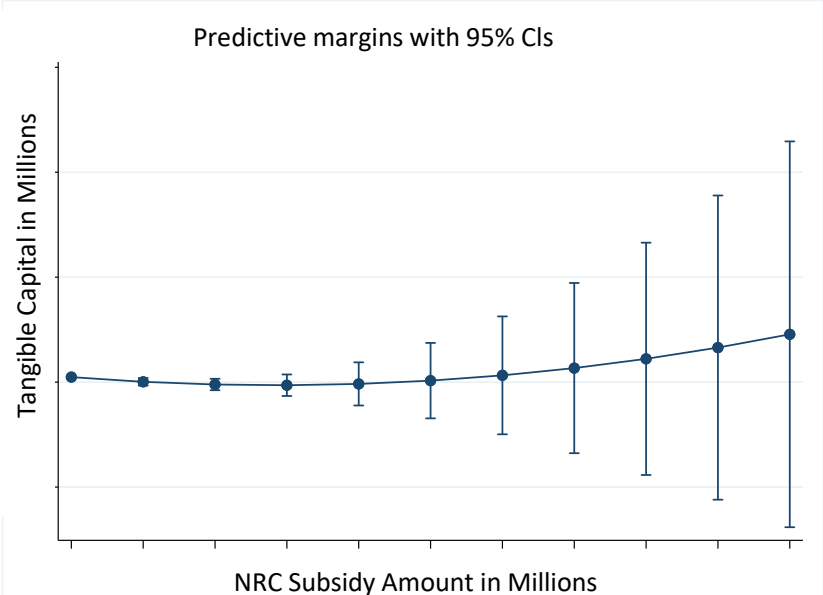
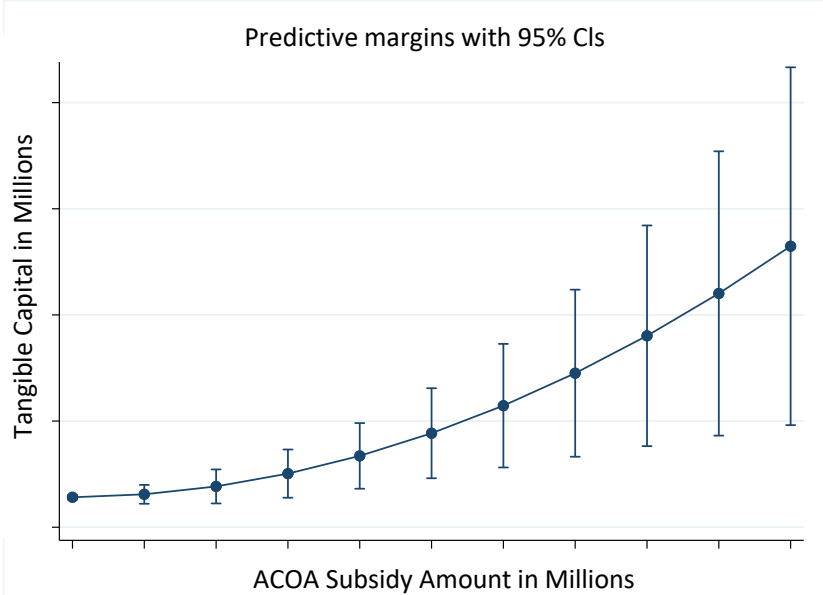
ACOA-BDP vs. NRC- IRAP: R&D Employee



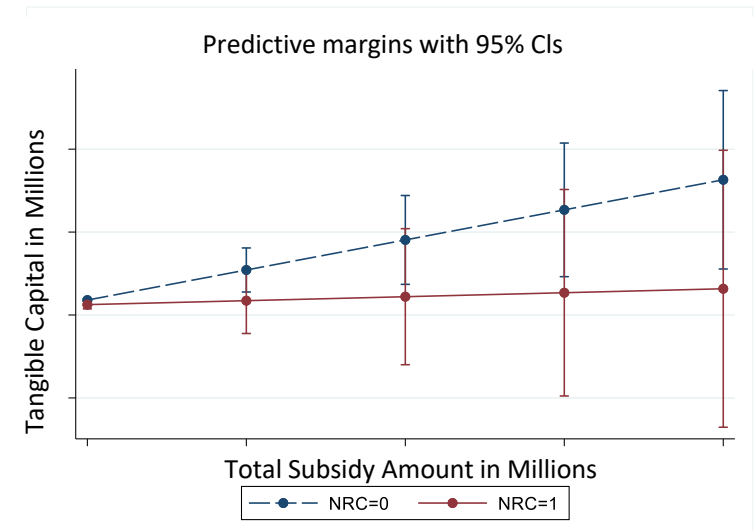
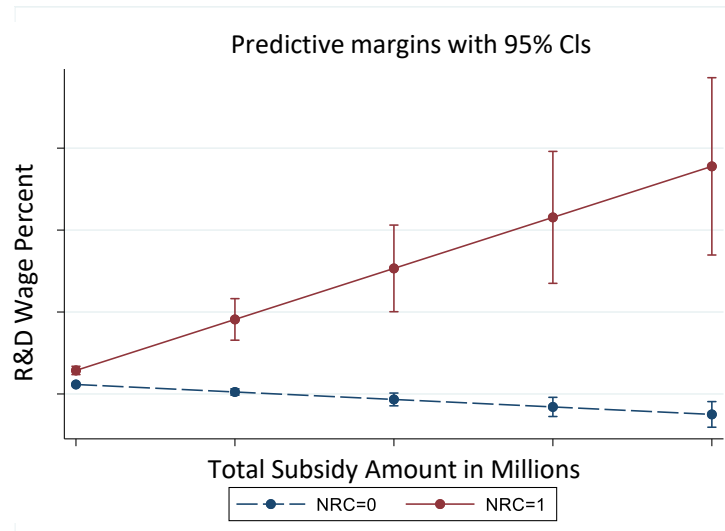
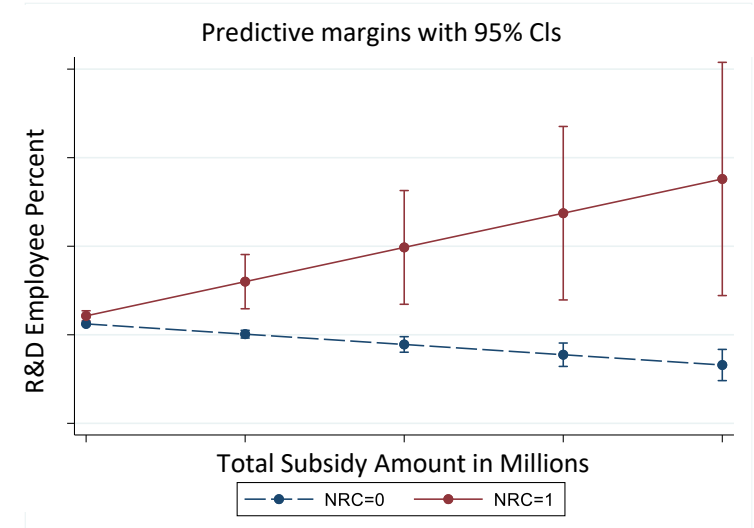
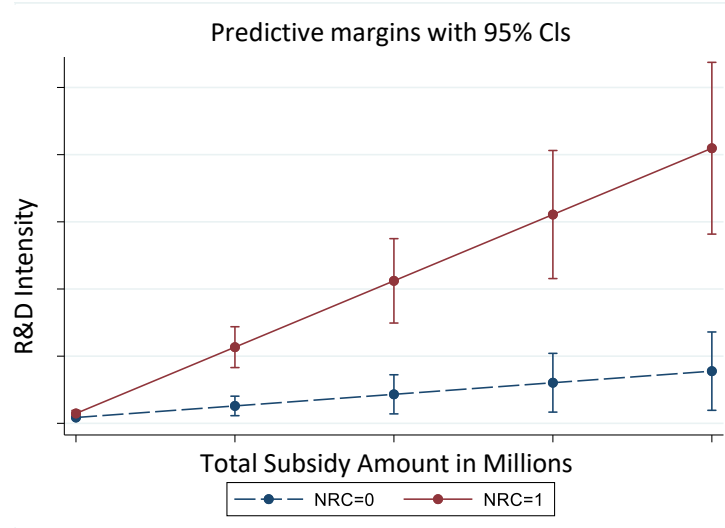
ACOA-BDP vs. NRC- IRAP: R&D Wages



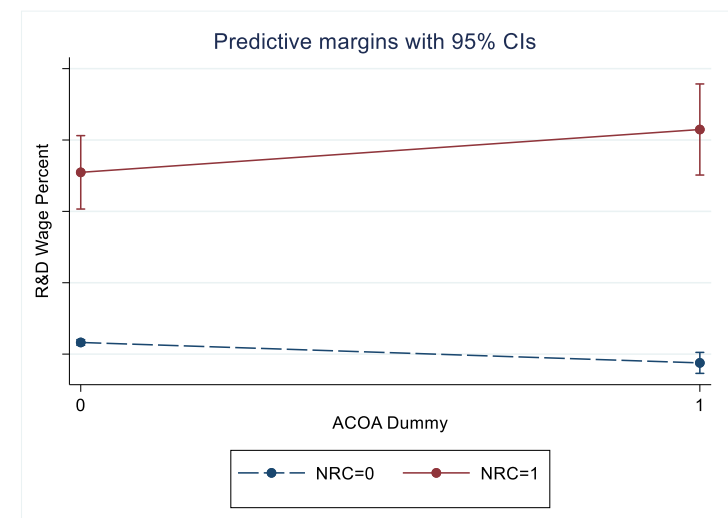
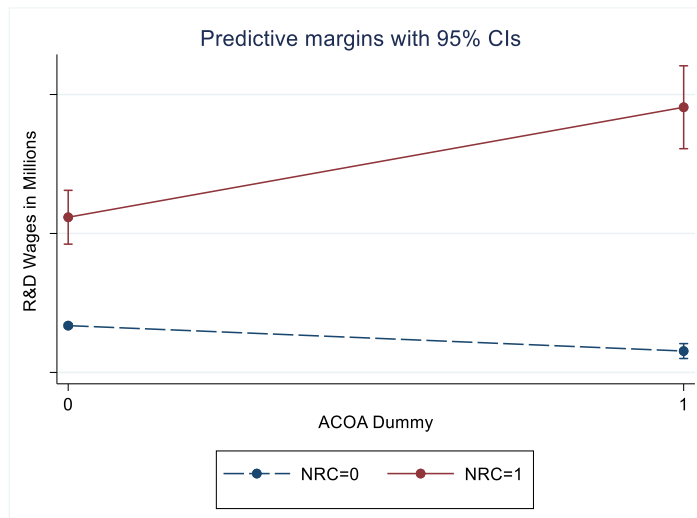
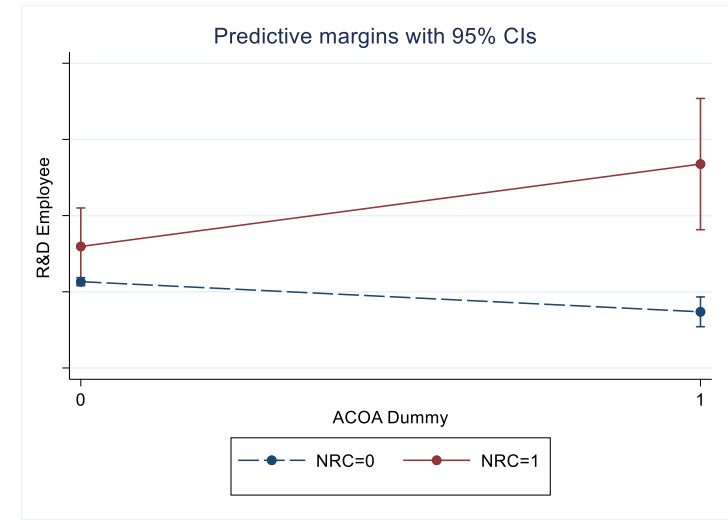
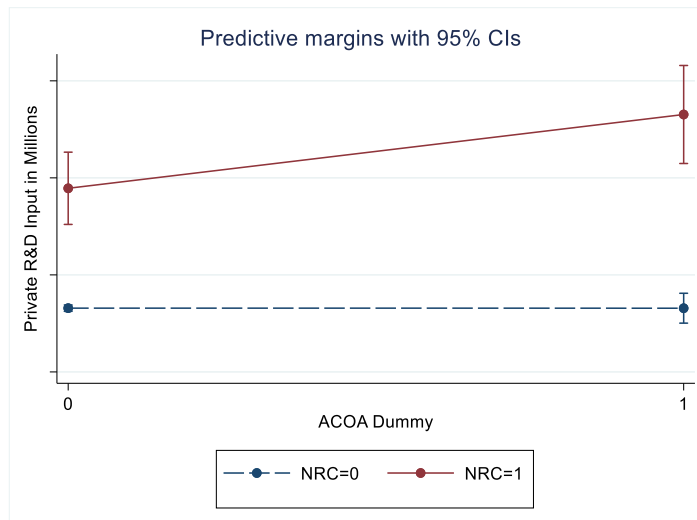
ACOA-BDP vs. NRC- IRAP: Tangible Investment



ACOA-BDP vs. NRC- IRAP: Combined Model

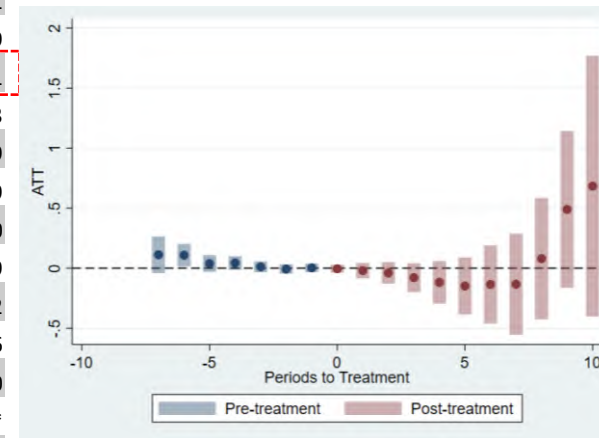


ACOA-BDP vs. NRC- IRAP: Combined Model (2)



ACOA-BDP. When does the impact occur?

Exports



	R&D investment	Wages R&D employees	Wages employees	In employment	% R&D employees	Sales (millions)	Productivity	% Exports	Gross profit/loss (Million)	Total revenue (Million)	Patents
Tm4	0.021	0.007**	0.030	0.004	0.004	0.644	0.005	-0.014**	0.280	-0.954	0.439
Tm3	-0.014	-0.003	0.016	0.009	0.002	-0.132	-0.038	0.003	-0.089	3.713	-0.045
Tm2	0.006	0.002	-0.007	0.002	-0.003	-0.340	-0.015	-0.009**	-0.191	-0.890	0.011
Tm1	-0.001	0.003	-0.017	0.000	0.009**	0.192	-0.010	-0.003	-0.058	-2.525	-0.069
Tp0	0.0259*	0.000	1.991	0.028*	-0.005	11.760	0.049**	-0.010***	6.878	13.170	-0.061
Tp1	0.283	0.071	0.709	0.02	-0.014***	12.620	0.031*	-0.004	7.051	13.780	-0.193
Tp2	0.255	0.064	2.262	-0.072***	-0.016***	14.380	0.042	-0.008	7.709	17.740	-0.009
Tp3	0.286	0.065	0.739	-0.115***	-0.018***	15.540	-0.012	-0.016	5.694	19.250	-0.179
Tp4	0.262	0.070	1.565	-0.220***	-0.0141**	20.500	-0.013	-0.015	9.272	23.360	-0.360
Tp5	0.281	0.064	1.721	-0.265***	-0.011	21.010	-0.008	-0.015	10.420	24.620	-0.349
Tp6	0.260	0.042	1.668	-0.340***	-0.019**	28.020	-0.008	-0.017	12.940	29.660	-0.352
Tp7	0.228	0.019	1.905	-0.391***	-0.025***	35.920	-0.004	-0.016	17.010	41.620	-0.306
Tp8	0.179	-0.049	1.81	-0.503***	(0.01)	41.84	0.007	-0.008	19.710	50.040	-0.230
Tp9	0.105	-0.172***	-1.258***	-0.597***	-0.064**	1.35	-0.003	0.059**	-1.427**	1.30	-0.155*
Tp10	-0.016	-0.173***	-1.041**	-0.697***	-0.063*	-2.052**	-0.077	0.068**	-1.140	-2.354**	-0.137
Rounded Observations	9400.00	9400.00	9400.00	9400.00	9400.00	8400.00	8400.00	9400.00	9400.00	9400.00	9400.00

Note: *: p<0.05; **: p<0.01; ***: p<0.001.

CANNOR-SINED. When does the impact occur?

