IRPET Istituto Regionale Programmazione Economica della Toscana

Assessing the effects of a deliberate policy mix: the case of innovation vouchers and technology and innovation advisory services

Marco Mariani

Joint work with Annalisa Caloffi, Marzia Freo, Stefano Ghinoi, Federica Rossi

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The policy problem

- Firms, and SMEs in particular, often need external knowledge and competencies to complement their internal ones → some policies provide vouchers/aids to purchase of knowledge intensive external services (OECD, 2000; Storey, 2003; IEG, 2013)
- Are these vouchers effective? Mixed results
- Actually, these policies address obstacles of financial nature. The idea is that firms are able to formulate a demand for knowledge-intensive services
- Is this idea too optimistic? Not necessarily true for SMEs (Muller and Zenker, 2001; Bougrain and Haudeville, 2002)

SMEs might need to increase awareness of their needs before purchasing specific services/consultancies in the market.

Knowledge/technology check-ups provided by ad hoc advisors may help make the right choices

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Our contribution

- we contribute to the comparative analysis of innovation policies by looking at innovation vouchers and innovation and technology advisory services (Howells, 2006; Cunningham et al., 2016)

- we perform an analysis of a deliberate policy mix (Flanagan et al, 2011): we examine whether bundling the two instruments is useful for SMEs

The policy scheme

- Many Italian regions provide small aids for the purchase of specialized services (**innovation vouchers/aids**)
- **Advisory services** can be provided by various agents, including **Innovation intermediaries**. We look at advisory services provided by innovation poles, created in the programming period 2007-2013 in several Italian regions to support innovation in SMEs.
- Focus on Tuscany, where the two programs may be used by firms singularly or in a mix (**advices+voucher**). The mix was encouraged by slightly higher vouchers (% of cost)
  - SMEs that become member of a pole (free membership) get (for free) a knowledge and technology check-up that help them identify their needs and how to satisfy them. Poles' members get a special subsidy for the purchase of specialized services (up to 80% of the cost of the service)
    Firms can also opt for a single treatment

Data

- Sample of 515 treated units to be surveyed, stratified by treatment level, from an initial population of about 3,000 manufacturing firms participating 2011-2014 in either of the two programmes

		Advisory	
		Yes	No
Voucher	Yes	128	194
	No	193	--

- SMEs that are not taking part to other policies and do not make use of external services
- Administrative records + AIDA Bureau van Dijk + interviews to collect pre- and post-treatment information on innovation-related aspects

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Methodology

- Three treatment levels: $W_i \in \mathbb{W} = \{v, a, m\}$
- Potential outcomes for each *i*: $Y_i(v)$, $Y_i(a)$, $Y_i(m)$, only one is observed
- Estimand of interest: for each pair of treatment levels *w, w'*

  $ATE_{w,w'} = E(Y_i(w)) - E(Y_i(w'))$
- Identification under the assumption of weak unconfoundedness (Imbens, 2000)
- Generalization of PSM to the case of multiple treatments (Lechner, 2002a; Yang et al., 2016)
- Covariate balance guaranteed through CBPS (Imai and Ratkovic, 2014), then nearest-neighbor matching to find, for each firm, the triplet of potential outcomes $Y_i(v)$, $Y_i(a)$, $Y_i(m)$

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Outcomes and covariates

- **Outcome variables**: internal R&D (1/0); R&D collaborations (1/0); innovations (1/0); increased awareness of technological (1/0) and human capital needs (1/0); improved capabilities to identify potential partners(1/0) and design R&D products (1/0); labour productivity (VA/employees, Th€)) in +1 and +2; sales (Th€) in +1 and +2; employees (N) in +1 and +2.

- **Calculation of the PS**: lagged values of outcome vars (in -1 and -2), age, NACE sector, location

A look at covariates (pre-intervention)

	Mix	Advisory s.	Voucher	Mix vs. Advisory	Mix vs. Voucher	Advisory vs. Voucher
	Means			Absolute Difference of Standardized Means		
Internal R&D (1/0)	0.445	0.440	0.397	0.010	0.098	0.088
R&D employees (N.)	2.281	1.865	1.706	0.115	0.160	0.044
R&D collaborations (1/0)	0.383	0.347	0.289	0.076	0.199	0.124
VA/employees	62.8	106.7	52.0	0.271	0.067	0.338
Ln(Total revenues)	7.6	7.2	7.5	0.266	0.054	0.213
Employees (n)	27.7	34.5	22.3	0.075	0.060	0.135
Patents (n)	0.242	0.155	0.186	0.222	0.145	0.077

MIX: firms were … more productive and leaned towards innovation, with higher turnover

VOUCHER: … less productive, less innovative, with lower turnover

ADVISORY SERVICE: … less productive, less innovative than those under the mix, but larger and more productive than those under the voucher

