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Do export promotion programs work? An evaluation with sequences of multiple treatments

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Warning

This research work is ongoing.

This presentation contains preliminary results which might be subject to changes in the near future.

Export promotion programs (EPP)

Usual tool of enterprise policy worldwide, additional to custom and exchange-rate policies

Economic theory: selling abroad involves sunk costs and only the “better” firms (efficient or productive) are able to overcome these entry barriers and export successfully (Clerides et al., 1998; Bernard and Jensen, 1999; Melitz, 2003)

Policy Rationale: compensate a number of possible deficiencies of firms in terms of information, know-how, business linkages or finance → very important for SMEs

They stimulate participation in / receipt of / set up of:

- ❑ international fairs
- ❑ trade missions with B2B meetings
- ❑ specialized consultancies
- ❑ temporary sale outlets
- ❑ subsidies, …

It makes sense that firms willing to enter a new market may need more than one type of support, or also repeated support

Previous literature (1)

Unlike other enterprise policies (e.g. R&D or investment subsidies), empirical analyses on EPP are rather uncommon.

Their evidence is negative when supports are viewed in a (too) generic way.
For example:

❑ Bernard & Jensen (2004), export promotion expenditures at the US state level → weak influence on firms' export decisions

❑ Görg et al (2008) analyze (DID) the effects of generic public grants on firm exports in Ireland, with no specific focus on EP supports → no effect for non exporters, positive effect for exporters with larger subsidies

❑ Girma et al. (2009) analyze (matching) the effects of generic production subsidies on firm exports in Germany → no effect for non exporters, weak effect on exporters

[continues…]

Previous literature (2)

When the focus on export supports is more precise, benefits start to arise.

❑ Spence (2003), overseas trade missions in the UK → if repeated, contribute to the generation of incremental exports by enhancing the relationship between business partners

In a series or work on Latin American countries Martincus & Carballo (MC) analyze the impact of export assistance provided by agencies and make the distinction between two outcomes: size of trade flows (intensive margin); new markets or new products (extensive margin). Their findings suggest that EPP…

❑ are overall beneficial for smaller firms (MC, 2010/ Chile; Martincus et al., 2010/ Argentina)
❑ are overall more effective on the extensive than on the intensive margin (MC, 2008/ Peru and 2010/ Uruguay; Martincus et al., 2010b/ Argentina)
❑ bundled services combining counselling, trade agenda, and trade missions and fairs are more effective than isolated assistance actions (MC, 2010/ Colombia)

According to more "descriptive" contributions, especially from business and marketing research, export assistance is beneficial with regard to the formation of marketing competencies and export strategies (Francis & Collins-Dodd, 2004/ Canada; Wilkinson and Brouthers, 2006/ US), but supports are not all the same (Alvarez, 2004/ Chile).

Novelty of this work

We build on the approach of Martincus & Carballo (2010/ Colombia).

Not only we are interested in:

❑ estimating the causal effects of alternative export supports (fairs, B2B, consultancies, subsidies)
❑ establish whether and how they should be provided in a bundled way

Since the provision of different supports occurs not only simultaneously (as in MC, 2010/ Colombia) and it is common that firms take sequences of supports in time, we are also interested in:

❑ estimating the causal effects of receiving sequences of supports

Once firms repeatedly receive (potentially different) exports supports, we should be able to disentangle what has really affected their outcome at a particular time point. This issue is particularly relevant in our paper, since we are interested in

❑ the timing of causal effects, not only simultaneous ones but also after 1, 2, 3, … years

Outcomes of interest and Data

We reconstruct firm-level export flows based on custom declarations.
Our outcomes variables are:

- ❑ the value of non European firm exports
- ❑ the number of non European market served
- ❑ the number of products exported in non European markets

The focus will be on variations and not on levels. This differences-in-difference approach enables us to get rid of firm fixed effects.

We analyse all export promotion programs for SMEs implemented in Tuscany (Italy) in the period 2006-2012. They consist of:

- ❑ Specific supports (fairs, B2B, consultancies) offered by the local export promotion agency (Toscana Promozione)
- ❑ a program of the regional Government offering export grants that firms could use for a series of goals, including those above mentioned, but unfortunately we are not able to know how they actually used them

In addition to beneficiaries of supports, we are also interested in analyzing a set of never-treated firms. This set is selected by means of matched sampling techniques (Rosenbaum and Rubin, 1985) based on pre-2006 covariates, so that we obtain a never-treated twin for each firm that will receive support in the future.