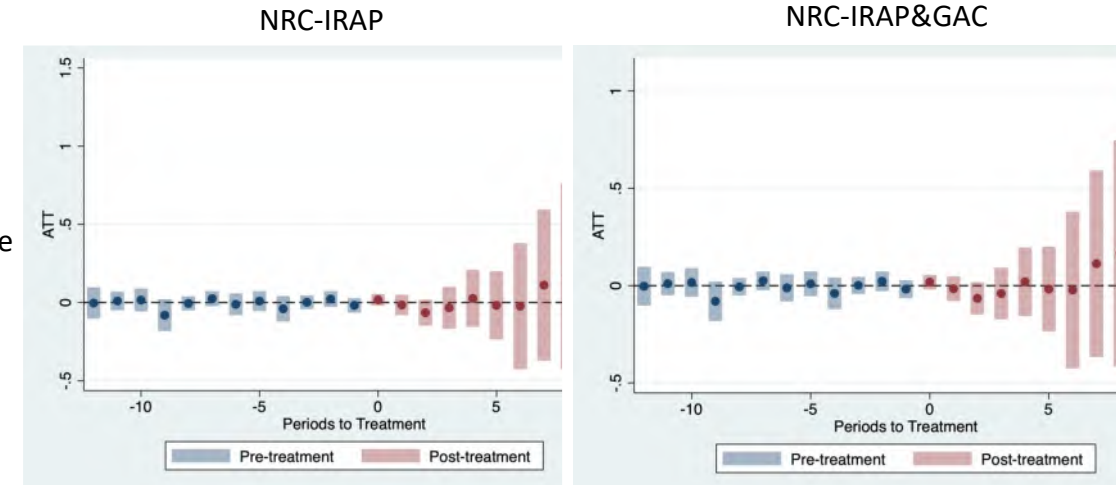
	Wages R&D employees	Wage employees (Million)	Total sales (Million)	Export (cumulative years)	Gross profit/loss (Million)	Total revenue (Million)
Tm4	0.000	0.117	-0.158	-0.003	0.028	0.230
Tm3	-0.001	0.058	-0.226	-0.030	-0.134	-0.709
Tm2	0.001	0.018	0.112	0.048	0.136	-0.067
Tm1	0.004	-0.028	-0.780	-0.004	0.032	-0.364
Tp0	0.004	-0.105	-0.234	0.000	0.030	0.013
Tp1	0.006	(0.14)	0.159	0.000	0.032	0.027
Tp2	0.000	0.14	-0.286*	0.000	0.513***	-0.640
Tp3	0.000	0.45	-0.020	0.000	1.127**	-2.635
Rounded Observations	400.00	400.00	300.00	400.00	300.00	400.00

NRC-IRAP & GAC (Input additionality)

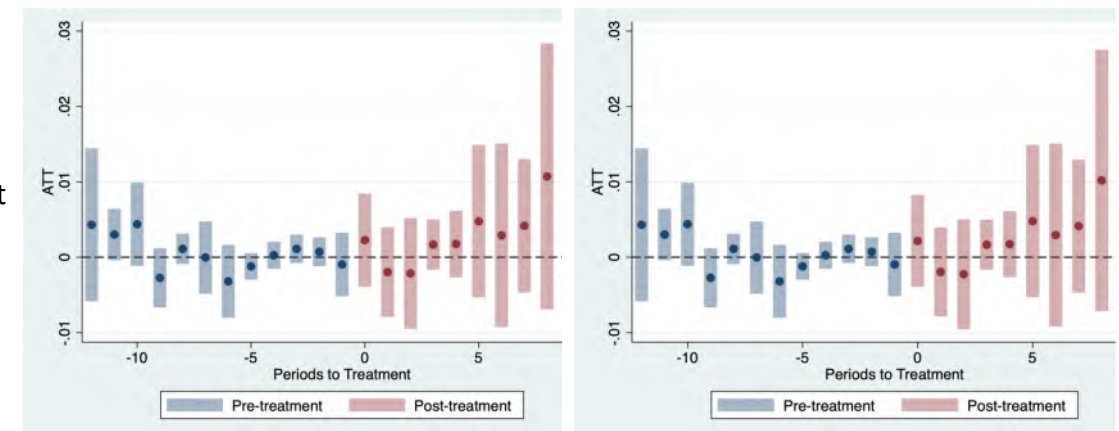
	R&D intensity (Million)		R&D expenditure (Million)	
	IRAP	IRAP+GAC	IRAP	IRAP+GAC
Pre_avg	0.001 (0.000)	0.001 (0.000)	-0.006 (0.009)	-0.006 (0.009)
Post_avg	0.004 (0.003)	0.003 (0.003)	0.050 (0.137)	0.048 (0.135)
Tm4	0.000 (0.001)	0.000 (0.001)	-0.040 (0.041)	-0.040 (0.041)
Tm3	0.001 (0.001)	0.001 (0.001)	0.001 (0.023)	0.001 (0.023)
Tm2	0.001 (0.001)	0.001 (0.001)	0.023 (0.026)	0.023 (0.026)
Tm1	-0.001 (0.002)	-0.001 (0.002)	-0.018 (0.024)	-0.018 (0.024)
TP0	0.002 (0.003)	0.002 (0.003)	0.018 (0.019)	0.018 (0.019)
TP1	-0.002 (0.003)	-0.002 (0.003)	-0.016 (0.033)	-0.016 (0.033)
TP2	-0.002 (0.004)	-0.002 (0.004)	-0.065 (0.042)	-0.065 (0.042)
TP3	0.002 (0.002)	0.002 (0.002)	-0.034 (0.069)	-0.040 (0.068)
TP4	0.002 (0.002)	0.002 (0.002)	0.027 (0.093)	0.020 (0.090)
TP5	0.005 (0.005)	0.005 (0.005)	-0.018 (0.111)	-0.018 (0.111)
TP6	0.003 (0.006)	0.003 (0.006)	-0.023 (0.206)	-0.023 (0.205)
Rounded Obs	12000.000	12000.000	12000.000	12000.000
Pre-trend test p-value	0.917	0.917	0.989	0.989

Standard errors in parentheses

R&D expenditure

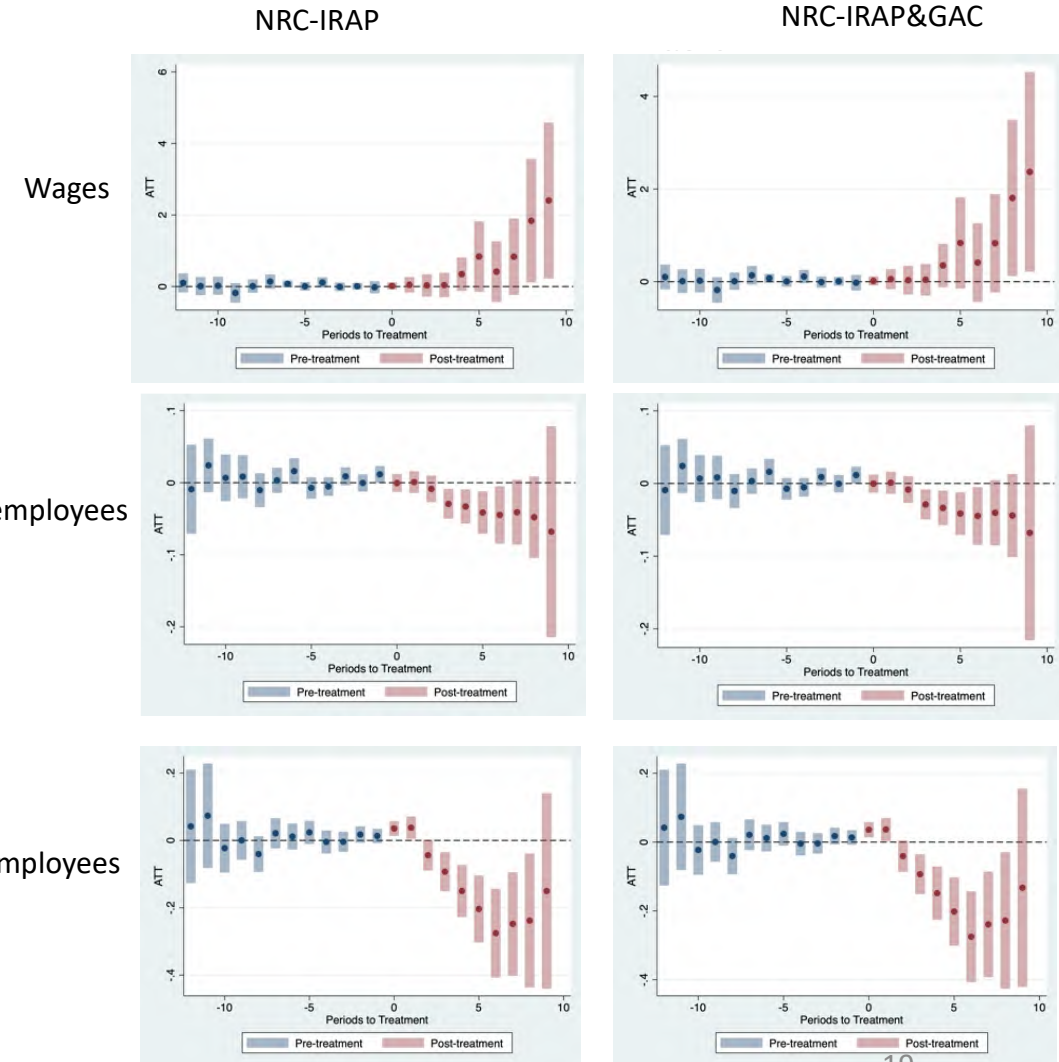


R&D investment



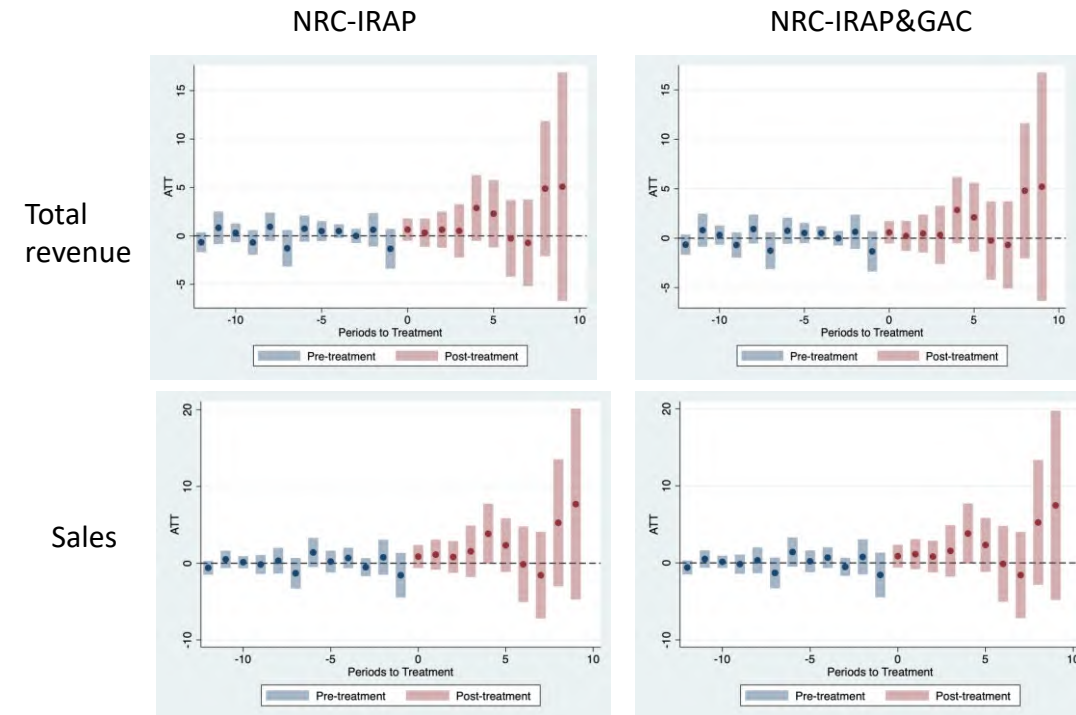
NRC-IRAP & GAC Output additionality (knowledge)

	Wages		% R&D employees		Total employees		Patents
	IRAP	IRAP+GAC	IRAP	IRAP+GAC	IRAP	IRAP+GAC	IRAP
Pre_avg	0.023 (0.026)	0.023 (0.026)	0.004 (0.003)	0.004 (0.003)	0.011 (0.010)	0.011 (0.010)	0.159* (0.094)
Post_avg	0.681** (0.321)	0.676** (0.317)	-0.0314** (0.014)	-0.0308** (0.014)	-0.133*** (0.045)	-0.129*** (0.045)	-0.160 (1.050)
Tm4	0.111 (0.074)	0.111 (0.074)	-0.005 (0.007)	-0.005 (0.007)	-0.005 (0.017)	-0.005 (0.017)	-0.110 (0.337)
Tm3	-0.008 (0.062)	-0.008 (0.062)	0.009 (0.006)	0.009 (0.006)	-0.004 (0.015)	-0.004 (0.015)	0.352 (0.412)
Tm2	0.009 (0.048)	0.009 (0.048)	0.000 (0.006)	0.000 (0.006)	0.018 (0.012)	0.018 (0.012)	0.049 (0.405)
Tm1	-0.023 (0.087)	-0.023 (0.087)	0.0116** (0.006)	0.0116** (0.006)	0.013 (0.011)	0.013 (0.011)	0.544 (0.393)
Tp0	0.016 (0.050)	0.017 (0.050)	0.000 (0.006)	0.000 (0.006)	0.0355*** (0.011)	0.0358*** (0.011)	-0.395 (0.457)
Tp1	0.049 (0.111)	0.054 (0.110)	0.001 (0.008)	0.001 (0.008)	0.0379** (0.017)	0.0365** (0.017)	0.503 (0.523)
Tp2	0.032 (0.160)	0.033 (0.159)	-0.009 (0.009)	-0.008 (0.009)	-0.0441* (0.023)	-0.0409* (0.023)	0.685 (0.515)
Tp3	0.041 (0.174)	0.042 (0.175)	-0.0294*** (0.011)	-0.0288*** (0.011)	-0.0930*** (0.030)	-0.0933*** (0.030)	-0.615 (0.548)
Tp4	0.346 (0.240)	0.350 (0.239)	-0.0330*** (0.012)	-0.0336*** (0.012)	-0.150*** (0.040)	-0.149*** (0.040)	-0.185 (0.677)
Tp5	0.836* (0.503)	0.836* (0.503)	-0.0414*** (0.015)	-0.0414*** (0.015)	-0.203*** (0.051)	-0.202*** (0.051)	-0.972 (0.768)
Tp6	0.416 (0.434)	0.413 (0.433)	-0.0447** (0.020)	-0.0446** (0.020)	-0.275*** (0.067)	-0.275*** (0.067)	-1.535 (1.170)
Obs.	12000.000	12000.000	12000.000	12000.000	12000.000	12000.000	12000.000
Pre-trend test p- value	0.661	0.661	0.676	0.676	0.146	0.146	0.221



NRC-IRAP & GAC Output additionality (commercial)

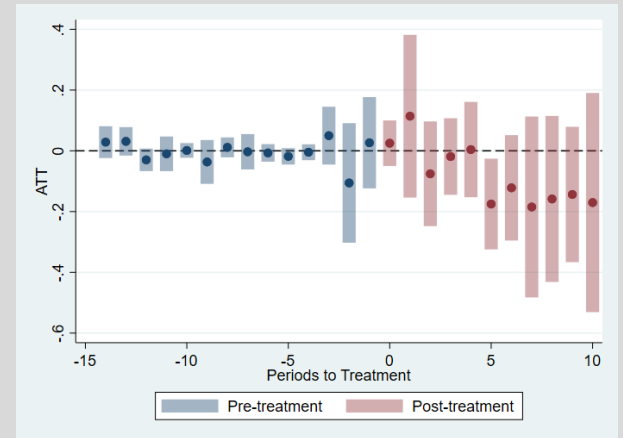
	Total sales (Million)		Productivity		Export (dummy)		% Export		Total revenue (Million)	
	IRAP	IRAP+GAC	IRAP	IRAP+GAC	IRAP	IRAP+GAC	IRAP	IRAP+GAC	IRAP	IRAP+GAC
Pre_avg	0.039 (0.112)	0.046 (0.110)	-0.005 (0.005)	-0.005 (0.005)	-0.018 (0.013)	-0.018 (0.013)	0.000 (0.002)	0.000 (0.002)	-0.012 (0.125)	-0.012 (0.125)
Post_avg	1.625 (1.548)	1.567 (1.537)	-0.010 (0.021)	-0.010 (0.021)	-0.035 (0.023)	-0.033 (0.023)	0.011 (0.015)	0.011 (0.015)	2.179 (1.748)	2.150 (1.732)
Tm4	0.498 (0.357)	0.511 (0.358)	0.008 (0.015)	0.008 (0.015)	-0.027 (0.025)	-0.027 (0.025)	-0.004 (0.005)	-0.004 (0.005)	0.678 (0.681)	0.678 (0.681)
Tm3	-0.006 (0.373)	-0.008 (0.376)	0.001 (0.007)	0.001 (0.007)	0.0314* (0.017)	0.0314* (0.017)	-0.001 (0.004)	-0.001 (0.004)	-0.520 (0.602)	-0.520 (0.602)
Tm2	0.625 (0.880)	0.648 (0.881)	-0.003 (0.007)	-0.003 (0.007)	-0.007 (0.015)	-0.007 (0.015)	-0.006 (0.005)	-0.006 (0.005)	0.772 (1.166)	0.772 (1.166)
Tm1	-1.342 (1.051)	-1.333 (1.040)	0.000 (0.005)	0.000 (0.005)	-0.019 (0.013)	-0.019 (0.013)	-0.005 (0.004)	-0.005 (0.004)	-1.571 (1.482)	-1.571 (1.482)
TP0	0.645 (0.587)	0.593 (0.573)	-0.006 (0.008)	-0.005 (0.008)	0.003 (0.012)	0.004 (0.011)	-0.003 (0.004)	-0.004 (0.004)	0.860 (0.765)	0.872 (0.754)
TP1	0.328 (0.742)	0.231 (0.769)	-0.012 (0.012)	-0.011 (0.012)	-0.003 (0.013)	-0.003 (0.013)	-0.001 (0.006)	-0.001 (0.006)	1.119 (0.999)	1.130 (0.992)
TP2	0.633 (0.950)	0.468 (0.975)	-0.006 (0.015)	-0.006 (0.014)	-0.0265* (0.015)	-0.0257* (0.015)	-0.007 (0.009)	-0.007 (0.009)	0.810 (1.058)	0.818 (1.053)
TP3	0.515 (1.404)	0.337 (1.502)	-0.008 (0.019)	-0.008 (0.019)	-0.0327* (0.018)	-0.0316* (0.018)	-0.005 (0.011)	-0.005 (0.011)	1.550 (1.706)	1.556 (1.705)
TP4	2.876* (1.731)	2.848* (1.708)	-0.001 (0.018)	-0.001 (0.018)	-0.0371* (0.022)	-0.035 (0.022)	0.000 (0.013)	0.001 (0.013)	3.843* (2.001)	3.812* (1.989)
TP5	2.283 (1.777)	2.114 (1.781)	-0.002 (0.021)	-0.002 (0.021)	-0.041 (0.028)	-0.041 (0.028)	0.009 (0.017)	0.009 (0.017)	2.341 (1.790)	2.328 (1.789)
TP6	-0.262 (2.018)	-0.244 (2.014)	0.002 (0.028)	0.002 (0.028)	-0.044 (0.034)	-0.043 (0.034)	0.003 (0.023)	0.005 (0.023)	-0.139 (2.516)	-0.129 (2.510)
Obs	11000.000	11000.000	11000.000	11000.000	12000.000	12000.000	12000.000	12000.000	12000.000	12000.000
Pre-trend test p- value	0.990	0.991	0.780	0.780	0.905	0.905	0.766	0.766	0.963	0.963



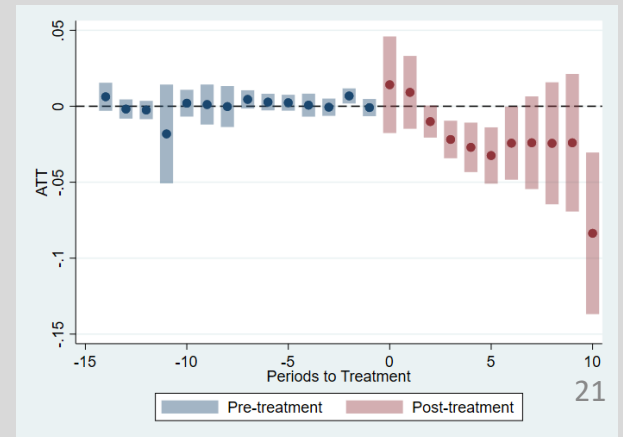
NRC-IRAP, Advisory Services, Input Additionality