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Results – Full sample

OUTCOME VARIABLE	Time	Mix vs. Advice			Mix vs. Voucher			Advice vs. Voucher		
		ATE(M,A)		S.E.	ATE(M,V)		S.E.	ATE(A,V)		S.E.
Internal R&D (1/0)	+1	0.126		0.09	0.035		0.093	-0.091		0.082
R&D collaborations (1/0)	+1	-0.027		0.09	0.470	***	0.086	0.497	***	0.077
Innovations (1/0)	+1	0.132		0.11	0.317	***	0.104	0.184	**	0.085
Improved capabilities:										
- to design R&D projects (1/0)	+1	0.097		0.09	0.140		0.097	0.043		0.087
- to identify potential partners (1/0)	+1	0.002		0.07	0.266	***	0.089	0.264	***	0.077
Improved awareness:										
- of technological needs (1/0)	+1	0.000		0.08	-0.043		0.072	-0.043		0.064
- of human capital needs (1/0)	+1	0.023		0.06	-0.014		0.069	-0.037		0.057
Employees	+1	3.1		8.7	2.8		7.4	-0.3		6.9
Total revenues (Th. Euros)	+1	2456		3986	2406		4020	-50		1222
	+2	4116		4212	-979		6392	-5096		5111
Value added per empl. (Th. Euros)	+1	15.1		35.7	41.3		36.0	26.2		18.7
	+2	94.1	**	42.5	94.5	**	42.2	0.5		7.2

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Results – Full sample

- In general, M performs better than V on some outcomes, but its superiority to the advisory service is more questionable

- **M better than V and A when the outcome is value added per employee at time +2** → it takes some time, but the mix leads to an internal reorganisation that improves productivity (no effects on revenues or employees)

- **M is superior to V, but not necessarily to A, when the outcomes are R&D collaborations, innovation, and the capability to identify potential partners** → this result probably also depends on the fact that the advice is provided by an innovation intermediary. These organisations evidently manage to provide advices that underline the potential benefits of external collaborations which, in the case of SMEs, may act as innovation drivers

Results – Subsamples

NON-R&D PERFORMERS (n = 238)	Time	Mix vs. Advice ATE(M,A)		S.E.	Mix vs. Voucher ATE(M,V)		S.E.	Advice vs. Voucher ATE(A,V)		S.E.
Internal R&D	+1	0.197	*	0.11	0.130		0.102	-0.067		0.083
R&D collaborations	+1	0.042		0.08	0.605	***	0.086	0.563	***	0.069
Innovations	+1	0.118		0.13	0.206	*	0.124	0.088		0.087
Improved capabilities:										
- to design R&D projects	+1	0.168	*	0.10	0.189	*	0.113	0.021		0.093
- to identify potential partners	+1	-0.013		0.08	0.197	**	0.101	0.210	***	0.080
Improved awareness:										
- of technological needs	+1	-0.034		0.09	-0.118		0.089	-0.084		0.065
- of human capital needs	+1	0.000		0.08	-0.076		0.088	-0.076		0.061
Employees	+1	4.1		10.7	-2.0		9.6	-6.2		8.4
	+2									
Total revenues	+1	4926		5750	5029		5759	104		988
	+2	7461		5979	-838		8329	-8299		6150
Value added per employee	+1	42.7		44.1	85.8	*	45.9	43.1	**	20.1
	+2	151.2	**	59.6	153.3	***	59.3	2.0		8.9
R&D PERFORMERS (n = 277)	Time	Mix vs. Advice ATE(M,A)		S.E.	Mix vs. Voucher ATE(M,V)		S.E.	Advice vs. Voucher ATE(A,V)		S.E.
Internal R&D	+1	0.065		0.08	-0.047		0.085	-0.112		0.081
R&D collaborations	+1	-0.087		0.10	0.354	***	0.087	0.440	***	0.083
Innovations	+1	0.144		0.09	0.412	***	0.085	0.267	***	0.084
Improved capabilities:										
- to design R&D projects	+1	0.036		0.08	0.097		0.081	0.061		0.081
- to identify potential partners	+1	0.014		0.06	0.325	***	0.079	0.310	***	0.074
Improved awareness:										
- of technological needs	+1	0.029		0.06	0.022		0.053	-0.007		0.063
- of human capital needs	+1	0.043		0.04	0.040		0.047	-0.004		0.054
Employees	+1	2.2		6.4	6.9		5.0	4.8		5.3
	+2									
Total revenues	+1	334		1097	153		1271	-181		1394
	+2	1243		1530	-1100		4065	-2343		4022
Value added per employee	+1	-8.7		26.5	3.0		24.7	11.7		17.4
	+2	44.9	**	17.7	44.1	**	17.5	-0.8		5.3

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Results – Subsamples

- The results found in the subsample of R&D-performers are fully in line with the general results discussed earlier. As for non-R&D performers, we also find:
  - **M is superior to both A and V when the outcome is the improved capability to design R&D projects**. This suggests that, to upgrade this capability, SMEs may require an adequate combination of expert advices and targeted external services.
  - **M is more effective than A, but not necessarily than V in increasing the probability that SMEs begin to invest in internal R&D** → the start of internal R&D activities might require the use of some external skills

Conclusion

- ✓ A policy maker willing to support innovation in SMEs should prioritise the financing of the activity of knowledge and technology advisors. This point is relevant because advisory services, unlike the specialised innovation services that can be bought using the voucher, do not have a clear market demand

- ✓ Although advisory services should be prioritised, a voucher easing the access to external services can be fruitfully bundled with the advice to help SMEs translate new innovation strategies into practice and to draw productivity gains from such strategies

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Thank you for your attention

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