Descriptive statistics

The 4 supports can be repeated in time and can be assigned simultaneously. Thus, we have 16 possible combinations of supports (only 11 observed).

Fair	B2B	Consultancy	Subsidy	Frequency
0	0	0	0	8746
1	0	0	0	465
0	1	0	0	536
0	0	1	0	1027
0	0	0	1	465
1	1	0	0	69
1	0	1	0	57
0	1	1	0	68
1	0	0	1	48
0	1	0	1	30
0	0	1	1	32
1	1	1	0	0
1	1	0	1	0
1	0	1	1	0
0	1	1	1	0
1	1	1	1	0

We have 1649 firms that receive al least one support in the period 2006-2012 (7 years).

N. repetitions	0	1	2	3	4+
Fair	1323	237	44	22	16
B2B	1241	300	74	23	4
Consultancy	835	649	121	21	16
Fair & B2B	1574	62	5	0	1
Fair & Consultancy	1570	63	6	3	0
B2B & Consultancy	1562	73	4	2	1
Subsidy	1259	309	66	8	-
Fair & Subsidy	1592	45	5	0	0
B2B & Subsidy	1612	29	1	0	0
Consultancy & Subsidy	1602	36	4	0	0

Firms by export experience: **habitually non EU 68%, occasionally non EU 14%**, only EU 5%, only domestic 13%

Marginal structural models (1)

Unfortunately, the complexity of our goals cannot be easily addressed by means of a non parametric, matched differences-in-difference approach as, for example, in Martincus & Carballo (2010/ Colombia). Some model structure is required.

Longitudinal settings with sequential treatments in which treatments (A), covariates (L) and outcomes (Y) are measured repeatedly over time pose a challenge to causal inference…

…need to control for dynamic confounders, i.e., variables that are affected by past treatment and that affect future treatment assignment in the sequence.

Using the potential outcomes framework in longitudinal settings, some assumptions are usually made.

Stable unit-treatment value assumption: the potential values of outcome and covariates for each unit are only functions of its own treatment history up to that point in time.

Sequential ignorability (unconfoundedness) assumption: the treatment assignment of unit i at time k is exogenous given the treatment and covariate history of the same unit up to that time point.

Marginal structural models MSM (2)

Under the previous assumptions, treatment effects can be consistently estimated with a MSM (Robins et al. 2000).

MSM do not require to model the relation of the outcome to the confounders, but instead they require to specify the relation of the confounders to the selection /assignment process

Estimation occurs in two stages :

(1)
Being a propensity-score-based methodology, a MSM requires to specify the relation of the confounders to the treatment A, which is synthesized by the weights.

(2)
Relying on inverse-probability-of-treatment weighting (IPTW) in order to adjust for time-dependent observed confounders, treatment effect estimation is carried out by means of a weighted regression.

Construction of the weights (1)

IPTW are the inverse of the probability of having one's own treatment history, conditional on past time-varying covariates $\bar{L}$, which include baseline covariates V and past outcomes, and previous treatments $\bar{A}$.

This is a longitudinal propensity score

$$w_i(t) = \prod_{k=0}^{t} \frac{1}{f\{A(k) = a_i(k) | \bar{A}(k-1) = \bar{a}_i(k-1), \bar{L}(k) = \bar{l}_i(k)\}}$$

A stabilized version of the weights is preferable due to its small variance and narrower confidence intervals (Hernan et al, 2000; Robins et al. 2000).

$$sw_i(t) = \prod_{k=0}^{t} \frac{f\{A(k) = a_i(k) | \bar{A}(k-1) = \bar{a}_i(k-1), V = v_i\}}{f\{A(k) = a_i(k) | \bar{A}(k-1) = \bar{a}_i(k-1), \bar{L}(k) = \bar{l}_i(k)\}}$$

MSMs may be sensitive to model misspecification of the treatment assignment mechanism, resulting in poorly balanced PSs and, thus, in extreme weights.

It is difficult to obtain reliable estimates of the treatment effects, when some groups of the target population have characteristics that make them very unlikely to experience a given sequence of treatments. Therefore, common support and covariate balance issues should be accurately checked for, which is not always done in the IPTW literature (Lechner, Imai and Ratkovic, 2013).

Construction of the weights (2)

Since, at each point in time, we have multiple alternative treatments (4) which can be combined with each other, we estimate our propensity scores with a multinomial model, assuming each possible combination of treatment as a treatment per se (Lechner, 2001).