OUTCOME	R&D Investment (\$M)		R&D Wage (\$M)		R&D Employment			R&D capital expenditures (\$M)		
	All Firms	Small	All Firms	Small	All Firms	LowTech	Small-HighTech	All Firms	Small	LowTech
Pre_avg	-0.00473 (0.004)	0.000157 (0.001)	-0.00189 (0.002)	0.000783*** (0.000)	5.914 (4.597)	2.375 (2.753)	-0.019 (0.051)	0.000899 (0.001)	0.00025 (0.000)	0.000142 (0.000)
Post_avg	-0.0823 (0.062)	-0.0226*** (0.009)	-0.0461 (0.036)	-0.0229*** (0.005)	2.875 (2.329)	3.552 (2.615)	-0.909*** (0.294)	0.000901 (0.004)	-0.00124** (0.001)	-0.00406* (0.002)
Tm5	-0.0183 (0.014)	0.00232 (0.003)	-0.0126 (0.009)	-0.000112 (0.001)	-10.13 (7.375)	-3.326 (4.157)	0.043 (0.127)	-0.000692 (0.002)	0.0000571 (0.001)	-0.00028 (0.001)
Tm4	-0.00469 (0.013)	0.00071 (0.004)	-0.00683 (0.007)	0.00249*** (0.001)	-9.2 (7.703)	-2.684 (5.399)	0.14 (0.143)	-0.00204 (0.001)	-0.000493 (0.000)	0.000556 (0.001)
Tm3	0.05 (0.049)	-0.000638 (0.003)	-0.00295 (0.004)	0.000253 (0.001)	16.57 (15.620)	-1.397 (2.603)	-0.00119 (0.131)	0.000621 (0.002)	0.000775 (0.000)	0.00138 (0.002)
Tm2	-0.106 (0.100)	0.00678*** (0.003)	0.000645 (0.005)	0.00270*** (0.001)	-14.4 (20.340)	4.132 (3.877)	0.136 (0.111)	-0.00185 (0.003)	-0.000196 (0.001)	-0.00284 (0.003)
Tm1	0.0266 (0.077)	-0.000884 (0.003)	-0.0128 (0.010)	0.0000595 (0.001)	10.99 (10.080)	-0.1 (0.203)	-0.185 (0.121)	0.00122 (0.001)	-0.0000692 (0.000)	0.000518 (0.001)
Tp0	0.0251 (0.038)	0.0141 (0.016)	-0.000644 (0.004)	-0.000979 (0.001)	22.56 (20.330)	30.53 (27.390)	-0.00311 (0.119)	0.0017 (0.003)	-0.000321 (0.000)	-0.00175 (0.001)
Tp1	0.114 (0.137)	0.00914 (0.012)	-0.00523 (0.006)	-0.00452** (0.002)	0.944 (0.875)	0.828* (0.492)	-0.253* (0.151)	0.00217 (0.003)	-0.000447 (0.000)	-0.00095 (0.002)
Tp2	-0.0756 (0.088)	-0.0101* (0.005)	-0.0092 (0.013)	-0.00952*** (0.003)	0.828 (2.652)	3.207 (2.262)	-0.388** (0.187)	0.0037 (0.005)	-0.000655 (0.001)	-0.00117 (0.002)
Tp3	-0.0189 (0.064)	-0.0219*** (0.006)	-0.0143 (0.016)	-0.0145*** (0.003)	-0.341 (3.604)	2.422 (2.581)	-0.691*** (0.253)	0.00204 (0.006)	-0.00121* (0.001)	-0.00455** (0.002)
Tp4	0.00409 (0.080)	-0.0271*** (0.008)	-0.0173 (0.025)	-0.0166*** (0.004)	3.391 (3.972)	3.056 (3.308)	-0.728** (0.321)	-0.00253 (0.003)	-0.00166** (0.001)	-0.00578** (0.003)
Tp5	-0.175** (0.076)	-0.0324*** (0.009)	-0.0871** (0.041)	-0.0224*** (0.005)	6.06 (7.399)	-0.512 (0.849)	-0.847*** (0.322)	-0.00378 (0.003)	-0.00254** (0.001)	-0.00696* (0.004)
Rounded Observations	80000	69000	79000	69000	79000	60000	16000	79000	69000	60000
Chi2	72.1285	115.0266	98.4024	120.2242	53.8682	74.2461	106.0471	84.6427	107.4769	101.4338
Pre-trend test p-value	0.9807	0.1293	0.4981	0.0723	0.9999	0.9702	0.2958	0.8297	0.2409	0.3859

R&D Investment – All Firms



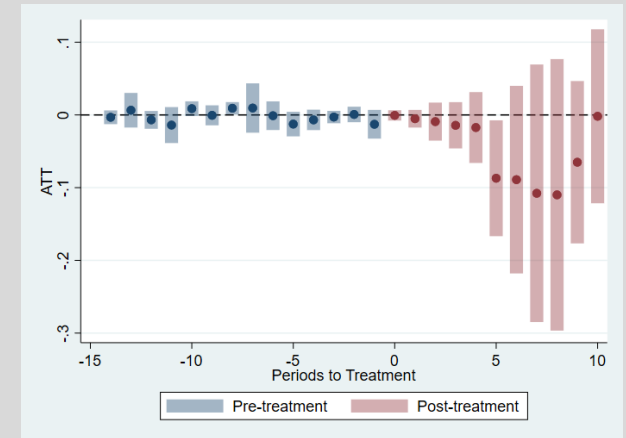
R&D Investment – Small



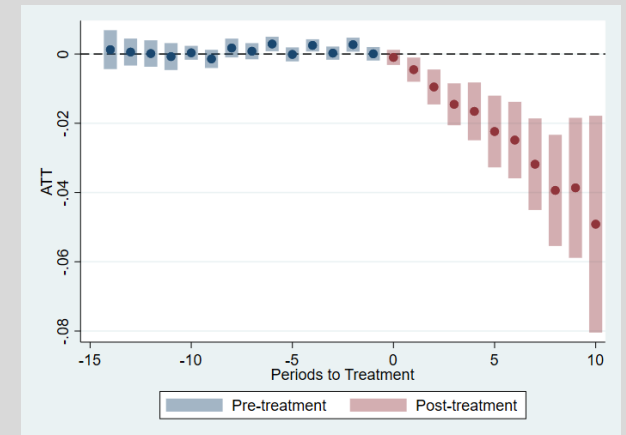
NRC-IRAP, Advisory Services, Input Additionality

OUTCOME	R&D Investment (\$M)		R&D Wage (\$M)		R&D Employment			R&D capital expenditures (\$M)		
	All Firms	Small	All Firms	Small	All Firms	LowTech	Small-HighTech	All Firms	Small	LowTech
Pre_avg	-0.00473 (0.004)	0.000157 (0.001)	-0.00189 (0.002)	0.000783*** (0.000)	5.914 (4.597)	2.375 (2.753)	-0.019 (0.051)	0.000899 (0.001)	0.00025 (0.000)	0.000142 (0.000)
Post_avg	-0.0823 (0.062)	-0.0226*** (0.009)	-0.0461 (0.036)	-0.0229*** (0.005)	2.875 (2.329)	3.552 (2.615)	-0.909*** (0.294)	0.000901 (0.004)	-0.00124** (0.001)	-0.00406* (0.002)
Tm5	-0.0183 (0.014)	0.00232 (0.003)	-0.0126 (0.009)	-0.000112 (0.001)	-10.13 (7.375)	-3.326 (4.157)	0.043 (0.127)	-0.000692 (0.002)	0.0000571 (0.001)	-0.00028 (0.001)
Tm4	-0.00469 (0.013)	0.00071 (0.004)	-0.00683 (0.007)	0.00249*** (0.001)	-9.2 (7.703)	-2.684 (5.399)	0.14 (0.143)	-0.00204 (0.001)	-0.000493 (0.000)	0.000556 (0.001)
Tm3	0.05 (0.049)	-0.000638 (0.003)	-0.00295 (0.004)	0.000253 (0.001)	16.57 (15.620)	-1.397 (2.603)	-0.00119 (0.131)	0.000621 (0.002)	0.000775 (0.000)	0.00138 (0.002)
Tm2	-0.106 (0.100)	0.00678*** (0.003)	0.000645 (0.005)	0.00270*** (0.001)	-14.4 (20.340)	4.132 (3.877)	0.136 (0.111)	-0.00185 (0.003)	-0.000196 (0.001)	-0.00284 (0.003)
Tm1	0.0266 (0.077)	-0.000884 (0.003)	-0.0128 (0.010)	0.0000595 (0.001)	10.99 (10.080)	-0.1 (0.203)	-0.185 (0.121)	0.00122 (0.001)	-0.0000692 (0.000)	0.000518 (0.001)
Tp0	0.0251 (0.038)	0.0141 (0.016)	-0.000644 (0.004)	-0.000979 (0.001)	22.56 (20.330)	30.53 (27.390)	-0.00311 (0.119)	0.0017 (0.003)	-0.000321 (0.000)	-0.00175 (0.001)
Tp1	0.114 (0.137)	0.00914 (0.012)	-0.00523 (0.006)	-0.00452** (0.002)	0.944 (0.875)	0.828* (0.492)	-0.253* (0.151)	0.00217 (0.003)	-0.000447 (0.000)	-0.00095 (0.002)
Tp2	-0.0756 (0.088)	-0.0101* (0.005)	-0.0092 (0.013)	-0.00952*** (0.003)	0.828 (2.652)	3.207 (2.262)	-0.388** (0.187)	0.0037 (0.005)	-0.000655 (0.001)	-0.00117 (0.002)
Tp3	-0.0189 (0.064)	-0.0219*** (0.006)	-0.0143 (0.016)	-0.0145*** (0.003)	-0.341 (3.604)	2.422 (2.581)	-0.691*** (0.253)	0.00204 (0.006)	-0.00121* (0.001)	-0.00455** (0.002)
Tp4	0.00409 (0.080)	-0.0271*** (0.008)	-0.0173 (0.025)	-0.0166*** (0.004)	3.391 (3.972)	3.056 (3.308)	-0.728** (0.321)	-0.00253 (0.003)	-0.00166** (0.001)	-0.00578** (0.003)
Tp5	-0.175** (0.076)	-0.0324*** (0.009)	-0.0871** (0.041)	-0.0224*** (0.005)	6.06 (7.399)	-0.512 (0.849)	-0.847*** (0.322)	-0.00378 (0.003)	-0.00254** (0.001)	-0.00696* (0.004)
Rounded Observations	80000	69000	79000	69000	79000	60000	16000	79000	69000	60000
Chi2	72.1285	115.0266	98.4024	120.2242	53.8682	74.2461	106.0471	84.6427	107.4769	101.4338
Pre-trend test p-value	0.9807	0.1293	0.4981	0.0723	0.9999	0.9702	0.2958	0.8297	0.2409	0.3859

R&D Wage – All Firms



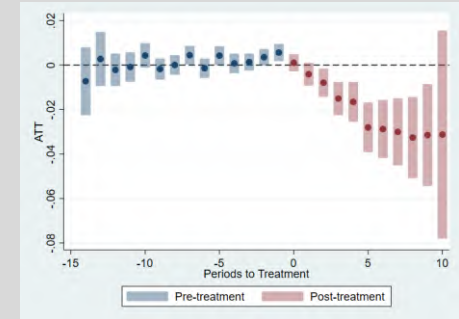
R&D Wage – Small



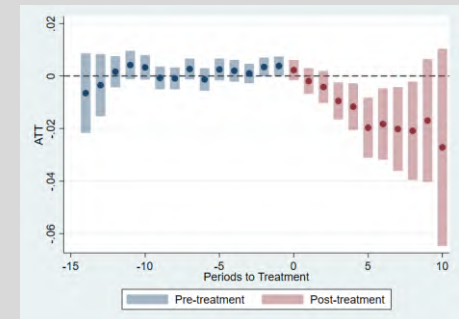
NRC-IRAP, Advisory Services, Input Additionality

OUTCOME	R&D Investment (\$M)		R&D Wage (\$M)		R&D Employment			R&D capital expenditures (\$M)		
	All Firms	Small	All Firms	Small	All Firms	LowTech	Small-HighTech	All Firms	Small	LowTech
Pre_avg	-0.00473 (0.004)	0.000157 (0.001)	-0.00189 (0.002)	0.000783*** (0.000)	5.914 (4.597)	2.375 (2.753)	-0.019 (0.051)	0.000899 (0.001)	0.00025 (0.000)	0.000142 (0.000)
Post_avg	-0.0823 (0.062)	-0.0226*** (0.009)	-0.0461 (0.036)	-0.0229*** (0.005)	2.875 (2.329)	3.552 (2.615)	-0.909*** (0.294)	0.000901 (0.004)	-0.00124** (0.001)	-0.00406* (0.002)
Tm5	-0.0183 (0.014)	0.00232 (0.003)	-0.0126 (0.009)	-0.000112 (0.001)	-10.13 (7.375)	-3.326 (4.157)	0.043 (0.127)	-0.000692 (0.002)	0.0000571 (0.001)	-0.00028 (0.001)
Tm4	-0.00469 (0.013)	0.00071 (0.004)	-0.00683 (0.007)	0.00249*** (0.001)	-9.2 (7.703)	-2.684 (5.399)	0.14 (0.143)	-0.00204 (0.001)	-0.000493 (0.000)	0.000556 (0.001)
Tm3	0.05 (0.049)	-0.000638 (0.003)	-0.00295 (0.004)	0.000253 (0.001)	16.57 (15.620)	-1.397 (2.603)	-0.00119 (0.131)	0.000621 (0.002)	0.000775 (0.000)	0.00138 (0.002)
Tm2	-0.106 (0.100)	0.00678*** (0.003)	0.000645 (0.005)	0.00270*** (0.001)	-14.4 (20.340)	4.132 (3.877)	0.136 (0.111)	-0.00185 (0.003)	-0.000196 (0.001)	-0.00284 (0.003)
Tm1	0.0266 (0.077)	-0.000884 (0.003)	-0.0128 (0.010)	0.0000595 (0.001)	10.99 (10.080)	-0.1 (0.203)	-0.185 (0.121)	0.00122 (0.001)	-0.0000692 (0.000)	0.000518 (0.001)
Tp0	0.0251 (0.038)	0.0141 (0.016)	-0.000644 (0.004)	-0.000979 (0.001)	22.56 (20.330)	30.53 (27.390)	-0.00311 (0.119)	0.0017 (0.003)	-0.000321 (0.000)	-0.00175 (0.001)
Tp1	0.114 (0.137)	0.00914 (0.012)	-0.00523 (0.006)	-0.00452** (0.002)	0.944 (0.875)	0.828* (0.492)	-0.253* (0.151)	0.00217 (0.003)	-0.000447 (0.000)	-0.00095 (0.002)
Tp2	-0.0756 (0.088)	-0.0101* (0.005)	-0.0092 (0.013)	-0.00952*** (0.003)	0.828 (2.652)	3.207 (2.262)	-0.388** (0.187)	0.0037 (0.005)	-0.000655 (0.001)	-0.00117 (0.002)
Tp3	-0.0189 (0.064)	-0.0219*** (0.006)	-0.0143 (0.016)	-0.0145*** (0.003)	-0.341 (3.604)	2.422 (2.581)	-0.691*** (0.253)	0.00204 (0.006)	-0.00121* (0.001)	-0.00455** (0.002)
Tp4	0.00409 (0.080)	-0.0271*** (0.008)	-0.0173 (0.025)	-0.0166*** (0.004)	3.391 (3.972)	3.056 (3.308)	-0.728** (0.321)	-0.00253 (0.003)	-0.00166** (0.001)	-0.00578** (0.003)
Tp5	-0.175** (0.076)	-0.0324*** (0.009)	-0.0871** (0.041)	-0.0224*** (0.005)	6.06 (7.399)	-0.512 (0.849)	-0.847*** (0.322)	-0.00378 (0.003)	-0.00254** (0.001)	-0.00696* (0.004)
Rounded Observations	80000	69000	79000	69000	79000	60000	16000	79000	69000	60000
Chi2	72.1285	115.0266	98.4024	120.2242	53.8682	74.2461	106.0471	84.6427	107.4769	101.4338
Pre-trend test p-value	0.9807	0.1293	0.4981	0.0723	0.9999	0.9702	0.2958	0.8297	0.2409	0.3859

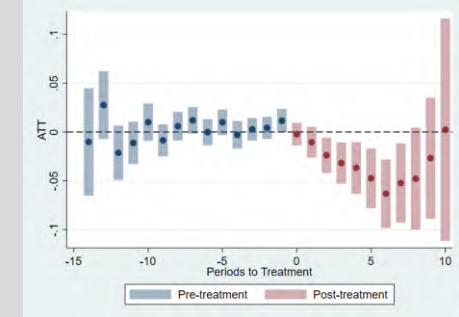
R&D Employment – All Firms



R&D Employment – Low Tech

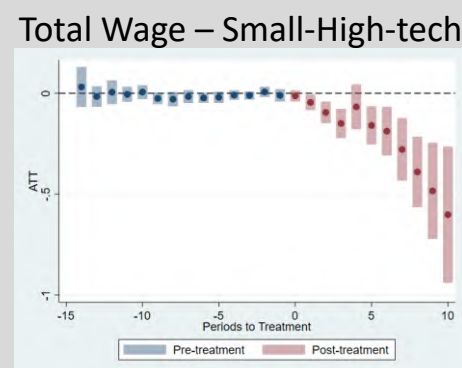
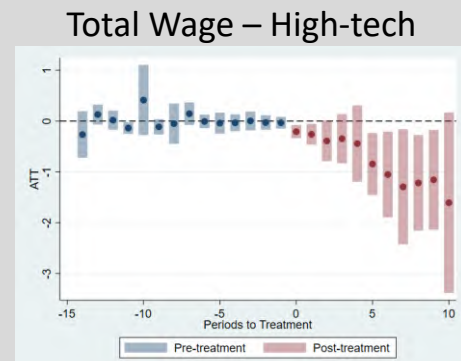
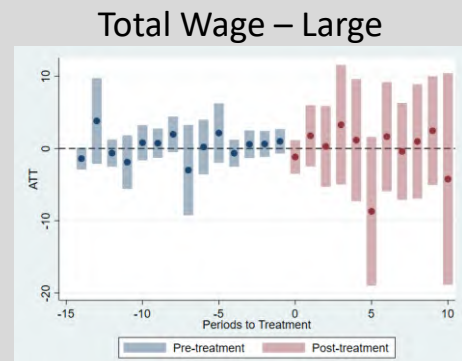
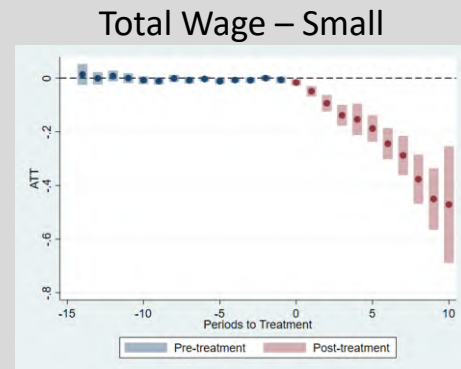
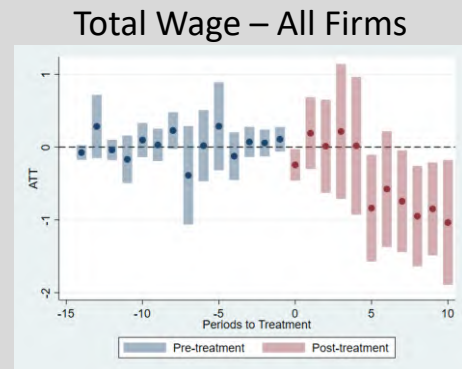


R&D Employment – Small High Tech



NRC-IRAP, Advisory Services, Output Additionality

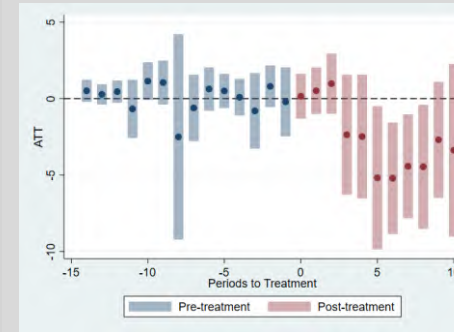
OUTCOME	Total Wage (\$M)					Total Sales (\$M)				R&D Labour Efficiency (\$M)			
	All Firms	Small	Large	HighTech	Small-HighTech	All Firms	Small	Large	HighTech	All Firms	Small	Sall-LowTech	Small-HighTech
Pre_avg	0.0283 (0.018)	-0.00319 (0.002)	0.302 (0.203)	-0.00108 (0.033)	-0.00849 (0.005)	0.0453 (0.157)	-0.00372 (0.019)	0.605 (1.303)	0.163 (0.121)	0.0539* (0.029)	-0.0044 (0.006)	-0.00302 (0.008)	-0.0283 (0.029)
Post_avg	-0.435* (0.223)	-0.225*** (0.028)	-0.274 (2.198)	-0.803*** (0.291)	-0.225*** (0.048)	-2.595** (1.098)	-1.125*** (0.225)	1.898 (10.500)	-1.138 (0.995)	-0.0056 (0.546)	-0.131 (0.114)	-0.0999 (0.177)	-0.191** (0.082)
Tm5	0.288 (0.309)	-0.0116** (0.006)	2.136 (2.100)	-0.0415 (0.105)	-0.0201 (0.014)	0.501 (0.573)	-0.07 (0.104)	3.929 (4.511)	0.339 (0.573)	0.4 (0.320)	0.0183 (0.022)	0.0371 (0.026)	-0.0189 (0.045)
Tm4	-0.124 (0.167)	-0.00725 (0.005)	-0.653 (0.955)	-0.0346 (0.085)	-0.00934 (0.012)	0.0889 (0.612)	-0.115* (0.062)	1.044 (5.065)	-0.673 (1.035)	0.434 (0.280)	0.0278 (0.023)	0.0377 (0.029)	-0.0108 (0.034)
Tm3	0.0715 (0.106)	-0.00809 (0.005)	0.585 (0.979)	0.00231 (0.094)	-0.0111 (0.010)	-0.804 (1.263)	0.0212 (0.053)	-2.935 (11.020)	-0.197 (0.470)	-0.47 (0.335)	-0.0212 (0.029)	-0.0324 (0.035)	0.0117 (0.043)
Tm2	0.0577 (0.094)	-0.000207 (0.005)	0.623 (0.917)	-0.0297 (0.072)	0.00693 (0.013)	0.799 (0.697)	0.14 (0.108)	5.397 (5.900)	0.216 (0.424)	0.349 (0.428)	0.019 (0.055)	0.0161 (0.070)	0.0429 (0.034)
Tm1	0.108 (0.087)	-0.00663 (0.006)	0.987 (0.863)	-0.0347 (0.059)	-0.0107 (0.016)	-0.214 (1.151)	-0.118 (0.076)	0.658 (8.731)	-0.257 (0.762)	0.23 (0.322)	0.0438 (0.037)	0.0241 (0.047)	0.0848** (0.041)
Tp0	-0.244** (0.110)	-0.0164*** (0.006)	-1.177 (1.192)	-0.210*** (0.066)	-0.0131 (0.014)	0.153 (0.751)	-0.155*** (0.050)	2.188 (5.441)	-1.250* (0.677)	-0.317 (0.251)	-0.000745 (0.027)	0.00125 (0.032)	-0.000754 (0.050)
Tp1	0.192 (0.252)	-0.0490*** (0.010)	1.749 (2.165)	-0.261** (0.104)	-0.0455** (0.020)	0.513 (0.776)	-0.404*** (0.106)	8.52 (6.303)	-0.856 (1.052)	-0.192 (0.341)	-0.046 (0.046)	-0.0156 (0.060)	-0.139** (0.064)
Tp2	0.0127 (0.326)	-0.0936*** (0.016)	0.291 (2.851)	-0.391* (0.204)	-0.0951*** (0.027)	0.977 (1.006)	-0.409*** (0.157)	15.44* (8.578)	-0.202 (1.454)	-0.401 (0.415)	-0.191*** (0.046)	-0.175*** (0.058)	-0.196*** (0.067)
Tp3	0.215 (0.473)	-0.139*** (0.020)	3.267 (4.225)	-0.348 (0.246)	-0.149*** (0.037)	-2.363 (2.001)	-0.718*** (0.159)	-7.477 (20.510)	0.937 (1.264)	-0.0548 (0.473)	-0.156*** (0.058)	-0.151* (0.077)	-0.0733 (0.088)
Tp4	0.0188 (0.483)	-0.154*** (0.030)	1.157 (4.308)	-0.444 (0.383)	-0.0676 (0.057)	-2.484 (2.065)	-0.930*** (0.250)	-11.63 (21.890)	-2.193 (1.734)	-0.307 (0.993)	-0.181*** (0.067)	-0.131 (0.088)	-0.300*** (0.100)
Tp5	-0.837** (0.374)	-0.188*** (0.025)	-8.697* (5.252)	-0.845*** (0.311)	-0.159*** (0.048)	-5.178** (2.390)	-0.990*** (0.234)	-27.06 (26.270)	-0.346 (2.009)	1.33 (1.602)	-0.111 (0.088)	-0.125 (0.106)	-0.111 (0.167)
Rounded Observations	79000	69000	9000	19000	16000	74000	64000	9000	18000	79000	69000	52000	16000
Chi2	95.1338	116.8257	92.8743	92.9444	107.1064	85.2092	104.0742	98.6558	97.0309	92.8129	119.1774	104.8545	115.7335
Pre-trend test p-value	0.5913	0.1066	0.6543	0.6524	0.2715	0.8369	0.3439	0.4909	0.5372	0.656	0.0818	0.3244	0.12



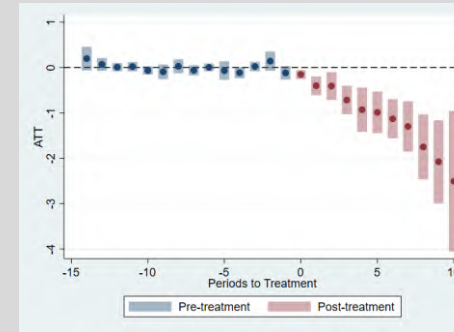
NRC-IRAP, Advisory Services, Output Additionality

OUTCOME	Total Wage (\$M)					Total Sales (\$M)				R&D Labour Efficiency (\$M)			
	All Firms	Small	Large	HighTech	Small-HighTech	All Firms	Small	Large	HighTech	All Firms	Small	Sall-LowTech	Small-HighTech
Pre_avg	0.0283 (0.018)	-0.00319 (0.002)	0.302 (0.203)	-0.00108 (0.033)	-0.00849 (0.005)	0.0453 (0.157)	-0.00372 (0.019)	0.605 (1.303)	0.163 (0.121)	0.0539* (0.029)	-0.0044 (0.006)	-0.00302 (0.008)	-0.0283 (0.029)
Post_avg	-0.435* (0.223)	-0.225*** (0.028)	-0.274 (2.198)	-0.803*** (0.291)	-0.225*** (0.048)	-2.595** (1.098)	-1.125*** (0.225)	1.898 (10.500)	-1.138 (0.995)	-0.0056 (0.546)	-0.131 (0.114)	-0.0999 (0.177)	-0.191** (0.082)
Tm5	0.288 (0.309)	-0.0116** (0.006)	2.136 (2.100)	-0.0415 (0.105)	-0.0201 (0.014)	0.501 (0.573)	-0.07 (0.104)	3.929 (4.511)	0.339 (0.573)	0.4 (0.320)	0.0183 (0.022)	0.0371 (0.026)	-0.0189 (0.045)
Tm4	-0.124 (0.167)	-0.00725 (0.005)	-0.653 (0.955)	-0.0346 (0.085)	-0.00934 (0.012)	0.0889 (0.612)	-0.115* (0.062)	1.044 (5.065)	-0.673 (1.035)	0.434 (0.280)	0.0278 (0.023)	0.0377 (0.029)	-0.0108 (0.034)
Tm3	0.0715 (0.106)	-0.00809 (0.005)	0.585 (0.979)	0.00231 (0.094)	-0.0111 (0.010)	-0.804 (1.263)	0.0212 (0.053)	-2.935 (11.020)	-0.197 (0.470)	-0.47 (0.335)	-0.0212 (0.029)	-0.0324 (0.035)	0.0117 (0.043)
Tm2	0.0577 (0.094)	-0.000207 (0.005)	0.623 (0.917)	-0.0297 (0.072)	0.00693 (0.013)	0.799 (0.697)	0.14 (0.108)	5.397 (5.900)	0.216 (0.424)	0.349 (0.428)	0.019 (0.055)	0.0161 (0.070)	0.0429 (0.034)
Tm1	0.108 (0.087)	-0.00663 (0.006)	0.987 (0.863)	-0.0347 (0.059)	-0.0107 (0.016)	-0.214 (1.151)	-0.118 (0.076)	0.658 (8.731)	-0.257 (0.762)	0.23 (0.322)	0.0438 (0.037)	0.0241 (0.047)	0.0848** (0.041)
Tp0	-0.244** (0.110)	-0.0164*** (0.006)	-1.177 (1.192)	-0.210*** (0.066)	-0.0131 (0.014)	0.153 (0.751)	-0.155*** (0.050)	2.188 (5.441)	-1.250* (0.677)	-0.317 (0.251)	-0.000745 (0.027)	0.00125 (0.032)	-0.000754 (0.050)
Tp1	0.192 (0.252)	-0.0490*** (0.010)	1.749 (2.165)	-0.261** (0.104)	-0.0455** (0.020)	0.513 (0.776)	-0.404*** (0.106)	8.52 (6.303)	-0.856 (1.052)	-0.192 (0.341)	-0.046 (0.046)	-0.0156 (0.060)	-0.139** (0.064)
Tp2	0.0127 (0.326)	-0.0936*** (0.016)	0.291 (2.851)	-0.391* (0.204)	-0.0951*** (0.027)	0.977 (1.006)	-0.409*** (0.157)	15.44* (8.578)	-0.202 (1.454)	-0.401 (0.415)	-0.191*** (0.046)	-0.175*** (0.058)	-0.196*** (0.067)
Tp3	0.215 (0.473)	-0.139*** (0.020)	3.267 (4.225)	-0.348 (0.246)	-0.149*** (0.037)	-2.363 (2.001)	-0.718*** (0.159)	-7.477 (20.510)	0.937 (1.264)	-0.0548 (0.473)	-0.156*** (0.058)	-0.151* (0.077)	-0.0733 (0.088)
Tp4	0.0188 (0.483)	-0.154*** (0.030)	1.157 (4.308)	-0.444 (0.383)	-0.0676 (0.057)	-2.484 (2.065)	-0.930*** (0.250)	-11.63 (21.890)	-2.193 (1.734)	-0.307 (0.993)	-0.181*** (0.067)	-0.131 (0.088)	-0.300*** (0.100)
Tp5	-0.837** (0.374)	-0.188*** (0.025)	-8.697* (5.252)	-0.845*** (0.311)	-0.159*** (0.048)	-5.178** (2.390)	-0.990*** (0.234)	-27.06 (26.270)	-0.346 (2.009)	1.33 (1.602)	-0.111 (0.088)	-0.125 (0.106)	-0.111 (0.167)

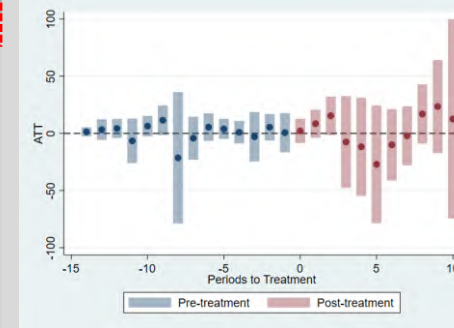
Total Sales– All Firms



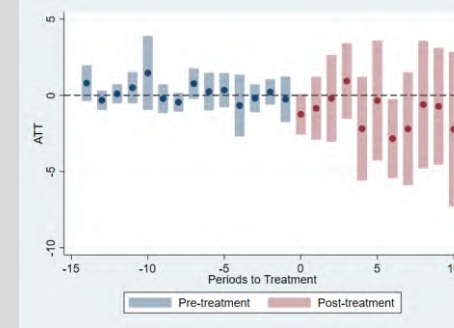
Total Sales– Small



Total Sales– Large



Total Sales– High-tech



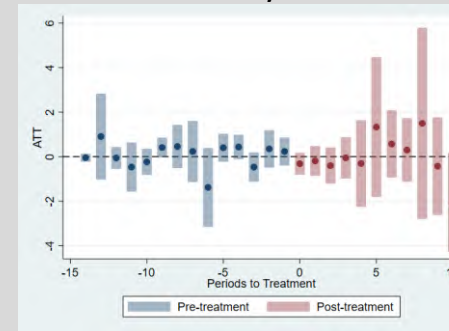
Rounded Observations	79000	69000	9000	19000	16000	74000	64000	9000	18000	79000	69000	52000	16000
Chi2	95.1338	116.8257	92.8743	92.9444	107.1064	85.2092	104.0742	98.6558	97.0309	92.8129	119.1774	104.8545	115.7335
Pre-trend test p-value	0.5913	0.1066	0.6543	0.6524	0.2715	0.8369	0.3439	0.4909	0.5372	0.656	0.0818	0.3244	0.12

NRC-IRAP, Advisory Services, Output Additionality

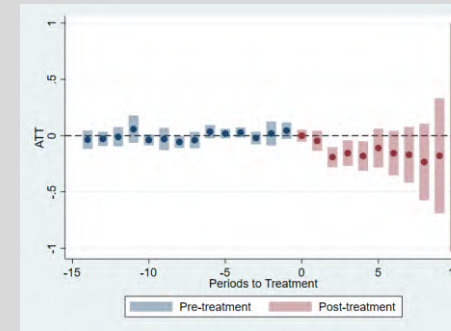
OUTCOME	Total Wage (\$M)					Total Sales (\$M)				R&D Labour Efficiency (\$M)			
	All Firms	Small	Large	HighTech	Small-HighTech	All Firms	Small	Large	HighTech	All Firms	Small	Sall-LowTech	Small-HighTech
Pre_avg	0.0283 (0.018)	-0.00319 (0.002)	0.302 (0.203)	-0.00108 (0.033)	-0.00849 (0.005)	0.0453 (0.157)	-0.00372 (0.019)	0.605 (1.303)	0.163 (0.121)	0.0539* (0.029)	-0.0044 (0.006)	-0.00302 (0.008)	-0.0283 (0.029)
Post_avg	-0.435* (0.223)	-0.225*** (0.028)	-0.274 (2.198)	-0.803*** (0.291)	-0.225*** (0.048)	-2.595** (1.098)	-1.125*** (0.225)	1.898 (10.500)	-1.138 (0.995)	-0.0056 (0.546)	-0.131 (0.114)	-0.0999 (0.177)	-0.191** (0.082)
Tm5	0.288 (0.309)	-0.0116** (0.006)	2.136 (2.100)	-0.0415 (0.105)	-0.0201 (0.014)	0.501 (0.573)	-0.07 (0.104)	3.929 (4.511)	0.339 (0.573)	0.4 (0.320)	0.0183 (0.022)	0.0371 (0.026)	-0.0189 (0.045)
Tm4	-0.124 (0.167)	-0.00725 (0.005)	-0.653 (0.955)	-0.0346 (0.085)	-0.00934 (0.012)	0.0889 (0.612)	-0.115* (0.062)	1.044 (5.065)	-0.673 (1.035)	0.434 (0.280)	0.0278 (0.023)	0.0377 (0.029)	-0.0108 (0.034)
Tm3	0.0715 (0.106)	-0.00809 (0.005)	0.585 (0.979)	0.00231 (0.094)	-0.0111 (0.010)	-0.804 (1.263)	0.0212 (0.053)	-2.935 (11.020)	-0.197 (0.470)	-0.47 (0.335)	-0.0212 (0.029)	-0.0324 (0.035)	0.0117 (0.043)
Tm2	0.0577 (0.094)	-0.000207 (0.005)	0.623 (0.917)	-0.0297 (0.072)	0.00693 (0.013)	0.799 (0.697)	0.14 (0.108)	5.397 (5.900)	0.216 (0.424)	0.349 (0.428)	0.019 (0.055)	0.0161 (0.070)	0.0429 (0.034)
Tm1	0.108 (0.087)	-0.00663 (0.006)	0.987 (0.863)	-0.0347 (0.059)	-0.0107 (0.016)	-0.214 (1.151)	-0.118 (0.076)	0.658 (8.731)	-0.257 (0.762)	0.23 (0.322)	0.0438 (0.037)	0.0241 (0.047)	0.0848** (0.041)
Tp0	-0.244** (0.110)	-0.0164*** (0.006)	-1.177 (1.192)	-0.210*** (0.066)	-0.0131 (0.014)	0.153 (0.751)	-0.155*** (0.050)	2.188 (5.441)	-1.250* (0.677)	-0.317 (0.251)	-0.000745 (0.027)	0.00125 (0.032)	-0.000754 (0.050)
Tp1	0.192 (0.252)	-0.0490*** (0.010)	1.749 (2.165)	-0.261** (0.104)	-0.0455** (0.020)	0.513 (0.776)	-0.404*** (0.106)	8.52 (6.303)	-0.856 (1.052)	-0.192 (0.341)	-0.046 (0.046)	-0.0156 (0.060)	-0.139** (0.064)
Tp2	0.0127 (0.326)	-0.0936*** (0.016)	0.291 (2.851)	-0.391* (0.204)	-0.0951*** (0.027)	0.977 (1.006)	-0.409*** (0.157)	15.44* (8.578)	-0.202 (1.454)	-0.401 (0.415)	-0.191*** (0.046)	-0.175*** (0.058)	-0.196*** (0.067)
Tp3	0.215 (0.473)	-0.139*** (0.020)	3.267 (4.225)	-0.348 (0.246)	-0.149*** (0.037)	-2.363 (2.001)	-0.718*** (0.159)	-7.477 (20.510)	0.937 (1.264)	-0.0548 (0.473)	-0.156*** (0.058)	-0.151* (0.077)	-0.0733 (0.088)
Tp4	0.0188 (0.483)	-0.154*** (0.030)	1.157 (4.308)	-0.444 (0.383)	-0.0676 (0.057)	-2.484 (2.065)	-0.930*** (0.250)	-11.63 (21.890)	-2.193 (1.734)	-0.307 (0.993)	-0.181*** (0.067)	-0.131 (0.088)	-0.300*** (0.100)
Tp5	-0.837** (0.374)	-0.188*** (0.025)	-8.697* (5.252)	-0.845*** (0.311)	-0.159*** (0.048)	-5.178** (2.390)	-0.990*** (0.234)	-27.06 (26.270)	-0.346 (2.009)	1.33 (1.602)	-0.111 (0.088)	-0.125 (0.106)	-0.111 (0.167)