Variables included in the multinomial model

Treatment History (all years)

Baseline covariates V (pre-treatment)

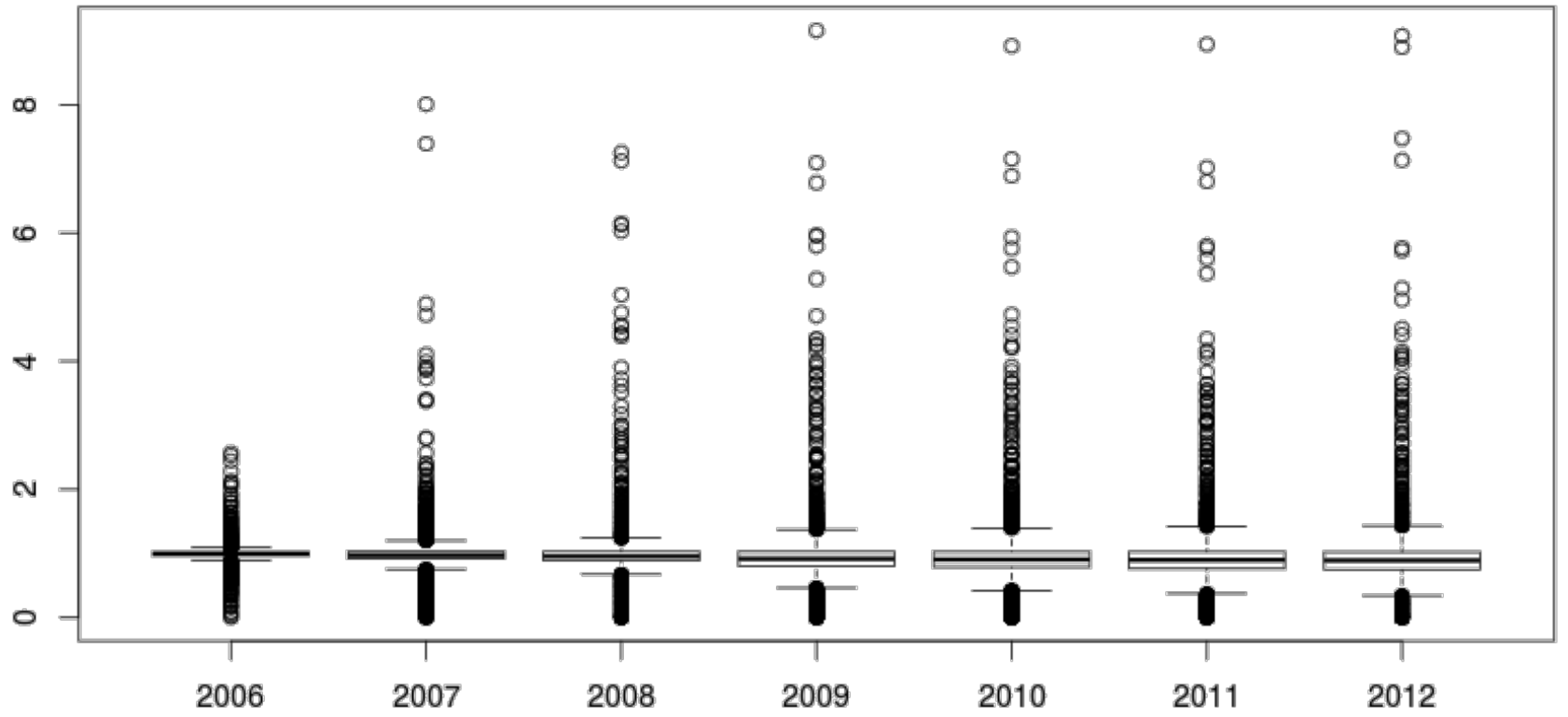
- Sector of activity (Food, Fashion, Jewellery, Machinery, Furniture, Other manif., Retail)
- Non European export history (No experience, Occasional, Habitual, Only EU exporter)
- Artisan or Industrial firm
- Legal form
- Age

Time-varying covariates L (included for 3 years)

- Number of employees
- Annual revenue (in class)
- Value of European exports, Number of products exported in Europe and Number of European market served in the previous year
- Value of non European exports, Number of products exported outside Europe and Number of non European market served in the previous year

The distribution of weights

After checking for common support and covariate balance, we exclude histories that are too unlikely and obtain the weights below:



Now we need to specify models linking outcomes to treatments (treatment histories) and estimate them by means of weighted regressions

The models (1)

- Several model specifications considered
- The outcomes variables are expressed as differences: $DY_{i,t} = Y_{i,t} - Y_{i,t-1}$
- We use the following model (the same for the 3 outcomes variables) for the analysis of simultaneous and lagged effects (1, 2, 3 years)

$$DY_{i,t+k} = \beta_0 + \beta_1 A^F_{i,t} + \beta_2 A^B_{i,t} + \beta_3 A^C_{i,t} + \beta_4 A^S_{i,t} + \beta_5 \left[A^F_{i,t} * A^B_{i,t}\right] + \beta_6 \left[A^F_{i,t} * A^C_{i,t}\right] + \\ + \beta_7 \left[A^B_{i,t} * A^C_{i,t}\right] + \beta_8 Y^M_{i,0} + \beta_9 Y^P_{i,0} + \beta_{10} Y^V_{i,0} \qquad \text{with} \quad k = 0,1,2,3$$

estimated by WLS with the corresponding weights $sw_i(t+k)$

- The interaction terms with $A^S_{i,t}$ are not included due to the vague specification of the "subsidy" treatment.

The models (2)

- In addition, as we are interested in the overall effect of receiving sequences of supports, we model the outcomes in 2012 (as difference $DY_{i,2012} = Y_{i,2012} - Y_{i,0}$) as function of the cumulative sum of each treatment or pairs of treatments :

$$C_i^F = \sum_{t=2006}^{2012} A_{i,t}^F, \quad C_i^B = \sum_{t=2006}^{2012} A_{i,t}^B, \quad C_i^C = \sum_{t=2006}^{2012} A_{i,t}^C, \quad C_i^S = \sum_{t=2006}^{2012} A_{i,t}^S,$$
$$C_i^{FB} = \sum_{t=2006}^{2012} (A_{i,t}^F * A_{i,t}^B), \; C_i^{FC} = \sum_{t=2006}^{2012} (A_{i,t}^F * A_{i,t}^C), \; C_i^{BC} = \sum_{t=2006}^{2012} (A_{i,t}^B * A_{i,t}^C),$$

- The final model uses a dummy variable for each sequence of treatments considered.

$$\begin{aligned} DY_{i,2012} = {} & \beta_0 + \beta_1 I\left[C_i^F = 1\right] + \beta_2 I\left[C_i^F = 2\right] + \beta_3 I\left[C_i^F = 3\right] + \beta_4 I\left[C_i^F \geq 4\right] + \beta_5 I\left[C_i^B = 1\right] \\ & + \beta_6 I\left[C_i^B = 2\right] + \beta_7 I\left[C_i^B = 3\right] + \beta_8 I\left[C_i^B \geq 4\right] + \beta_9 I\left[C_i^C = 1\right] + \beta_{10} I\left[C_i^C = 2\right] \\ & + \beta_{11} I\left[C_i^C = 3\right] + \beta_{12} I\left[C_i^C \geq 4\right] + \beta_{13} I\left[C_i^S = 1\right] + \beta_{14} I\left[C_i^S = 2\right] + \beta_{15} I\left[C_i^S = 3\right] \\ & + \beta_{16} I\left[C_i^{FB} = 1\right] + \beta_{17} I\left[C_i^{FB} \geq 2\right] + \beta_{18} I\left[C_i^{FC} = 1\right] + \beta_{19} I\left[C_i^{FC} \geq 2\right] + \beta_{20} I\left[C_i^{BC} = 1\right] \\ & + \beta_{21} I\left[C_i^{BC} \geq 2\right] + \beta_{22} Y_{i,0}^M + \beta_{23} Y_{i,0}^P + \beta_{24} Y_{i,0}^V \end{aligned}$$

estimated by WLS with the corresponding weights $sw_i(2012)$.