Rounded Observations	79000	69000	9000	19000	16000	74000	64000	9000	18000	79000	69000	52000	16000
Chi2	95.1338	116.8257	92.8743	92.9444	107.1064	85.2092	104.0742	98.6558	97.0309	92.8129	119.1774	104.8545	115.7335
Pre-trend test p-value	0.5913	0.1066	0.6543	0.6524	0.2715	0.8369	0.3439	0.4909	0.5372	0.656	0.0818	0.3244	0.12

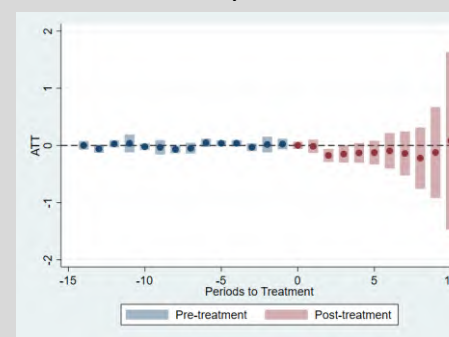
Labour Efficiency– All Firms



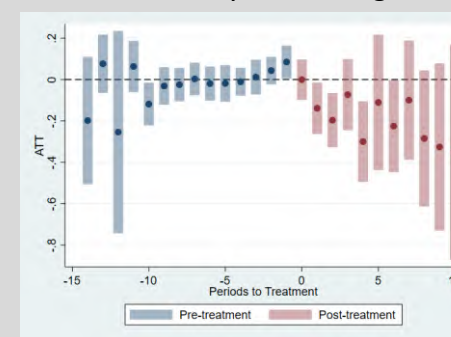
Labour Efficiency– Small



Labour Efficiency– Small-Low-tech

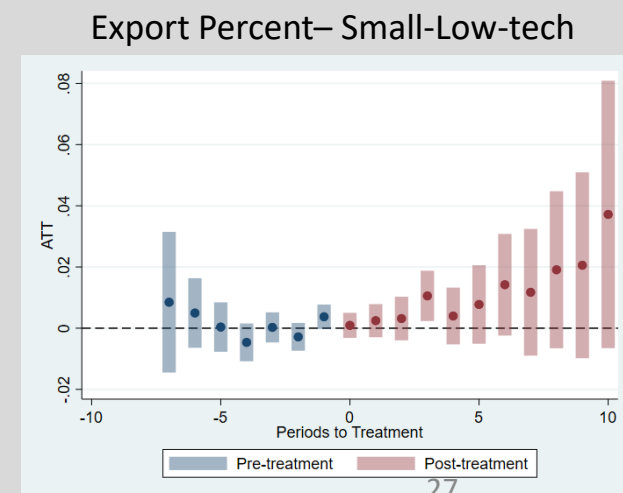
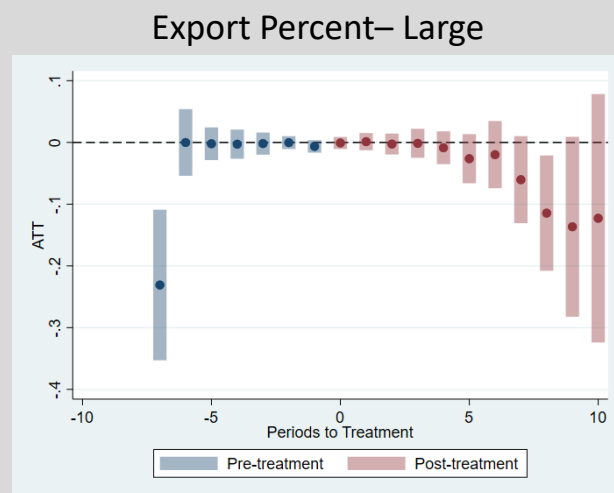
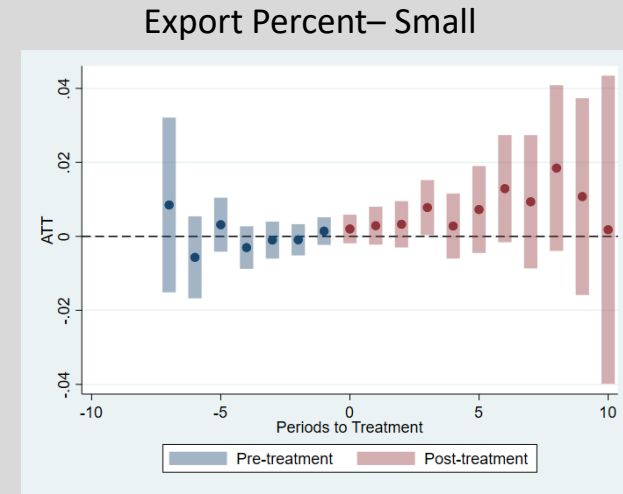
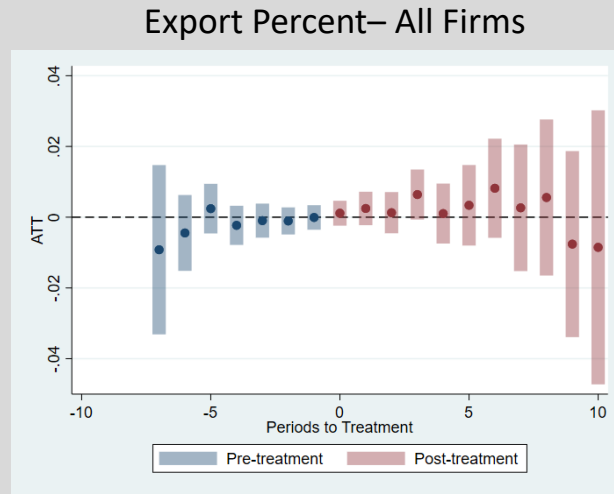


Labour Efficiency– Small-High-tech



NRC-IRAP, Advisory Services, Output Additionality

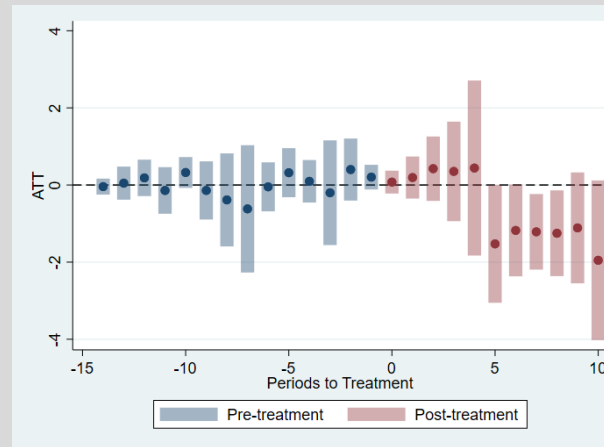
OUTCOME	Export Percent				Gross Profit-loss (\$M)		Number of Patents	
	All Firms	Small	Large	Small-Low-Tech	All Firms	Small	All Firms	Small-Low-Tech
Pre_avg	-0.00224 (0.002)	0.000348 (0.002)	-0.00121 (0.002)	0.00148 (0.002)	-0.000109 (0.056)	-0.0116** (0.005)	-0.00563 (0.015)	-0.017 (0.015)
Post_avg	0.00145 (0.006)	0.0072 (0.006)	0.00327 (0.006)	0.0120* (0.007)	-0.614 (0.406)	-0.319*** (0.072)	-0.159 (0.106)	-0.255*** (0.095)
Tm5	0.00242 (0.004)	0.00315 (0.004)	0.000865 (0.004)	0.000369 (0.004)	0.319 (0.325)	0.0145 (0.016)	-0.111 (0.127)	-0.0838 (0.053)
Tm4	-0.00231 (0.003)	-0.00303 (0.003)	-0.00409 (0.003)	-0.00464 (0.003)	0.0958 (0.281)	-0.0146 (0.022)	-0.00662 (0.139)	0.0298 (0.060)
Tm3	-0.000975 (0.002)	-0.00101 (0.003)	0.000629 (0.002)	0.000257 (0.003)	-0.201 (0.693)	-0.0298 (0.028)	-0.123 (0.109)	-0.028 (0.069)
Tm2	-0.00106 (0.002)	-0.000932 (0.002)	-0.00174 (0.002)	-0.00283 (0.002)	0.401 (0.410)	0.0229 (0.028)	0.0773 (0.085)	-0.0274 (0.045)
Tm1	-0.0000789 (0.002)	0.00143 (0.002)	0.0021 (0.002)	0.00375* (0.002)	0.204 (0.163)	-0.0322 (0.024)	-0.0624 (0.103)	0.0503 (0.056)
Tp0	0.00112 (0.002)	0.00199 (0.002)	-0.0000641 (0.002)	0.000923 (0.002)	0.0752 (0.151)	-0.0542*** (0.019)	-0.0879 (0.097)	-0.0467 (0.084)
Tp1	0.00247 (0.002)	0.00289 (0.003)	0.00213 (0.003)	0.00245 (0.003)	0.193 (0.278)	-0.146*** (0.034)	-0.0388 (0.105)	-0.0217 (0.068)
Tp2	0.00127 (0.003)	0.00326 (0.003)	0.00035 (0.003)	0.00315 (0.004)	0.423 (0.426)	-0.151*** (0.033)	-0.043 (0.105)	-0.138** (0.054)
Tp3	0.00640* (0.004)	0.00779** (0.004)	0.00666* (0.004)	0.0106** (0.004)	0.353 (0.659)	-0.188*** (0.044)	0.0059 (0.131)	-0.117** (0.059)
Tp4	0.00103 (0.004)	0.00279 (0.004)	-0.00134 (0.005)	0.00398 (0.005)	0.44 (1.158)	-0.241*** (0.068)	-0.135 (0.111)	-0.163** (0.065)
Tp5	0.00336 (0.006)	0.00725 (0.006)	0.00242 (0.006)	0.00775 (0.007)	-1.528** (0.779)	-0.287*** (0.068)	-0.00953 (0.123)	-0.169** (0.074)
Rounded Observations	77000	66000	58000	50000	78000	67000	79000	52000
Chi2	30.0248	30.743	30.5816	32.9156	87.1048	118.5189	100.0444	82.104
Pre-trend test p-value	0.362	0.3286	0.336	0.2389	0.7978	0.0882	0.0236	0.2427



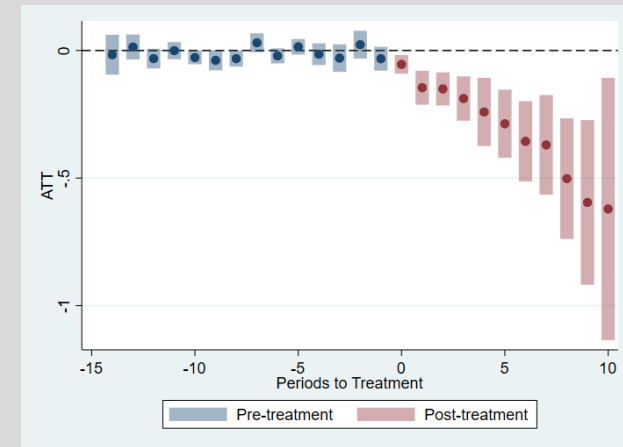
NRC-IRAP, Advisory Services, Output Additionality

OUTCOME	Export Percent				Gross Profit-loss (\$M)		Number of Patents	
	All Firms	Small	Large	Small-Low-Tech	All Firms	Small	All Firms	Small-Low-Tech
Pre_avg	-0.00224 (0.002)	0.000348 (0.002)	-0.00121 (0.002)	0.00148 (0.002)	-0.000109 (0.056)	-0.0116** (0.005)	-0.00563 (0.015)	-0.017 (0.015)
Post_avg	0.00145 (0.006)	0.0072 (0.006)	0.00327 (0.006)	0.0120* (0.007)	-0.614 (0.406)	-0.319*** (0.072)	-0.159 (0.106)	-0.255*** (0.095)
Tm5	0.00242 (0.004)	0.00315 (0.004)	0.000865 (0.004)	0.000369 (0.004)	0.319 (0.325)	0.0145 (0.016)	-0.111 (0.127)	-0.0838 (0.053)
Tm4	-0.00231 (0.003)	-0.00303 (0.003)	-0.00409 (0.003)	-0.00464 (0.003)	0.0958 (0.281)	-0.0146 (0.022)	-0.00662 (0.139)	0.0298 (0.060)
Tm3	-0.000975 (0.002)	-0.00101 (0.003)	0.000629 (0.002)	0.000257 (0.003)	-0.201 (0.693)	-0.0298 (0.028)	-0.123 (0.109)	-0.028 (0.069)
Tm2	-0.00106 (0.002)	-0.000932 (0.002)	-0.00174 (0.002)	-0.00283 (0.002)	0.401 (0.410)	0.0229 (0.028)	0.0773 (0.085)	-0.0274 (0.045)
Tm1	-0.0000789 (0.002)	0.00143 (0.002)	0.0021 (0.002)	0.00375* (0.002)	0.204 (0.163)	-0.0322 (0.024)	-0.0624 (0.103)	0.0503 (0.056)
Tp0	0.00112 (0.002)	0.00199 (0.002)	-0.0000641 (0.002)	0.000923 (0.002)	0.0752 (0.151)	-0.0542*** (0.019)	-0.0879 (0.097)	-0.0467 (0.084)
Tp1	0.00247 (0.002)	0.00289 (0.003)	0.00213 (0.003)	0.00245 (0.003)	0.193 (0.278)	-0.146*** (0.034)	-0.0388 (0.105)	-0.0217 (0.068)
Tp2	0.00127 (0.003)	0.00326 (0.003)	0.00035 (0.003)	0.00315 (0.004)	0.423 (0.426)	-0.151*** (0.033)	-0.043 (0.105)	-0.138** (0.054)
Tp3	0.00640* (0.004)	0.00779** (0.004)	0.00666* (0.004)	0.0106** (0.004)	0.353 (0.659)	-0.188*** (0.044)	0.0059 (0.131)	-0.117** (0.059)
Tp4	0.00103 (0.004)	0.00279 (0.004)	-0.00134 (0.005)	0.00398 (0.005)	0.44 (1.158)	-0.241*** (0.068)	-0.135 (0.111)	-0.163** (0.065)
Tp5	0.00336 (0.006)	0.00725 (0.006)	0.00242 (0.006)	0.00775 (0.007)	-1.528** (0.779)	-0.287*** (0.068)	-0.00953 (0.123)	-0.169** (0.074)
Rounded Observations	77000	66000	58000	50000	78000	67000	79000	52000
Chi2	30.0248	30.743	30.5816	32.9156	87.1048	118.5189	100.0444	82.104
Pre-trend test p-value	0.362	0.3286	0.336	0.2389	0.7978	0.0882	0.0236	0.2427

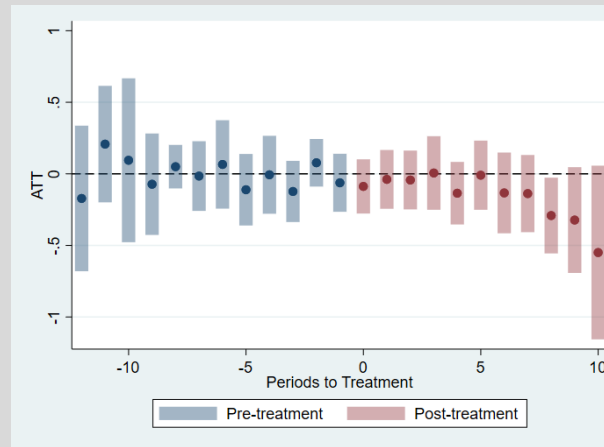
Gross Profit-Loss– All Firms



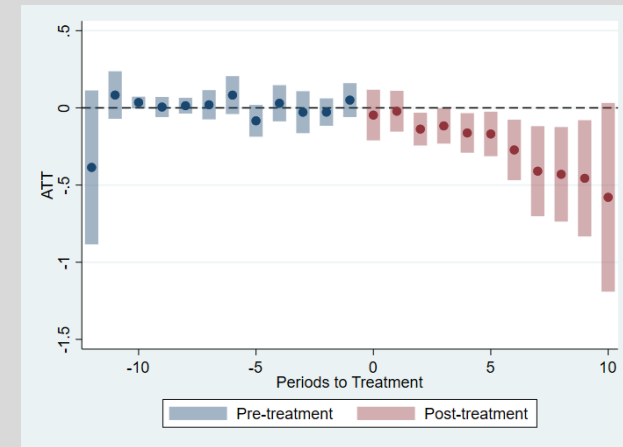
Gross Profit-Loss– Small Firms



Number of Patents– All Firms



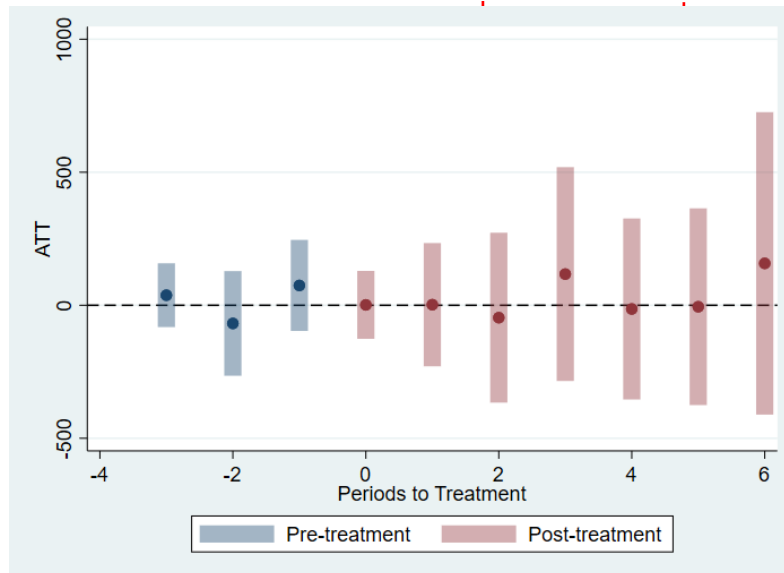
Number of Patents– Small-Low-tech



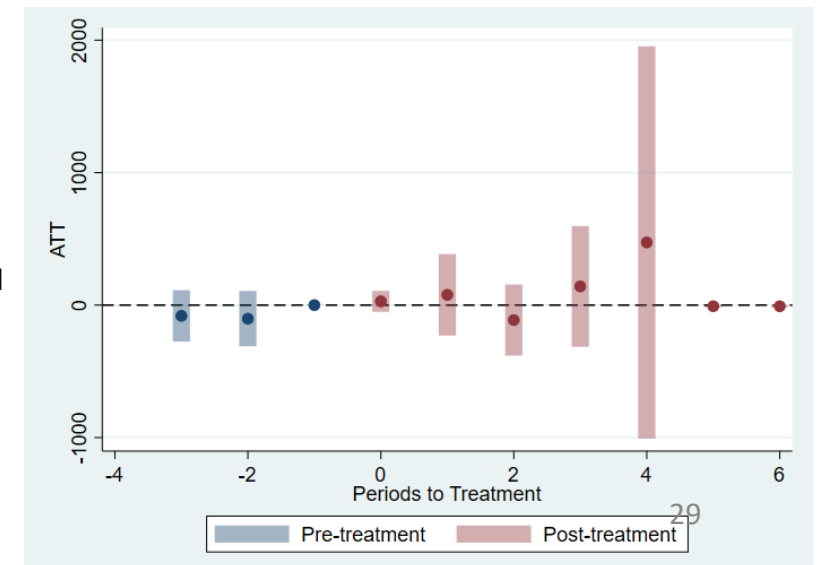
NSERC-CRD & IEG (Employees and Tangible capital)

	t-3	t-2	t-1	t	t+1	t+2	t+3	t+4	t+5	t+6	Rounded Obs.
Number of employees	37.81	-68.33	74.49	1.415	2.143	-46.71	117.2	-13.94	-5.48	157.4	29000
	(61.19)	(100.3)	(87.32)	(65.12)	(118.2)	(162.9)	(205)	(173.6)	(188.7)	(290)	
Tangible capital	-81.29	-102.3	0.0608	28.22	77.49	-112.9	140.8	473.2	-8.453**	-8.689**	23000
	(98.93)	(106.5)	(0.955)	(40.36)	(156.8)	(137)	(232.5)	(755.3)	(4.024)	(4.26)	

Employees



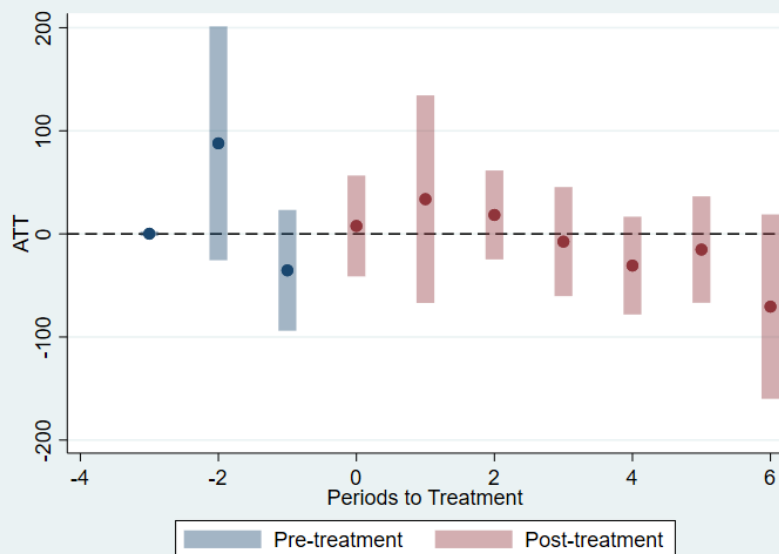
Tangible capital



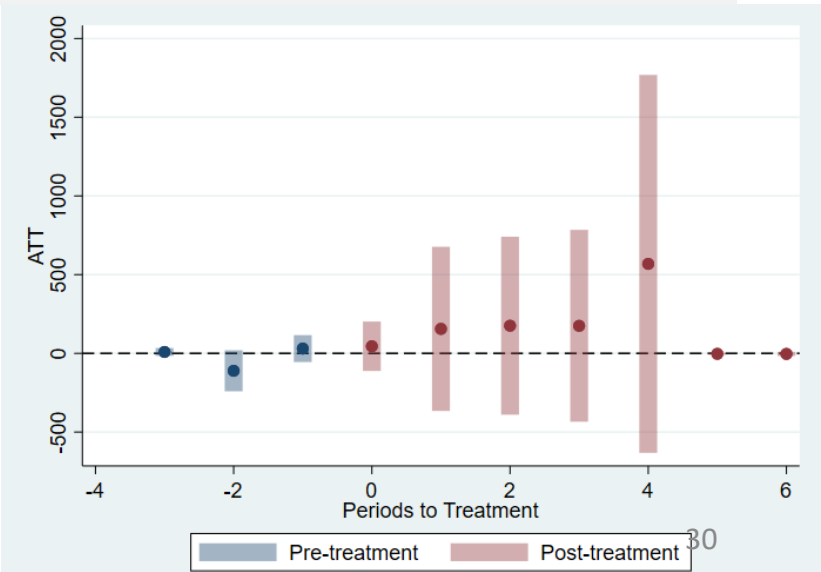
NSERC-CRD & IEG (Output additionality)

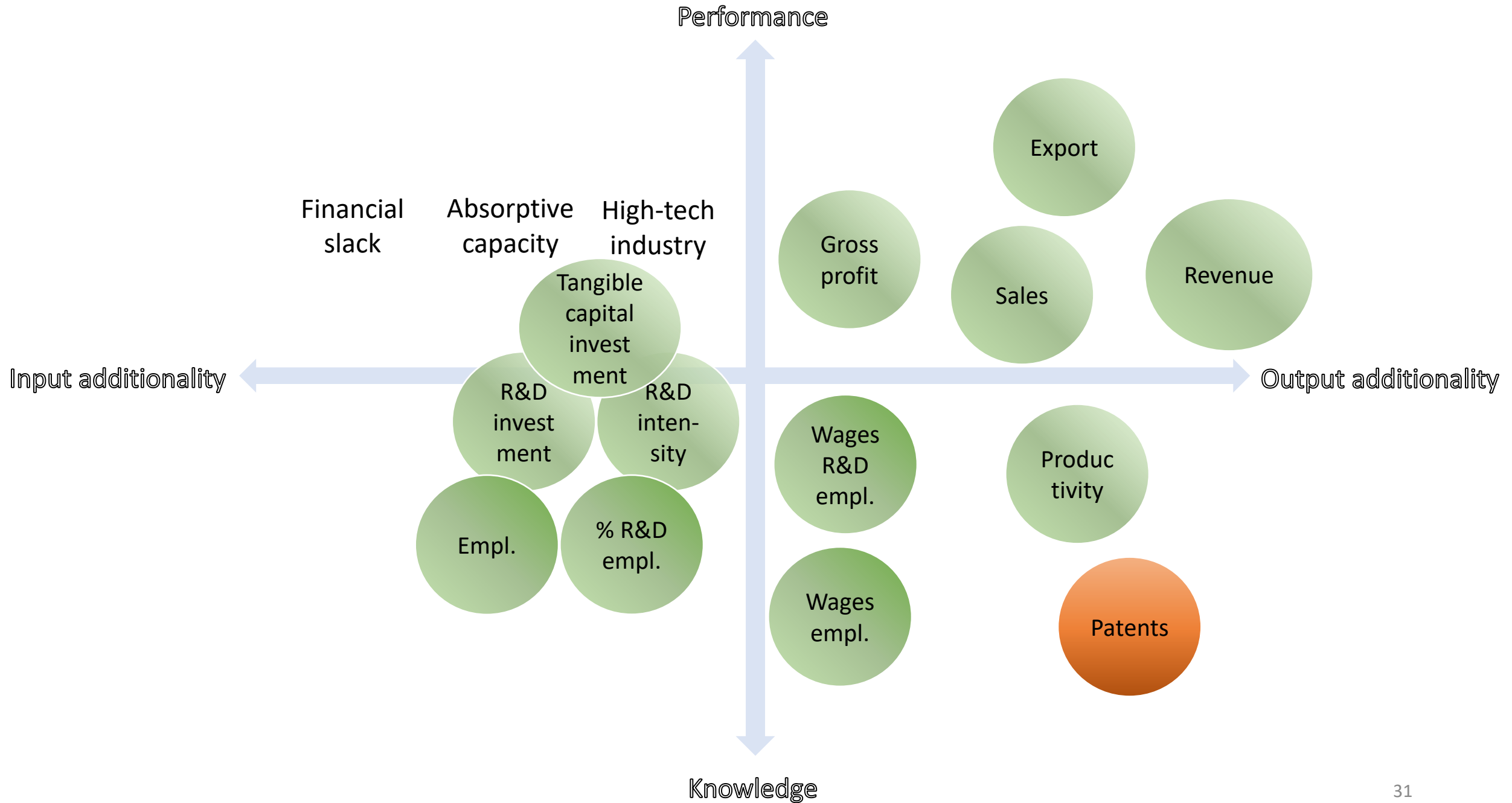
	t-3	t-2	t-1	t	t+1	t+2	t+3	t+4	t+5	t+6	Rounded Obs
Total revenue	8.769	-110.8*	30.24	44.95	155.4	175.6	174.9	568.3	-3.087	-3.524	24000
	(12.64)	(66.55)	(43.66)	(80.06)	(266)	(288.4)	(310.9)	(612.4)	(3.193)	(6.693)	
Number of patents	0.199	87.86	-35.37	7.683	33.7	18.39	-7.476	-30.74	-15.2	-70.54	29000
	(1.2)	(57.85)	(29.89)	(24.96)	(51.38)	(22)	(26.98)	(24.21)	(26.34)	(45.63)	

Patents



Total revenue



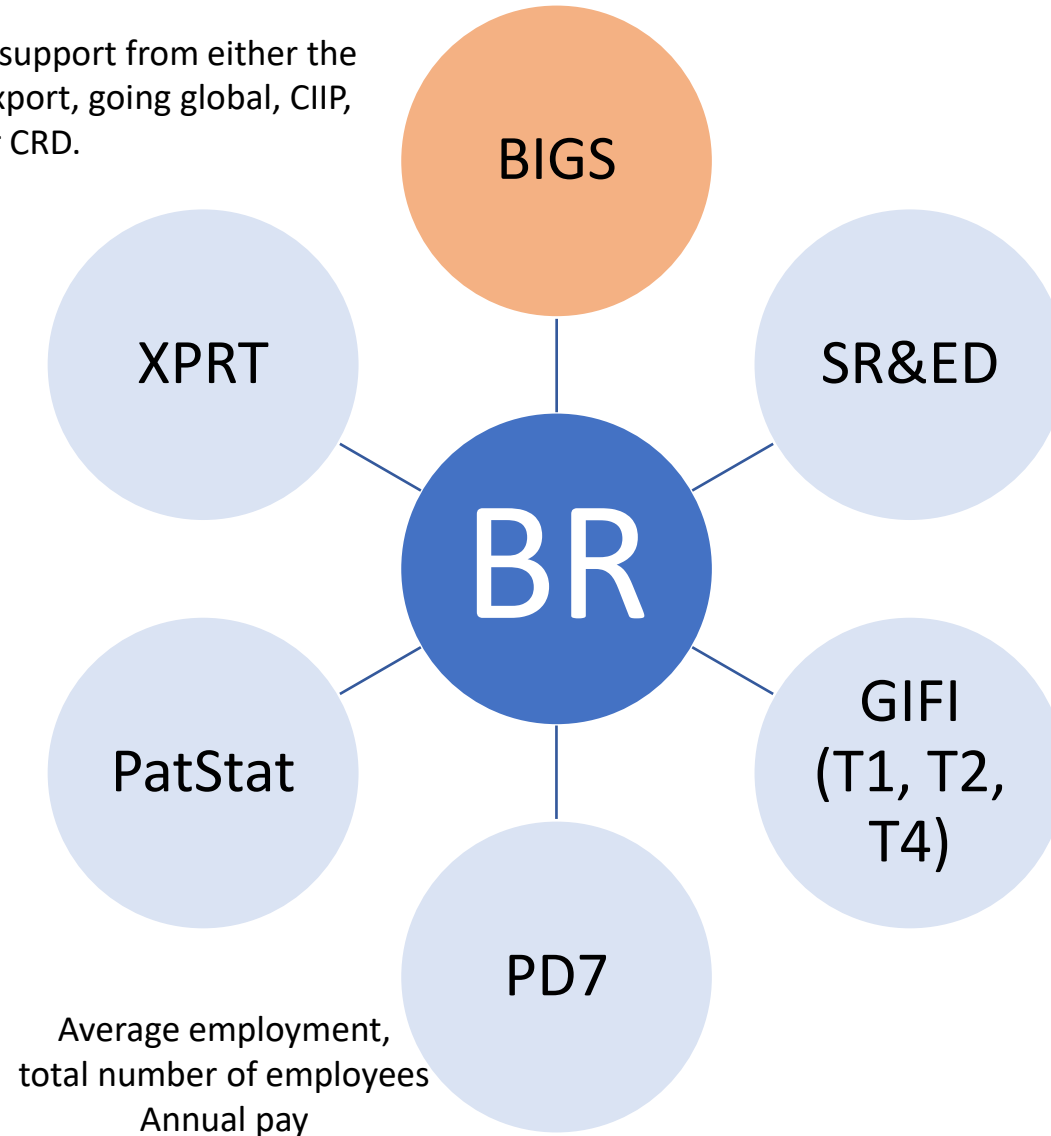




Analysis

Data

Firm that have received support from either the BDP, SINED, IRAP, Can export, going global, CIIP, IEG or CRD.

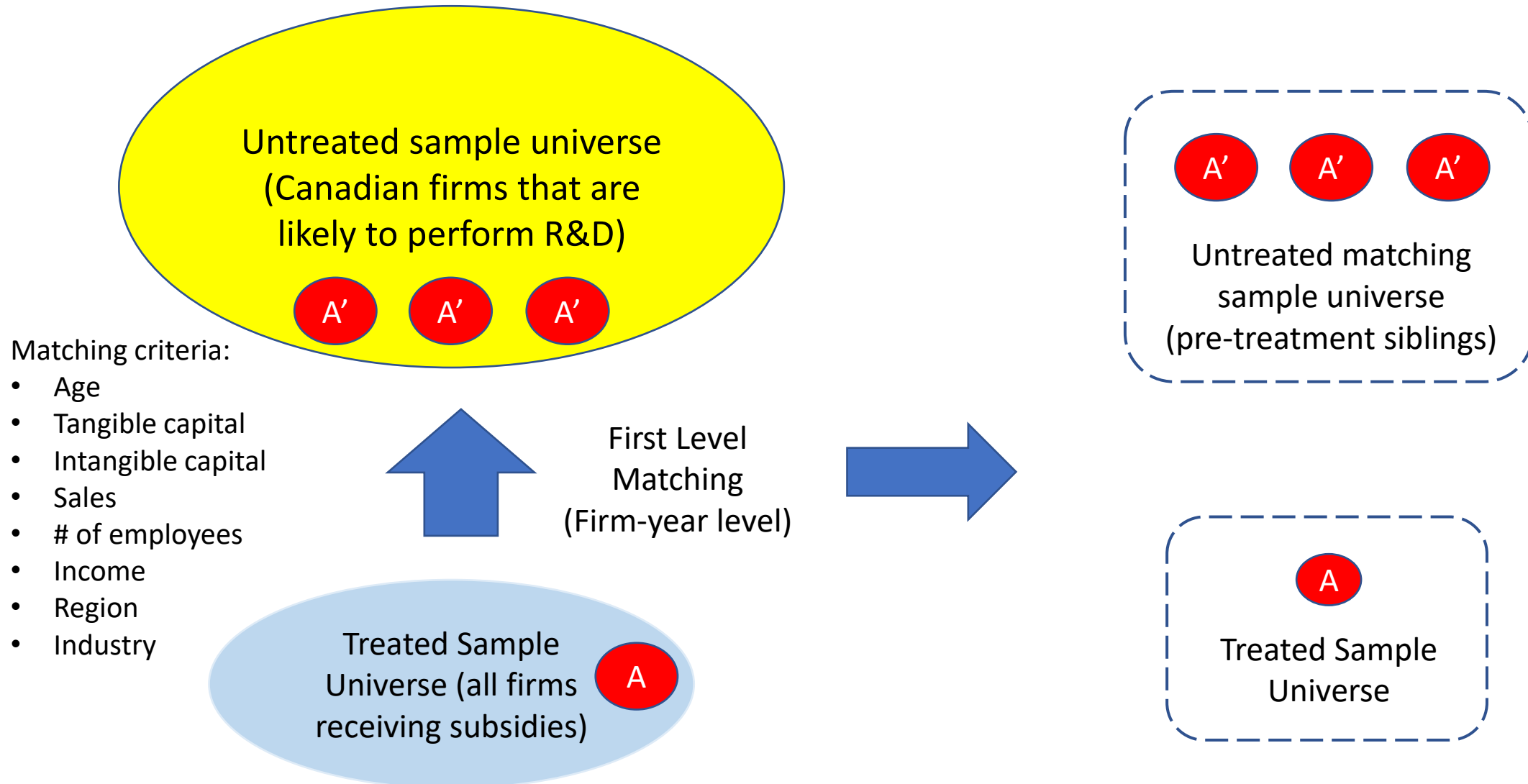


Total amount expenditures of SR&ED:
R&D total expenditure, material, capital and other R&D expenditures, R&D employees including scientist and engineers, technologist and technicians, managers and administrators, technical support, wages and salaries for R&D employees, and contract research

Total current assets, capital assets, intangible assets, long term investments, liabilities, long-term debt, shareholders equity, earnings, sales, revenues, expenses, and salaries and wages.