Results (1)

Average causal effects on the number of non European market served (in difference)
On the year of treatment (t+0), one year later (t+1) and two years later (t+2)

	t+0		***t+1***		***t+2***	
	coeff.	***p-value***	**coeff.**	***p-value***	**coeff.**	***p-value***
Fair	**0.32**	*0.00*	-0.15	*0.26*	-0.08	*0.60*
B2B	0.03	*0.84*	**0.36**	*0.02*	-0.18	*0.21*
Consultancy	**0.21**	*0.01*	0.00	*0.96*	-0.08	*0.36*
Subsidy	**-0.34**	*0.03*	**0.99**	*0.00*	-0.26	*0.10*
Fair & B2B	-0.73	*0.06*	-0.27	*0.67*	0.40	*0.54*
Fair & Consultancy	0.49	*0.18*	-0.08	*0.87*	0.33	*0.50*
B2B & Consultancy	0.23	*0.45*	0.05	*0.90*	0.18	*0.74*

Average causal effects on the number of product exported in non European market (in difference). On the year of treatment (t+0), one year later (t+1) and two years later (t+2)

	t+0		***t+1***		***t+2***	
	coeff.	***p-value***	**coeff.**	***p-value***	**coeff.**	***p-value***
Fair	0.39	*0.09*	0.20	*0.47*	-0.33	*0.20*
B2B	0.03	*0.88*	**0.54**	*0.01*	0.02	*0.94*
Consultancy	0.18	*0.18*	0.13	*0.47*	-0.23	*0.21*
Subsidy	**-0.94**	*0.00*	**1.27**	*0.00*	-0.38	*0.28*
Fair & B2B	-1.77	*0.19*	-0.36	*0.67*	0.49	*0.65*
Fair & Consultancy	0.84	*0.23*	-0.41	*0.53*	0.14	*0.81*
B2B & Consultancy	0.36	*0.55*	0.20	*0.84*	-0.73	*0.38*

Results (2)

Average causal effects of sequences of treatments on the number of non European market served at the end of the period (in difference 2012-2005)

	1		*2*		*3*		*4 +*	
	coeff.	***p-value***	**coeff.**	***p-value***	**coeff.**	***p-value***	**coeff.**	***p-value***
Fair	0.22	*0.50*	0.19	*0.77*	**2.76**	*0.01*	1.75	*0.08*
B2B	0.54	*0.07*	**1.70**	*0.00*	**3.52**	*0.00*	3.98	*0.10*
Consultancy	**0.62**	*0.00*	**1.72**	*0.00*	0.61	*0.55*	**2.16**	*0.04*
Subsidy	**1.51**	*0.00*	**4.04**	*0.00*	2.87	*0.09*	-	-
Fair & B2B	-0.20	*0.77*	1.35	*0.57*				
Fair & Consultancy	-0.96	*0.13*	**3.79**	*0.02*				
B2B & Consultancy	**1.24**	*0.04*	**4.73**	*0.05*				

Average causal effects of sequences of treatments on the number of product exported in non European markets at the end of the period (in difference 2012-2005)

	1		*2*		*3*		*4 +*	
	coeff.	***p-value***	**coeff.**	***p-value***	**coeff.**	***p-value***	**coeff.**	***p-value***
Fair	0.67	*0.23*	1.71	*0.13*	1.00	*0.55*	**3.36**	*0.04*
B2B	0.45	*0.35*	0.72	*0.46*	2.40	*0.13*	3.05	*0.44*
Consultancy	**0.97**	*0.01*	**2.62**	*0.00*	-0.56	*0.74*	0.66	*0.71*
Subsidy	**2.57**	*0.00*	**3.24**	*0.00*	0.18	*0.95*	-	-
Fair & B2B	0.00	*1.00*	5.02	*0.20*				
Fair & Consultancy	0.79	*0.46*	-3.25	*0.24*				
B2B & Consultancy	-0.50	*0.63*	3.37	*0.40*				

Some final remarks

Effects on what

- Supports have positive effects on the extensive rather than on the intensive margin. Increase in markets and in the array of products exported suggests a diversification of markets and / or exported products, but not necessarily implying a significant growth in aggregate export flows.

Effects of what and when (remember: the majority of our firms were already exporters)

- Immediate benefits from isolated participation in trade fairs or from the receipt of specialized consultancies
- B2B/trade agendas services are less effective than what expected and tend to work in the short run, although perhaps at a later stage than fairs and consultancies
- Subsidies seems to generate a sort of lock in situation, with an immediate disadvantage and a positive effect arising a year later.

Overall, we observe a short period effect of the supports: after a first increase in markets or exported products, firms do not experience further growth at a later stage.

Bundled supports

- If received one spot, they do not help much. At least no more than isolated supports.

Sequences of supports

- The more supports the higher the increase in markets or in the variety of exported goods.

It makes sense to imagine public export assistance in a way that it enduringly accompanies firms in implementing their strategies in time.

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Thank You!

Comments and suggestions are very welcome!

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