Average employment,
total number of employees
Annual pay

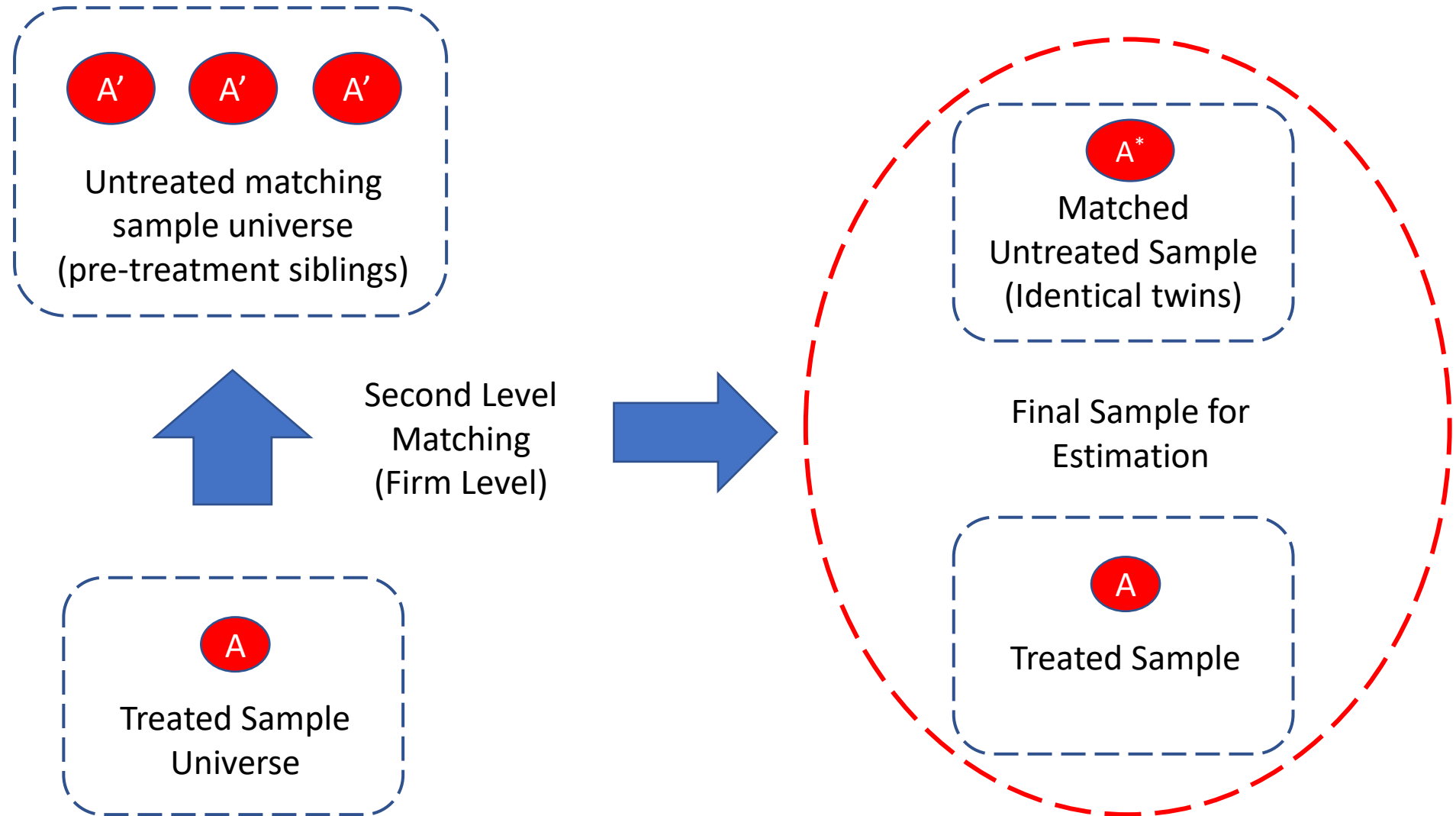
Analysis – PSM Procedures Step 1



Analysis – PSM Procedures Step 2

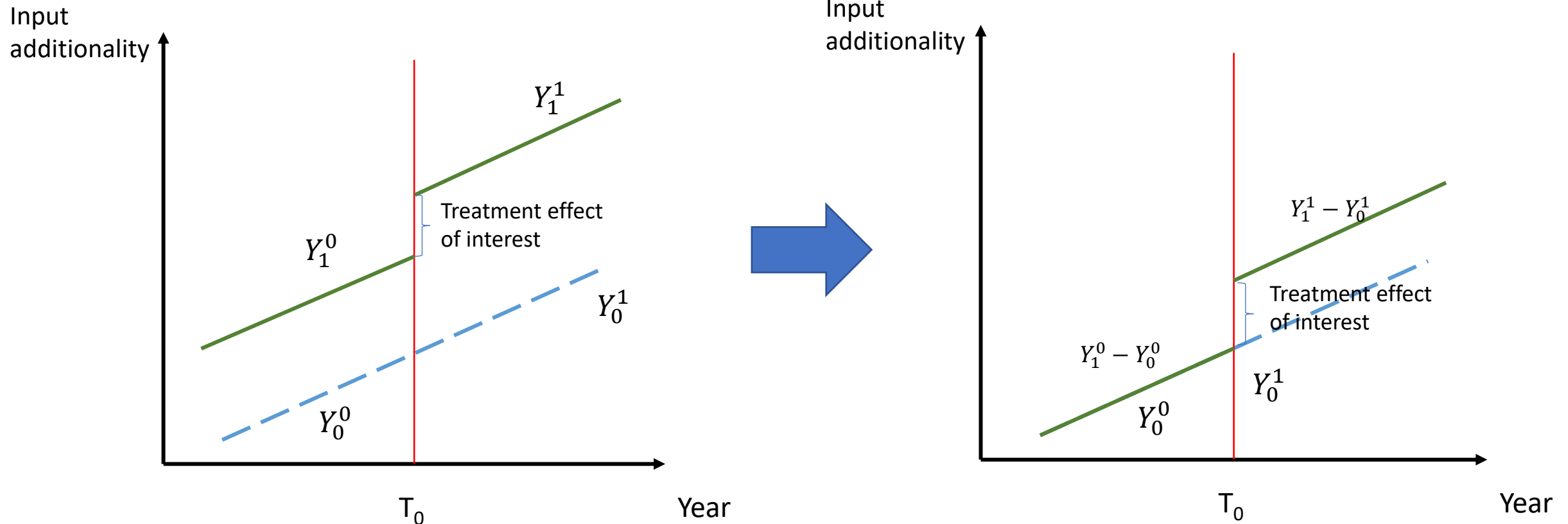
Matching Criteria:

- Age
- Profitability
- R&D intensity
- Size
- Labour efficiency
- Industry
- Economic Region



Input Additionality ACOA-BDP

Two Way Fixed Effect DiD Model



$$\text{Average Treatment Effect (ATT)} = E(Y_1^1 - Y_0^1) - E(Y_1^0 - Y_0^0)$$

Regression Models (1)

$$Y_{it} = \alpha + \beta_1 * \rho_{it} + \theta_t + \delta_i + X'\Gamma + \varepsilon_{it}$$

Where:

ρ_{it} = *Dummy variable that equals 1 if the firm receives ACOA. subsidies in year t, 0 otherwise (impact assessment of ACOA).*

or

ρ_{it} = *Amount of subsidies received from ACOA (NRC) in year t (comparison analysis).*

θ_t = *year fixed-effects.*

δ_i = *Group dummy that equals 1 if the firm is in the treatment group.*

X' = *The vector of control variables.*

Regression Models (2)

$$Y_{it} = \alpha + \beta_1 * \pi_{it} * \mu_{it} + \beta_2 * \pi_{it} + \beta_3 * \mu_{it} + \theta_t + \delta_i + X' \Gamma + \varepsilon_{it}$$

Where:

π_{it} = *Total amount of subsidies received from both ACOA & NRC in year t.*

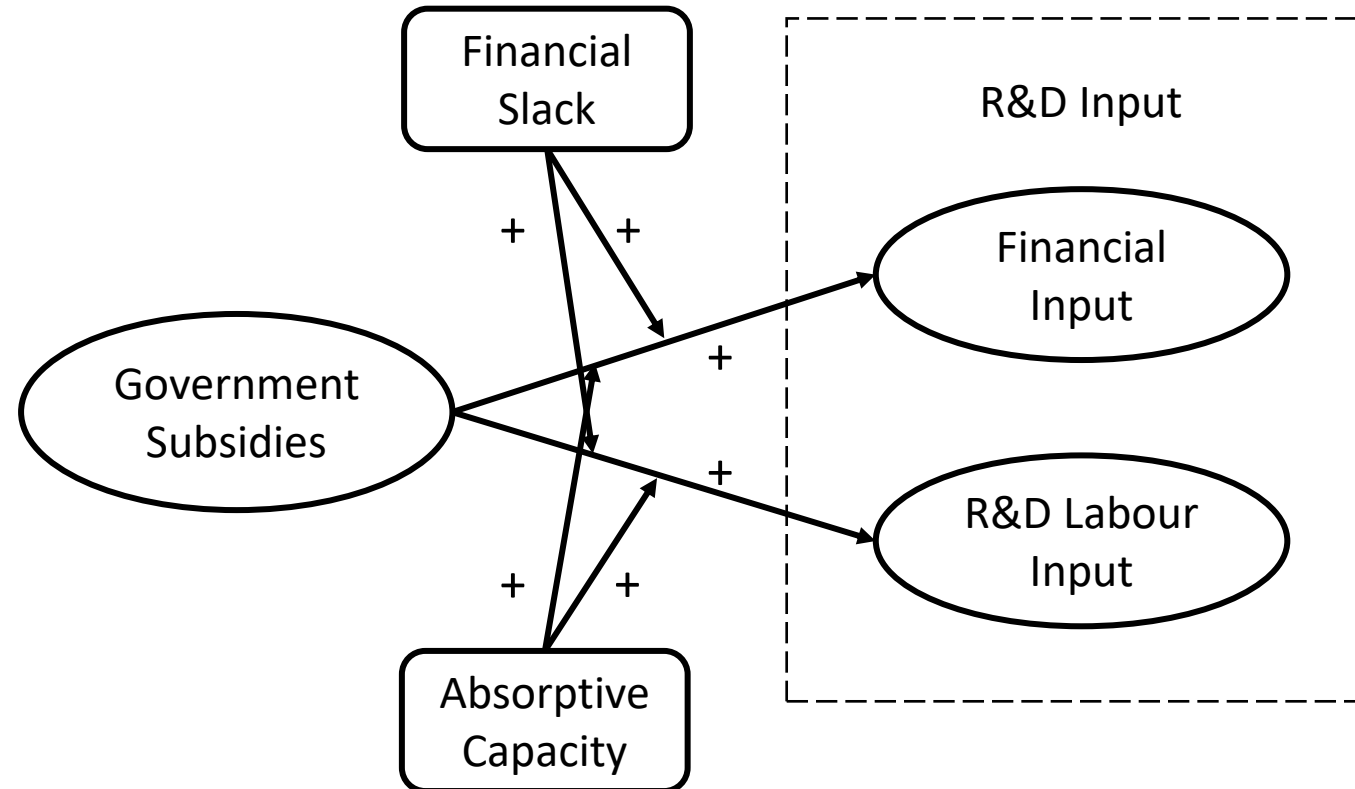
μ_{it} = *Dummy variable that equals 1 if the amount is at least partially provided by NRC, 0 if the amount is solely provided by ACOA.*

θ_t = *Year fixed-effects.*

δ_i = *Group dummy that equals 1 if the firm is in the treatment group.*

X' = *The vector of control variables.*

Input Additionality ACOA-BDP - Theoretical Model



Analysis CSDID

Illustrative example: Treatment Time Variation

Grant received in T :

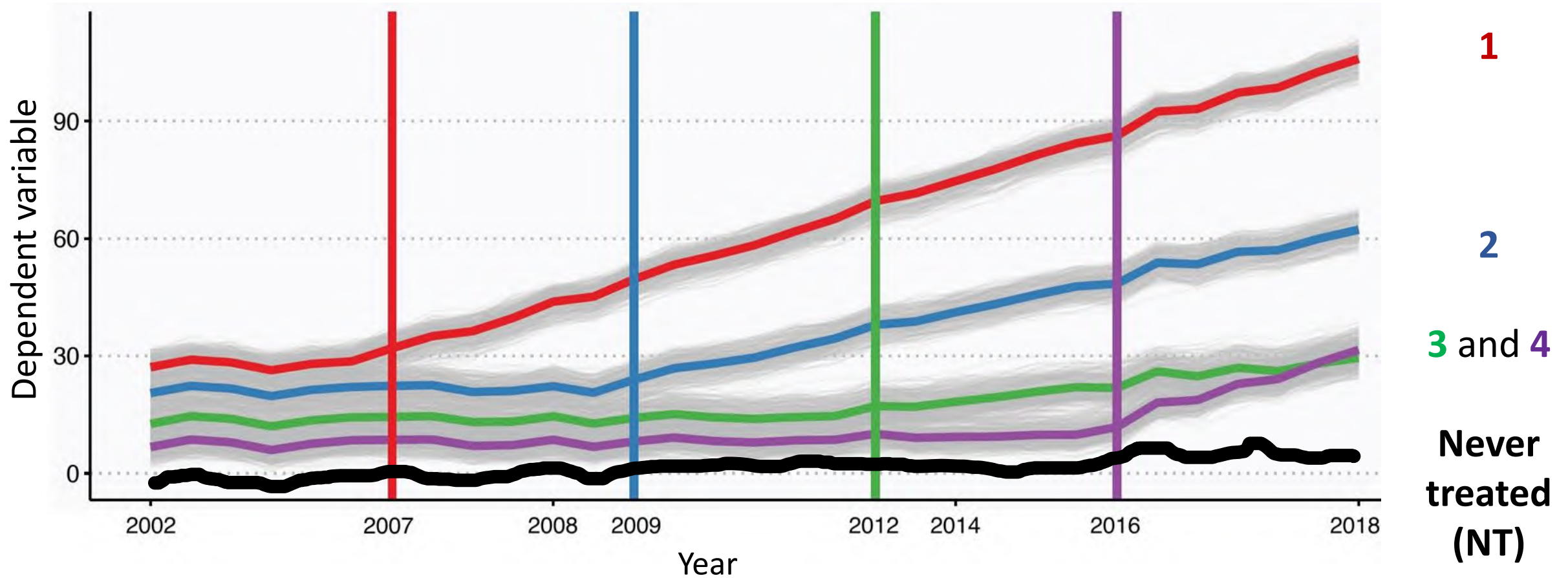
2007

2009

2012

2016

Treatment
groups G :



Breaking down GxT DID to multiple 2x2 DID

		Group G				
		1	2	3	4	NT
Time T	2007	Treated	Not-yet treated	Not-yet treated	Not-yet treated	Never treated (NT)
	2009	Treated	Treated	Not-yet treated	Not-yet treated	Never treated (NT)
	2012	Treated	Treated	Treated	Not-yet treated	Never treated (NT)
	2016	Treated	Treated	Treated	Treated	Never treated (NT)

Treated

Not-yet treated

Never treated (NT)

Average Treatment on the Treated: $ATT(g,t)$

ATT(2, '09)		Group G				
		1	2	3	4	NT
Time T	'07	Orange	Blue X	Blue	Blue	Green X
	'09		Orange X			Green X
	'12		Orange	Blue	Green	
	'16					Orange

ATT(2, '12)		Group G				
		1	2	3	4	NT
Time T	'07	Orange	Blue X	Blue	Blue	Green X
	'09		Orange			Green X
	'12		Orange X	Blue	Green	
	'16		Orange			

ATT(2, '16)		Group G				
		1	2	3	4	NT
Time T	'07	Orange	Blue X	Blue	Blue	Green X
	'09		Orange			Green X
	'12		Orange	Blue	Green	
	'16					Orange X

ATT(3, '12)		Group G				
		1	2	3	4	NT
Time T	'07	Orange	Blue	Blue	Blue	Green
	'09					
	'12		Orange	Orange X	Blue	Green
	'16			Orange		

ATT(3, '16)		Group G				
		1	2	3	4	NT
Time T	'07	Orange	Blue	Blue	Blue	Green
	'09					
	'12		Orange	Orange	Blue	Green
	'16			Orange X		

ATT(4, '16)		Group G					
		1	2	3	4	NT	
Time T	'07	Orange	Blue	Blue	Blue	Green	
	'09						Orange
	'12		Orange	Blue	Green	Blue X	Green X
	'16					Orange	Orange X

TWFE ATT is a weighted average of $ATT(g,t)$'s (1/2)

Bacon Decomposition (Goodman-Bacon, 2021)

Comparison group:

Never Treated

ATT(3,'12)		Group G					
		1	2	3	4	NT	
Time T	'07						
	'09						
	'12						
	'16						

Not-yet Treated

ATT(3,'12)		Group G					
		1	2	3	4	NT	
Time T	'07						
	'09						
	'12						
	'16						

Already Treated

ATT(3,'12)		Group G					
		1	2	3	4	NT	
Time T	'07						
	'09						
	'12						
	'16						

TWFE ATT is a weighted average of $ATT(g,t)$'s (2/2)

Bacon Decomposition (Goodman-Bacon, 2021)

Comparison group:

Never Treated

ATT(3,'12)		Group G					
		1	2	3	4	NT	
Time T	'07						
	'09						
	'12						
	'16						

Not-yet Treated

ATT(3,'12)		Group G					
		1	2	3	4	NT	
Time T	'07						
	'09						
	'12						
	'16						

Already Treated

ATT(3,'12)		Group G					
		1	2	3	4	NT	
Time T	'07						
	'09						
	'12						
	'16						

Forbidden ATT(g,t)'s (de Chaisemartin and Hauptfallet, 2020)

		Group G					
		1	2	3	4	NT	
Time T	'07		<div style="display: flex; justify-content: space-around;"> X X </div>				
	'09						
	'12		<div style="display: flex; justify-content: space-around;"> X X </div>				
	'16						

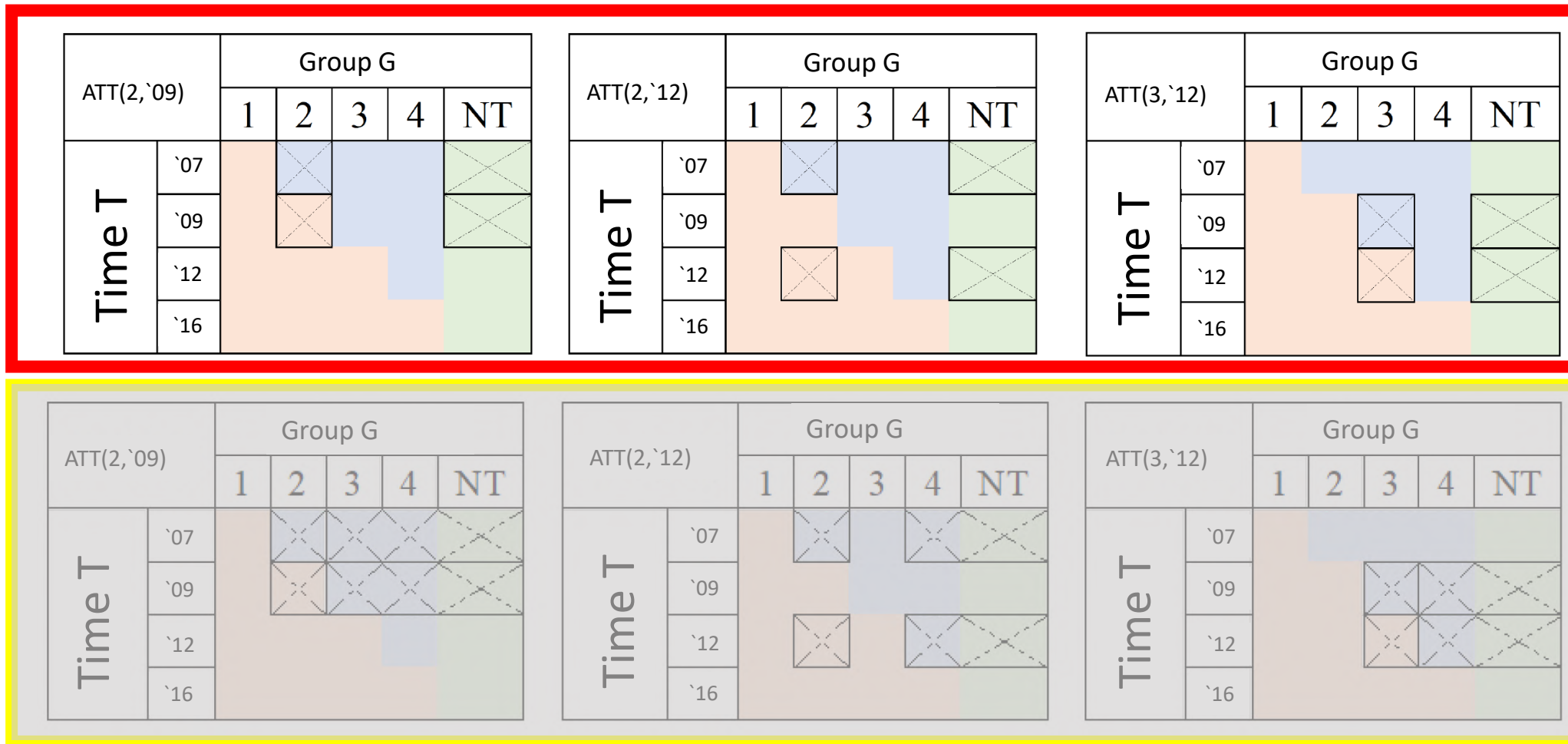
		Group G					
		1	2	3	4	NT	
Time T	'07		<div style="display: flex; justify-content: space-around;"> X X </div>				
	'09						
	'12		<div style="display: flex; justify-content: space-around;"> X X </div>				
	'16						

		Group G					
		1	2	3	4	NT	
Time T	'07		<div style="display: flex; justify-content: space-around;"> X X </div>				
	'09						
	'12		<div style="display: flex; justify-content: space-around;"> X X </div>				
	'16						

		Group G					
		1	2	3	4	NT	
Time T	'07		<div style="display: flex; justify-content: space-around;"> X X </div>				
	'09						
	'12		<div style="display: flex; justify-content: space-around;"> X X </div>				
	'16						

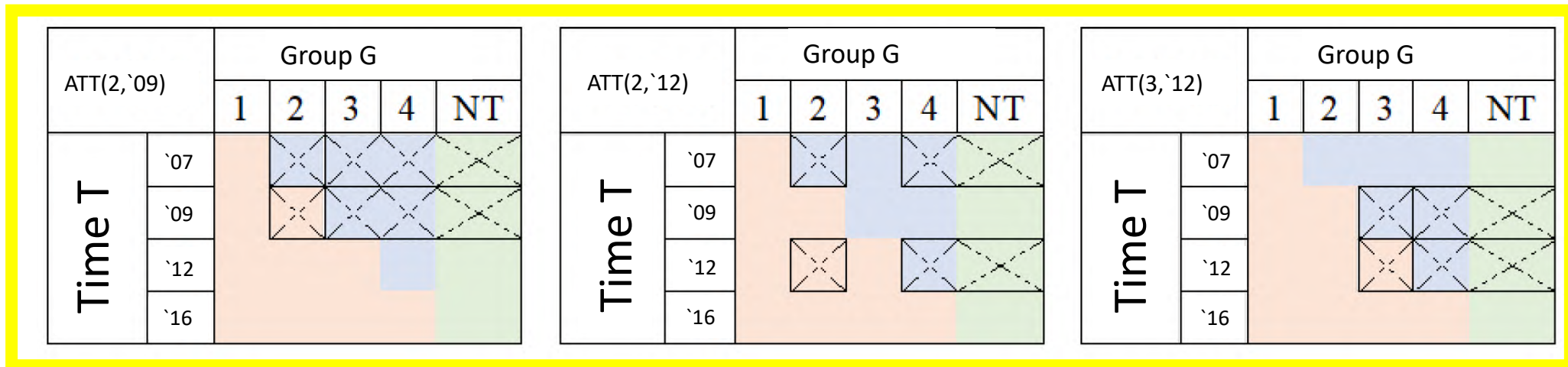
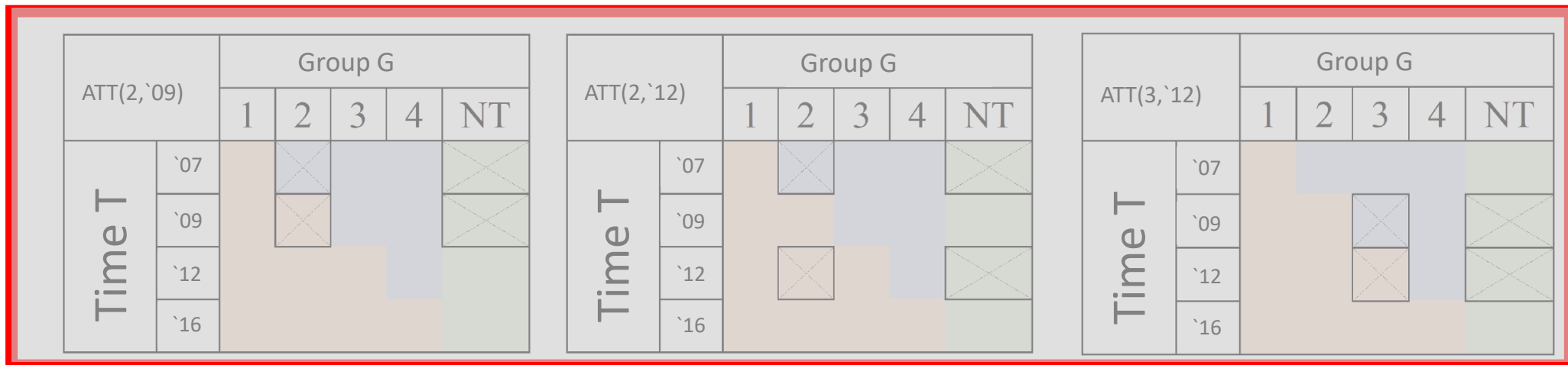
Not-yet Treated added in Comparison Group (1/2)

(Callaway and Sant'Anna, 2021)



Not-yet Treated added in Comparison Group (2/2)

(Callaway and Sant'Anna, 2021)



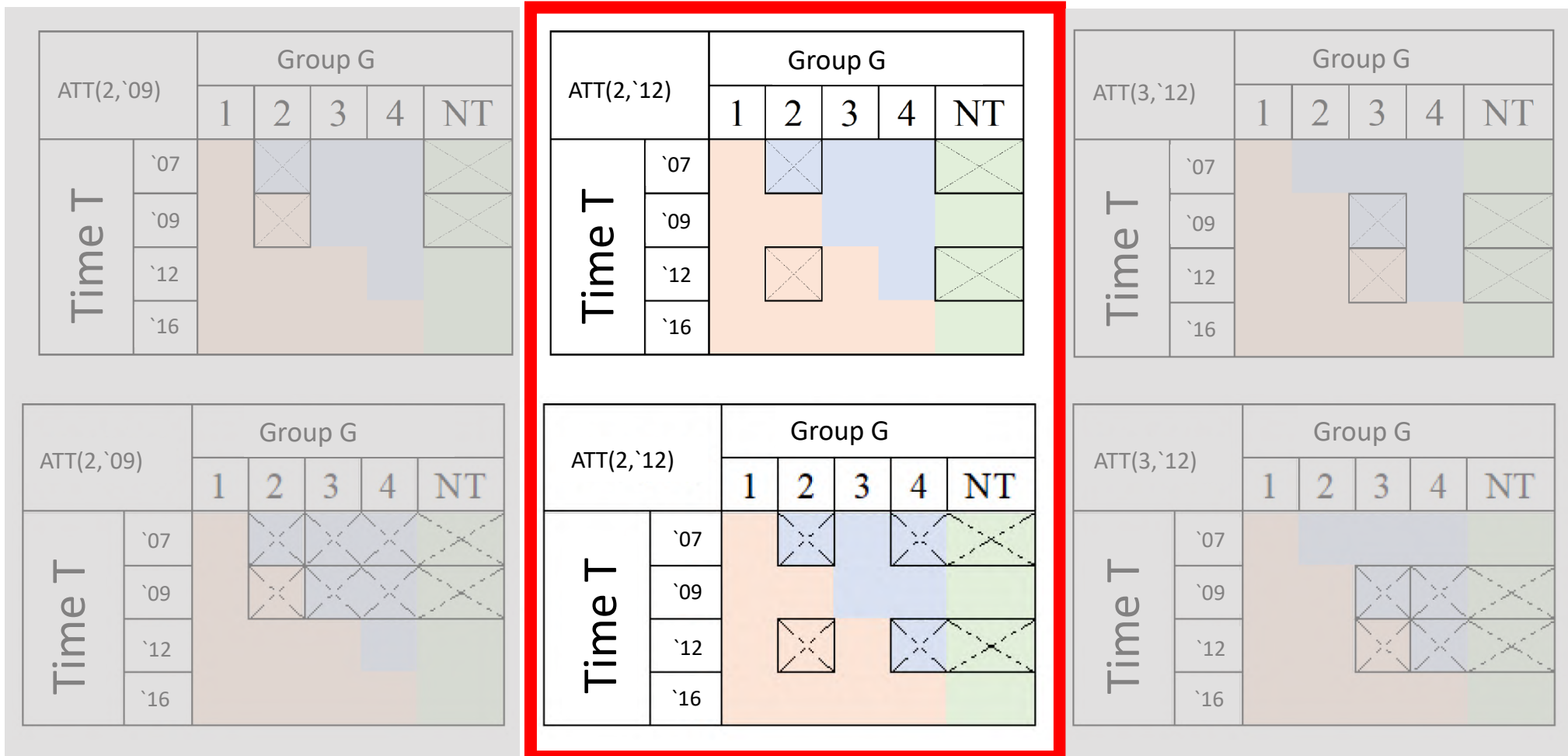
Not-yet Treated added in Comparison Group (1/3)

(Callaway and Sant'Anna, 2021)



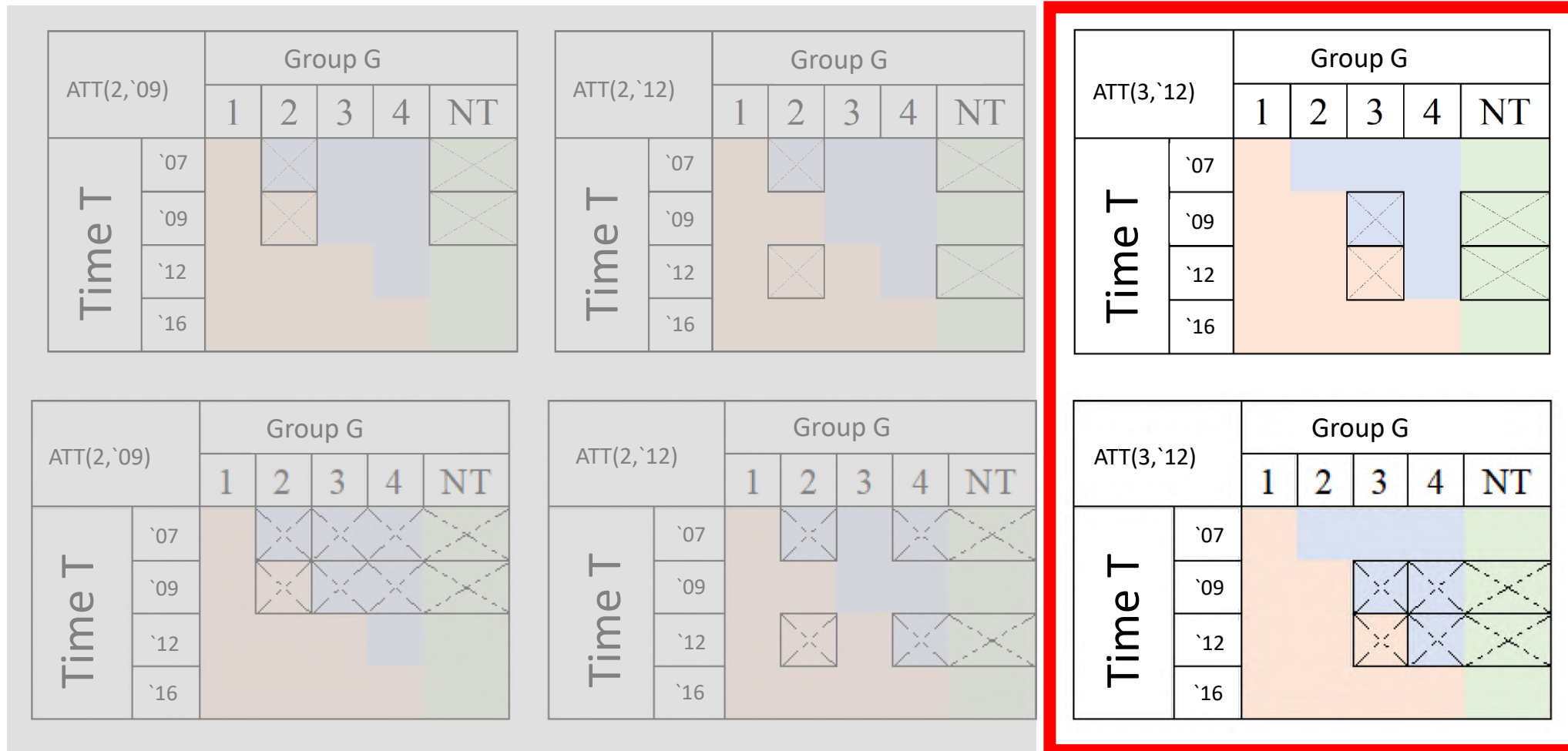
Not-yet Treated added in Comparison Group (2/3)

(Callaway and Sant'Anna, 2021)



Not-yet Treated added in Comparison Group (3/3)

(Callaway and Sant'Anna, 2021)



Estimator: CSDID

(Callaway and Sant'Anna, 2021)

		Group G				
		1	2	3	4	NT
ATT(2, '09)						
Time T	'07		X			X
	'09		X			X
	'12					X
	'16					X

		Group G				
		1	2	3	4	NT
ATT(2, '12)						
Time T	'07		X			X
	'09					X
	'12		X			X
	'16					X

		Group G				
		1	2	3	4	NT
ATT(3, '12)						
Time T	'07					X
	'09			X		X
	'12			X		X
	'16					X

		Group G				
		1	2	3	4	NT
ATT(2, '09)						
Time T	'07		X	X	X	X
	'09		X	X	X	X
	'12				X	X
	'16					X

		Group G				
		1	2	3	4	NT
ATT(2, '12)						
Time T	'07		X		X	X
	'09					X
	'12		X		X	X
	'16					X

		Group G				
		1	2	3	4	NT
ATT(3, '12)						
Time T	'07					X
	'09			X	X	X
	'12			X	X	X
	'16					X

Pre-trend tests

(Callaway and Sant'Anna, 2021)

		Group G				
		1	2	3	4	NT
Time T	'07					
	'09					
	'12					
	'16					

		Group G				
		1	2	3	4	NT
Time T	'07					
	'09					
	'12					
	'16					

		Group G				
		1	2	3	4	NT
Time T	'07					
	'09					
	'12					
	'16					

Outcome variables

Input additionality

R&D expenditures

R&D intensity

Output additionality

Total employment

R&D employment

Wage (Total employees)

Wage (R&D employees – total and %)

Sales

Exports

Labor productivity (sales per employee)

Financial structure

Financial performance

Profit

Revenue

Treatment variables

Agency	Program	Type
ACOA	Business Development Program	Non-repayable contributions
CANNOR	SINED	Non-repayable contributions
NRC	IRAP	Non-repayable contributions Advisory services
GAC	Going global	Non-repayable contributions
	Can Export	Non-repayable contributions
	CIIP	Non-repayable contributions
NSERC	CRD	
	IEG	

Control variables

Proxies for knowledge stock

Cumulative experience (years of being awarded)

Allowable SR&ED (dummy)

Capital opacity

Financial standing

Cash slack

Firm general characteristics

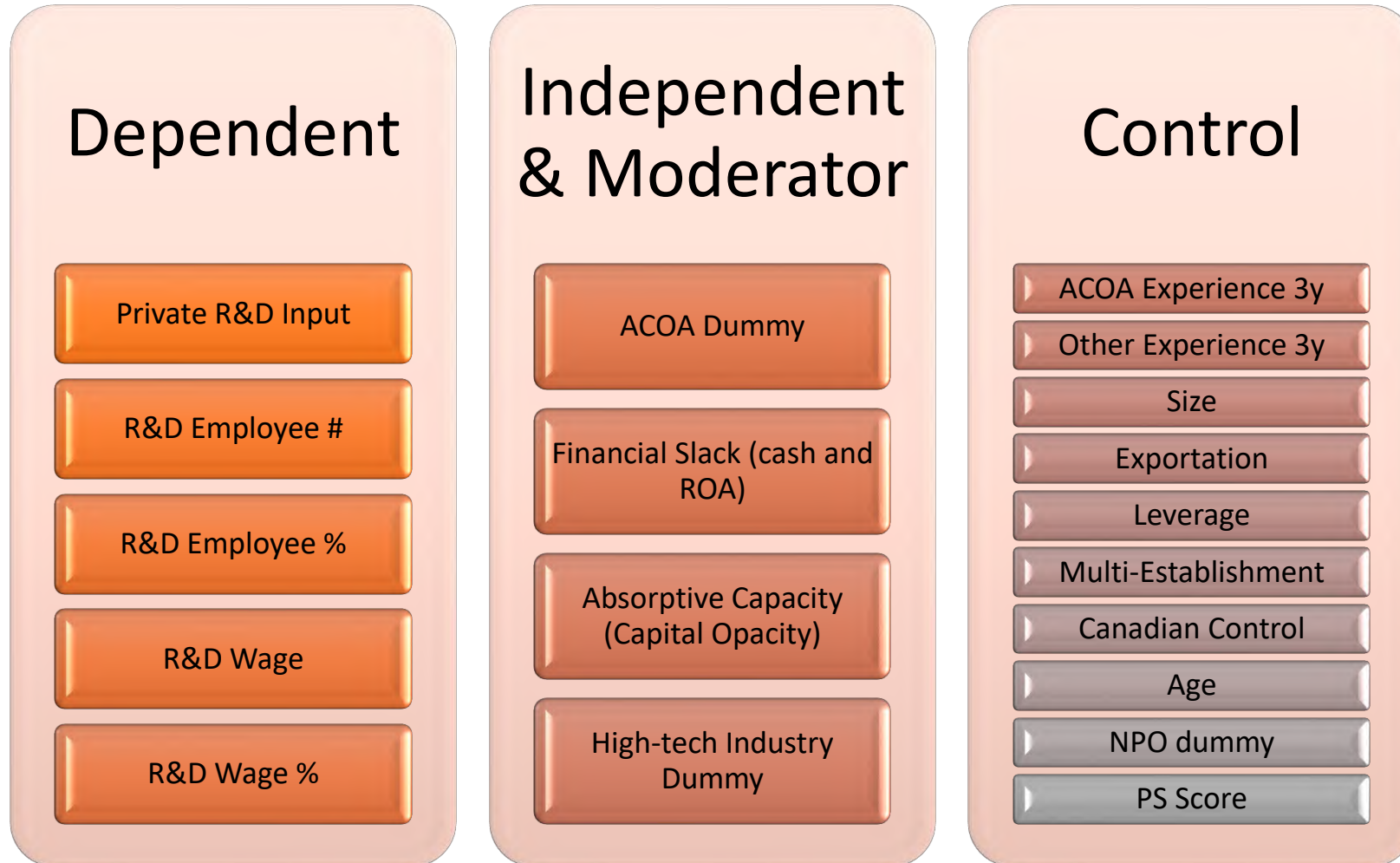
Medium-high tech


Multi establishment

Country of control

Size

Input Additionality ACOA-BDP - Variables





Thanks for your
attention

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